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Target OPC Process - Implementation document

Version 1.0 Project

Group OPC

6th December, 2017

Contents

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Document history

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Related document

Version	Date	Documents
1.0	29.03.2016	Coordinated Outage Planning Process, March 2016
1.0	28.04.2016	OPC intermediate business process, April 2016
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Glossary

TSO	Transmission System Operator
DSO	Distribution System Operator
CDSO	Closed Distribution System Operator
RSC	Regional Security Coordinator
NRA	National Regulatory Authority
OPI	Outage Planning Incompatibilities
OPSC	Outage Planning Security Constraint
OPA	Outage Planning Agent
OCR	Outage Coordination Region
RORA	RSC Outage responsibility area
TLI	Tie-line inconsistency
PAP	Preliminary availability plan
SGU	Significant Grid User
SO GL	Guideline on Transmission System Operation
NC	Network Code
OPS	Operational Planning and Scheduling
OPDE	Operational Planning Data Environment
CCR	Capacity Calculation Region

1. Definitions

In order to better follow the business process and its steps described in this document, the following definitions are provided. The definitions are either directly extracted from SO GL (or other Network Codes) or a result of the decision of OPC Project group (marked with *).

1. **'availability plan'** means the combination of all planned availability statuses of a relevant asset for a given time period;

2. **'availability status'** means the capability of a power generating module, grid element or demand facility to provide a service for a given time period, regardless of whether or not it is in operation;

3. **'contingency list'** means the list of contingencies to be simulated in order to test the compliance with the operational security limits

4. **'contingency case'** * comprise of the following:
   - Monitoring elements – set of network elements that are to be monitored during contingency analyses
   - Simulated outages (Contingency list) – set of network elements that define the outages to be simulated during the contingency analyses.

5. **'constraint'** means a situation in which there is a need to prepare and activate a remedial action in order to respect operational security limits concerning power flows.

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6. **'contingency influence threshold'** means a numerical limit value against which the influence factors are checked and the occurrence of a contingency located outside of the TSO's control area with an influence factor higher than the contingency influence threshold is considered to have a significant impact on the TSO's control area including interconnectors.

7. **'ENTSO for Electricity operational planning data environment'** means the set of application programs and equipment developed in order to allow the storage, exchange and management of the data used for operational planning processes between TSOs;

8. **'forced outage'** means the unplanned removal from service of a relevant asset for any urgent reason that is not under the operational control of the operator of the concerned relevant asset;

9. **'internal relevant asset'** means a relevant asset which is part of a given TSO's control area or a relevant asset located in a distribution system, including a closed distribution system, which is connected directly or indirectly to that TSO's control area;

10. **'internal contingency'** means a contingency within the TSO's control area, including interconnectors;

11. **'external contingency'** means a contingency outside the TSO's control area and excluding interconnectors, with an influence factor higher than the contingency influence threshold;

12. **'outage coordination region'** means a combination of control areas for which TSOs define procedures to monitor and where necessary coordinate the availability status of relevant assets in all timeframes;

13. **'relevant demand facility'** means a demand facility which participates in the outage coordination and the availability status of which influences cross-border operational security;

14. **'relevant asset'** means any relevant demand facility, relevant power generating module, or relevant grid element partaking in the outage coordination;

15. **'relevant grid element'** means any component of a transmission system or of a distribution system, including a closed distribution system, such as a single line, a single circuit, a single transformer, a single phase-shifting transformer, or a voltage compensation installation, which participates in the outage coordination and the availability status of which influences cross-border operational security;

16. **'RSC Regional process description'** refers to the specific OPC Process description which shall define the concrete OPC Process that is implemented within a certain RSC. It is considered a responsibility of the RSC and its depending TSOs to define the operational OPC Process for specific RORA.

17. **'outage planning security constraint'** means the state in which a combination of the availability status of one or more relevant grid elements, relevant power generating modules, and/or relevant demand facilities and the best estimate of the forecasted electricity grid situation leads to violation of operational security limits before taking into account any remedial actions which are at TSO's disposal.

18. **'outage planning incompatibility'** means the state in which a combination of the availability status of one or more relevant grid elements, relevant power generating modules, and/or relevant demand facilities and the best estimate of the forecasted electricity grid situation leads to violation of operational security limits taking into account remedial actions without costs at the TSO's disposal;

19. **'outage planning agent'** means an entity with the task of planning the availability status of a relevant power generating module, a relevant demand facility or a relevant grid element;

20. **'relevant power generating module'** means a power generating module which participates in the outage coordination and the availability status of which influences cross-border operational security;

21. **'regional security coordinator'** means the entity or entities in one or more capacity calculation regions performing tasks related to TSO regional coordination;

22. **'RSC Outage responsibility area'** is defined within one or more Outage coordination regions and consists of the TSOs which are assigned to the respective RSC for the service of coordinated outage planning.

23. **'scheduling agent'** means the entity or entities with the task of providing schedules;

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24. **'scheduling area'** means an area within which the TSOs' obligations regarding scheduling apply due to operational or organisational needs; In order to better follow the business process description and its steps described in this document, the following definitions of introduced terminology are provided.

25. **'tie-line inconsistency'** presents a state in which the difference in outage information, delivered by the TSOs in the Availability plans, is identified in one of the following fields of the used OPC format (given in the Annex): - Outage date and/or time (incl. the missing information from one of the involved parties), -   Case Type
    - Outage type (Daily, Permanently)
    - Fields defining the respective day of the week - *Mon-Fri, Saturday, Sunday*
      - Restitution time - Element type

26. **'internal overlap'** * presents a state in which the TSOs delivered different availability information within one timeframe for one unique internal TSO element (ElementID). In other words, the TSOs may define multiple cases of unavailability (outage) for one element within the same time-frame since these individual cases can refer to different types of planned outages taking into account information provided in the following fields of the defined OPC Format (given in the Annex):
    - Outage date and/or time (incl. the missing information from one of the involved parties), - Case Type
    - Outage type (Daily, Permanently)
    - Fields defining the respective day of the week - *Mon-Fri, Saturday, Sunday*
    - Restitution time

27. **'Capacity Calculation Region'*** The geographic area in which coordinated capacity calculation is applied.

2. Introduction

ENTSO-E Network Code Operational Planning and Scheduling requires TSOs to establish a common medium- and long-term outage planning process based on predefined standards with the following key objectives:

1. ENTSO-E wide harmonization of regionally differing outage planning processes

2. Harmonised data format for data exchange, which shall be an integral part of the ENTSO for Electricity operational planning data environment

TSOs already perform successful Outage Planning activities for areas defined over years of experience, however there is not yet a commonly agreed process, regarding the implementation of the RSCs in outage coordination, to be followed among all ENTSO-E TSOs. Therefore ENTSO-E setup the "TSO coordination strategy implementation with RSCIs" project (Figure 1) with the goal to implement the future TSO coordination strategy as described in the ENTSO Policy Paper released in November 2014.
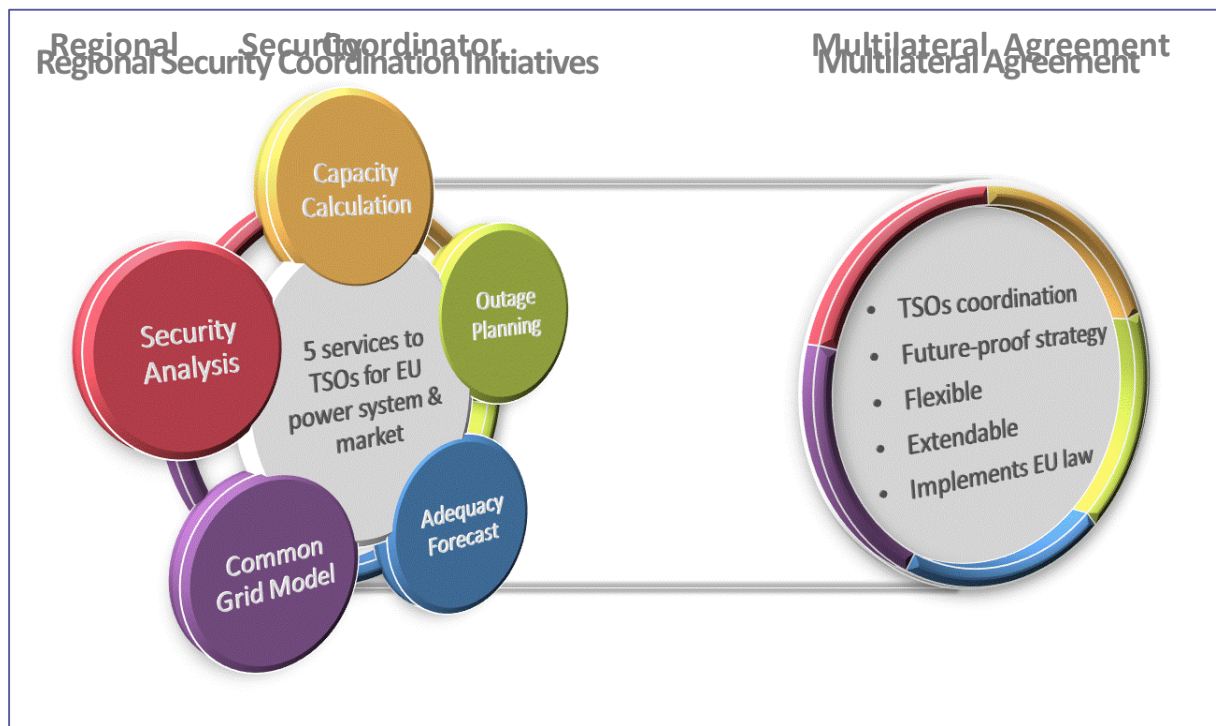
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Figure 1: Standardized 5 services of RSCIs and Multilateral Agreement

It is important to mention that the target business process for the Coordinated Outage Planning Process is already described in the "Coordinated Outage Planning Process" document. All the relevant definitions, requirements from OPS, roles and responsibilities as well as the target business process itself are described in the aforementioned document.

Within this document, the implementation of the Target Outage Planning Coordination (OPC) Process consisting of detailed **Process** description and **Methodology** is provided.

3. High Level Business Process Description

Each TSO participates in the outage planning and coordination in accordance with the principles described in the OPS (SO GL) in order to check the availability status of its relevant assets and coordinate their availability plans to ensure the operational security of the transmission system.

The high level Coordinated Outage Planning Business process consists of the following steps:

    A.   Definition of Outage Coordination Regions and relevant assets

    B.   Development and update of availability plans of relevant assets

    C.   Execution of availability plans

These steps are described in more details in the dedicated document ("Coordinated Outage Planning Process") while this document aims more at describing the detailed implementation of the operational process which is focused mostly on step B, which is also often referred within this document as just *OPC Process* since it mostly concerns operational activities that are to be performed.

Therefore, to avoid any possible misunderstanding that could arise between process descriptions defined in the Highlevel OPC Process description ("Coordinated Outage Planning Process") and the detailed OPC Process & Methodology description ("Implementation document for Target Business process") the following clarifications are given for each of the main steps.

A. Definition of Outage Coordination Regions and relevant assets

According to the Article 80 of the System Operation Guidelines, the Outage Coordination Region (OCR) shall be at least equal to the Capacity Calculation Region (CCR). At the same time, according to the article 77 of the System Operation Guidelines, it is possible that TSOs propose to appoint more than one regional security coordinator for the same CCR (subsequently for the same OCR) as long as the following justifications are provided:

- a proposal for a coherent allocation of the tasks between the regional security coordinators who will be active in that capacity calculation region. The proposal shall take full account of the need to coordinate the different tasks allocated to the regional security coordinators;
- an assessment demonstrating that the proposed setup of regional security coordinators and allocation of tasks is efficient, effective and consistent with the regional coordinated capacity calculation established pursuant to Articles 20 and 21 of Commission Regulation (EU) No 1222/2015[1];
- an effective coordination and decision making process to resolve conflicting positions between regional security coordinators within the capacity calculation region;

In the context of the OPC project and taking into account the current state of the RSCs and their involvement in different CCRs, we consider the following reasonable assumptions:

- In OCRs, where more than one RSC is active, TSOs may appoint more than one RSC
- In case of more than one RSC per OCR, there is an allocation of tasks and areas among the RSCs, meaning that each RSC is responsible for a specific Outage responsibility area (RORA), which is at least equal to the area covered by its TSOs.

Based on the aforementioned the coordination process (RSC-TSO and RSC-RSC) has been defined upon the jurisdiction of the RSCs over a certain area – RORA.   However, the Outage coordination region is still considered in the OPC Process with main goal of mitigating any possible risk of applying unnecessary costly solutions for the identified OPIs. Therefore, the RSC Outage responsibility area (RORA) is mainly introduced in order to ease the implementation and operations of the OPC Process, but without impacting the overall performance of the outage coordination process and its benefit for a certain Capacity calculation region (CCR) / Outage coordination region (OCR).

Based on the description and assumptions stated above, there are three different types of Regions identified within the OPC Process:

- OCR - Outage coordination region
- RORA – RSC Outage responsibility area
- TSO Area

B. Development and update of availability plans of relevant assets – *Operational OPC Process*

Requirements of System Operation Guidelines

According to the Article 92 of the System Operation Guidelines, the availability status of a relevant asset shall be one of the following:

- "available" where the relevant asset is capable of and ready for providing service regardless of whether it is or not in operation
- "unavailable" where the relevant asset is not capable of or ready for providing service
- "testing" where the capability of the relevant asset for providing service is being tested

Within the context of the OPC Format (given in Annex) the aforementioned requirements are fulfilled implicitly in order to provide a better overview of the outage planning to all involved subjects. Therefore, the provision of the Availability plans in the OPC Format consists of two parts:

- Element list (OPC_Element list)– containing all relevant assets of each TSO and allowing the TSOs to select or deselect the element unavailability information which are of their interest. Additionally, non-relevant assets can be defined within the element list as well, in order only to support the possible information exchange on them in accordance with the Article 80., without trigger of the coordination process. [2]

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[1] Guideline on Capacity Allocation and Congestion Management - CACM

[2] The relevant assets shall be defined by the TSOs according to the methodology provided by the PG CSAM.

- Unavailability plans (OPC_UAP) – containing information on all relevant assets which are scheduled to be part of the outage planning process for the respective time-frame (out of operation, testing, special switching state(s)) and selected non-relevant assets.

Taking into account the structure of the Availability plan provided within the OPC Format, the requirements stated in the SO GL are fulfilled according to the following (Table 1):

Table 1. Availability plan representation within OPC Format

SO GL requirement	OPC Format input (Case type)	Brief Description
"unavailable"	Outage (OUT)	Relevant and/or non-relevant asset defined in the Element list is unavailable due to planned maintenance or due to an unplanned/forced outage. This status is represented in the OPC Format by stating the case type of the relevant asset as "OUT" in the Unavailability Plans.
"testing"	Testing (TEST)	Relevant and/or non-relevant asset defined in the Element list is in testing mode. This status applies either between first connection and final commissioning of the relevant asset, or directly following maintenance of the relevant asset. This status is represented in the OPC Format by stating the case type of the relevant asset as "TEST" in the Unavailability Plans.
"available"		Relevant and/or non-relevant asset defined in the Element list is available. This status is represented in the OPC Format in an implicit way since all elements which are not defined in the Unavailability Plans are considered in operation or available.
	Special switching state (SSS)	This state applies to grid elements which are in operation in an exceptional state (e.g. separated nodes operation, Live line working). Current OPC format supports several possibilities of special switching states which can be separately defined within the Format - Auxiliary busbar operation, Automatic reclosing off, Busbar protection off. In case no specific case is defined the status SSS represents any status of the element defined in the Unavailability Plans which is not OUT nor TESTING. This status is represented in the OPC Format by stating the case type of the relevant asset as "SSS" in the Unavailability Plans.

OPC Availability database and incremental update process

The Target business process foresees the use of xml-based[3] OPC format which has been developed in close cooperation with ENTSO-E EDI with its full description given in the Annex 1. The OPC Format is a time-series based CIM-UML

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[3] The OPC format shall be aligned with the expected CGMES format migration

format, supporting definition of different types of outages assigned to same elements over time and the continuous update of the information.

All Availability plans which have been delivered and properly validated during the Quality check shall be immediately implemented in the OPC Availability database, which contains information stated in Table 1. on all of the relevant and/or non-relevant assets.

It is important to note that the possibility of continuous update of the Availability plans by the TSOs is foreseen within the OPC Process, meaning that the TSOs may send updated availability information at any time but still respecting the foreseen deadlines. The process is designed to support the continuous incremental update of the Availability plans during various time-frames (Yearly, Monthly, Weekly) without setting any restrictions in this phase, meaning that the status of each defined asset can be updated throughout the calendar year. The delivered information will then be instantly updated in the Availability Database and used later on in the official OPC Processes (Weekly, Monthly, Yearly) at respective time defined by the Process description.

In order to better explain the use of continuously updated Availability plans within OPC Process a following simple example is given:

▪ Example: TSO A sends the updated Availability information for CW 45 at 10th of February ○ The delivered information passes the Quality check and is updated in the Availability database ○ The Monthly OPC process for February will use the updated information during Security analysis ○ The information can be updated multiple times during course of year, but in OPC Weekly process for CW 45 the last available information will be used in the start of the process (currently Tuesday @ 13:00)

Once the input data is delivered and accepted the following actions are possible concerning information in the OPC Availability Database:

▪ Update of Availability information (contained within OPC UAP) ○ Cancelation of an outage (unavailability)
  ○ Update of availability information (change in time series, type or defining a new unavailability) ○ Confirmation of an existing outage (in case no action is stated)
▪ Update of Element information (contained within OPC Element list) ○ Adding a new Element (asset) into the OPC Availability Database ○ Changing information on existing Element (voltage, type, interest, relevancy) ○ Deleting an Element from the OPC Availability Database ○ Deactivating an Element from the OPC Availability Database

Depending on the correlations explained under chapter *Requirements of System Operation Guidelines* it is easily possible to define subsets of the Availability database which could contain Available relevant assets, Unavailable relevant assets, Testing relevant assets, Relevant assets in Special switching state, Non-relevant assets, etc.
An example of database containing Unavailable relevant assets is depicted below in *Figure 2. Example of Unavailability database*.

Figure 2. Example of Unavailability database

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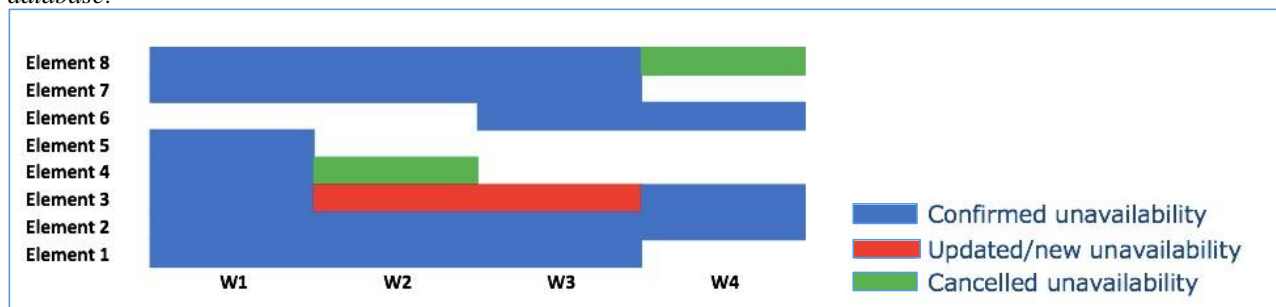
It is important to note that due to limitations of the xls-based OPC Format, certain business rules needed to be implemented (i.e. Implicit deletion) which are provided within Annex 2 - "Handling of the xls-based OPC Format".

C. Execution of availability plans

Execution of the availability plans is an exclusive responsibility of the TSOs and is not addressed in details within the Implementation document.

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A high level overview of the Coordinated Outage Planning Process is briefly presented in Figure 3.
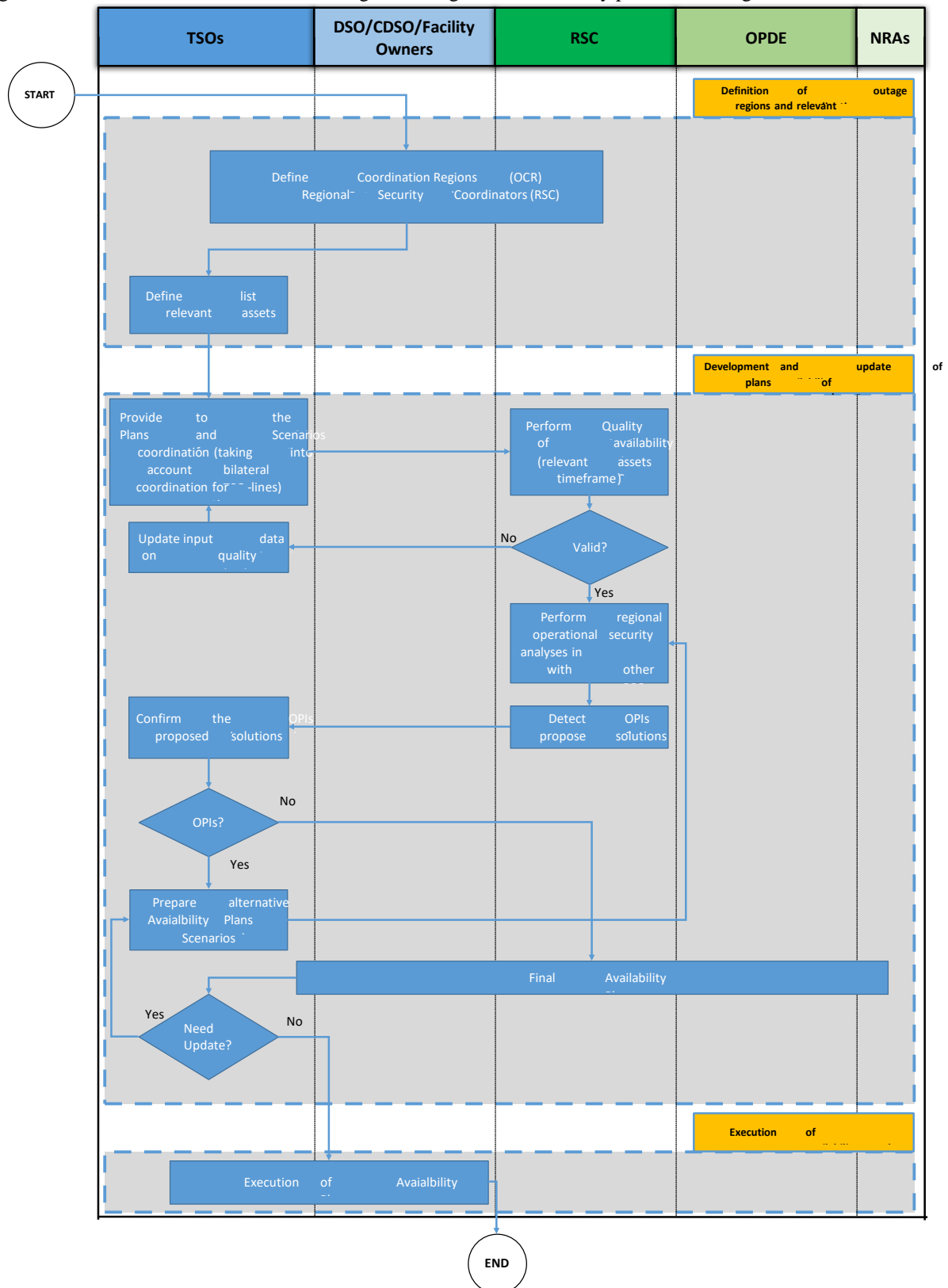
Figure 3: High Level Business Process Flowchart Overview

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4. Operational Outage Planning Coordination Process

Business Process Description

The Target business process for the coordinated outage planning was presented in the document "Coordinated Outage Planning Process" and is strongly related to the OPS (SO GL except the monthly process). In the frame of the OPC project, an operational Outage planning coordination (OPC) process is proposed to be implemented in order to facilitate the coordinated outage planning among TSOs and RSCs.

In order to close the gap between implementation of the Intermediate and the Target business process the Experimentation phase is introduced in 2017, which aims at implementing a step-wise approach towards the Target business process, consisting of three general steps. Detailed description of the Experimentation phase is given in a separate document available on Sharepoint (link) and will not be addressed here since continuous changes are foreseen and ongoing during the Experimentation phase, in order to answer quickly on the recognised to improve the overall process.

OPI Assessment in the Target business process is based on the security analysis performed upon ENTSO-E Year-ahead Seasonal scenarios and is described in detail in Chapter 5.

The main steps of the Target OPC business process are summarized in the next table (Table 2).

Table 2: Main steps of the coordinated outage planning in the target business process

ID	STEPS	Responsible Parties	Brief Description
S.1	Delivery of Preliminary availability plans	TSOs, RSCs	TSOs: ■ Deliver to the RSCs the Preliminary availability plans containing status of the relevant & non relevant assets for desired relevant planning timeframe based on which the OPC Availability database is updated. ■ Define conditions that are to be applied in case of a certain outage case which need to be implemented into the base-variant grid model as well (e.g. special topology) – Special conditions RSCs[4]: ■ Perform the quality and availability check of the input data.
S.2	Merge and Review of the Preliminary Availability Plans	RSCs, TSOs	The RSCs[1] shall provide the Preliminary Merged Availability Plan and the results of Tie-line inconsistency check. The Review process consists of the following steps: 1. RSCs acknowledge the measures related to outage cases which are stated in the Availability plans in order to align on the base-variant model that is to be used for the respective time-frame 2. If needed, RSCs trigger the tie-line inconsistency check towards TSOs (RSC-TSO coordination)[5].

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[4] Part of the tasks assigned to the RSCs shall be performed automatically by the OPC Pan-European tool.

[5] During current stage of Experimentation phase (3A) this step also includes the RSC activities focused on OPC-CGM crosscheck which is required

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			3. TSOs validate the results of the Merged preliminary plan and take part in RSC-TSO coordination on detected tie-line inconsistencies[2].
			4. RSCs confirm the results of tie-line inconsistency check during the RSC-RSC coordination.
			5. The Amended Merged Availability Plan is published upon delivery of amended Availability plans from the TSOs at the respective deadline. The Amended MAP, including applied Backup procedure #4, serves as the basis for creation of the base-variant model which is to be used during OPI assessment process.
S.3	Assessment of Outage Planning Incompatibilities	RSC, TSOs	OPI asssessment based on the Security analysis is performed by each RSC as described in Chapter 5. RSCs: ▪ Perform the outage incompatibility check based on Security analysis of the validated base-variant model and specific additional scenarios (variants) predefined by the TSOs ▪ Distribute the results of the OPI assessment, consisting of the recognized constraints (OPSC / OPI) with proposals of remedial actions to solve them. The proposals shall be based on TSO input data and defined within RSC regional process description, taking into account the list of actions defined in the Chapter 5. ▪ In case the identified OPSCs cannot be resolved by application of non-costly remedial actions an OPI is identified. RSCs shall then also deliver proposal(s) to the TSOs how to resolve the the identified constraint(s), based on the TSO input data and defined within RSC regional process description, taking into account the list of actions defined in the Chapter 5 ▪ Trigger the RSC-TSO and RSC-RSC coordination at any point of the process, in case it is needed TSOs: ▪ Take part in RSC-TSO coordination ▪ Shall define the list of specific remedial actions which can be applied to mitigate the constraints identified during the OPI assessment process. The list must be compliant with the definitions provided in Chapter 5 ▪ Shall propose solutions to mitigate the identified constraints, in addition to the ones proposed by RSCs during the coordination process. ▪ Shall validate the final proposals and/or accept the identified OPIs during OPI Validation step

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			▪ Shall update their availability plans, based on the validated outcome of the RSC-TSO and RSC-RSC coordination process The Validated Merged Availability Plan (MAP) is published upon delivery of amended Availability plans from the TSOs at the respective deadline, after the OPI assessment process had finished. The Validated MAP may contain only OPIs which were accepted by the respective TSOs during OPI Validation step.
S.4	Validation of Final availability plans	TSOs	All possible amendments to the Validated Merged availability plan shall be assessed by the RSCs (OPI assessment), but without triggering the coordination process. Based on the results of the Final OPI assessment of the last amendements to the Validated PAP the TSOs shall assess the feasibility of the Final Availability Plan during the Validation step, by either accepting or rejecting the amendments. The Final Availability Plan is published at the respective deadline, taking into account the last delivered Amended availability plans from TSOs which shall contain the decisions taken during step of Validation of the Final availability plan. Therefore, the Final Availability Plan may contain only OPIs/OPSCs which were accepted by the respective TSOs during step of Validation of the Final availability plan.
S.5	Execution of Outage Planning	TSOs	TSOs shall consider the results of the coordinated outage planning process and execute the Final availability plan in real-time

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Figure 4. OPC Process overview

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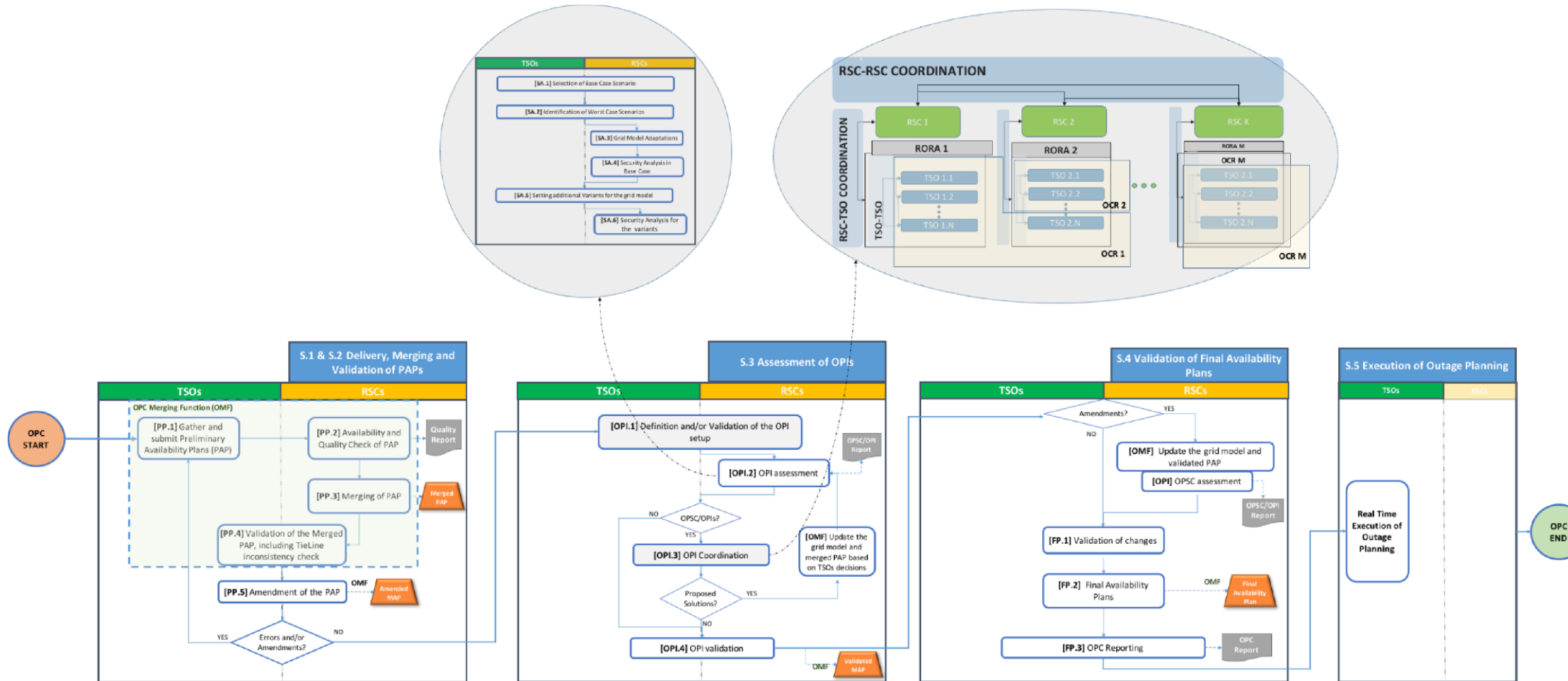
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Roles and Responsibilities

The Outage Planning is a coordinated process among the participating TSOs and is supported by RSC. The roles and their responsibilities of the involved parties are described below.

TSO(s)

One of the most crucial roles of the process, is the TSO(s). The TSOs own and operate most of the grid elements, while at the same time they are responsible for the security of supply within their area of interest and action.
Within the Outage Planning and Coordination Process, their main responsibilities are:

- Provide to RSC the Availability plans of its relevant elements (target: relevant assets will be developed in PG CSA)
- Share with other TSOs and other roles all the relevant information at its disposal on the infrastructure projects related to the transmission system, distribution system, closed distribution system, power generating modules, or demand facilities that may have an impact on the operation of the control area of another TSO and role within the outage coordination region
- Inform all relevant roles about the single list of relevant assets (TSOs, DSOs, CDSOs, NRAs, ENTSO-E, etc), based on TSOs experience and knowledge for the intermediate process (target: relevant assets will be developed in PG CSA)
- Coordinate with (C)DSOs and Facility Owners about the availability plans of their relevant assets
- Assess the availability plans of the relevant assets and establish a final availability plan of relevant assets for each outage coordination region.
- Cope with the outage planning incompatibilities and coordinate to resolve them with the application of the proposed or other solutions (analysis provided by the regional security coordinators based on security analysis)
  ▪ Inform all relevant roles about the final availability plans of the relevant assets (TSOs, DSOs, CDSOs, ENTSOE OPDE, etc.)
- Take care of the real time execution of the availability plans of its assets
- Define the Contingency cases which are to be part of the OPI Assessment process

DSO/CDSO

Similar to TSOs, (C)DSOs also own and/or operate elements in the distribution grid, while at the same time are responsible for the security of supply within their area of interest and action. In the Outage Planning and Coordination Process, their main responsibilities are:

- Plan the availability status of the relevant grid assets for which they perform duties of outage planning agents and that are not interconnecting different control areas
- Coordinate with TSOs the outage planning of internal elements that are part of the distribution system
- Coordinate with TSOs and Outage Planning Agents to resolve any outage planning incompatibilities ▪ Take care of the real time execution of the availability plans of its assets

Facility Owner

The facility owners are the ones who own the power generating and demand facilities, that is, some of the key elements of the power grid.
Within the Outage Planning and Coordination Process, its main responsibilities are:

- Inform and coordinate with the TSOs and the Outage Planning Agents about the availability of their assets ▪ Take care of the real time execution of the availability plans of its assets

Regional Security Coordinator

The regional security coordinator is performing tasks related to TSOs regional coordination, within an outage responsibility area.
Within the Outage Planning and Coordination Process, its main responsibilities are:

- Prepare an annual report and submit it to ENTSO for Electricity providing information about the number of outage incompatibilities detected during the regional outage coordination
- Perform regional outage coordination with TSOs and others RSCs
- Detect regional outage planning incompatibilities and tie-line inconsistencies and provide the TSOs of the outage coordination region the proposed solutions to solve those outage planning incompatibilities

Outage Planning Agent

The outage planning agent is the entity responsible for planning the availability status of a relevant power generating module, a relevant demand facility or a relevant grid element.

Within the Outage Planning and Coordination Process, its main responsibilities are:

- Provide indicative availability plans for its relevant assets
- Provide alternative availability plans for its relevant assets, if requested so by TSOs in case of Outage Planning Incompatibilities
- Coordinate with TSOs and DSOs to resolve any outage planning incompatibilities
- If needed, launch a procedure for the amendment of the final year-ahead availability plan in the time between the finalisation of the year-ahead outage coordination and before its real-time execution
- Provide to the TSOs detailed information about all its relevant assets which have a "testing" status
- Notify the forced outages of one or more of its relevant assets to the TSO and, if connected to a distribution system or to a closed distribution system, the DSO or the CDSO respectively, as soon as possible following the start of the forced outage (including the reason, the expected duration and if applicable the impact to availability plan of its other relevant assets)

NRAs

National regulatory authority is a national regulatory authority designated in accordance with Article 35(1) of Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity.

Within the Outage Planning and Coordination Process, its main responsibilities are:

- Be informed of the single list of relevant grid assets
- Be informed of the availability plans of all relevant grid assets for the year-ahead

Data Exchange Infrastructure

In order to facilitate the data exchange, handling and monitoring, a common "Data Format for Availability Plans" is used by TSOs and RSCs. The description and example of the used format can be found in the Annex 1.

All data exchange concerning the Availability plans takes place via OPDE and is handled by the "Pan-European OPC Tool", while the Backup procedure foresees usage of the "OPC Prototype Tool" and file delivery over e-mail.

Roles interaction – RSC-TSO and RSC-RSC coordination process

Based on various steps in the process several levels of coordination are recognised and needed in case a tie-line inconsistency and/or security constraint is detected. However, it should be emphasized that the TSO-TSO coordination level is out of scope of the OPC Project and is therefore not defined within this document. Two levels of coordination which involve the role of RSCs are recognised and defined based on the following:

RSC – TSO (RT) coordination

The RSC – TSO coordination process can be triggered as a bilateral or a multilateral activity between the RSC and the TSOs that are part of the RSC's outage responsibility area (RORA). The exact way of coordination process and detailed

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description is defined by each RSC for their own outage responsibility area but needs to be compliant with the process description provided within this document.

Generally, the RSC-TSO coordination is triggered by the RSC in case one of the following conditions is fulfilled:

RT-A. Tie-Line inconsistencies detected after the Merge of preliminary availability plan
1. RSCs check the results of detected tie-line inconsistency case and identify the cases that are to be solved, each RSC for its own outage responsibility area (RORA).
2. Each RSC informs of the results the TSOs that are part of their outage responsibility area. The involved TSOs have to be informed about all identified tie-line cases, including the inconsistencies towards the TSOs that are part of other RSC outage responsibility area.
3. TSOs confirm the results and deliver the amended availability plan and/or information concerning the inconsistency to its own RSC, in case it is necessary.
4. All still remaining tie-line inconsistencies will be treated as worst-case scenario described in Backup procedure #1, e.g. assuming out of operation state for the entire overlap period.

RT-B. OPSCs detected in the grid of TSOs belonging to their outage responsibility area
1. RSCs check the results in terms of security constraints (OPSCs) detected during the step of Initial OPI assessment and identify the cases that are treated as potential OPIs.
2. Each RSC informs its own TSOs about the identified OPSC that are treated as potential OPIs. The RSCs shall deliver proposals to mitigate the constraints taking into account the list of possible actions provided and following the general priorities stated in Chapter 5. Therefore, these initial RSC proposals may already be composed of both options – costly and non-costly remedial actions.
3. Each TSO acknowledges the results of the OPI assessment and may inform the respective RSC of counterproposals that are to be taken to mitigate the constraints, taking into account the list of possible remedial actions stated in Chapter 5 and also considering already delivered proposals from RSCs.
4. Each RSC needs to verify the confirmed proposals from their TSOs and update the results accordingly.
5. In case the identified OPSC is not resolved by application of **non-costly** remedial actions, the coordination process continues with the step RR-C of RSC-RSC coordination.

RT-C. OPIs detected in the grid of TSOs belonging to their outage responsibility area
0. OPI is identified in case that the RSC-TSO (RT-B) and RSC-RSC coordination (RR-B) has not managed to resolve the identified security constraints (OPSC) by application of non-costly remedial action.
1. Each RSC informs its own TSOs and neighboring RSCs of the identified OPI and delivers proposals to mitigate the constraints, taking into account the list of possible actions provided and following the general priorities stated in Chapter 5.
2. Each TSO acknowledges the results and may inform the respective RSC of counterproposals that are to be taken to mitigate the constraints, taking into account the list of possible remedial actions stated in Chapter 5 and also considering already delivered proposals from RSCs.
3. In case RSC-TSO coordination did not manage to resolve the identified constraint by application of **costly** remedial actions or acceptance of the risk for identified constraint, OPI is considered unresolved and coordination process continues with the step RR-D of RSC-RSC coordination.

In order to clarify, this level of coordination always presents the first step in solving all Tie-line inconsistencies identified during Review step and all Security constraints identified during the step of Initial OPI assessment (OPSC).

RSC – RSC (RR) coordination

The RSC – RSC coordination process is always triggered as a continuation of the RSC-TSO coordination step and is fixed in the workflow of the process description, for each phase it takes place in. Generally, the RSC-RSC coordination[6] is triggered by default or requested by at least one RSC in case one of the following conditions is fulfilled:

RR-A. Tie-Line inconsistencies detected after the Merge of preliminary availability plans, between TSOs for which different RSCs are responsible:

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1. RSCs inform each other of the results of the RSC-TSO coordination step.

2. RSCs align on the proposals delivered by the TSOs per identified tie-line inconsistency case.

3. All still remaining tie-line inconsistencies will be treated as worst-case scenario described in Backup procedure #1, e.g. assuming out of operation state for the entire overlap period.

RR-B. OPSC detected during the Initial OPI assessment involving one of the following elements as part of the contingency case[7]:

- Tie-line between TSOs for which different RSCs are responsible
- Elements which are part of neighbouring RSC outage responsibility area

1. RSCs confirm the results and inform each other (RSC – RSC) of the cases and proposed non-costly remedial actions which are result of the already finished step RT-B of the RSC-TSO coordination process.

2. Final proposal of the **non-costly** remedial action is agreed between the RSCs and provided to the respective TSOs for approval.

3. In case RSC-TSO coordination did not manage to resolve the identified constraint or the presented proposal from RR-B.2 is not approved by all involved TSOs, OPI is identified and coordination process continues with step RT-C of the RSC-TSO coordination.

RR-C. OPSC remaining after the RSC-TSO coordination

1. The requesting RSC contacts neighboring RSCs and informs of the case. The RSCs agree on the results of the security analysis.

2. The requested RSC triggers the RSC-TSO coordination in its outage responsibility area to check the possibility of resolving the identified OPSC by application of **non-costly** remedial actions (RT-B).

3. In case the RSC-TSO coordination managed to resolve the identified OPSC and was approved by the respective TSOs, the requested RSC will inform the requesting RSC of the non-costly remedial actions which will be applied.

4. In case the RSC-TSO coordination did not manage to resolve the identified OPSC, an OPI is identified and the coordination process will continue with step RT-C of the RSC-TSO coordination.

RR-D. OPIs remaining after the RSC-TSO coordination

1. The requesting RSC contacts neighboring RSCs and informs of the case. The RSCs agree on the results of the security analysis.

2. The requested RSC triggers the RSC-TSO coordination in its outage responsibility area to check the possibility of resolving the identified OPI by application of **costly** remedial actions (RT-C).

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[6] Within current stage of Experimentation phase the RSC-RSC Coordination on identified OPSCs / OPIs is implemented as a single Teleconference meeting involving all RSCs, which aims at facilitating all the involved RSC-RSC Coordination steps (RR.B – RR.D), in order to gain more experience and improve the performance of the overall process.

[7] Contingency cases are to be defined by the TSOs (in cooperation with responsible RSC) and comprise of the following:
- Monitoring elements – set of network elements that are to be monitored during contingency analyses
- Simulated outages – set of network elements that define the outages to be simulated during the contingency analyses.

3. In case the RSC-TSO coordination managed to resolve the identified OPI and was approved by the respective TSOs, the requested RSC will inform the requesting RSC of the costly remedial actions which will be applied.

In order to better clarify the general principles, it is important to emphasize that all proposals of Remedial actions which are delivered from the RSC side during RT and RR coordination are based on initial inputs from the TSOs and

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need to be verified by the respective TSOs before they are considered as a final proposal for resolving the identified OPSC/OPI.

The aforementioned cases of coordination in case of identified Tie-line inconsistencies are presented in Figure 5 (cases RT-A and RR-A)
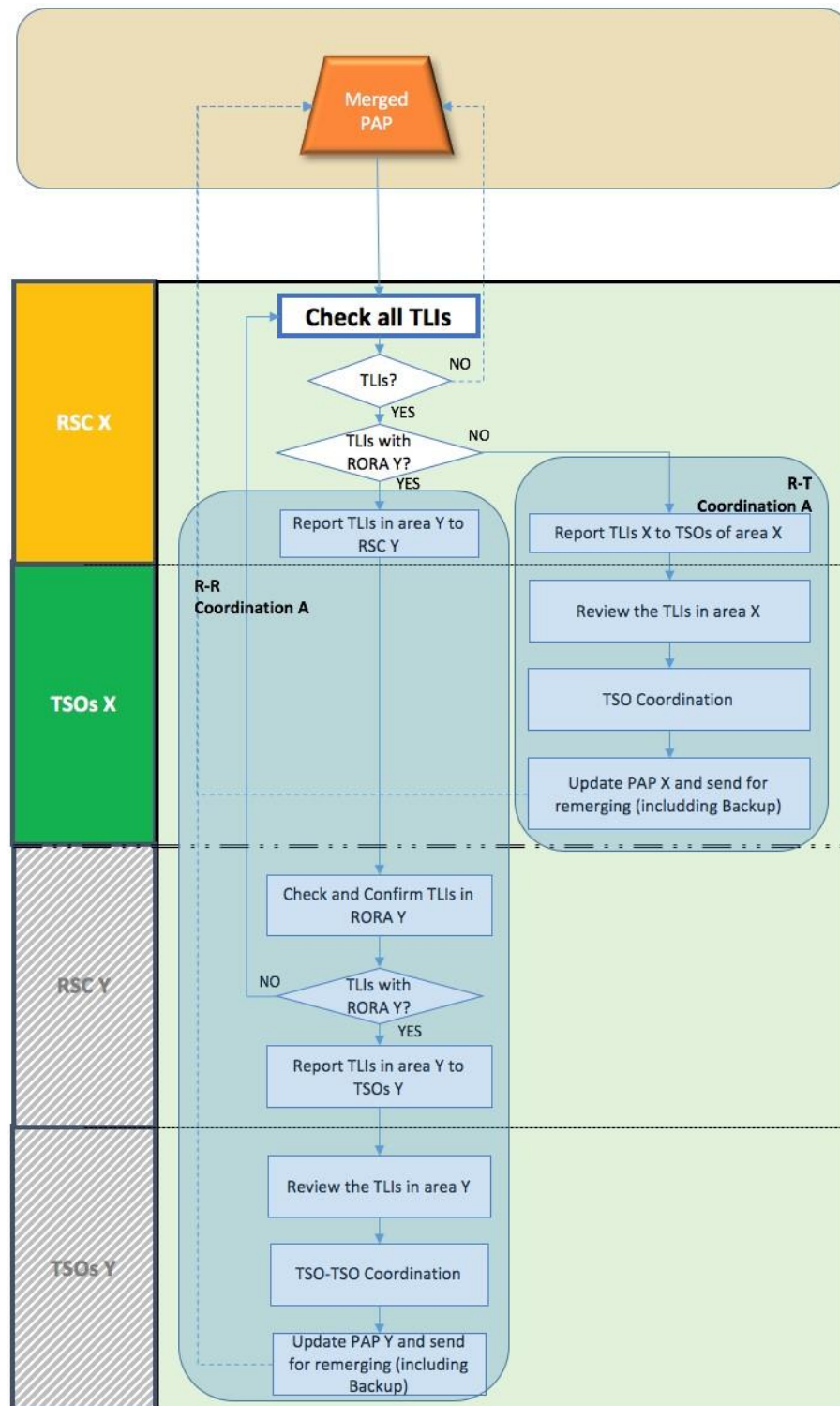

Figure 5: Tie Line Coordination (RSC-TSO-RSC)

Target OPC Process - Implementation document

The aforementioned procedure of coordination in case of identified OPSCs and/or OPIs is presented in the Figure 6. It is important to emphasize that the flow chart of the procedure should be read from the perspective of the RSC X and/or TSO X since the role of the RSC Y and TSO Y is depicted only for the cases of the support in coordination process during the OPSC and OPI assessment process and design of the proposals of remedial actions.
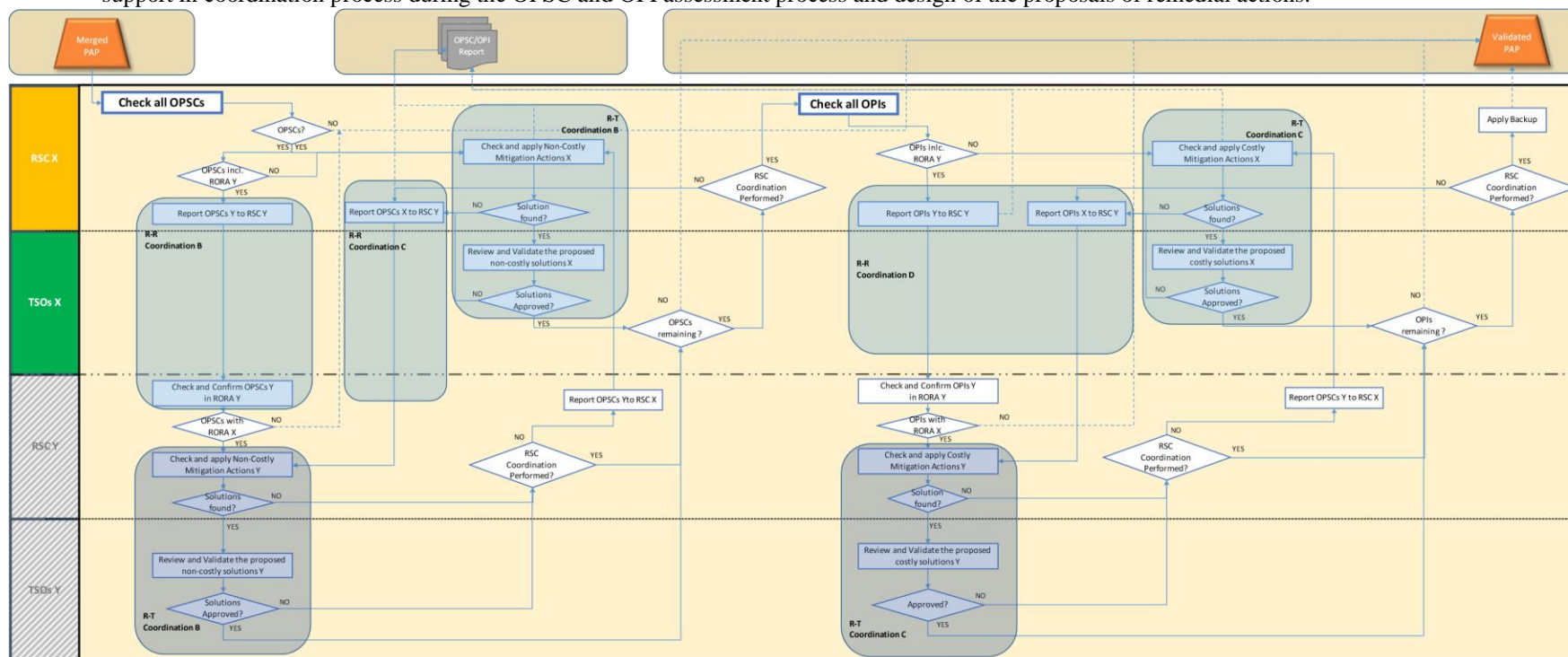

Figure 6: OPSC/OPI Coordination (RSC-TSO-RSC)

Implementation document

5. Methodology of OPI assessment process based on Security analysis

Within this Chapter the complete methodology which is to be used during complete OPI assessment shall be defined in order to provide a clear overview of what is performed during this step, before the concrete OPC Process is defined in the later Chapters.

It is important to emphasize that the implementation of the OPC Target Process is strongly linked to the status of CGMES 2.4 implementation. Taking this into account, within current stage of Experimentation it was not possible to implement certain aspects of solution defined by the Target OPC Process, mainly due to recognized limitation of the UCTE format. Therefore, in order to keep the implementation of the OPC process transparent and open to further development, the methodology is sometimes defined for both recognized options, meaning the status is given for the foreseen solution within Target OPC Process (CGMES) and currently implemented one within OPC Experimentation phase 3 (UCTE).

Identification of constraints

The initial goal of the OPI assessment is to identify the security constraints in the grid, which arise after the application of the latest Availability plan upon the grid model. The identification of the constraints is to be performed by the RSCs, based on the security analysis of the grid model. It should be noted that identification of constraints in this context refers to both recognised possibilities – OPSC and OPI identification.

Complete methodology of the security analysis foresees four obligatory (SA.1 – SA.4) and two optional (SA.5 – SA.6) steps, as explained below:

Table 3. OPI assessment based on Security analysis

ID	Activities	Owner
SA.1	Selection of the base-case scenario	TSOs RSC
SA.2	Identification of worst cases to study	TSOs RSC
SA.3	Grid model adaptations – base variant creation	RSC
SA.4	Security analysis of the base variant	RSC
SA.5	Selecting additional variants of the grid model *	TSOs RSC
SA.6	Security analysis of the variants *	RSC

SA.1: Selection of the "outage free" base-case scenario
- As the base case, a scenario (Article 64/65/66/67/68/69, SO GL) defined by the "SO GL implementation project for year-ahead scenarios" will be used for the respective season and daily time frame
- In total there will be at least 8 base case scenarios defined for the next year, 2 per each quarter of the year containing peak and off-peak conditions in the ENTSO-E grid
- These official ENTSO-E scenarios shall not contain any planned outages nor security constraints **SA.2**: Identification of worst cases (outage combinations) to study
- Each RSC will, in cooperation with their TSOs, define which cases shall be studied, with maximum of 3 daily scenarios defined for analysed time-frame, referring to timestamps early morning, morning, evening (i.e. respectively 03:30, 10:30 and 18:30): o   E.g.   maximum
  of 21 week-ahead scenarios will be defined
- The following official ENTSO-E scenarios need to be used:

- o   For timestamp night (i.e. 03:30) – off-peak scenario of the respective yearly quarter
- o   For timestamps morning & evening (i.e. 10:30 & 18:30) – peak scenario of the respective yearly quarter

SA.3: Grid model adaptations – base variant creation

- ▪   Last agreed and reviewed availability plan that is available after the step of tie-line inconsistency check (i.e. Amended Merged Availability Plan) shall be applied upon the selected base-case scenario. Within application of the availability plan (outages) the special conditions linked to a specific outage case shall be implemented in the base-case scenario as well.

- ▪   The above stated adaptations are performed upon the base-case scenario, resulting in the grid models containing the agreed topological state for each of the defined timestamps under SA.2. The created models are also referred to as **base-variants** in the OPC Process. **SA.4**: Security analysis of the base-variants

- ▪   Detection of the constraints based on Security analysis is performed on the defined base-variant scenarios which contain the agreed topological state for the next time-frame.

- ▪   Security analysis is performed based on the input data defined by the TSOs within the OPI setup phase, which is defined in more details later in the Process descriptions of Yearly, Monthly and Weekly OPC Process **SA.5**: Selecting additional variants of the grid model [6]

- ▪   Each RSC may, in cooperation with their TSOs, define additional scenario variants that need to be studied for the following time-frame and are related to more detailed forecast information with intention to provide a more precise and wider overview of possible situations in the grid

- ▪   The **variants** may be defined taking into account the information on possible different net positions of the TSOs, implemented NTC reduction, etc. **SA.6**: Security analysis of the variants

- ▪   Detection of the constraints based on Security analysis is performed on defined additional variants of the scenarios which contain the agreed topological state for the next time-frame.

- ▪   Security analysis is performed based on the input data defined by the TSOs within the OPI setup phase, which is defined in more details later in the Process descriptions of Yearly, Monthly and Weekly OPC Process

Target OPC Process

In order to be able to apply the correct topology upon the base-case scenarios as defined within step SA.3, it is of utmost importance for the OPC process that the requirement concerning the rdf:ID stability is fulfilled, meaning that the rdf:ID within the base-scenarios shall be stable in order that the mapping between the OPC Format and the respective CGMES profiles of the base-case scenarios can be performed in a consistent and stable manner.

The OPC Element list foresees the use of mRID as unique element identifier which shall be mapped to respective rdf:ID codes defined within the base-case scenario. For this purpose, a Mapping guide shall be developed under guidance from the ENTSO-E EDI group.

OPC Experimentation phase 3 status

The base-case scenario which are used during the current OPC Process are based on the ENTSO-E Seasonal Outlook models given in UCTE format and referring to Summer and Winter scenario. Therefore, the application of the Availability plan upon the base-case scenario is implemented in the UCTE environment for which a special field in the OPC Element list is used within which the TSOs are able to define the UCTE codes of element(s) that are referring to the relevant asset stated in the Element list.

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[6] These steps are considered optional (Article 69, SO GL) and will be performed by the RSCs based on RSC regional process description.

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Treatment of Generators

In order to properly assess possible changes of the availability status for relevant assets of type Generator, special methodology has been agreed to be used for the purposes of the OPC Process with the main goal of properly defining how the possible imbalance of a specific TSO Area caused by changes in the Availability plans, shall be treated during the OPI assessment process.

The problem occurs whenever the availability status of the generator differs from the status defined within the base-case scenario since any difference will lead to different net position of particular TSO area, which needs to be balanced. The stated problem is mainly connected and recognised within aspect of the Weekly OPC Process since the changes in the Generator availability status are quite often, comparing to the information stated in the base-case scenarios.

Target OPC Process

Within the Target OPC Process and CGMES 2.4 environment in operation, the methodology on how to commonly assess the Generator availability status and align on the balance algorithm between the TSOs, has been developed based on the simplified approach given below:

GEN 0. All generators defined in the OPC Element list are successfully mapped to the respective generating units defined within the base-case scenario, including their operational limits in terms of minimal and maximal permissible active power output (stated within EQ Profile of the respective base-case scenario).

GEN 1. The Amended Merged Availability Plan is applied upon the respective base-case scenario (SA.3), also including the application of the Generator unavailability information which shall result in the disconnection of the specific generator units and/or reduction of the active power[7].

GEN 2. The application of Generator availability status under GEN 1. leads to imbalance of the specific TSO area which shall be covered by changing the output of remaining generators within TSO area based on the following approach:

- Within the OPI setup phase the TSOs may define a specific GLSK file, which shall contain information on which generator/load output and in which manner shall be adjusted to cover the imbalance that occurred.

- The output of available generators within TSO area is changed according to the method defined within OPI setup phase (GSK file) in order to reach the initial TSO net position.

- In case that there is not enough generation available for balancing purposes, load adjustment will be triggered proportionally to active power on all nodes within respective TSO area.

It should be stated that the above stated solution is the best available under the current conditions and foreseen status of implementation of the other related business processes, mostly involving the CGM and CSA topics. The OPC PG recognizes the limitations of the proposed method since it is not foreseen at the moment to include the possibility of TSO net position adjustment within the process of base-variant creations. If the desired TSO net positions for the upcoming week would be included in the OPC process, an obligatory sub-process of their alignment or coordinated forecast is needed as well, in order to avoid extremely low quality of the created models due to high imbalances.

Therefore, since currently there is no active process of Week-ahead net position forecast, the recommendation of the OPC PG is to consider the development and implementation of the Week-ahead process as well, as indicated within the SO GL (Article 69). The coordinated process of Week-ahead CGM publish that would also include the process of net position forecast alignment, could answer on all requirements of OPC Week-ahead process and also facilitate the further development of the OPC process towards a rolling activity.

OPC Experimentation phase 3 status:

Within the current status of OPC Process and UCTE environment in operation, the methodology on how to commonly assess the Generator availability status and align on the balance algorithm between the TSOs, has been developed based on the simplified approach given below:

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[7] Since the base-case scenario is defined as outage free it is not foreseen to define the process of possible generating unit reconnection, based on the status in the Availability Plan. However, a simple process could be easily implemented since the status of generating units that are defined as relevant assets is known based on the defined within Chapter 3 (OPC Availability database).

GEN 0. All generators defined in the OPC Element list are successfully mapped to the respective UCTE nodes defined within the base-case scenario, including their operational limits in terms of minimal and maximal permissible active power output (stated within UCTE code of the respective base-case scenario).

GEN 1. The Amended Merged Availability Plan is applied upon the respective base-case scenario (SA.3), also including the application of the Generator unavailability information which shall result in setting the active power output of specific node within the base-case scenario to the reduced active power defined by the respective TSO[6].

GEN 2. The application of Generator availability status under GEN 1. leads to imbalance of the specific TSO area which shall be covered by changing the output of remaining generators within TSO area based on the following approach:

- Change the output of all available generators within TSO area proportionally to reserve (difference between value of active power output and limit defined in UCTE model)

- For this purpose Available generators are defined as Nodes with status 0, 2 and/or 3 and defined limits for Pmax, Pmin, Qmax and Qmin within the UCTE base-case scenario.

- In case that there is not enough generation available for balancing purposes, load adjustment will be triggered proportionally to active power on all nodes within respective TSO area.

Application of remedial actions

During the process of OPI assessment the RSCs will identify the security constraints in the grid based on the above given methodology and provide **proposals** to the TSOs how to resolve them. In order to standardise and define possible proposals that are to be provided by the RSCs and the TSOs a list of remedial actions is given below (Table 4). The below stated remedial actions can be applied by the RSCs and TSOs during the step of OPI assessment, in order to resolve the both possible identified security constraints, OPSCs and OPIs.

It should be emphasized that **all proposals of remedial actions** provided by the RSCs are based on the input data defined by the TSOs within the OPI setup phase. Furthermore, these proposals of remedial actions provided by the RSCs are to be treated strictly and only as proposals which are always to be validated by the TSOs during TSO - TSO Coordination level, also taking into account the process of operational planning in the upcoming time-frames.

OPC Process is always to be considered only as one part of the rolling operational planning procedure which covers all needed time frames and continuously improves the quality of forecasts throughout the process and time (i.e. Year-ahead, Week-ahead, Day-ahead, Intraday).

Table 4. Remedial actions proposals

Remedial actions proposals	
Non-costly	**Costly**
Control: Tap position modification of a PST and/or Transformer	Topological: Amendment of the Availability plan based on changing the status of the relevant asset to available (cancellation of the outage)[8]
Topological: Node or grid reconfiguration	Energy injections: Modification of generation patterns (Re-dispatch)

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[8] The cancellation of the outage can be considered as a proposal of remedial action taking into account specific attributes of the outage itself, which are defined within RSC regional process description and based on values stated in the fields of start time, restitution time, type – permanent/daily, etc. 11

The OPC Format supports this functionality within the field (property) called *Offset time*. In case this option is used for the respective relevant asset within the submitted Availability plan, it is considered to be a non-costly action.

Topological: Amendment of the Availability plan based on postponing the unavailability of the relevant asset to a different time period, but without changing its duration (shifting the outage) [11]	Energy injections: Flow control via DC links
Energy injections: Flow control via DC links	Energy injections: Demand side management
	NTC Reduction (as a means of TSO-TSO redispatch, depending on the region and the CC methodology of the region)

The coordination and prioritisation of the remedial actions has been described in details in Chapter 4 under the RSCTSO and RSC-RSC coordination levels. However, in order to summarise the order of needed coordination activities, the general priorities in resolving the identified security constraints by application of remedial actions and coordination of proposals during the OPI coordination step is given also in Table 5.

Table 5. Prioritisation and coordination of proposals of remedial actions

Priorities and coordination of proposals of remedial actions		
Order	**Proposals of remedial actions**	**Coordination level**
1	Internal TSO non-costly measures	RSC-TSO
2	Multilateral TSO non-costly measures within the responsibility area of one RSC	RSC-TSO
3	Multilateral TSO non-costly measures between TSOs that are part of different RSC responsibility area	RSC-RSC
4	Costly measures between TSOs within the responsibility area of one RSC (incl. internal TSO measures)	RSC-TSO
5	Costly measures between TSOs that are part of different RSC responsibility areas	RSC-RSC

The coordination on costly measures defined within Step 4 stated above shall always include the neighbouring RSCs as well in order to allow their contribution to a possibly better solution which can be assessed by triggering the RSC-TSO coordination in their RORA, if recognised as beneficial.

Exchange of information on remedial actions

The process of exchange of information on remedial actions among the RSCs and between the RSC and its respective TSOs is also considered within the OPC Process. In order to be able to exchange the information on the proposed remedial actions it is necessary to use the strictly defined template and procedure. Based on the aforementioned, two possibilities are recognized and described below:

Target OPC Process

For the purpose of exchange of information on remedial action proposals it is foreseen to use two streams, defined below:

- OPC Availability plans - covering the RA proposals which contain information on changes in the foreseen outage plans

- CRAC file – covering the proposals which contain information on all remaining RA proposals given in the Table 4. The foreseen implementation is based on the CIM-UML format defined by the ENTSO-E EDI group

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and described within "ENTSO-E Contingency list, Remedial Actions and Additional Constraints (CRAC) Implementation guide v2.0".

OPC Experimentation phase 3 status

For the purpose of exchange of information on remedial action proposals it is foreseen to use two streams, defined below:

- OPC Availability plans - covering the proposals which contain changes in the foreseen outage plans

- CRAC file – covering the proposals which contain information on all RA proposals related to remaining topological and PST-based remedial actions. The implementation is based on the XLS format given in the Annex and used currently within TSCNET area with intention to involve the remaining RSCs as well.

Example Algorithm

In order to provide an overview of the complete OPI Assessment methodology, a simple example of possible implementation is given below. Please treat the flowchart only as example since the exact algorithm of the OPI assessment process can vary, depending on the RSC Regional process description and agreed implementation of the OPC Process.
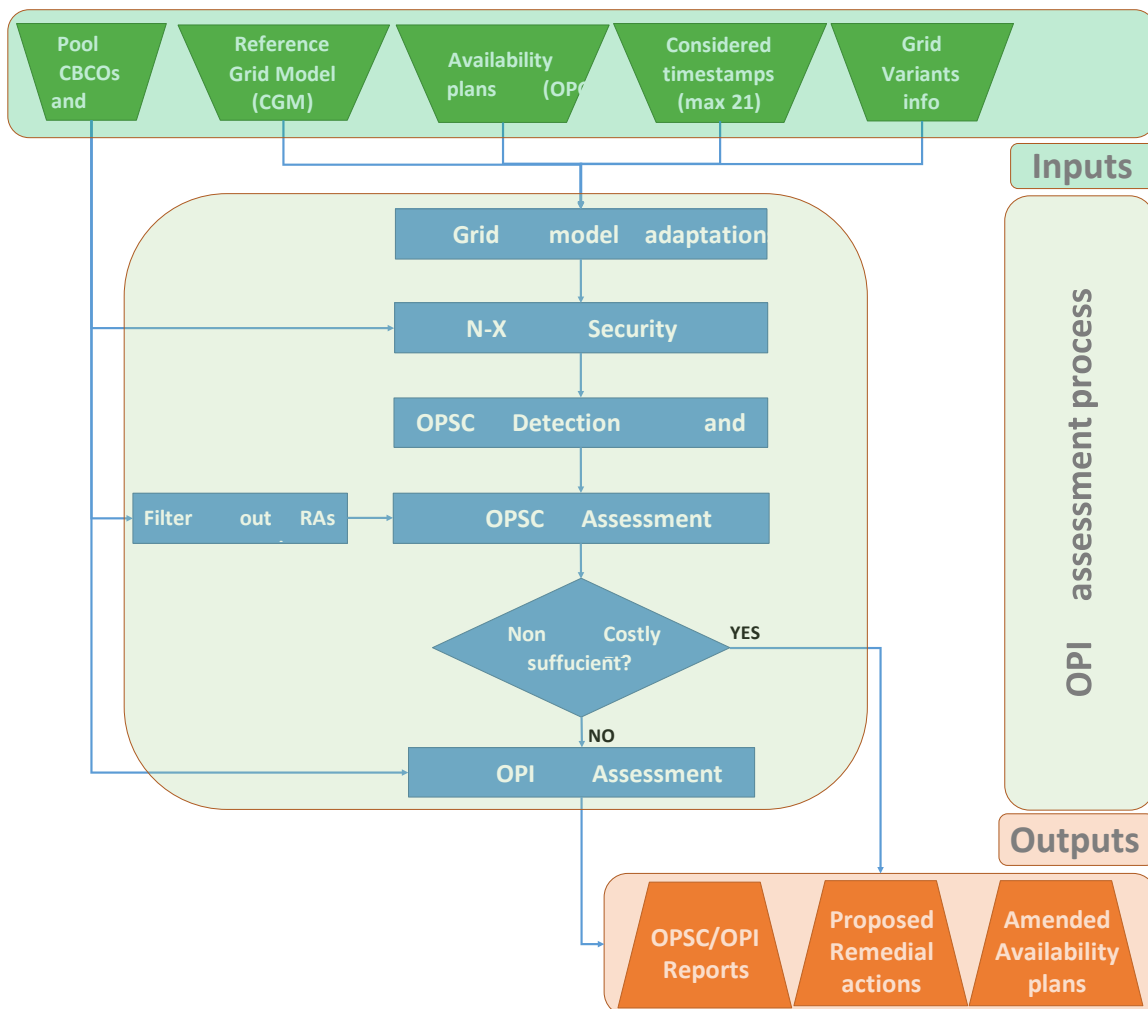
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Figure 7. OPI Assessment algorithm - example

6. Yearly OPC Process: Detailed Process Description

Preliminary availability plans (S.1, S.2)

TSOs are responsible for providing and approving the scheduling of maintenance on all transmission facilities making up the Transmission System and for coordinating with Generator Owners, as appropriate, to schedule maintenance on generation facilities.

In the highly interconnected grid of continental Europe, it is reasonable to consider that the outage planning of a TSO can affect the outage planning and the grid operation of the rest of the TSOs. Therefore, the TSOs of each outage coordination region participate in a common process towards a coordinated outage planning, as this described in this document. Part of the coordination process, is the delivery of each TSO's preliminary availability plans for all of the relevant assets of its observability area.

The overview of needed activities in the steps related to delivery of Preliminary availability plans is given below, in Table 6. It should be emphasized that all of the stated deadlines and process steps are either defined by requirements of SO GL or a result of TSOs' current practices and best knowledge at this point. **Therefore, it is foreseen that the Business process and the stated deadlines might be updated (relevant for all the deadlines that are not explicitly mentioned in the SO GL), after experience from the Experimentation phase is fully gathered and assessed by the OPC FG.**

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Table 6. Preliminary Availability plans

ID	Activities	Involved	Tool	Deadline	Output Data
PP.1	Gather availability plans of non-TSO and TSO assets and submit preliminary availability plans	TSOs	Local tools, OPC Tool	30.10.	Internal DSO, Facility owner info, TSO information Preliminary availability plan (xml)
PP.2	Availability and Quality check of preliminary availability plans	RSC TSOs	OPC Tool	01.11.	Reporting about quality check Preliminary availability plans (xml)
PP.3	Initial Merging of preliminary availability plans	RSC	OPC Tool	01.11.	Merged Preliminary availability plan (xml) Merging report
PP.4	Review of the Merged preliminary availability plan	TSOs RSCs	Local tools, OPC Tool	06.11.	Amended Merged availability plan (xml) Merging report Base variant grid model
PP.5	Amendment of the preliminary availability plans	TSOs RSC	Local tools OPC Tool	27.11.	Amended preliminary availability plans (xml)

PP.1 Delivery of Preliminary Availability Plans

The TSOs submit the Preliminary availability plans for the following calendar year, containing all relevant internal assets.

TSO User:

- At latest at the deadline, delivers the Preliminary availability plans (PAP) of non-TSO assets & TSO assets for the upcoming year.
- The preliminary availability plans need to be compliant with the agreed OPC format, appointed in Annex 1.
- The delivery of the preliminary availability plans into the OPC tool is done via OPDE (as well as the OPC tool interfaces). In case of problems during the delivery the Backup procedure #1 is triggered, which foresees the delivery of the plans towards the OPC Prototype via designated e-mail.

PP.2 Availability and Quality check

The input data, in terms of the submitted Preliminary availability plans, is checked and validated by the respective RSC Operator. All issues are reported to the TSOs who are responsible for updating the input data in case of identified errors. The validation checks that are performed upon the delivered input data are defined in detail within the OPC Tool specification document and shall assess the input data quality from syntax and business point of view.

RSC Operator:

- Triggers the availability and quality check of each TSO's preliminary availability plans and reports any validation issues toward the TSOs concerning the format.
- In case the Preliminary availability plan was not delivered and/or successfully validated before the deadline, the Backup procedure #2 is triggered. TSO User:
- Submits new version of the Preliminary availability plan in case of validation issues reported by RSC Operator.
- In case the Preliminary availability plan was not delivered and/or successfully validated before the deadline,

PP.3 Merge of Preliminary Availability Plans

Merge of preliminary availability plans is a continuous process which is triggered every time a new Availability plan is delivered. However, the publish of the 1st Merge in terms of Preliminary Merged availability plan takes place after all input datasets have been delivered and successfully validated or latest at the deadline.

RSC Operator:

- As soon as all Preliminary availability plans have been delivered and validated and latest at the deadline, triggers the publish of results of the 1st Merge process in terms of Merged Preliminary availability plan.

- The Merge is performed automatically within the OPC tool under supervision of RSC Operator. In case of errors during the Merge or unavailability of the OPC tool the Backup procedure #3 is triggered.

- After the Merge, distributes the Merged preliminary availability plan and the Merging report to the TSOs using the OPC Tool. In case of problems during the distribution of the Merge results the Backup procedure #1 is triggered.

- The Merging report shall contain information on possibly identified Tie-line inconsistencies and mismatches between the OPC Format information and the base-case scenario (possible mRID inconsistency)

PP.4 Review of the Merged Preliminary Availability Plan

The Merged preliminary availability plan is checked by the RSCs and finally reviewed by the TSOs. The tie-line inconsistency check is performed as soon as the Merge process is finished with the results distributed to the involved TSOs and RSCs. Depending on the identified inconsistencies the following coordination is triggered:

- RSC-TSO coordination – triggered towards all involved TSOs as described under Chapter 4 and finished latest 1 day before deadline of PP.4

- RSC-RSC coordination – triggered towards all involved RSCs as described under Chapter 4 and finished latest at the deadline of PP.4 RSC Operator:

- Triggers the Tie-line inconsistency check as soon as the Merged Preliminary availability plan and respective Merging report is available.

- Delivers the results of the Tie-line inconsistency check to the respective TSOs and triggers the RSC-TSO and RSC-RSC coordination, if necessary.

- Within the coordination process, acknowledges the measures related to unavailability cases which are stated in the Availability plans in order to align on the "outage-free" base-case model that is to be used for the respective time-frame (Special conditions)

- After delivery of the amended Preliminary availability plans by the TSOs, publishes the results of 2nd Merge latest at the deadline in terms of Amended Merged Availability Plan and respective Merging report. TSO User:

- Reviews the Merged preliminary availability plan latest at the deadline and informs the RSC Operator in case action on the identified tie-line inconsistencies is needed.

- In case of identified Tie-line inconsistencies, takes part in the RSC-TSO coordination, triggers TSO-TSO coordination and submits the amended version of the Preliminary availability plan, respecting the deadline.

- In case the tie-line inconsistency is not resolved before the deadline of the Review step, the Backup procedure #4 is triggered.

PP.5 Amendment of the Preliminary availability plans

Amendment of the Preliminary availability plans is an ongoing process running in parallel with the process of Review and OPI assessment and consists of two major procedures:

PP.5.1 Amendment of the Preliminary availability plans during Review process (PP.4)

- It is foreseen that the TSOs can submit updates in their Preliminary availability plans taking into account results of RSC-TSO and RSC-RSC coordination on identified tie-line inconsistencies.

PP.5.2 Amendment of the Preliminary availability plans during OPI coordination (OPI.3)

- It is foreseen that the TSOs can submit updates in their Preliminary availability plans taking into account possible changes during the TSO-TSO coordination process and / or the results of the OPI assessment process.

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TSO User:
- Delivers amendments of the Preliminary availability plans for the upcoming year in order to finalise the yearahead availability plans for internal relevant assets, at the latest one day before the deadline.
- The delivery of the Preliminary availability plans into the OPC tool is done via OPDE. In case of problems during the delivery the Backup procedure #1 is triggered. RSC Operator:
- In case of delivery of the amended Preliminary availability plans, publishes the results of the respective Merge process using OPC Tool, at the latest at the respective deadline.
- The Continuous Merge process shall be triggered with every delivery of new Availability plans, but the publish of results is done only at the deadline of each process by the RSC Operator.
- Regardless of the official publish of the results of the Merge process, the latest information on the availability of the relevant assets is always available in the OPC Availability database.

OPC Merging Function (OMF)

To ease the process description of continuous Merge process of the Availability plans, the OPC Merging function (OMF) has been introduced, as seen before in the OPC Process flowchart (Figure 3). The stated function is triggered throughout the OPC Process and is defined by the following functionalities described in steps PP.1 – PP.4:
- Availability and Quality check of the delivered Availability plans
- Continuous Merge process in terms of incremental update of the OPC Availability database and its publish toward the Users
- Publish of Merging report which contains information needed for review of the Merged Availability plan in terms of Tie-line inconsistency check and possible OPC-CGM inconsistencies (mRID mapping).

Assessment of Outage planning incompatibilities (S.3)

RSC supports the TSOs by performing assessment of outage planning incompatibilities based on delivered and validated merged preliminary availability plan and in order to identify unacceptable system conditions due to proposed transmission and generation outages. The assessment of OPIs is triggered after the review step of the Merged preliminary availability plans has finished meaning that the Amended MAP is considered the basis for Security analysis, as defined within Chapter 5. The OPI Assessment is considered a continuous process throughout the outage planning coordination stage. It involves different TSOs and RSCs with different roles and responsibilities.

The main overview of activities performed during the assessment of Outage Planning Incompatibilities is given in the following

Table 7:

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Table 7. OPI assessment – process details

	Activities	**Involved**	**Tool**	**Deadline**	**Output**
OPI.1	Definition and Validation of the OPI setup	RSC, TSOs	OPC tool, Local Tools	06.11	OPI setup
OPI.2	Initial OPI assessment	RSC, TSOs	OPC tool, RSC OPI Tool	20.11	Initial OPI assessment report
OPI.3	OPI coordination	RSCs, TSOs	OPC tool, RSC OPI Tool	23.11	OPI assessment report
OPI.4	OPI validation	RSC, TSO	OPC tool, RSC OPI Tool	27.11	Amended preliminary availability plans (xml) Validated Merged Availability Plan (xml) Merging Report OPI Validation report

OPI.1 Definition and Validation of the OPI setup

As a first action prior to the OPI assessment is the validation of the OPI setup that is to be used in the process of OPI assessment, which is described in the Chapter 5. This is an important step in order to properly define and have a common agreement on the parameters to be used in the OPI assessment. These parameters include:

- Definition of the different variants that are to be used – TSO net position adjustments, NTC reduction, etc.,
- Specification of Monitoring and Contingency lists / CBCOs which are used as basis for Security analysis
- Specification of Costly and Non-Costly Remedial actions which are to be used for building proposals of RA.

RSC Operator:

- Performs all the relevant activities, as described in the methodology of OPI detection, taking into account the OPI setup defined in cooperation with the respective TSOs
- Validates and confirms the OPI setup before the start of OPI.2 TSO User:
- Supports the RSC with the definition of the OPI setup with the provision of all necessary data needed to perform the OPI assessment
- Validates and confirms the OPI setup before the start of OPI.2

OPI.2 Initial OPI assessment

Once the OPI setup is defined and the Amended Merged availability plan is available, the OPI assessment based on security analysis, as described in Chapter 5, shall be triggered. The results of the OPI assessment shall be documented in a dedicated report, including information about the violation of grid security constraints as well as possible proposals for remedial actions. The assessment and the report may focus both on the OPSC as well as OPIs, mostly depending on the internal process of each RSC and their TSOs taking into account the OPI setup.

RSC Operator:

- Triggers the OPI assessment process by starting the Security analysis upon the agreed variants for the defined timestamps
- Creates the Initial OPI assessment report which contains at least the list of OPSCs and initial RA proposals. Distributes the report to all TSOs which are part of their RSC Outage responsibility area and neighbouring RSCs

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- In case the execution of the OPI assessment is not possible, the RSC may ask for support of another RSC in order to perform the OPI assessment (tool, resources, etc).

TSO User:

Reviews the Initial OPI assessment report

If needed, prepares initial input and feedback for the OPI Coordination step in terms of possible amendments to the Availability plans and additional proposals of remedial actions that are to be used

Depending on the RSC Regional process description, the Initial OPI Assessment report may already contain the list of identified OPSCs and OPIs, as well as full list of proposals of costly and non-costly RAs.

OPI.3 OPI coordination

After the OPI assessment is performed, TSOs and RSCs have complete information about the availability plans and their impact on the grid, both for their as well as for neighbouring areas. The goal of the coordination is to identify and agree on remedial actions for any security constraint that is detected (OPSC and OPI).

During this step the OPI assessment process can be triggered multiple times, depending on the results of the coordination and available remedial actions.

RSC Operator:

- Triggers RSC-TSO coordination as described in Chapter 4., by initiating and organising a meeting (telco, videoconference, physical, etc) with the TSOs of its responsibility area to discuss the results of the OPI assessment

- Presents to the TSOs all the security constraints (OPSC) detected in their area and asks them to provide amended availability plans and/or updated information on available proposals of remedial actions. RSCs shall propose remedial actions within this step as well.

- In case the detected OPSCs cannot be resolved within the RSC area, the RSC triggers RSC-RSC coordination as described in Chapter 4. In that case, the RSC presents the detected OPSCs to the neighbouring RSCs and, if necessary, asks for their support via the provision of additional remedial actions or changes in the preliminary availability plans of their TSOs.

- In case the RSC participates to a coordination meeting of another RSC, asks from its TSOs to validate and confirm any possible remedial action proposals or amendments in the Availability plans that can support the OPI remedial in neighbouring RSC areas.

- In case of remaining security constraints after the last OPI assessment process, when all available non-costly remedial actions have been exhausted, an OPI is detected and relevant TSOs and RSCs informed. Finally, RSC Operator shall propose to TSOs costly remedial actions which are to be taken, according to the Table 4.

- Throughout the OPI coordination process, may update the respective grid models and trigger again the OPI assessment process in order to take into account the results of the OPI coordination (delivery of amended PAP and/or update of RA proposals).

- Creates and distributes to the TSOs of their area and neighbouring RSCs a detailed report with all the detected OPIs, latest Availability plans and list of updated remedial action proposals – **OPI assessment report**. The last version of OPI assessment report is to serve as basis for validation of the proposed solutions.

TSO User:

- Participates in the coordination meeting organized by the RSCs and provides necessary feedback during RSCTSO Coordination

- Acknowledges the reported OPSCs and the detected OPIs.

- Reviews the OPI assessment report and list of RA proposals

- If needed, provides updated availability plans and remedial action proposals in order to cope with the reported OPSCs and detected OPIs.

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OPI.4 OPI validation

The goal of this activity is to validate all remedial action proposals needed for the mitigation of the detected OPIs as well as to jointly validate all the remaining OPIs. The purpose of OPI Validation is the publish of the Validated Merged Availability Plan which shall either contain no OPIs at all or contain only the ones which were validated by the TSOs. The possible validation of the remaining OPIs is an activity recognised as necessary, mainly because the results of the OPI assessment process can easily contain non-realistic results, mostly due to forecast quality issues and extremely long time-frame considered.

RSC Operator:

If requested by TSOs, triggers again the OPI coordination activities.

Creates the OPI Validation report which shall contain all agreed RA proposals, last amendments in the Availability plans and remaining OPIs that need to be validated by the TSOs. The OPI Validation report is distributed to the TSOs of their area and to the neighbouring RSCs, in order to coordinate the overall activities and minimize any possible risk later on.

- Publishes the results of the 3rd Merge in terms of Validated Merged Availability Plan and appropriate Merging report, which is distributed after the OPI Validation step has been completed or latest at deadline.

TSO User:

- Acknowledges and validates the reported OPSCs and respective non-costly remedial actions proposals provided in the OPI assessment report.
- Acknowledges and validates the reported OPIs and respective costly remedial actions proposals provided in the OPI assessment report.
- If needed, provides amended availability plans and/or updated remedial action proposals in order to cope with the detected OPIs and requests from the RSC to trigger the OPI assessment and coordination activities
- Validates any remaining OPIs and/or confirms that these can be solved and/or handled in real time. This action needs to be confirmed by all involved TSOs of the respective RORA.
- Reviews the OPI Validation Report which shall contain summary of all above stated actions (RA proposals, Amended Plans, Acknowledged OPIs)

Depending on the RSC Regional process description and specifics of OPC implementation under RSC, the process steps OPI.3 and OPI.4 can easily be joined under one since the coordination and validation are often overlapping activities.

In case the OPI Validation step has not finished successfully, meaning that the **identified OPIs were not resolved**, it shall be clearly reported during the Final OPI assessment, which is performed within the step of Validation of changes in the Availability plans (FP.1) as indicated below.

Final availability plans (S.4)

Following the outage planning coordination and assessment of the availability plans, the last step of the process focuses on the validation, finalization and reporting of the coordinated outage planning process. The main purpose of the Finalisation process is to leave room for the TSOs to validate any possible last-minute changes before jointly agreeing on the results of the Outage planning coordination for the next year. The main activities under the final availability plans are listed below:

Table 8. Final availability plans – process details

	Activities	**Owner**	**Tool**	**Deadline**	**Data**

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					Amended preliminary availability plans (xml)
FP.1	Validation of changes in availability plans	RSCs, TSOs	Local Tools	29.11	Final OPI assessment report
FP.2	Final availability plans	TSOs	OPC tool	30.11	Final availability plans (xml)
FP.3	Outage Planning Reporting	RSC	OPC tool	01.12	Merged Final Availability plan (xml)
					Final OPC Report

FP.1 Validation of changes in availability plans

The results of the last step of the OPI assessment process need to be validated by all TSOs before publish of the Final availability plan.

<u>TSO User:</u>

May submit amended Availability plans containing additional changes

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  Reviews the results of the Final OPI assessment report with focus on last amendments of the Availability plan and possible OPIs which are still remaining after the OPI Validation step.
- Accepts or rejects the changes (amendments) to the Validated Availability plan, taking into account the results delivered by RSCs within Final OPI assessment report.

RSC Operator:
- Updates the grid model (base variant, additional variants) based on the last delivered amended Availability Plans from the TSOs and triggers the OPI assessment in terms of only the security analysis as defined within Chapter 4., meaning that the OPI Coordination process is not foreseen during this step.
- Provides the Final OPI assessment report to the TSOs **before** they enter the Validation step FP.1

FP.2 Final availability plans RSC
Operator:
- publishes the Final merged availability plan as result of the 4th Merge

TSO User:
- Based on the outcome and decision made within step FP.1, at the latest at deadline submits the final availability plans of its relevant assets
- In case an OPI is still remaining and not resolved nor validated by all parties at deadline, delivers amended PAP according to the Backup procedure #7

FP.3. Outage planning reporting RSC
Operator:
- At the latest at deadline, distributes to TSOs the coordinated outage planning report which summarizes the main steps of the process.

Execution of Outage Planning (S.5)

The real time execution of the agreed outages is an explicit responsibility of the respective TSO departments, but should be performed according to the Final validated availability plan.

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The activities of the Year Ahead Outage Planning process are presented in the following Gantt chart. The deadlines are given as an orientation and refer only to some of the steps given in the above process description and the regular process flow. In case of need, some of the steps may be triggered later as well depending on the process description (E.g. Changes in the Final availability plans)
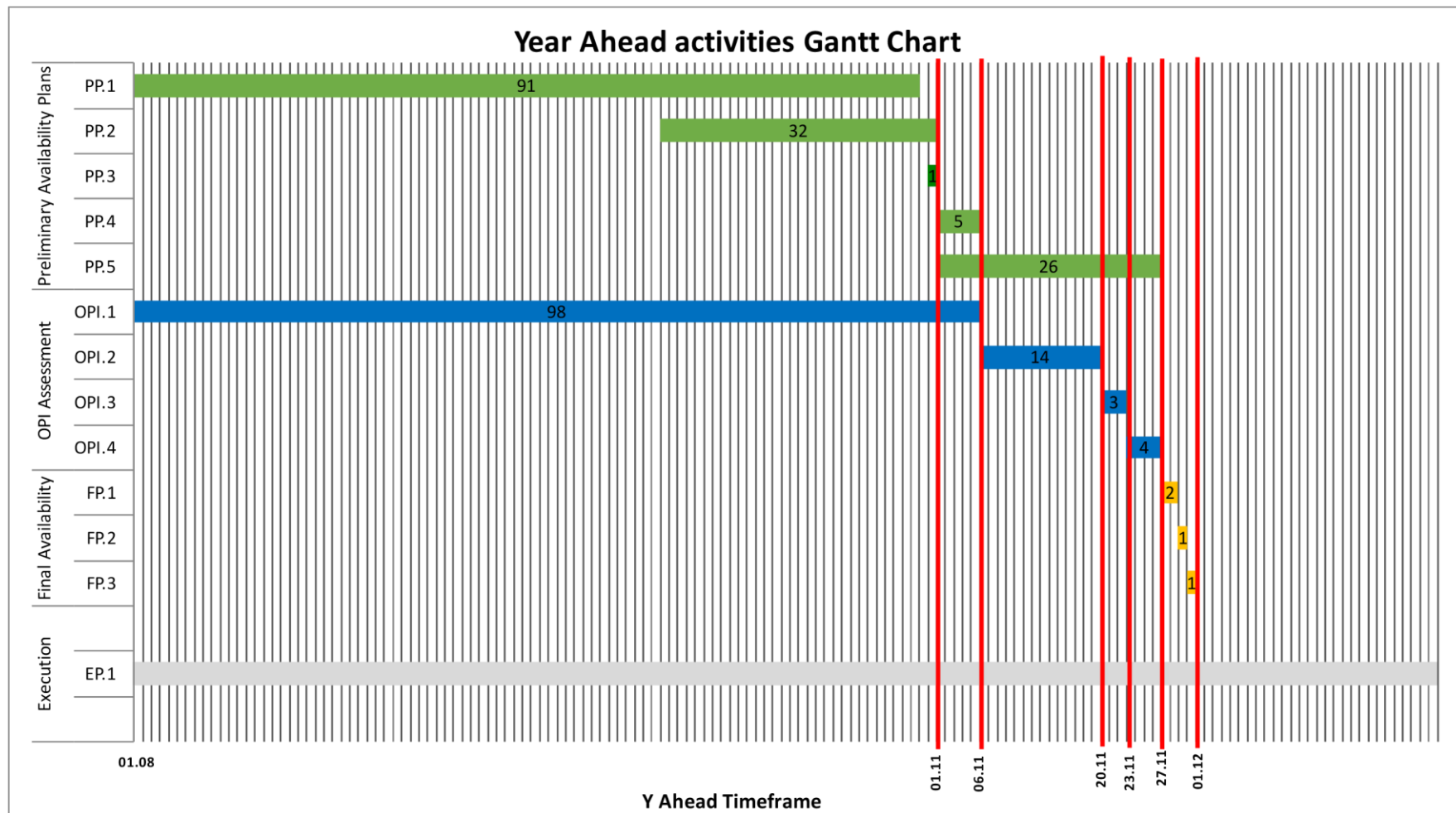
Figure 8: Year-ahead outage planning Gantt chart

7. Monthly OPC Process: Detailed Process Description

The goal of Monthly OPC Process is to provide to the TSOs a long-term outlook into Year-ahead plan on a monthly level, meaning that it shall be performed each month for the period from 1st of the following month until end of year, taking into account the last available information from the Availability database.

The Monthly OPC Process shall not trigger any coordination on RSC-RSC or RSC-TSO level, but the results of the Security analysis may be used within TSO-TSO coordination process to update the information in the OPC Availability database. For the time being there is no agreed date on the launch of the monthly process.

Preliminary availability plans (S.1, S.2)

The activities referring to the delivery of Preliminary availability plans are not obligatory since the existing data in the OPC Availability database shall be used for the purpose of the security assessment process.

However, in case that the TSOs wish to regularly update the information in the Database and build the internal TSO monthly process in order to be compatible with the OPC Process, the deadlines for the file delivery and process are stated in the Table 9. below.

Table 9. Preliminary Availability plans

ID	Activities	Involved	Tool	Deadline	Output Data
PP.1	Confirm/update the existing availability plans and/or submit Preliminary availability plans	TSOs	Local tools, OPC Tool	3 working days before EOM	Internal DSO, Facility owner info, TSO information Preliminary availability plan (xml)
PP.2	Availability and Quality check of preliminary availability plans	RSC TSOs	OPC Tool	2 working days before EOM at 09:00	Reporting about quality check Preliminary availability plans (xml)
PP.3	Initial Merging of preliminary availability plans	RSC	OPC Tool	2 working days before EOM at 10:00	Merged Preliminary availability plan (xml) Merging report

PP.1 Delivery of Preliminary Availability Plans

The TSOs submit the Preliminary availability plans or confirm the existing plans Availability plans within OPC Availability database for the period of 1st of the upcoming Month until end of the Year, containing all relevant internal assets.

TSO User:

- At latest at the deadline, delivers the Preliminary availability plans (PAP) of non-TSO assets & TSO assets for the period of 1st of the upcoming Month until end of the Year.
- The preliminary availability plans need to be compliant with the agreed OPC format, appointed in Annex 1.
- The delivery of the preliminary availability plans into the OPC tool is done via OPDE. In case of problems during the delivery the Backup procedure #1 is triggered, which foresees the delivery of the plans towards the OPC Prototype via designated e-mail.

PP.2 Availability and Quality check

The input data, in terms of the submitted Preliminary availability plans, is checked and validated by the respective RSC Operator. All issues are reported to the TSOs who are responsible for updating the input data in case of identified errors.

Target OPC Process -

The validation checks that are performed upon the delivered input data are defined in detail within the OPC Tool specification document and shall assess the input data quality from syntax and business point of view.

RSC Operator:

- Triggers the availability and quality check of each TSO's preliminary availability plans and reports any validation issues toward the TSOs concerning the format.

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- In case the Preliminary availability plan was not delivered and/or successfully validated before the deadline, the Backup procedure #2 is triggered. TSO User:
- Submits new version of the Preliminary availability plan in case of validation issues reported by RSC Operator.
- In case the Preliminary availability plan was not delivered and/or successfully validated before the deadline, the Backup procedure #2 is triggered.

PP.3 Merge of Preliminary Availability Plans

Merge of preliminary availability plans is a continuous process which is triggered every time a new Availability plan is delivered. However, the publish of the 1st Merge in terms of Preliminary Merged availability plan takes place after all input datasets have been delivered and successfully validated or latest at the deadline.

RSC Operator:

- As soon as all Preliminary availability plans have been delivered and validated and latest at the deadline, triggers the publish of results of the 1st Merge process in terms of Merged Preliminary availability plan.
- The Merge is performed automatically within the OPC tool under supervision of RSC Operator. In case of errors during the Merge or unavailability of the OPC tool the Backup procedure #3 is triggered.
- After the Merge, distributes the Merged preliminary availability plan and the Merging report to the TSOs using the OPC Tool. In case of problems during the distribution of the Merge results the Backup procedure #1 is triggered.
- The Merging report shall contain information on possibly identified Tie-line inconsistencies and mismatches between the OPC Format information and the base-case scenario (possible mRID inconsistency)

Assessment of Outage planning security constraints (S.3)

RSC supports the TSOs by performing security assessment of the latest Availability plan based on the Merged preliminary availability plan and taking into account the Backup procedure #4 concerning possible tie-line inconsistencies. The goal of the security assessment is to identify unacceptable system conditions due to proposed transmission and generation outages.

The OPSC assessment during the Monthly OPC Process differs a bit from the methodology given within Chapter 5 since it is expected only to provide towards the TSOs results of Security assessment, without triggering the RSC-RSC and/or RSC-TSO coordination process and without intention to identify and resolve possible OPIs.

The main overview of activities performed during the security assessment of Outage Planning Incompatibilities is given in the following Table 10 below:

Table 10. OPSC Assessment for Monthly OPC Process

	Activities	**Involved**	**Tool**	**Deadline**	**Output**
OPI.1	Definition and Validation of the OPI setup	RSC, TSOs	OPC tool, Local Tools	2 working days before EOM at 10:00	OPI setup

				1 working day before EOM at 10:00	
OPI.2	OPSC assessment	RSC, TSOs	OPC tool, RSC OPI Tool		OPSC Assessment report

OPI.1 Definition and Validation of the OPI setup

As a first action prior to the OPI assessment is the validation of the OPI setup that is to be used in the process of OPI assessment, which is described in the Chapter 5. This is an important step in order to properly define and have a common agreement on the parameters to be used in the OPI assessment. These parameters include:

▪ Specification of Monitoring and Contingency lists / CBCOs which are used as basis for Security analysis <u>RSC Operator:</u>

▪ Validates and confirms the OPI setup before the start of OPI.2 <u>TSO User:</u>

▪ Supports the RSC with the definition of the OPI setup with the provision of all necessary data needed to perform the OPI assessment

▪ Validates and confirms the OPI setup before the start of OPI.2

OPI.2 OPSC assessment

Once the OPI setup is defined and the Preliminary Merged availability plan available, the OPSC assessment based on security analysis shall be triggered for the time-frame of the 1st of the following Month until end of the Year, covering list of timestamps compatible to the mandatory ones stated within Chapter 5 and clearly defined within RSC Regional process description.

The results of the OPSC assessment shall be documented in a dedicated report, including information about the violation of grid security constraints.

<u>RSC Operator:</u>

▪ Triggers the OPSC assessment process by starting the Security analysis upon the base variants for the defined timestamps

▪ Creates the OPSC assessment report which contains at least the list of identified security constraints. Distributes the report to all TSOs which are part of their RSC Outage responsibility area and neighbouring RSCs

▪ In case the execution of the OPI assessment is not possible, the RSC may ask for support of another RSC in order to perform the OPI assessment (tool, resources, etc).

<u>TSO User:</u>

▪ Reviews the OPSC assessment report

▪ If needed, triggers activities on TSO-TSO Coordination level and delivers the amended Availability plans for the respective time in which the need to change the long-term plans was recognised.

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8. Weekly OPC Process: Detailed Process Description

The main goal of the Week Ahead Outage Planning Process is continuous assessment of changes and updates in the initial Year-ahead Availability plan, which are stored in the OPC Availability database. The process is foreseen as a once-per-week activity with goal of assessing the feasibility of Outage planning for the following week, considered from next Saturday at 00:00 until next Friday 23:59.

The process follows the same approach as the already described Year Ahead Process. However, there are still some points that are different when comparing the Year Ahead with the Week Ahead process.

The main differences are:
- The Week-ahead process is also requested from the SO GL, however, there is no information about the expected deadlines whatsoever.
- The deadlines of the main activities of the Week Ahead process are based on TSOs best and current practices as well as the limitation imposed by the quite narrow timeframe.
- In addition to the already described activities of the Year Ahead process, the Week Ahead has a preparatory activity (PP.1) which is meant to review and confirm/update the results of the Year/Month Ahead processes and appropriate data in the OPC Availability database.

With the exception of the aforementioned points, all of the other activities of the Week Ahead process are similar to the one of the Year Ahead. The detailed activities, as well as the involved roles, tools, deadlines and outputs are presented in the Table.

The main activities under the delivery of preliminary availability plans within the Week-ahead process are listed below in Table 11.

It should be emphasized that all of the stated deadlines and process steps are a result of TSOs' current practices and best knowledge at this point. Therefore, it is foreseen that the Business process and the stated deadlines will be updated, after experience from the Experimentation phase is gathered and assessed by the OPC PG.

Table 11. Week-ahead process

STEP	ID	Activities	Owner	Tool	Deadline	Output Data
Preliminary availability plans	PP.0	Gather availability plans of non-TSO and TSO assets	TSOs	Local tools, OPC Tool	Wed of W-1, 12:00	Internal DSO, Facility owner info, TSO information
	PP.1	Confirm/update the existing availability plans and/or submit preliminary availability plans	TSOs	OPC Tool	Wed of W-1, 12:00	Reporting about quality check Preliminary availability plans (xml)
	PP.2	Availability and Quality check of preliminary availability plans	RSC	OPC Tool	Wed of W-1, 12:00	Merged Preliminary availability plan (xml) Merging report
	PP.3	Merging of preliminary availability plans	RSC	OPC Tool	Wed of W-1, 13:00	Amended Merged availability plan (xml) Merging report

	Code	Activity	Responsible	Tools	Timing	Output
	PP.4	Review of the Merged preliminary availability plans	TSOs RSCs	Local tools, OPC Tool	Wed of W-1, 17:00	Amended preliminary availability plans (xml)
	PP.5	Amendment of the preliminary availability plans	TSOs RSC	Local tools OPC Tool	Fri of W-1, 09:00	Reporting about quality check Preliminary availability plans (xml)

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|	Code	Activity	Responsible	Tools	Timing	Output
Assessment of Outage planning incompatibilities	OPI.1	Definition and Validation of the OPI setup	RSC, TSOs	OPC tool, Local Tools	Wed of W-1, 13:00	OPI setup
	OPI.2	Initial OPI assessment	RSC, TSOs	OPC tool, RSC OPI Tool	Thu of W-1, 12:00	Initial OPI assessment report
	OPI.3	OPI coordination	RSCs, TSOs	OPC tool, RSC OPI Tool	Thu of W-1, 15:00	OPI assessment report
	OPI.4	OPI validation	RSCs, TSO	OPC tool, RSC OPI Tool	Thu of W-1, 17:00	Amended preliminary availability plans (xml) Validated Merged Availability Plan (xml) Merging Report OPI Validation report
Final availability plans	FP.1	Validation of changes in availability plans	RSCs, TSOs	Local Tools	Fri of W-1, 12:00	Amended preliminary availability plans (xml) Final OPI assessment report
	FP.2	Final availability plans	TSOs	OPC tool	Fri of W-1, 13:00	Final availability plans (xml)
	FP.3	Outage Planning Reporting	RSC	OPC tool	Fri of W-1, 14:00	Merged Final Availability plan (xml) Final OPC Report
Execution of Outage Planning	**Out of the scope of OPC project TSOs' Responsibility**					

Target OPC Process -

In addition to the already aforementioned changes, the following deadlines have to also be respected within the Week Ahead process:

- During the PP.4 the following deadlines apply instead of ones defined for Year-ahead process: o RSC-TSO coordination – triggered towards all involved TSOs as described under Chapter 4 and finished latest 1 hour before deadline of PP.4
  - o RSC-RSC coordination – triggered towards all involved RSCs as described under Chapter 4 and finished latest at the deadline of PP.4

The activities of the Week Ahead Outage Planning process are presented in the following Gantt chart. The deadlines are given as an orientation and refer only to some of the steps given in the above process description and the regular process flow. In case of need, some of the steps may be triggered later as well, depending on the process description (E.g. Changes in the Final availability plans)
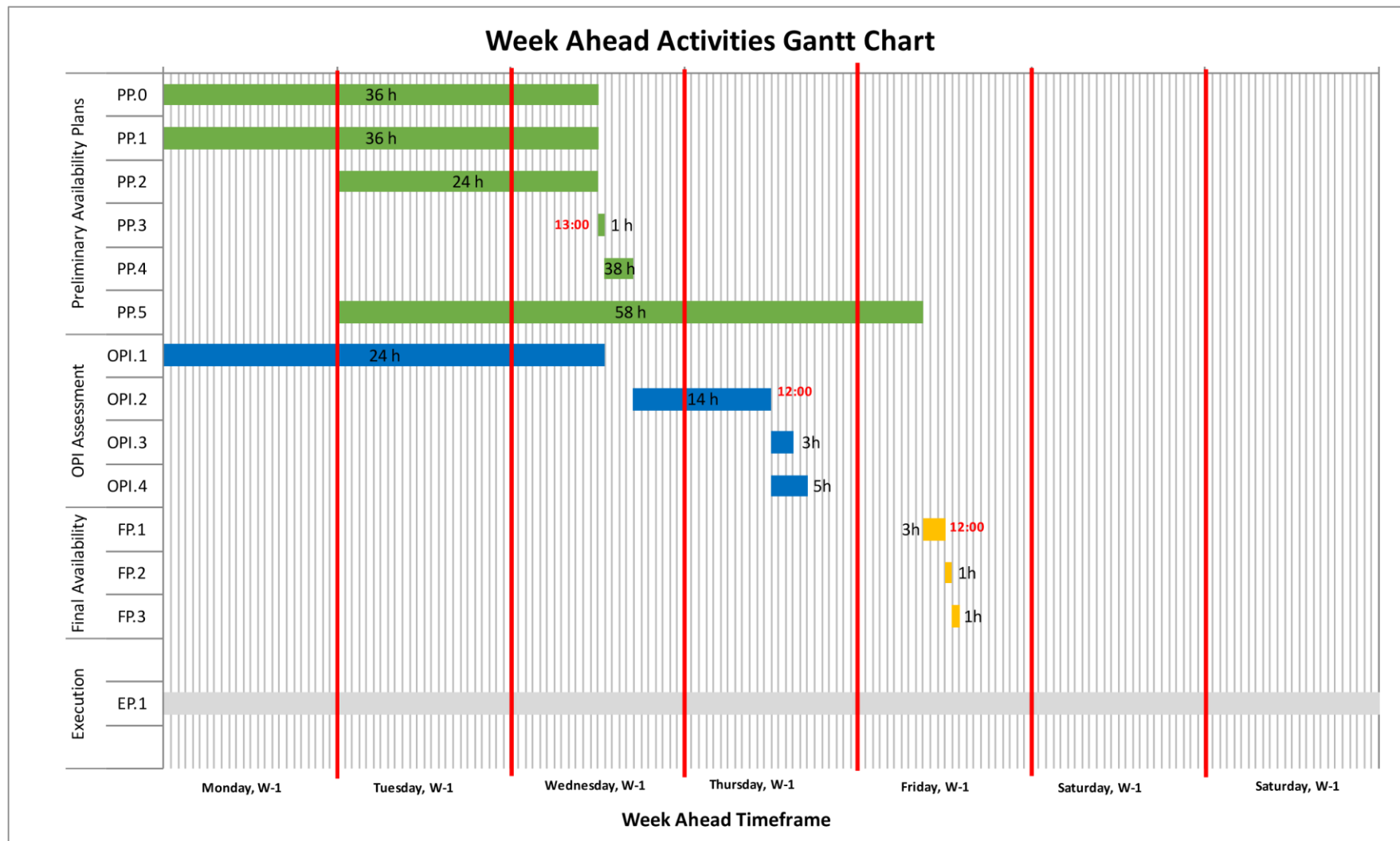
Figure 9: Week Ahead Outage Planning Gantt Chart

9. Backup procedures

The Backup procedures are summarized for all above-stated processes and given below with detailed description of the roles, actions needed and timing (if applicable).

Backup procedure #1: Errors during delivery of the availability plans in the OPC tool

Scenario: It is not possible to deliver the Individual and/or Merged availability plans into OPC Tool through the OPDE (or the OPC Tool interfaces)

Actions from TSO User and/or RSC Operator**:**

- Submits the Availability plan via e-mail towards the predefined distribution list, which shall also include the official e-mail address of the OPC Prototype Tool

Backup procedure #2: Missing Preliminary availability plan at the deadline

Scenario: Preliminary availability plan is not delivered or is still validated with an error at deadline

In case of missing Yearly Preliminary availability plan:

- No information is used for their relevant assets meaning all internal elements are defined as available while the tie-lines are treated according to the Backup procedure #4.
- Actions from TSO User: o Delivers the Preliminary availability plan as soon as possible during the Amendment phase (PP.5) ▪ Actions from RSC Operator: o Informs the responsible TSO that its Availability plan is missing at deadline and not taken into account for the respective process.

In case of missing Monthly and or Weekly Preliminary availability plan:

- The latest available information in the OPC Availability database is used for the respective time-frame.

Backup procedure #3: Errors during the Merge of the availability plans

Scenario: It is not possible to perform the Merge of availability plans or access the OPC Tool

Actions from RSC Operator:

- Performs the Merge of availability plans using the OPC prototype tool

Backup procedure #4: Handling of remaining tie-line inconsistencies

Scenario: Tie-line inconsistencies identified after the Merge of preliminary availability plans are not resolved by RSC coordination during PP.4

Actions from RSC Operator:

- Every still remaining tie-line inconsistency will be treated as worst case scenario in the Merged preliminary availability plan and in the rest of the OPC business process, e.g. meaning that the tie-line will be considered out of operation in all identified mismatch cases. More precise, the following rules shall be applied:
    - o Outage date and/or time – the tie-line is considered as out of operation for the complete stated duration of each of the planned unavailability, regardless of the overlap period. This procedure includes the fields MON-FRI, SAT and SUN as well.
    - o Case Type – in case that the inconsistency is recognised in the field of Case Type the case OUT will be used in the rest of the process.
    - o Outage type (Daily, Permanently) – in case that the inconsistency is identified in the field of Outage Type the type PERMANENTLY will be used in the rest of the process o   Element type – Element type TIE will be automatically assigned according to the EIC code o Restitution time – longer restitution time is used in the rest of the process

Backup procedure #5: Issues with non-TSO availability plans

Scenario: One or more TSOs fail to gather the availability plans of the non-TSO assets after the deadline

Actions from TSO User**:**
- Informs via email all TSOs and RSCs accordingly.
- Develops for the non-TSO assets its own alternative availability plans and provides them to RSC via its preliminary availability plans

Backup procedure #6: Missing feedback from TSOs on detected Security constraints (OPSC and OPI) during the OPI coordination step (OPI.3)

Scenario: One (or more) TSO outage planning incompatibilities are detected during OPI assessment and at least one TSO did not provide any feedback before the deadline (OPI.3) or took part in the RSC-TSO and/or RSC-RSC coordination.

Actions from RSC Operator:
- Contacts all relevant TSOs and reminds them of their missing feedback at latest 2 days before deadline in case of Year-ahead and/or 1 hour before deadline in case of Week-ahead process (OPI.3).
- In case of updated input data and no later than the deadline (OPI.3), repeats the OPI assessment (OPI.2) to determine whether any outage planning incompatibilities remain and informs TSOs accordingly. In case of no outage planning incompatibilities or in case they have all been validated, RSC informs the TSOs that their common planning proposal is feasible.
- In case of no feedback by the deadline (OPI.3), all the latest availability plans are considered and the process continues with the next foreseen steps, which may finish with the Backup procedure #7.

Actions from TSO User:
- At the latest at deadline (OPI.3) submits amended availability plans to cope with the detected OPSCs and OPIs or informs RSC that the detected incompatibilities are acceptable and manageable in real-time operation.

Backup procedure #7: OPI not solved until deadline for the publish of the Final availability plans Scenario:

OPIs/OPSCs are still present or not validated before publish of the Final availability plans (S.4)

Actions from RSC Operator:
- Informs the involved TSOs of the latest results and indicates the deadline for publish of the Final availability plans.
- In case of no feedback by the deadline, all the latest availability plans are considered and the process continues with the next foreseen steps, resulting in the last stated action from the TSO User given below Actions from TSO User:
- In case no solution is identified, each TSO forces to "available" all the "unavailable" or "testing" statuses for the internal relevant assets which are involved in an outage planning incompatibility during the period concerned (compliant to the SO GL Article 98). The change of status shall be applied with respect to the defined availability information and the respective time-frame (i.e. restitution time).

The provision of feedback and/or the delivery of the file(s) is the responsibility of the TSO(s) for all stated Backup procedures when this is required.

10.   High Level Timing

The timing of the specific steps of the year-ahead coordinated outage planning process is presented Figure 10. The timing is compliant with the OPS (SO GL), however there is no timeline defined for the monthly and/or the weekly coordination.
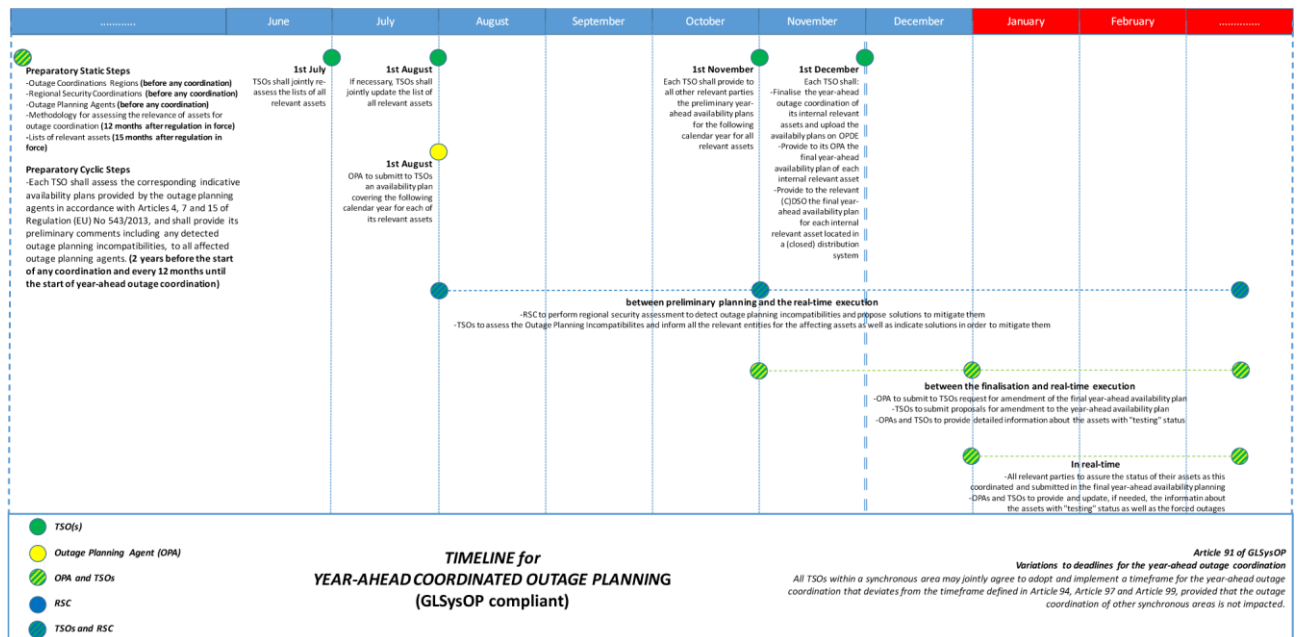
Figure 10: Timeline for Year-Ahead Coordinated Outage Planning (SO GL compliant)

The timing for the week-ahead coordinated outage planning process is presented in Figure 11: Timeline for the week-ahead coordinated outage planning . The timing is indicative and is based on TSOs' current practices.
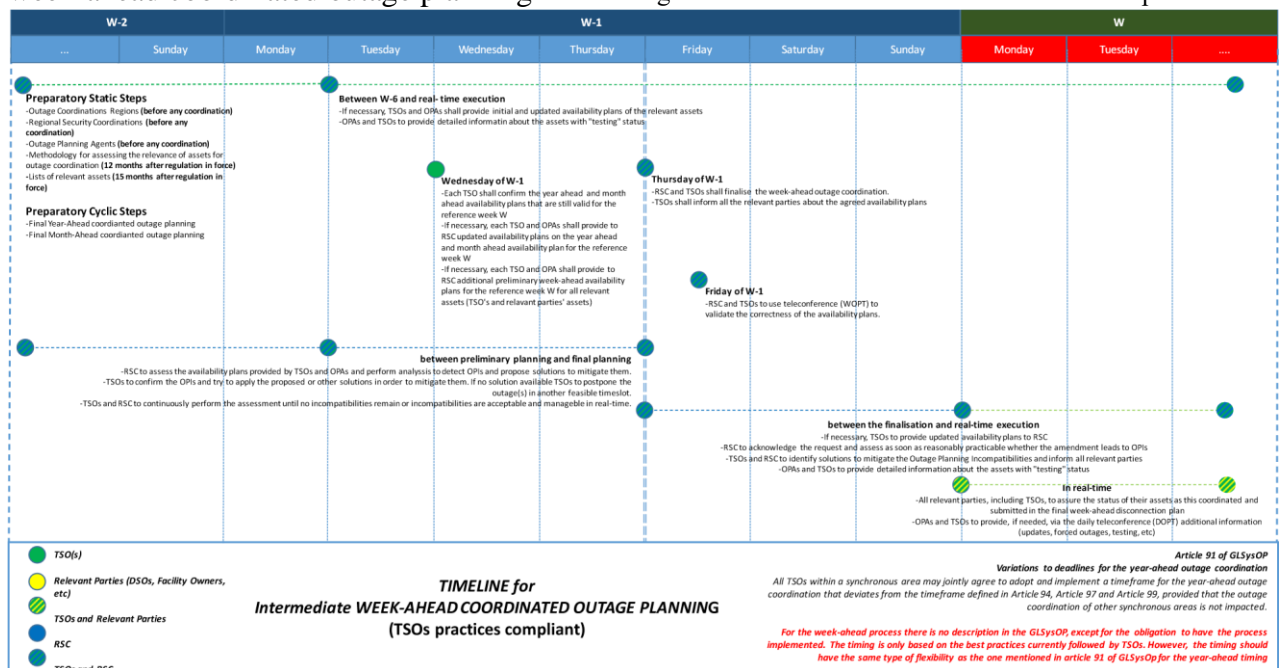

Figure 11: Timeline for the week-ahead coordinated outage planning

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11. Annex – 1: CIM-UML OPC format description

See attached file: 20171027_Outage_Business_Process_and_Format – link

12. Annex – 2: Handling of the xls-based OPC Format – OPC UAP & OPC Element list

The files stated below represent the current template files in xls version which are used during the OPC Experimentation phase:

OPC_UAP_Template_201706 - link

OPC Element list_20171229 – link

Current process of OPC Database update

Rule of implicit deletion

Main limitation of the xls-based OPC Pilot-DEF template is the inability to properly update specific availability cases since the described process of incremental change is not possible with usage of Pilot-DEF XLS format. Therefore, special business rule was defined in order to allow the TSOs to update availability information related to certain outages for the respective desired time-frame.

Business rule:

Based on the defined validity time-frame provided within header (Valid-from / Valid-to) of respective OPC UAP in XML or cells E3-F3 of the specific OPC UAP file in xlsx, the current central database of outages is updated with the content of **most recently** delivered Availability plan (outages). In other words, the importing routine into the OPC Database reads the time interval from the new OPC UAP input file and deletes all content which is already stored for the particular time interval for the specific TSO from the central database, after which the content of the delivered OPC UAP file is implemented in the database.

As already stated, this rule was introduced because of limitation of the OPC Pilot-dEF format. However, once all TSOs shall be able to deliver the unavailability information within the OPC UAP format the rule of implicit deletion could be cancelled since the format supports possibility to update specific pieces of information. Nevertheless, the existing rule can be kept in the future as well in case it is required by the TSOs.

Example:

- TSO sends availability plan for the rest of 2017 on 14/06 at 13:00 (Valid from: 2017-06-15 23:00Z / Valid to: 2017-12-31 22:59Z). In CW 25 there are 10 outages defined.

- TSO sends a new availability plan for CW 25 at 14/06 at 13:30 (Valid from: 2017-06-17 23:00Z / Valid to: 2017-06-23 22:59Z) stating 8 outages from the original plan o   RESULT: 2

    outages from year-ahead plan stated within CW25 have been deleted.

- TSO sends an empty availability plan for CW 25 on 14/06 at 14:00 (empty xml file with fields (Valid from: 2017-06-17 23:00Z / Vaid to: 2017-06-23 22:59Z)) o   RESULT: All outages from year-

    ahead plan stated within this week have been deleted.

Recommendation for Weekly experimentation phase:

- In case the Availability plan is delivered each week it is recommended to use the cells E3 and F3 to define the timing of next week – CET time).

- In case the Availability plan is defined for a longer time period (probably reduced effort on side in long term) please indicate the desired time period and bear in mind the rules concerning the updates

OPC Element list maintenance procedure

In case it is needed to update the information within the OPC Element list, the TSOs may deliver the updates to OPC Merge operator 24 hours before the 1st Merge. The following possibilities of updates are supported:

- Add a new Element – by stating the action code ADD within column H it is possible to add a new Element to the list. Please note that it is extremely important to perform this action on time in order to avoid any problems with CGM inconsistencies during OPI assessment.

- Update information on the existing element – by stating the action code UPD within column H it is possible to update any information (including UCTE code) linked to the respective element.

- Delete an element – by stating the action code DEL within column H it is possible to delete an Element from the list. In this case the Element will still remain part of the list but with his Status changed to INACTIVE.

- No action – by stating the action code NONE within column H.

13.   Annex – 3: CRAC format

The overview of the format of the CRAC file, to be used in the experimentation phase for the gathering of the OPI setup, is presented in the following excel - link.

14.   Annex – 4: Contact information

The overview of the contact information is available in the contact summary excel - link.