

## **ENTSO-E Draft Network Code for Operational Planning and Scheduling**

according to

**Article 6 of Regulation (EC) No 714/2009 of the European Parliament and of the Council of  
13. July 2009 on conditions for access to the network for cross-border exchanges in  
electricity and repealing Regulation (EC) No 1228/2003**

**14. May 2012**

### **Notice**

**This document is a draft work in progress reflecting the status of ongoing work by TSO experts as of 14. May 2012, in line with the ACER Framework Guidelines on System Operation published on 2. December 2011. It is distributed with a sole purpose to provide information on the state of the development of the Network Code for Operational Planning and Scheduling as an input for the first Workshop with the DSO experts and with stakeholders, taking place on 23. May 2012.**

**The document does not in any case represent a firm, binding or definitive ENTSO-E position on the contents, the structure, or the prerogatives of the Network Code for Operational Planning and Scheduling. Such position will be released for public consultation following the procedure according to the provisions of the 3<sup>rd</sup> Legislative Package.**

## PURPOSE AND OBJECTIVES

Having regard to 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 and repealing Directive 2003/54/EC;

Having regard to Regulation (EC) 714/2009 of the European parliament and of the Council of 13 July 2009;

Having regard to the priority list issued by the European Commission on 22 December 2010;

Having regard to the Framework Guidelines on Electricity System Operation issued by ACER on 2. December 2011;

Whereas:

(1) 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 and repealing Directive 2003/54/EC and Regulation (EC) 714/2009 of the European parliament and of the Council of 13. July 2009 (whereas section 6) underline the need for an increased cooperation and coordination among Transmission System Operators within a European Network of Transmission System Operators for Electricity (ENTSO-E) to create network codes for providing and managing effective and transparent access to the Transmission Systems across borders, and to ensure coordinated and sufficiently forward-looking planning and sound technical evolution of the Transmission System in the Community, including the creation of Interconnection capacities, with due regard to the environment ;

(2) Directive 2009/72/EC (whereas section 5) stresses that a secure supply of electricity is of vital importance for the development of European society, the implementation of a sustainable climate change policy, and the fostering of competitiveness within the internal market;

(3) Transmission System Operators (TSOs) are according to Article 12 of Directive 2009/72/EC responsible for providing and operating high and extra-high voltage networks for long-distance transmission of electricity as well as for supply of lower-level regional distribution systems and directly connected customers. Besides this transmission and supply task it is also the TSOs' responsibility to ensure the operational security of their Control Areas and together in the whole Synchronous Area and EU, with a high level of reliability and quality;

(4) Secure system operation is only possible by close cooperation and an obligation of the TSOs, Distribution System Operators (DSOs), Generators and Consumers to meet the relevant minimum technical requirements for the operation of the interconnected Transmission Systems as one entity;

(5) To ensure system security within the interconnected Transmission System and to provide a common security level it is essential that a common set of minimum requirements for EU-wide operational security principles is defined as a basis for both the cross-border cooperation between the TSOs and for utilising where relevant characteristics of the connected generation, consumption and distribution systems;

ENTSO-E has drafted this **Network Code for Operational Planning and Scheduling (Operational Planning and Scheduling Network Code, OPS NC)** aiming at setting out clear and objective minimum requirements to prepare the real-time operation in order to contribute to a harmonised framework for cross-border exchange of electricity and to non-discrimination, effective competition and the efficient functioning of the Internal Electricity Market (IEM) of the EU.

Pursuant to Article 6 of Regulation (EC) 714/2009, ENTSO-E will submit this network code to ACER.

## Title 1

### GENERAL PROVISIONS

#### Article 1

##### SUBJECT MATTER

This Network Code defines a common set of minimum requirements for ensuring coherent and coordinated preparation of real-time operation of Transmission Networks and Power Systems regarding security analysis, outage planning, System Adequacy, access to Ancillary Services and scheduling. It reflects on the common issues with the ENTSO-E Network Codes for Operational Security (OS NC) and for Load-Frequency Control and Reserves (LFC NC), referring where applicable to the issues defined in the ENTSO-E Network Codes for Requirements for Grid Connection Applicable to all Generators (RfG NC), for Demand Connection (DC NC), for Capacity Allocation and Congestion Management (CACM NC) and for Electricity Balancing Markets Integration (EBMI NC). It defines the minimum requirements of relevance for operational planning and scheduling related to the DSOs, generators and consumption units connected to the Transmission System. It aims at maintaining a common pan-European operational security and supporting the integration of the Internal Electricity Market.

#### Article 2

##### DEFINITIONS

For the purpose of this Network Code, the following definitions shall apply:

**(N-1)-Situation** – is a situation in the Transmission System in which a Fault on an element of Transmission System has happened

**Ancillary Services** – services necessary to effect a transfer of electricity between purchasing and selling entities (transmission) and which a provider of transmission services must include in an open access transmission tariff.

**Availability** – State of a generating unit, transmission line, ancillary service or another facility is capable of providing service, whether or not it actually is in service.

**Bidding Zone** – The smallest geographical area for which one single clearing price in the Day Ahead Market is always applicable.

**Close to Real-Time** – Time interval before real-time within the Security State of the Power System can be considered as stable excepted in case of unforeseen events. This time interval is usually around 15 minutes.

**Common Grid Model (CGM)** – European-wide data set used as a unique basis for security analysis and created through merging functions for year-ahead, month-ahead, day-ahead and intraday timeframes.

**Congestion** – a situation in which a Transmission System element cannot accommodate all physical flows resulting from market participants' activities.

**Consumption Unit** – An end-use device or customer that receives power from the electric system.

**Contingency** – is the identified possible or already occurred failure of an element of the Transmission System. Internal contingency is a contingency within the TSO's Control Area, including not only transmission but also distribution systems on lower voltage levels. External contingency is a contingency within the Control Area(s) of neighbouring TSO(s), having effects in the Control Area of the TSO, including not only the transmission but also the distribution systems of DSOs on lower voltage levels.

**Contingency List** – a list of contingencies to be simulated in the operational security analyses ("Contingency analysis") in order to verify respecting of the Operational Security Limits also after a Contingency would have happened.

**Control Area** – is a coherent part of a Synchronous Area, usually coinciding with the territory of a company, a country or a geographical area, physically demarcated by the position of points for measurement of the interchanged power and energy to the remaining interconnected network, operated by a single System Operator, with physical loads and controllable generation units connected within the Control Area.

**Distribution System** – medium or low voltage electricity grid for supplying end consumers or electricity supply companies.

**Distribution System Operator (DSO)** – natural person or legal entity responsible for ensuring safe and reliable operation of a Distribution System and the technical quality of the power supply. Distribution System Operator ensures, among others, that all the necessary contracts, processes and regulations for distribution grid connection, operation and usage are in place at all the connection points of its Distribution System.

**External Contingency** – is a Contingency in the Control Area of the neighbouring TSO(s) having significant effects in the area of the TSO.

**Failure** – random, fault-related tripping of a Transmission System element to an unplanned Switching State.

**Fault** – An unplanned/unscheduled event occurring on an electric system such as a short circuit, a broken wire, or an intermittent connection.

**Forced Outage** – 1. The removal from service Availability of a generating unit, transmission line, or other facility for emergency reasons. 2. The condition in which the equipment is unavailable due to unanticipated failure.

**Generating Unit** – an indivisible set of installations which can generate electrical energy. If there is more than one unit generating power within a power generating facility, that cannot be operated independently from each other or can reasonably be considered in a combined way, then each of the combinations of these units shall be considered as one Generating

Unit. This includes more than one Generating Unit in a Combined Cycle Gas Turbines and multiple units in a power parks.

**Generator** – is natural person or legal entity which is the owner or operator of one or more power plants or shared power plants. In this Network Code, the Generator refers to the Generator either connected to the Transmission System or connected to the Distribution System, having impact on the operational security of the Transmission System. The generator types are defined in the ENTSO-E RfG NC.

**Grid element** – Element of the Transmission System.

**Interconnection** – a transmission link (AC or DC line, circuit or transformer) which connects two Control Areas or Market Balance Areas.

**Internal Contingency** – of a TSO is a Contingency within its own Transmission System or associated with the connected DSOs.

**Market Balance Area** – A geographic area consisting of one or more metering grid areas with common market rules for which the settlement responsible party carries out a balance settlement and which has the same price for imbalance. A market balance area may also be defined due to bottlenecks. In general, a MBA corresponds to a Bidding Zone as defined in CACM Network Code.

**Market Operator** – The unique power exchange of trades for the actual delivery of energy that receives the bids from the Balance Responsible Parties that have a contract to bid. The market operator determines the market energy price for the market balance area after applying technical constraints from the system operator. It may also establish the price for the reconciliation within a metering grid area.

**Market Participant** – an entity authorized by a Market Operator or by local market rules (e.g. BRP contract) to perform trades or transactions. In that Network Code, TSOs and PXs (Shipping Agent) and their designated entity(ies) are considered as Market Participant.

**N-Situation** – is a situation in the Transmission System in which there are no failures.

**National Regulatory Authority (NRA)** – a regulatory authority as referred to in Article 35 (1) of Directive 2009/72/EC.

**Netted Area AC-Position** – The netted aggregation of all AC-External Schedules of an area.

**Netted Area Global Position** – The netted aggregation of all External Schedules of an area.

**Observability Area** – An area of the relevant parts of the Transmission Systems of the TSO and its neighbouring TSOs, on which TSO shall implement a real-time monitoring and modelling to ensure reliability of the respective responsibility area.

**Operational Security** – measure of the power system capability to retain Normal State or to return to the Normal State as soon and close as possible; characterized by the Operational Security Level which is a function of constraints like e.g. thermal, voltage, short-circuit current and stability limits.

**Operational Security Limits** – the acceptable operating boundaries (thermal, voltage and stability limits). The TSO must have defined Operational Security Limits for its own Transmission System and must agree with neighbouring TSOs on Operational Security Limits

at the Interconnection to their Transmission Systems. The TSO shall ensure adherence to these Operational Security Limits. Violation of Operational Security Limits could cause damage and/or failures that can cause further deterioration of system operating conditions. Operational Security Limit for power flows is calculated in established regime, which means that the conductor is in thermal balance. Consequently, the duration of operating a conductor at this value is not limited in time. Transitory Load Limit is calculated in a transitory overload regime, characteristic of a thermal imbalance of the conductor. It corresponds to exploitation in limited duration (post fault operation for example).

**Outage Planning Region** – a combination of Control Areas in which processes are defined to coordinate outage planning on all planning timescales

**Regional Security Coordination Initiative (RSCI)** – Regional unified scheme set up by TSOs in order to coordinate security analysis on a determined geographic area.

**Real-Time Reliability Margin** – The margin reserved on the permissible loading of a critical branch or interconnector to cover against uncertainties related to real time operation and connected to capacity calculation.

**Remedial Action** – A measure activated by the TSO(s) to relieve consequences of disturbances.

**Responsibility Area** – Is a coherent part of the interconnected system (usually coinciding with the territory of a company, a country or a geographical area, physically demarcated by the position of points for measurement of the interchanged power and energy to the remaining interconnected network), operated by a single TSO, with physical loads and controllable generation units connected within the area.

**Schedule** – a reference set of values of energy or power within a future time period and for a resolution time interval. Schedules refer to:

- a) An Internal Commercial Trade Schedule: Commercial exchange between different Market Participants in a Market Balance Area
- b) An External Commercial Trade Schedule: Commercial exchange between Market Participants in different Market Balance Areas
- c) A Generation Schedule: the generation program of a particular Generating Unit or the aggregation of generation programs of a group of Generating Units
- d) A Consumption Schedule: the Demand program of a particular Consumption Unit or the aggregation of consumption programs of a group of Consumption Units
- e) An External Schedule: planned exchange of energy between Market Balance Areas on a given time interval and at a given time resolution. These Market Balance Areas might belong to different Synchronous Areas and might be none neighbouring.
- f) Aggregated Cross Border Exchange Program

**Scheduling Agent** – an entity in charge according to local market rules to provide Schedules.

**Scheduling Operator** – TSO which is responsible of the scheduling process of a Market Balance Area.

**Significant Grid Users** – every Grid User that is able to influence transmission flow patterns beyond the defined thresholds, as a consequence of the events or actions in the equipment under its own responsibilities. The threshold for significance of the Grid Users is defined by the relevant TSO, depending on the specifics of the Transmission System under the TSO responsibility like size, number of Generating and Demand Facilities connected to the Transmission System, generation mix, etc.

**State Estimation** – the methodology and algorithms used to calculate a reliable set of measurements defining the Transmission System state (usually complex node voltages with voltage value and angle) out of the redundant set of measurements which might contain faulty and inaccurate values or where some measurement values are missing. State Estimation is the essential element of real-time and offline System Operation, for managing uncertainties and inaccuracies of data and information needed to effectively control the Transmission System and maintain Operational Security.

**Synchronous Area** - an area covered by interconnected TSOs with the common system frequency in a steady operational state. A certain number of Synchronous Areas may exist in parallel on a temporal or permanent basis.

**System Adequacy** – System Adequacy of a power system is a measure of the ability of a power system to supply the load in all the steady states which the power system may face considering reliability standards as defined by NRAs.

**System Operator** – a party that is responsible for a stable power system operation, including the organisation of physical balance, through a Transmission System in a geographical area. The TSO will also determine and be responsible for cross border capacity and exchanges. Transmission as means "the transport of electricity on the extra high or high voltage network with a view to its delivery to final customers or to distributors. Operation of transmission includes as well the tasks of system operation concerning its management of energy flows, reliability of the system and Availability of all necessary system services."

**System User** – any natural or legal person supplying to, or being supplied by a transmission or distribution system. System Users are: Generators, Consumers and Distribution System Operators.

**Third-party Owned Tie-Line** – A tie-line whose owner is not a TSO.

**Tie Line** - A Transmission Line connecting two Control Areas or Market Balance Areas.

**Transient Stability** – The ability of the power system and/or generators to maintain synchronism when subjected to a severe disturbance. In case of transient instability single generators or a group of generators in a subsystem suffer the loss of synchronism with the interconnected power system during faults or in post fault conditions, which e.g. results in inadmissible frequency and voltage deviations, which are no longer manageable by the system.

**Transmission** – the transport of electricity on the extra high or high voltage network with a view to its delivery to final customers or to distributors. Operation of transmission includes as well the tasks of system operation concerning its management of energy flows, reliability of the system and availability of all necessary system services.

**Transmission Line** – a system of structures, wires, insulators and associated hardware that carry electric energy from one point to another in an electric power system. Transmission Lines are operated at voltages varying from 50 kV up to 765 kV. One Transmission Line can have one or more Transmission Circuits.

**Transmission System** – electric power network used to transmit electric power over long distances within and between the Control Areas. Transmission systems are usually operated at the 220 kV and 380 kV voltage level.

**Transmission System Operator (TSO)** – a company that is responsible for operating, maintaining and developing the Transmission System for an area and its Interconnections.

### Article 3

#### SCOPE

This Network Code defines the principles, requirements and methodologies for Transmission System Operators and Significant Grid Users for ensuring a coherent and coordinated preparation of real-time operation in order to achieve and maintain a satisfactory level of Operational Security of the interconnected Transmission Systems.

This Network Code implements a common framework for the Operational Planning and Scheduling, adhering to the System Operation Framework Guidelines of ACER. These minimum requirements shall apply to all TSOs, DSOs Generators and Consumption Units of significance for the Transmission System and refer to:

- a) Security analysis
- b) Generating Unit, Consumption Unit, Grid Element and Third-Party Owned Tie-Line Outage planning
- c) System Adequacy analysis
- d) Access to Ancillary Services
- e) Scheduling of Commercial Exchanges and of Generating and Consumption Units

Some TSOs may mandate regional security coordination initiatives or regional coordination centres to perform a part of their operational tasks. The applicability of the principles, standards and minimum requirements from this Network Code shall always be under the responsibility of the TSOs, ensuring also that any regional security coordination initiatives or regional coordination centres follow these standards and requirements, including confidentiality of the data and information used.

## Article 4

### REGULATORY ASPECTS

1. The requirements established in this Network Code and their applications are based on the principle of non-discrimination and transparency as well as the principle of optimisation between the highest overall efficiency and lowest total cost, while maintaining security and quality of supply, for all involved parties.
2. Notwithstanding the above, the application of non-discrimination principle and the principle of optimization between the highest overall efficiency and lowest total costs for all involved parties shall be balanced with the aim of achieving the maximum transparency and the assignment to the real originator of the costs.
3. Where reference is made to this paragraph, any decision by a Relevant Network Operator and/or a Relevant TSO or any agreement between, on the one hand, a Relevant Network Operator or a Relevant TSO and, on the other, a Generator, Consumption Unit or DSO shall be performed under the conditions of the applicable national legal framework and in accordance with the principles of transparency, proportionality and non-discrimination and, as the case may be, with the involvement of the National Regulatory Authority.
4. The costs related to the obligations referred to in this Network Code which have to be borne by the regulated Network Operators shall be taken into account in the calculation of tariffs. Regulatory authorities shall approve those costs if they are reasonable and proportionate.

## Article 5

### CONFIDENTIALITY OBLIGATIONS

1. Each TSO, Generator, DSO or Consumption Unit shall preserve the confidentiality of the information and data submitted to them in connection with this Network Code and shall use them exclusively for the purpose they have been submitted in compliance with the Network Code, notably to verify the compliance of requirements set forth in this Network Code.
2. Notwithstanding the above, disclosure of such data may occur in case a Relevant Network Operator, a Relevant TSO or a Relevant DSO is compelled under relevant EU or national law to disclose it, under the conditions set forth in the relevant legislation.

## Article 6

### RELATIONSHIP WITH NATIONAL LAW PROVISIONS

1. This Network Code shall be without prejudice to the rights of Member States to maintain or introduce measures that contain more detailed or more stringent provisions than those set out herein, provided that these measures are compatible with the principles set forth in this Network Code.

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## Title 2

### REQUIREMENTS

#### Chapter 1

#### REQUIREMENTS FOR SECURITY ASSESSMENT

##### Section 1

##### Article 7

##### GENERAL PROVISIONS

1. Each and all TSOs shall perform coordinated Security Analysis, consistent with Capacity Calculation Code requirements, in order to ensure the accomplishment of the operational security criteria as stated in Operational Security Code, at least at the following timeframes:
  - a) Year-ahead and updates
  - b) Week-ahead
  - c) Day ahead
  - d) Intraday
  
2. Each and all TSOs shall carry out the processes required to support the following functions for each relevant timeframe:
  - a) All TSOs in a coordinated way define, as applicable, appropriate Pan-European or Regional scenarios, as described in Article 8.1 and Article 8.2.
  - b) Each TSO performs the collection and delivery of data in accordance with the defined scenarios, as described in Article 8.3 and Article 8.4, or in accordance with the regionally agreed scenarios, as described in Article 9 and Article 10.
  - c) All TSOs define a Pan-European procedure for merging the datasets and assuring quality of the so constructed Common Grid Models, as described in Article 8.3 and Article 8.4.
  - d) Each TSO performs Security analysis through relevant simulations ensuring at least Regional coordination, as described in Article 11, Article 12 and Article 13.
  - e) Regional coordination is ensured by involved TSOs in the evaluation of the simulation results and the assessing of constraints, as described in Article 14.
  - f) Each TSO develops in a bilateral or regionally coordinated way the required Remedial Actions, as described in Article 14.
  - g) Each TSO sets up the Remedial Actions, ensuring coordination with the affected neighbouring TSO(s), as described in Article 14.

## Section 2

### DATA FOR SECURITY ANALYSIS

#### Article 8

#### YEAR-AHEAD SCENARIOS AND COMMON GRID MODEL

##### Article 8.1

##### DEFINITION OF YEAR-AHEAD SCENARIOS

1. All TSOs together shall define, at least 2 months before Year Ahead, one list of common scenarios covering the most representative Year Ahead conditions of the European system. These scenarios should cover, not being limited to, the next parameters:
  - a) Load
  - b) Possible conditions in relation with renewable energies contribution
  - c) Defined import/export positions (including agreed reference values allowing the merging task)
  - d) Generation pattern
2. These scenarios, based on the best estimation of TSOs, shall be defined allowing to detect the different Operational Security Limits to be assessed and taking into account the probability of occurrence of the scenarios.
3. Significant grid users (generators, significant Consumption Units, DSO) shall provide, at least two months before year ahead, relevant information to help constructing the year-ahead scenarios, at least:
  - a) Availability, in accordance with Article 21
  - b) Their best estimation on the production and consumption in coherence with the defined common scenarios.Each TSO shall limit the number of its requests on a reasonable level by choosing appropriately the scenarios.
4. Periodically, all TSOs together shall review the relevance of the common scenarios on the basis of the feedback experience on constraints situations faced in operations.

## Article 8.2

### CONSTRUCTION OF YEAR-AHEAD INDIVIDUAL GRID MODELS

1. Each TSO shall construct and provide its respective individual grid model in the agreed format and time and obeying the global scenarios defined in Article 8.3, ensuring the coherent merge of its individual grid model into the Common Grid Model.
2. Each TSO shall comply with the following requirements, not limited to:
  - a) The net exchanges on AC shall be agreed among the relevant TSOs
  - b) The estimated power flow on DC cables shall be agreed upon by the relevant TSOs
  - c) For each individual scenario, the following sum shall be balanced: net exchanges, estimated power flows on DC cables, load (including losses estimation) and generation.

## Article 8.3

### CONSTRUCTION OF YEAR-AHEAD COMMON GRID MODELS

1. All TSOs shall decide, no later than 6 months after the entry into force of this Network Code, on the provisions dealing with the gathering and merging of the individual scenarios within a common data base, including the possibility of subcontracting an entity that will perform the tasks of gathering and merging. This provisions shall cover the following but not limited to elements:
  - a) Data Format
  - b) Deadlines
  - c) Quality control of datasets
  - d) Tasks to be performed at the Regional and Pan-European level
  - e) Tools for the common data base
2. With independence of the solution retained by TSOs, all and each TSOs remain responsible for the general task of gathering and merging individually delivered grid models.
3. As a result of the defined provisions, a single Common Grid Model for each scenario shall be created at the European level by merging inputs from all TSOs.
4. Each TSO shall provide associated to each Common Grid Model the next information but not limited to:
  - a) Planned outages of relevant Grid Elements and Third-Party Owned Tie-Lines.
  - b) Planned outages of relevant Generating and Consumption Units.

- c) Identification of Remedial Actions linked to above described outages, in case of need.
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5. Each TSO shall deliver on request to the affected neighbour TSOs further detailed information containing the topology modifications or operational arrangements issued as a consequence of an outage, in such a way that an accurate representation of the system is provided for performing complete security analysis.

#### **Article 8.4**

##### **UPDATES OF YEAR-AHEAD COMMON GRID MODELS**

1. Taking into account the updated information gathered from Significant Grid Users as per described in Article 22 as well as relevant and significant changes in TSOs' best estimations previously considered in the construction of Year-ahead scenarios, TSOs shall update individual scenarios in accordance with the new identified conditions.
2. Significant grid users shall provide in accordance to Article 22, their TSO relevant and significant update of the information provided in year-ahead as soon as they know.

#### **Article 9**

##### **WEEK-AHEAD GRID MODELS**

1. At least on a Regional level, all TSOs shall define the most representative conditions for the security of the system for the next week.
2. Each TSO shall provide information to the TSOs in its region in order to allow TSOs to update their grid model in accordance with the conditions defined in the previous article.

#### **Article 10**

##### **DAY-AHEAD AND INTRADAY GRID MODELS**

1. All TSOs shall decide, no later than 6 months after the entry into force of this Network Code, on the provisions dealing with the gathering and merging of the individual scenarios within a common data base, including the possibility of subcontracting an entity that will perform the tasks of gathering and merging. This provisions shall cover the following but not limited to elements:
  - a) Data Format,

- b) Deadlines compatibles with setting up Remedial Actions and capacity calculation,
  - c) Quality control of datasets,
  - d) Tasks to be performed at the Regional and Pan-European level including times schedules for the different tasks in all timeframes,
  - e) Tools for the common data base.
2. Each TSO shall create individual grid models to provide at least on a regional basis the input for the day-ahead and intraday security analysis. As a result, at least on a Regional basis, Day-ahead and Intraday grid models shall be available, including next information:
- a) The results of the exchange capacity allocation functions.
  - b) Production and consumption by significant units in accordance with the local market rules and results as per specified in Article 35 including renewable generation and load at distribution level.
  - c) Provisions for Ancillary Services and actions taken for congestion management and for procuring reserves Expected grid topology
3. Each TSO shall check, update and deliver on an intraday basis its individual grid model, according to the defined provisions described in Article 10.
4. Each TSO shall periodically check the accuracy and adapt the Individual Grid Model for a given time by comparing its results with State Estimation results at the same time, the Individual Grid Model being upgrading with the events occurred between the time of Individual Grid Model elaboration and the time of the State Estimation. The comparison shall assess the discrepancies regarding voltages, active and reactive power flows.

### **Section 3**

## **REQUIREMENTS AND COORDINATION FOR SECURITY ANALYSIS**

### **Article 11**

#### **GENERAL PROVISIONS FOR SECURITY ANALYSIS**

1. Each TSO, in accordance with the provisions described in Article 12 of the Operational Security Network Code, shall perform the necessary analysis and ensure provisions leading to:
  - a) Manage active and reactive power flows within the established limits,
  - b) Keep the impact of short circuit events on the operation of the network at a level that provides a correct functioning of transmission facilities and protection,
  - c) Check that available Ancillary Services and reactive power resources are sufficient to secure the technical functioning of the power system.

2. Each TSO shall coordinate its security analyses together with the relevant TSOs in accordance to Articles 8, 9, 10 and 11 of Operational Security Network Code in order to verify the respect of the Operational Security Limits affecting the own and the responsibility areas of other TSOs.
3. Security analyses shall be performed at the relevant Timeframes in N-situation, simulating each Contingency from the TSO's Contingency List as referred in Operational Security NC, thus checking that the Operational Security Limits as defined in Operational Security NC in the (N-1) Situation are fulfilled.
4. Each TSO shall perform the security analyses based on the Grid Model described in Article 8.3, Article 9 and Article 10 in the corresponding Timeframes.
5. As far as real-time is approached, operational parameters in accordance with the scheduled generation and the most probable state of the system shall be taken into account as input data for security analysis.
6. In order to ensure the secure interoperability of the interconnected system when establishing Operational Security Limits within synchronous connected systems, each TSO shall determine the size of the Real-Time Reliability Margin.
7. At least 6 months after the entry into force of this Network Code, each and all TSO shall define a methodology, to evaluate the uncertainties of power flows on AC Interconnections as the basis for the determination of Real-Time Reliability Margins used for security analysis.
8. This methodology shall be transparent and based on a well-defined and described approach. It has to integrate but not limited to an analysis of the historic of deviation of power flows and cover but not limited to:
  - a) Future expectations on unintended deviation of power flows,
  - b) Inaccuracies in measurements
  - c) Emergency exchanges between TSOs to cope with unexpected unbalanced situations in real-time.
9. If this methodology has to be adapted due to other reason, each TSO shall produce a justification document explaining the methodology and the level of the corresponding risk covered.
10. Each TSO shall calculate and systematically update the Real-Time Reliability Margin according to this methodology.
11. In case of different results in calculations made by neighbour TSOs of real time component of the Real-Time Reliability Margin in a certain border, the highest value shall be applied.

## Article 12

### PROVISIONS FOR YEAR-AHEAD AND UPDATED SECURITY ANALYSIS

1. Each TSO shall perform security analysis on its Observability Area as defined in Operational Security Network Code, taking as an input the updates of the Common Grid Model and relevant information (outages of relevant elements) described in Article 8.3 and Article 9, in order to detect possible constraints and agree upon Remedial Actions with the impacted neighbouring TSOs.
2. The coordinated simulation methodology shall ensure to detect at least the following network constraints:
  - a) Active power flow over limits,
  - b) Voltage instability
3. Each TSO shall ensure, as necessary and as preliminary detected in long term planning studies, bilateral or regional coordination of actions preventing possible constraints, in coherence with Articles 10 and 11 of Operational Security NC, regarding
  - a) Short-circuit current,
  - b) Transient stability.
4. Each TSO shall assess or update, when it is estimated necessary, the list of relevant elements operated by other TSOs to be considered in its own security analysis.
5. Each TSO shall prepare Remedial Actions by its own or in a coordinated way with affected TSOs to be implemented in due time to cope with any Contingency detected in Year-Ahead security analysis. Remedial Actions shall be prioritized on economical basis.
6. The efficiency of a Remedial Action shall be checked in advance by load-flow calculations.
7. In order to allow a complete representation of possible situations, each TSO shall communicate to the impacted neighbouring TSOs the considered relevant security and operational criteria applied in its area.
8. In case a constraint in its system is detected as a result of the security analysis, each TSO shall communicate and coordinate actions with the TSO which relevant element causes or has an impact on the detected constraints.

## Article 13

### PROVISIONS FOR DAY-AHEAD, INTRADAY AND CLOSE TO REAL-TIME SECURITY ANALYSIS

1. On a day-ahead basis and within the intraday periods, each TSO shall perform security analysis on its Observability Area as defined in Operational Security Network Code, in order to detect possible constraints and agree upon Remedial Actions with the impacted neighbouring TSOs.
2. For these analyses and in order to finally assess that planned outages do not affect Security of Supply, the TSO shall consider the results of the scheduling tasks between TSOs as well as updates of generation or load patterns and implicitly the results of the Day-ahead market coupling processes and intraday processes described in CACM Network Code that constitute an input for Scheduling.
3. At least on the Day-ahead, each TSO shall evaluate the effectiveness of the Remedial Actions referred to in Article 12 necessary to relieve possible detected constraints, in accordance with provisions defined in Article 12.7 of Operational Security Network Code. Remedial Actions shall be prioritized on economical basis.
4. Close to real-time, each TSO shall perform security analysis from the State Estimation. This security analysis shall be performed on a time cycle basis not exceeding 15 minutes and shall be executed on request in case of change affecting voltage or flows significantly.

## Article 14

### COORDINATION, INCLUDING PREVENTION AND REMEDIAL ACTIONS

1. Each TSO as individual company is responsible for system operation security analysis, no matter what cooperation rules they commit to.
2. TSOs shall agree upon relevant coordinated processes to deal with the interaction between them including:
  - a) Analysis to assess the degree of interdependency,
  - b) Possible required additional hypothesis and datasets to the ones described in Article 8,
  - c) Evaluation of operational constraints,
  - d) Decisions on Remedial Actions.
3. Led by the high level of interdependency of certain areas in the European power system, TSOs may decide to coordinate security analysis in a regional unified scheme termed as Regional Security Coordination Initiatives, and in such a case :

- a) TSOs shall sign specific multilateral agreements for the realization of joint regional security including the possibility to establish a single entity to perform all or part of the necessary functions requested for the regional security analysis
  - b) These multilateral agreements shall cover, but not limited to :
    - i. The compatible or common tools and processes to deliver these functions,
    - ii. The processes to set up common Remedial Actions,
    - iii. Where applicable, the functions covered by single entities
4. When, as a result of Security Analysis, a Contingency whose consequences concerned several TSOs is detected, the detecting TSO shall share the information with the relevant TSOs.
5. TSOs shall, at least at regional level, commonly evaluate the consequences and probability of occurrence of the forecast situation, sharing the security and operational criteria applied in their area.
6. TSOs shall agree on appropriate curative or preventive measures, not limited to:
- a) Preparing coordinated Remedial Actions: adapting topology, PST...
  - b) Adopting dedicated solutions concerning planned outages
  - c) Utilizing redispatch or countertrade in order to prevent constraints between the subsystems.

## Chapter 2

### REQUIREMENTS FOR OUTAGE PLANNING

#### Article 15

##### DETERMINATION OF OUTAGE PLANNING REGIONS

1. No later than 6 months after the entry into force of this regulation, all TSOs shall define the Outage Planning Regions within which coordinated outage planning shall be performed.
2. The definition of the outage planning regions shall comply with the following:
  - a) Each Control Area shall be attributed to at least one outage planning region; and
  - b) Each border between Control Areas shall be attributed to exactly one outage planning region; and
  - c) The definition of Outage Planning Regions shall be based on an assessment against the cross-border impact on system security of a planned outage in a Control Area. Control Areas with a major mutual impact will preferentially be attributed to a common Outage Planning Regions; and
  - d) For each Outage Planning Region one or more coordinating TSOs shall be appointed; and
  - e) A procedure for making changes to the defined Outage Planning Regions shall be included in the definition; and
  - f) Relevant non EU/EAA member states may be included in the Outage Planning Regions through voluntary agreements.

#### Article 16

##### REQUIREMENTS FOR REGIONAL COORDINATION

1. The practical organisation of the coordination process for outage planning shall be managed by the coordinating TSO(s) for each Outage Planning Region according to the provisions agreed upon by all TSOs of the concerned Outage Planning Region.
2. Each TSO shall participate to the installed outage planning coordination process(es) for the Outage Planning Regions of which he is a member.
3. Regional Security Coordination Initiatives operating in a certain Outage Planning Region and/or TSOs operating Control Areas outside the relevant Outage Planning Region may be invited to participate to the relevant coordination process on a voluntary basis.

4. Coordination meetings shall be held within the coordination process to allow coordination of outages, information sharing about past, current and future states of the electricity grid, and validating outages plans relevant to the concerning time horizon.
5. Coordination meetings shall be organized at least on the following time frames:
  - a) Year ahead
  - b) Week ahead

The modalities of these coordination meeting shall be defined in the coordination process, and can differ depending on the concerned timeframe.

## Article 17

### LIST OF RELEVANT THIRD-PARTY OWNED TIE-LINES, GENERATION AND CONSUMPTION UNITS

1. No later than 3 months after the entry into force of this regulation, each TSO shall submit a proposal to the Relevant National Authority, according to the applicable national legislation, regarding:
  - a) The Generating and Consumption Units and Third-Party Owned Tie-Lines for which information is required to be provided to the relevant TSO for coordinated outage planning;
  - b) The types of information to be submitted. This information shall include, but not be limited to:
    - i. Information related to technical characteristics;
    - ii. Information related to Availability.

This proposal shall respect the principles of transparency, proportionality and non-discrimination.

2. The proposed list of units will contain at least:
  - a) All Generating and Consumption Units of which their outage brings about an impact across the Control Area borders;
  - b) All Third-Party Owned Tie-Lines.
3. If applicable, the Relevant National Authority shall approve or reject the proposal submitted by the TSO within 3 months of the date of receipt.

4. Following a decision by the Relevant National Authority, and according to local regulations regarding transparency and confidentiality, the following shall be published:
  - a) A list of parties required to provide information; and
  - b) A list of information to be provided.
5. In the event that a TSO identifies a need to reassess the list of relevant Third-Party Owned Tie-Lines, Generating or Consumption Units, he will submit a request for change to the Relevant National Authority for approval. Within 2 months, the national authority shall approve or reject the request. Reasons for a reassessment include but are not limited to the commissioning of new Third-Party Owned Tie-Lines, Generating or Consumption Units.

## Article 18

### LIST OF RELEVANT GRID ELEMENTS WITH IMPACT ACROSS BORDERS

1. No later than 6 months after the entry into force of this regulation, all TSOs shall set up a common list of relevant Grid Elements for coordinated outage planning.
2. The list of relevant Grid Elements shall contain at least:
  - a) All Grid Elements interconnecting Control Areas;
  - b) All Grid Elements of which their planned outage brings about an impact across Control Area borders;
  - c) All Grid Elements contained in the External Contingency List of at least one TSO.
3. The types of information that are to be provided by each TSO are described together with the list of relevant Grid Elements. This information shall include, but not be limited to outage dates, outage reason (maintenance, grid development, reparation or combined works) and restitution time information.
4. The list of relevant Grid Elements shall be published according to transparency guidelines and respecting all relevant confidentiality requirements.
5. Prior to the start of the year ahead planning process, each TSO shall examine the list of relevant Grid Elements in order to identify the need to add or subtract Grid Elements.
6. The coordinating TSO of each Outage Planning Region shall collect all change requests to the list of relevant Grid Elements, and – if appropriate – organize a meeting between all relevant TSOs to update the list of relevant Grid Elements.

## Article 19

### COMMON TSO PLATFORM FOR COORDINATED OUTAGE PLANNING

1. No later than 12 months after the entry into force of this regulation, all TSOs shall develop a common platform to contain all relevant outage planning information.
2. This information encompasses at least:
  - a) Planned outages of relevant Grid Elements including, but not limited to outage period, specific conditions for execution and restitution time.
  - b) Planned outages of relevant Generating Units including, but not limited to outage period, eventual commissioning period and lost generation capacity.
  - c) Planned outages of relevant Consumption Units including, but not limited to outage period, eventual commissioning period and lost load.
  - d) Planned outages of Third-Party Owned Tie-Lines including, but not limited to outage period, specific conditions for execution of the outage and restitution time.
3. Each TSO is responsible to provide and update the relevant information to the common TSO platform.
4. Data exchanges with the common TSO platform shall be based on a common, standardized data format defined by all TSOs. The description of this data format shall be an integral part of the common platform description.
5. All TSOs and RSCIs operating in one of the Outage Planning Regions developed in Article 16 shall have access to all information contained in this common TSO platform.

## Article 20

### REQUIREMENTS FOR MORE THAN YEAR-AHEAD OUTAGE PLANNING

1. Each TSO shall provide on a best effort basis all relevant information at its disposal to the relevant TSO's regarding grid-, generation- or consumption-related projects that impact the operation of neighbouring TSO's grids.

## Article 21

### REQUIREMENTS FOR YEAR AHEAD OUTAGE PLANNING

1. A proposal of the relevant generation, consumption and Third-Party Owned Tie-Line Availability shall be submitted by its owner or its delegate for the following year to the relevant TSO. This information shall be provided before July 1<sup>st</sup>.
2. Generation or consumption units and Third-Party Owned Tie-Lines that are considered to be in commissioning the following year will be declared as such by their owner or its delegate. An estimated commissioning period will be provided to the relevant TSO. Before this period the respective asset will be declared as unavailable, after this commissioning period a proposal regarding Availability will be provided as per Article 21.1.
3. Each TSO shall assess if System Adequacy and Security of Supply can be fulfilled taking into account the generation, consumption and Third-Party Owned Tie-Line outage proposals. If incompatibilities arise all affected parties shall coordinate with the goal of establishing a feasible alternative outage plan. If System Adequacy and/or Security of Supply cannot be guaranteed, the TSO can impose the Availability status of certain generation units or Third-Party Owned Tie-Lines to its respective owner or its delegate.
4. Grid elements interconnecting different responsibility areas shall be planned in a coordinated manner within the defined Outage Planning Regions. Planned outages shall be combined as much as possible, hereby minimizing market impact while maintaining Security of Supply. TSOs shall take into account all received generation, load and Third-Party Owned Tie-Line outage proposals as per Article 21.3.
5. Each TSO shall plan outages of all remaining relevant Grid Elements (cf. Article 18) taking into account Third-Party Owned Tie-Lines, generation and consumption outage proposals and outages of Control Area Interconnection Grid Elements. If Security of Supply or System Adequacy cannot be guaranteed due to the combination of grid and generation/consumption outages, the TSO can request a change of the generation/consumption outage proposal, and coordination with the concerned generation/load owner or its delegate shall be initiated by the TSO.
6. Information about grid-related conditions for executing specific planned grid outages shall be included by the TSO in the grid outage plans published on the common TSO platform to allow other TSOs to take this information into account.
7. If the TSO is not able to plan grid outages within the reasonable delays and normal practices, which might lead to the inability to guarantee the security of supply on a local or regional scale, the TSO together with the generation and consumption owners or their delegates shall find a solution to allow critical grid outages to be planned.

8. Each TSO shall publish Third-Party Owned Tie-Line, generation and consumption preliminary outage plans for the following year before September 1<sup>st</sup> to the relevant generation and consumption owners, their delegates or Significant Grid Users – whichever is appropriate.
9. Each TSO shall provide its preliminary grid outage plans for all relevant grid elements and its generation, consumption and Third-Party Owned Tie-Line outage plans for Year+1 to other TSOs before September 1<sup>st</sup>. This shall be achieved by means of the common TSO platform for outage planning. These plans shall contain at least the types of information listed in Article 18.3.
10. Each TSO shall analyse the compatibility of internal outage plans with outage plans of the neighbouring TSOs, coordinating and resolving issues should they arise with their neighbouring TSOs. When all conflicts are resolved, a final coordination step is initiated per Outage Planning Region, where all member TSOs shall validate the year-ahead grid outage plans.
11. Before November 1<sup>st</sup>, outage plans for the following year will be finalized. Each TSO will publish the validated outage plans on the common TSO platform which will serve as the reference up to real time. Every change to this plan that is requested by any party (barring the results of forced events) can be subject to approval of all concerned parties according to the requirements set forth in Article 22.
12. Each TSO shall publish Third-Party Owned Tie-Line, generation and consumption final outage plans for the following year before November 1<sup>st</sup> to the relevant generation and consumption owners, their delegates or Significant Grid Users – whichever is appropriate.

## Article 22

### REQUIREMENTS FOR PLANNED UPDATES TO THE YEAR-AHEAD OUTAGE PLANNING

1. Each generation or consumption owner or its delegate wanting to initiate an adaptation of the validated outage plan shall send a change request to the relevant TSO. The TSO shall assess the impact on System Adequacy and Security of Supply taking into account all previously validated grid, generation and consumption outages. If incompatibilities are detected, a coordination step between all affected parties shall be initiated. If no feasible solution can be reached, the TSO can deny the requested change unless Security of Supply is at stake or Article 21.7 applies. If the change is approved by the TSO, it is incorporated in the validated outage plan and published to all relevant parties and on the common TSO platform.
2. Each TSO wanting to initiate an adaptation of the validated outage plan shall determine which parties are impacted through an assessment of System Adequacy and

Security of Supply taking into account all previously validated grid, generation and consumption outages. If outages planned by other parties are impacted, a coordination step between all affected parties will be initiated. If no feasible solution can be reached, the requested change can be denied unless Security of Supply is at stake or Article 21.7 applies. If the change is approved by all impacted parties or if no other parties are impacted, the change is incorporated in the validated outage plan and published to all relevant parties and on the common TSO platform.

3. For Generating or Consumption Units or Third-Party Owned Tie-Lines that are declared to be in commissioning, the relevant owner or its delegate shall provide the relevant TSO with a detailed Availability and test plan as soon as it is available, and no later than two months before the start of the declared commissioning period.
4. For generation or consumption units or Third-Party Owned Tie-Lines that are declared to be in commissioning, the relevant owner or its delegate shall provide an update of the Availability and test plan to the relevant TSO on a regular basis.

## **Article 23**

### **REQUIREMENTS FOR UNPLANNED UPDATES TO THE YEAR-AHEAD OUTAGE PLANNING**

1. In case of unforeseen events jeopardizing the security of the national or European electricity grid, each TSO has the right to impose the Availability or unavailability of Third-Party Owned Tie-Lines, Generating and/or Consumption Units to the concerning owners or their delegates in its Control Area within technical limits and feasibility. Before imposing any decision, the TSO will use all means that are reasonably at its disposal to come to a fulfilling negotiated solution. The TSO shall hereby minimize impact on the market.
2. In case of unforeseen Forced Outages of Generating and/or Consumption Units or Third-Party Owned Tie-Lines, the concerning owner or its delegate shall inform the relevant TSO as soon as possible, hereby declaring the reason of the event, the expected duration and the impact on the Availability of other assets under his responsibility. In case the security of the national or European electricity grid is jeopardized, the TSO can impose the obligation of limiting the duration of the Forced Outage as much as possible, within technical limits and practical feasibility.
3. In case of unforeseen Forced Outages of Grid Elements with cross-border impact, the relevant TSO shall inform all other impacted TSOs as soon as possible, hereby declaring the reason of the event, the expected duration and the impact on the Availability of other Grid Elements.

4. Following all unplanned updates to the outage planning, and as soon as reasonably possible, the relevant TSO shall update the common TSO platform to contain the most up to date information.

## Article 24

### REQUIREMENTS FOR REAL-TIME EXECUTION OF THE OUTAGE PLANNING

1. Each TSO and each generation, consumption and Third-Party Owned Tie-Lines owner or its delegate cannot intentionally deviate from the validated outage planning unless security of supply is at stake:
  - a) All Generating Units that were declared as being available have to be ready to produce energy pursuant to their declared technical capacities when necessary to maintain System Adequacy and/or Security of Supply.
  - b) All Generating and Consumption Units that were declared as being unavailable cannot produce resp. consume energy.
  - c) All Grid Elements including Third-Party Owned Tie-Lines that were declared as being available have to be ready to transport energy pursuant to their declared technical capacities when necessary to maintain System Adequacy and/or Security of Supply.
2. If specific grid-related constraints apply for the execution of a planned grid outage, the relevant TSO shall assess if these constraints are met before real-time execution of the outage. If not, the planned outage, or a part thereof, shall not be executed.
3. Each TSO has the right to refuse the real-time execution of planned grid or generation outages when Security of Supply and/or System Adequacy cannot be guaranteed.
4. Each TSO has the right to refuse the real-time execution of a planned test during the commissioning period of generation or consumption units or Third-Party Owned Tie-Lines when Security of Supply and/or System Adequacy cannot be guaranteed.
5. Each real-time deviation from the validated outage planning concerning generation, consumption or Third-Party Owned Tie-Line Availability shall be documented to the TSO, at least including the reason for and the duration of the deviation.
6. Each real-time deviation from the validated outage planning concerning grid element Availability shall be documented by the TSO, at least including the reason for and the duration of the deviation.

## Article 25

### COMPLIANCE TO DEADLINES AND REVISION

1. Compliance of all relevant parties to the deadlines set for data provisions shall be monitored. In case of repeated non-compliance with one or more deadlines, a non-compliance report will be addressed to the Relevant National Authority.
2. If there is a need to change the deadlines defined in Article 21.1, Article 21.8, Article 21.9 and Article 21.11, all TSOs together shall produce a report for motivation, consult the affected parties on feasibility and possible implementation date and fix a possible date for implementation complying with the result of the consultation in order to enter in the Comitology process.

## Chapter 3

### REQUIREMENTS FOR ADEQUACY

#### Article 26

##### REQUIREMENTS FOR SYSTEM ADEQUACY IN GENERAL

1. Each TSO shall do its utmost to achieve the required System Adequacy to prevent and/or to allow to remedy incidents which can affect neighbouring power systems or the Synchronous Areas.
2. Each TSO shall monitor its individual System Adequacy. If a TSO integrates in its System Adequacy imports from neighbouring TSOs, this TSO shall check with these neighbouring TSOs that these imports do not breach the System Adequacy of the neighbouring TSOs or of the Synchronous Areas. If a System Adequacy breach does occur, the TSO shall re-evaluate as a result its level of System Adequacy.
3. Each TSO shall inform the affected TSOs on the security criteria for System Adequacy assessment required for its area.
4. Each TSO shall assess if there are sufficient/available connected means to fulfil the following functions to be performed by TSOs:
  - a) Balancing generation, exchanges and load including losses
  - b) Controlling frequency
  - c) Controlling voltage
  - d) Safeguarding and restoring the system
5. Each TSO shall perform System Adequacy analysis based upon the last available data provided by the Grid Users, DSO or the TSO and including at least the following information:
  - a) Generation capacities and their Availability
  - b) Tie-Lines Availability and Interconnection capacity
  - c) The relevant outage plan
  - d) a probabilistic model of Forced Outages of generator
  - e) Non usable capacity at peak load under normal conditions due to lack of primary sources (hydro, wind, sun, insufficient fuel Availability, mothballed plants, etc...)
  - f) Load estimation
  - g) Availability of Ancillary Services.

6. Each TSO shall, by performing the System Adequacy analysis, ensure the following knowledge upon potential inadequacies:
  - a) The type of inadequacy as defined in Article 26.4;
  - b) The expected duration of the inadequacy;
  - c) The possible actions to take in order to remedy the inadequacy;
  - d) If any, the consequences for market parties (i.e. market restrictions).
7. Each TSO shall publish the above according to the transparency guidelines.
8. Each TSO shall inform the relevant NRAs in case of the System Adequacy does not fit with the set-up criteria.
9. Each TSO shall do its utmost when arranging that the necessary mechanism is in place for the provision of an adequate level and the correct location of Ancillary Services required to meet security criteria; either alone or in coordination with neighbouring TSOs.
10. Each TSO shall do its utmost when arranging that Remedial Actions are available if the level of System Adequacy is still not fulfilling the relevant security criteria. Remedial Actions are prioritized on economical basis.
11. Each TSO shall inform the relevant neighbouring TSOs, if the national System Adequacy analysis indicates that the TSO is relying on import to maintain security of supply.

## **Article 27**

### **REQUIREMENTS FOR PAN-EUROPEAN SYSTEM ADEQUACY SEASON-AHEAD**

1. No later than 12 months after the entry into force of this regulation, all TSOs shall set up a procedure for performing seasonal Pan-European System Adequacy outlook for at least summer and winter period.
2. Each TSO shall perform a seasonal national System Adequacy analysis in order to contribute to the aforementioned Pan-European System Adequacy outlook.
3. The Pan-European System Adequacy outlook procedure shall comply with at least the following:
  - a) Each TSO shall provide the necessary data for performing a Pan-European System Adequacy analysis no later than the deadlines given in the procedure;
  - b) The procedure shall include delegation of individual and shared responsibilities;
  - c) The agreement shall describe the provisions for reviewing the procedure to perform Pan-European System Adequacy outlook concerning in particular (but not limited to) the periodicity of the analysis and the methodologies used

- d) Relevant non EU/EAA member states may be included in the System Adequacy outlook through voluntary agreements.
  - e) The procedure shall define the methodology used to assess the Pan-European System Adequacy. This methodology shall precise how to take into account the uncertainties regarding at least but not limited to:
    - i. Generation Forced Outages
    - ii. Renewable generation level
    - iii. Load.
4. Significant Grid Users, DSO and TSO shall provide the relevant data mentioned in Article 26.5 for the above analysis on request of the TSO. This data comprises but not limited to:
- e) Generation capacities and their Availability
  - f) Tie-Lines Availability and Interconnection capacity
  - g) The relevant outage plan
  - h) a probabilistic model of Forced Outages of generator
  - i) Non usable capacity at peak load under normal conditions due to lack of primary sources (hydro, wind, sun, insufficient fuel Availability, mothballed plants, etc...)
  - j) Load estimation
  - k) Availability of Ancillary Services.

## Article 28

### REQUIREMENTS FOR SYSTEM ADEQUACY FROM SEASON AHEAD TO WEEK AHEAD

1. In case of significant change on generation Availability or on load impacting the result of previous System Adequacy analysis, each TSO shall perform an updated national adequacy analysis.
2. Each TSO shall do its utmost arranging that Remedial Actions are available when the level of adequacy is still not fulfilling the relevant security criteria defined by NRA. Remedial Actions are prioritized on economical basis.
3. Significant Grid Users, DSO and TSO shall provide the relevant data mentioned in Article 26.5 on request of the TSO or in case of significant changes.

## Article 29

### REQUIREMENTS FOR SYSTEM ADEQUACY WEEK AHEAD

1. Each TSO shall, by performing the week ahead adequacy analysis, ensure the following knowledge upon potential inadequacies:
  - a) If so, the type of inadequacy as defined in Article 26.4;
  - b) the expected duration of the inadequacy;
  - c) The possible and proposed actions to take in order to remedy the inadequacy;
  - d) If any, the consequences for market parties (i.e. market restrictions).
2. Each TSO shall do its utmost that Remedial Actions are available if the level of System Adequacy is still not fulfilling the relevant security criteria defined by NRA. Remedial Actions are prioritized on economical basis.
3. Each TSO shall perform System Adequacy analysis using statistical data allowing to take into account uncertainties as estimated week-ahead regarding:
  - a) Generation Forced Outages
  - b) Renewable generation level regarding uncertainties on weather conditions
  - c) Load regarding uncertainties on weather conditions.
4. Each TSO shall assess the maximum level of import or export within the exchanges capacity compatible with the adequacy security criteria approved by NRA.
5. Each significant Grid User, DSO and TSO shall provide the relevant data mentioned in Article 26.5 on request of the TSO.

## Article 30

### REQUIREMENTS FOR ADEQUACY DAY AHEAD AND INTRADAY

1. In case of cleared markets results in inadequacy of a product(s) mentioned in Article 26.3 for the Day-ahead timeframe, each TSO shall set up the available Remedial Actions. Remedial Actions shall be, as far as possible, prioritized on economical basis.
2. Each TSO shall perform System Adequacy analysis using:
  - a) Market participant Schedules according to Local market rules and as defined in Article 352.a)1
  - b) Statistical data allowing to take into account uncertainties as estimated day-ahead regarding Generation Forced Outages and Uncertainties on load and Renewable generation.

## Chapter 4

### REQUIREMENTS FOR ANCILLARY SERVICES

#### Article 31

##### REQUIREMENTS ANCILLARY SERVICES IN GENERAL

1. Each TSO shall, depending on and according to its national legislation, ensure access to an adequate level and location of Ancillary Services in real-time, assessing they are sufficient to meet security criteria and the requirements set at Synchronous Area; either alone or in coordination with neighbouring TSOs.
2. Each TSO shall design, in accordance with LFC NC and with applicable local market rules, the adequate procedures for the provisions of Ancillary Services by ensuring the necessary mechanism is in place for the provision of an adequate level and the correct location of Ancillary Services required to meet security criteria; either alone or in coordination with neighbouring TSOs.
3. Each TSO according to local market rules shall make sure that at least the following products are available:
  - a) Frequency Containment Reserve;
  - b) Frequency Restoration Reserve ;
  - c) Replacement Reserve;
  - d) Reactive power;
  - e) Black start capacities
4. Each Significant Grid User, DSO and TSO shall provide information to its TSO on their Availability to provide Ancillary Services in accordance with their capability in accordance with Requirements for Grid Connection Applicable to all Generators Network Code and local market rules.

#### Article 32

##### REQUIREMENTS ANCILLARY SERVICES DAY AHEAD AND INTRADAY

1. Each TSO shall perform calculation of the requirements on the different categories of control reserves with the aim to optimize these requirements.
2. Each TSO shall manage in an efficient way the designed procedures to provide Ancillary Services.

3. TSOs shall agree and establish a procedure for exchange of Ancillary Services across Interconnections.
4. TSOs shall deliver on request information about their available level of reserves to the neighbouring Control Areas.
5. If a TSO is procuring Ancillary Services from units in other TSO Control Area, the connecting TSO shall agree with the contracting TSO and the procurement of reserves shall be coordinated.
6. If a TSO is sharing or procuring Ancillary Services cross border, this TSO shall ensure that free capacity corresponding to the amount of the shared or the procured cross border Ancillary Services will be available between the involved areas.
7. Each Significant Grid User shall provide the relevant Ancillary Services as agreed upon with the relevant TSO or as foreseen in the national legislation: in time, with the agreed upon quantities per product and in the correct format. Each TSO shall perform Remedial Actions, if the level of Ancillary Services is inadequate. Remedial Actions are prioritized on economic basis.

### **Article 33**

#### **REQUIREMENTS FOR ANCILLARY SERVICES BEFORE REALTIME**

1. Each TSO shall, no later than before real time, perform calculation of the requirements on the different categories of control reserves with the aim to optimize these requirements.
2. Each TSO shall inform the affected TSOs, if he procures Ancillary Services in other Control Areas than his own.
3. TSOs shall share information about their available level of reserves to the neighbouring Control Areas. If a TSO estimates that the level of reserves is inadequate, this TSO shall inform the neighbouring TSOs as soon as possible.
4. Each TSO shall prevent disturbances and blackouts, which can affect neighbouring Control Areas or the Synchronous Areas by using sufficient Ancillary Services in real-time to meet security criteria and the requirements set at Synchronous Area level for each operational planning stage.

## Chapter 5

### REQUIREMENTS FOR SCHEDULING

#### Article 34

##### GENERAL PROVISIONS

1. At the latest after 6 months of coming into force of this Network Code, each Scheduling Operator shall set up and implement the relevant process(es) in order to operate Scheduling within the Market Balance Area(s) under its responsibility. These process(es) shall include:
  - a) a list of Generating Units and Consumption Units to which these requirements for scheduling apply;
  - b) a definition of the time resolution of the Schedules to be submitted by the Scheduling Agent;
  - c) Rules of how dispersed small Generating units and Consumption Units must be handled and how DSOs are involved.

#### Article 35

##### REQUIREMENTS FOR NOTIFICATION OF SCHEDULES BETWEEN MARKET PARTICIPANTS AND SCHEDULING OPERATORS

1. Scheduling Agents within a Market Balance Area shall submit Schedules to the correspondent Scheduling Operator for each Market Time Frame in accordance with the local market rules. These Schedules include (but not limited to):
  - a) Generation Schedules;
  - b) Consumption Schedules;
  - c) Internal Commercial Trade Schedules;
  - d) External Commercial Trade Schedules using AC-Interconnections;
  - e) External Commercial Trade Schedules using DC-Interconnections.
2. In case TSOs need to perform Cross Border Exchanges to ensure Security of Supply or operational needs, these External TSO-related Schedules:
  - a) have to be agreed before setting them into force.
  - b) are not bound to Market Deadlines or a specific Market Time Period
  - c) shall be reconciled, maybe ex post.

3. External TSO-related Schedules include (not being limited to):
  - a) Compensation program (where applicable)
  - b) Countertrading
  - c) Balancing energy exchanges
  - d) Emergency reserves
  - e) Tertiary reserves

### **Article 36**

#### **REQUIREMENTS FOR COHERENCY OF SCHEDULES**

1. Each Scheduling Operator shall implement rules and processes to ensure the agreement of all External Schedules between their own Market Balance Area and other Market Balance Areas.
1. Each Scheduling Operator shall ensure its area internal balance for Generation Schedules, Consumption Schedules and External Schedules.
2. Each and all Scheduling Operators shall implement a process to ensure that all Schedules between Market Balance Areas are balanced, including areas whose operators have no legal obligation to respect this Network Code.

### **Article 37**

#### **REQUIREMENTS FOR PROVIDING INFORMATION TO OTHER TSOs, REQUIRED FOR FURTHER PROCESSING**

1. In order to allow further processing by TSOs, including at least but not limited to:
  - a) LFC
  - b) Common Grid Model,each Scheduling Operator shall calculate:
  - a) Aggregated Cross Border Exchange Programs (per border / DC-Interconnection (where applicable))
  - b) Netted Area AC Position (where applicable)
  - c) Netted Area Global Position
2. Each Scheduling Operator shall provide on request of a TSO this TSO with its
  - a) Generation Schedules;
  - b) Consumption Schedules;
  - c) Aggregated Cross Border Exchange Programs (per border / DC-Interconnection (where applicable)).

- d) Netted Area AC Position (where applicable)
  - e) Netted Area Global Position.
3. Each TSO shall provide on request of a TSO this TSO with its Netted Area AC Position (where applicable) and /or Netted Area Global Position.

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## **Title 3**

### **DEROGATIONS**

There shall be no derogation from the requirements of this Network Code but it is possible to state that specific requirements are not applicable for a particular TSO or a group of TSOs (e.g. isolated systems). These cases must be justified by ENTSO-E.

#### **Chapter 1**

##### **Article 38**

##### **REGIONAL VARIANCES OF THE REGION BALTIC**

##### **Article 39**

##### **REGIONAL VARIANCES OF THE REGION CONTINENTAL EUROPE**

##### **Article 40**

##### **REGIONAL VARIANCES OF THE REGION IRELAND**

##### **Article 41**

##### **REGIONAL VARIANCES OF THE REGION NORDIC**

##### **Article 42**

##### **REGIONAL VARIANCES OF THE REGION GREAT BRITAIN**

##### **Article 43**

##### **SPANISH ISOLATED SYSTEMS**

##### **Article 44**

##### **FRENCH ISOLATED SYSTEMS**

## Title 4

### FINAL PROVISIONS

#### Article 47

##### ENTRY INTO FORCE

This Network Code shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply as from the day of expiration of a 3 year period following its publication.