ENTSO-E Draft Network Code for Operational Security

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

05. April 2012

Notice
This document is a draft work in progress reflecting the status of ongoing work by TSO experts as of 05. April 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 Security as an input for the first Workshop with the DSO experts and with stakeholders, taking place on 20. April 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 Security. Such position will be released for public consultation following the procedure according to the provisions of the 3rd 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. 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 Areas 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

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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 Security** (**Operational Security Network Code**, **OS NC**) aiming at setting out clear and objective minimum requirements to the real-time operational security and main goals to be reached to keep the power system in continuous 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.

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Title 1

GENERAL PROVISIONS

Article 1

SUBJECT MATTER

The Objectives of the Operational Security Network Code are to:

- Determine common Operational Security principles;
- Ensure the conditions for maintaining Operational Security Level throughout the EU;
- Provide for coordination of system operation;
- Determine common requirements for DSOs, Generators and Consumers connected to Transmission and Distribution Systems, which are relevant for the Operational Security.

These objectives adhere to the requirements from the System Operation Framework Guidelines of ACER and are the basis for the other System Operation Codes, aiming at:

- Operational Security of transmission, referring among others to the (N-1)-Security Criterion, Operational Security Limits, protection, prevention and remedy of disturbances, dependencies with capacity calculation and interfaces to operational planning and load-frequency control;
- Quality of supply and service, referring among others to the frequency and voltage (including reserves), short term balancing planning, testing of ancillary services, balance management, demand forecast;
- System stability, and short circuit currents;
- Coordination of system operation referring among others to the monitoring, data exchange, states of system operation, training, safety coordination, emergency procedures and investigation;
- Contribution from system operation to the well-balanced, coordinated and integrated system development;
- Support of the European Internal Electricity Market integration.

Article 2

DEFINITIONS

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

(N-1)-Criterion – a rule according to which elements remaining in operation after a Fault of Transmission System element must be capable of accommodating the new operational situation without violating Operational Security Limits.

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(N-1)-Situation – is a situation in the Transmission System in which a Fault has happened

Alert State – operational state where Transmission System is within Operational Security Limits, but a Contingency has been detected, for which in case of occurrence, the available Remedial Actions are not sufficient to cope with. In Alert State, all consumption is being met, frequency, voltage and power flows are within acceptable limits. The reserve requirements may not be fulfilled and Faults of critical Transmission System elements or of critical production or consumption components will lead to an Emergency State. If there is no risk of propagation of Alert State outside of the TSO's control area, Alert State is qualified as "local". If the contingency can endanger the security of the interconnected Transmission Systems, Alert State is qualified as "wide area".

Area Control Error (ACE) – instantaneous difference between the actual and the reference value (measured total power value and scheduled control program) for the power interchange of a Control Area (inadvertent deviation), taking into account the effect of the frequency bias for that Control Area according to the network power frequency characteristic of that Control Area and the overall frequency deviation.

Automatic Voltage Control – automatic control system at the generation node, at the end nodes of the AC lines, High-Voltage DC lines or including actions on automatic voltage and reactive power control of transformers, or other means that contribute to Voltage Control, designed to maintain the set (reference) voltage level and the set value of reactive power.

Blackout State – interruption of electricity generation, transmission, distribution and consumption processes, when operation of the Transmission System or a part thereof is terminated. Blackout State is always qualified as "wide".

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

Congestion – a situation in which a Transmission System element cannot accommodate all physical flows without endangering Operational Security Limits.

Contingency – is the identified possible or already occurred Fault 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 – the composition of one or more market balance areas under the same technical load frequency control responsibility in terms of Frequency Containment Reserve, Frequency Restoration Reserve and Replacement Reserve.

Defence Plan – summarises all technical and organisational measures undertaken to prevent the propagation or deterioration of an incident in the Transmission System, in order to avoid a widespread disturbance and Blackout.

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Distribution Network (DN) – is an electrical network for the distribution of electrical power from and to third parties connected to it, a Transmission or another Distribution Network.

Distribution Network Operator (DNO) – operator (electricity) of Distribution Network assets. This role will include associated functions and responsibilities. This means a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the Distribution Network in a given area and, where applicable, its connections with other networks and for ensuring the long-term ability of the system to meet reasonable demand for the distribution of electricity.

Distribution System Operator (DSO) – regulated Distribution Network Operator (electricity) of Distribution Network assets.

Disturbance – an unplanned event that produces an abnormal system condition.

Dynamic Stability Assessment – security assessment in terms of Small Disturbance Angle Stability, Transient Stability and Voltage Stability.

Emergency Plan – a plan detailing TSO's responses to a loss of critical tools and facilities.

Emergency State – Operational Security Limits are not kept in Emergency State, with at least one of the operational parameters outside of the respective limits. Reserves have been activated and are either partially or totally exhausted. System defence actions (load shedding, voltage reduction, etc.) are undertaken. No guarantee exists of total effectiveness of Remedial Actions to limit propagation to neighbouring systems or to the widely interconnected system. In case Operational Security is endangered because of a major IT problem (e.g. unavailability of the main or back-up SCADA system), the TSO has to declare Emergency State.

Exceptional Contingency – the unusual loss of an element such as, but not limited to: a double line (two circuits on the same towers), a single busbar, a common mode Fault with the loss of more than one Generating Unit, a common mode Fault with the loss of more than one DC line.

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

Fault – an event occurring in a Transmission System such as a short circuit, a broken wire, open circuit, or an intermittent connection.

Frequency Containment Reserve (FCR) – operating reserves necessary for constant containment of frequency deviations (fluctuations) from nominal value in order to constantly maintain the power balance in the whole synchronously interconnected Transmission System. Activation of these reserves results in a restored power balance at a frequency deviating from nominal value. This includes operating reserves with the activation time typically of 30 seconds (depending on the specific requirements in the ENTSO-E regions). Operating reserves of this category are usually activated automatically and locally.

Frequency Restoration Reserve (FRR) – operating reserves necessary to restore frequency to the nominal value and power balance to the forecast value after a sudden system imbalance. This category includes operating reserves with an activation time typically up to 15 minutes (depending on the specific requirements of the ENTSO-E regions). Operating

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reserves of this category are typically activated centrally and can be activated automatically or manually.

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. A storage device operating in the electricity generation mode is also a Generating Unit.

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 Network Code on Requirements for Grid Connection Applicable to All Generators.

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

Interconnector – an AC or HVDC Interconnection which connects two bidding or market areas.

Load Shedding – the disconnection of load from the synchronous electric power system, usually performed automatically or manually, to control the system frequency, to avoid voltage deterioration, or prevent another disturbance and deterioration of Operational Security.

Local – a qualification of an Alert or Emergency State when there are only local consequences with no risk of extension outside the Transmission System (Control Area)

Normal State – Operational State in which there is a low risk for Transmission System operation. All consumption and production are in balance and requirements on Ancillary Services are met; Frequency, voltage and power flows are within their predefined and allowed limits (thresholds) and reserve (margins) are sufficient to withstand Contingencies. Operation is within normal limits, taking into account Remedial Actions effects.

N-Situation – a situation in the Transmission System in which there are no Faults.

Observability Area – an area of the relevant parts of the Transmission Systems of the TSO and its DSOs and 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 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, Fault levels 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 interconnections to their Transmission Systems. The TSO shall ensure adherence to these Operational Security Limits. Violation of Operational Security Limits could cause damage and Faults 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).

Ordinary Contingency – the non-unusual loss of an element such as, but not limited to: a single line, a single Generating Unit, a single transformer, a phase-shifting transformer, a voltage compensation installation of 50 MVAr or more, a DC link.

Out-of-Range Contingency – the very unusual simultaneous loss of more elements such as, but not limited to: two independent lines, a substation with more than one busbar, a tower with more than 2 circuits, a power swinging or oscillation event with the loss of more than one large Generating Unit.

Pre-Fault / Post-Fault Remedial Action – Remedial Action that is applied before/after a Fault.

Protection – is composed of automatic protection equipment. It is used to limit the impact of Faults.

Redispatch – changing of Generating Unit output by TSO in order to resolve a violation of Operational Security Limits. In case of redispatch the System Operators do not engage in offsetting trading contracts, but directly change the dispatching order of the power plants, to create overall power flows which remain within the Operational Security Limits.

Remedial Action – a measure activated by the TSO(s) to relieve consequences of disturbances and maintain Normal State or move towards Normal State, which can be applied Pre-Fault or Post-Fault and may involve costs.

Replacement Reserve (RR) – operating reserves used to restore the required level of operating reserves to be prepared for a further system imbalance. This category includes operating reserves with activation time from 15 minutes up to hours.

Reserve Power – operational reserves available for maintaining the planned power exchange and for guaranteeing secure operation of the Transmission System.

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.

Restoration State – transition between different operational states characterized by the network being restored, production being regulated upwards, and frequency, voltage and transmission being brought within acceptable limits. Demand Facilities are connected at a pace which the network and production resources can take.

Schedule – definition to be taken from Operational Planning and Scheduling NC.

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Security Plan – a plan containing a risk assessment of critical TSO's assets to major physical- and cyber-threat scenarios with an assessment of the potential impacts.

Set-Point – a target value for any parameter typically used in control schemes.

Small Disturbance Angle Stability – the ability of a Transmission System to maintain the operating condition under small disturbances. Small Disturbance Angle Instability endangers the whole interconnected system as it may result in permanent (self-exciting) oscillations or even in oscillations increasing in amplitude.

Social Welfare – the well-being of the entire society, concerned with the factors such as quality of the environment, availability of services, economic efficiency, etc.

Stability Limits – the acceptable operating boundaries of the Transmission System in terms of respecting of the constraints of Voltage Stability, Small Disturbance Angle Stability and Transient Stability.

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 temporary or permanent basis.

System Operator (SO) – a person responsible for operating Transmission System in real-time.

System Protection Schemes (SyPS) and Special Protection Schemes (SPS): System Protection Schemes are all kinds of coordinated and automatic measures to ensure fast reaction to disturbances and to avoid their propagation through Transmission System. Special Protection Schemes can be event based.

System State – operational state of the Transmission System in terms respecting Operational Security Limits.

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.

Tie Line – a Transmission Line connecting two Control Areas.

Transient Stability – the ability of the Transmission System and generators to maintain synchronism when subjected to a severe disturbance. In case of transient instability single generators or a group of generators 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.

Transitory Admissible Overloads – temporary overloads of Transmission System elements or equipment which are allowed for a limited period of time during switching or Fault conditions and which do not cause physical damage to the elements or equipment as long as the defined duration and thresholds are respected.

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 management of power flows, reliability of the system and availability of necessary system services.

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Transmission Circuit – one system of three-phase alternating current conductors with accompanying earth wire and other hardware (AC transmission) or one direct-current conductor with accompanying hardware (DC transmission).

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 Network – is an electrical Network for the Transmission of electric power from and to third party[s] connected to it, including Demand Facilities, Distribution Networks or other Transmission Networks.

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 above for AC or HVDC.

Transmission System Operator (TSO) – a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the Transmission in a given area and, where applicable, it's Interconnections with other networks, and for ensuring the long-term ability of the n etwork to meet demand for the transmission of electricity.

Voltage Control – balancing of the reactive power needs of the network and the customers in order to maintain acceptable voltage profile.

Voltage Stability – is concerned with the ability of a Transmission System to maintain acceptable voltages at all buses in the system under normal conditions and after being subjected to a disturbance.

Wide Area – a qualification of an Alert or Emergency State when there is a risk of propagation to the interconnected Transmission Systems (Control Areas).

Article 3

SCOPE

This Network Code defines the minimum Operational Security requirements and principles for Transmission Systems. It implements a common framework for the Operational Security, adhering to the System Operation Framework Guidelines of ACER. These minimum requirements apply to all TSOs, DSOs Generators and Consumers of significance for the Transmission System.

Where an Independent System Operator (ISO) has been designated, the Transmission System owner shall provide all the relevant cooperation and support to the ISO for the fulfilment of its tasks.

The Operational Security principles in this Network Code are essential for the TSOs to operate the interconnected Transmission Systems with an adequate level of coordination,

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Operational Security, quality, stability and to support efficient functioning of the IEM. These principles refer to:

- System States;
- Congestion and power flows management;
- Voltage Control and reactive power management;
- Short-circuit current management;
- Dynamic Stability Assessment;
- Contingency Analysis and handling;
- Protection;
- Frequency control management;
- Operational testing, monitoring and investigation;
- Operational training and certification;
- Data exchange.

Some TSOs may mandate regional 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 coordination initiatives or regional coordination centres follow these standards and requirements, including confidentiality of the data and information used.

Each TSO shall endeavour to ensure that the principles, standards and requirements from this Network Code are met by utilising, where relevant, characteristics of the Generators, Consumers and Distribution Systems connected to the Transmission System.

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 Transmission or Distribution System Operator any agreement between, on the one hand, a Relevant TSO or DSO and, on the other, a Generator, Consumer or DSO shall be performed under the

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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 responsible regulatory authority.

4. The costs related to the obligations referred to in this Network Code which have to be borne by the regulated TSOs and DSOs 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 Consumer 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 TSO or DSO is compelled under relevant EU or national law to disclose it, under the conditions set forth in the applicable legislation.

Article 6

RELATIONSHIP WITH NATIONAL LAW PROVISIONS

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

Article 7

SYSTEM STATES

1. Each TSO shall monitor relevant parameters of its system, using a common set of criteria for the determination and description of System State. This shall enable determination of the operational states in the TSOs throughout the EU in a common and coherent way and support communication among TSOs and where necessary between TSOs and System Users.

2. Each TSO shall for each network element of its Transmission System and Interconnections establish Operational Security Limits to reflect power flow limits, normal voltage ranges, Stability Limits and short-circuit currents. Each TSO shall operate its Transmission System respecting the Operational Security Limits. If a violation occurs, the TSO shall immediately apply Remedial Actions. Each TSO shall monitor in real-time the following parameters:
   a) Power flows;
   b) Busbar voltages;
   c) Frequency;
   d) Active and reactive power reserves;
   e) System generation and demand.

3. Each TSO shall differentiate five operational states: Normal, Alert, Emergency, Restoration and Blackout. These System States are defined in Article 2.

4. While determining System State, each TSO shall use the criteria from Article 2 and take into account the effect of Remedial Actions. Depending on the risk of propagation, the non-Normal State shall be classified as Local or Wide Area.

5. Each TSO shall determine if its system is in a non-Normal State and set-up the communication and necessary Remedial Actions with other TSOs and if necessary with System Users, in order to prevent the propagation of a non-Normal State across the borders of its own Responsibility Area.

6. Each TSO shall ensure the availability, reliability and redundancy of the critical tools and facilities required for system operation:
   a) Facilities for monitoring of System States including state estimation applications;

b) Means for controlling of switching;

c) Communication between the TSOs' control centres;

d) Communication between its own control centre and DSOs generators and Consumers, for balancing, ancillary services, system defence and restoration and for the delivery and coordination of real-time operational data;

e) Tools for security analysis.

7. The tools and facilities from Article 7.6 shall be continuously monitored, their malfunctions detected and enunciated as soon as possible. In case of a Fault of equipment, software, cabling or power supply, any interruption of functionality which is delivered by the critical tools and facilities shall be as short as technically possible and the full functionality established as soon as possible. In case of an interruption of mains power supply to the tools and facilities from Article 7.6, each TSO shall ensure their functionality based on the reserve power supply, for a defined time period.

8. Each TSO shall have an Emergency Plan describing its own responses to a major loss of critical tools and facilities. This plan shall be reviewed at least annually or following any significant change of operational circumstances.

9. Each TSO shall establish a confidential security plan containing a risk assessment of critical TSO assets to major physical- and cyber-threat scenarios with an assessment of the potential impacts. Each TSO shall have in place security measures which shall cover a sufficiently wide range and be kept under regular review (including intruder detection, access control, organizational measures, training, alert processes and other counter-measures as deemed appropriate) to limit the impact of threats and maintain the secure operation of the Transmission System, IT systems and the interconnected Transmission Systems. This plan shall be kept strictly confidential, only for the TSO's own use and not disclosed to any third party, except to the authorized authorities.

10. Each TSO shall perform security analyses based on the forecast and real-time system operation parameters.

11. When preparing and launching Remedial Actions each TSO shall consider the actions in and outside its own Transmission System. Neighbouring and affected TSOs, shall deliver all necessary information to enable cooperation and coordination of Remedial Actions.

12. For Operational Security analysis in operational planning, each TSO shall use information on network, load and generation based upon a Common Grid Model.

13. Each TSO shall operate its system aiming at maintaining Normal State, keeping the technically permitted Operational Security Limits of voltage, current, short-circuit capability, sufficient active power reserve and maintaining System Stability. In case of disturbance (Fault), when system reaches steady-state operation again, each TSO shall re-establish Normal State as reasonably practical. The technically permitted

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Operational Security Limits of frequency shall be defined and implemented accordingly at the level of the Synchronous Area.

14. If a TSO detects or forecasts a non-Normal State it shall:
    a) Activate measures that initiate a return to Normal State as soon as reasonably practical, or serve to avoid non-Normal State;
    b) Inform the TSOs and System Users involved in the system defence and restoration, if there is a risk of Emergency State.

15. If a TSO detects or forecasts a wide area non-Normal State, it shall:
    a) Inform all TSOs about non-Normal State via a common awareness system;
    b) Provide additional information on elements that are a part of the external Observability Area of affected TSOs;
    c) Coordinate joint measures with affected TSOs, in order to initiate a return to Normal State as reasonably practical or to avoid non-Normal State.

16. Each System User (Generator, Consumer or DSO) shall execute the instructions given by the TSO (or the DSO, if DSO is in charge of implementing such instructions) to support maintaining Operational Security, without undue delay. These instructions may affect amongst others topological changes in a substation, disconnection of Generating Units or Demand Facilities, adjustment of active or reactive power injections and withdrawals at the connection point to the TSO or DSO.

Article 8

CONGESTION AND POWER FLOWS MANAGEMENT

1. Each TSO shall operate its Transmission System in a manner such that the power flows do not violate Operational Security Limits. An exception to this requirement is allowed for a limited time after a disturbance, before the steady-state operation is established again.

2. Each TSO shall coordinate security analyses with other TSOs in order to verify the respect of the power flow Operational Security Limits affecting the own and the Responsibility Areas of other TSOs. Security analyses shall be performed in N-Situation, simulating each Contingency from the TSO's Contingency List, thus checking that power flows do not violate Operational Security Limits in the (N-1)-Situation. Each TSO shall perform security analyses based on the forecast and real-time operational parameters.

3. Each TSO shall consider that physical flows on AC links can differ between forecast and actual values due to:
    a) Changes of generation and load in time and place;

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b) Load-frequency control activation in real-time;

c) Difference between the Transmission System model and real-time measurements.

Each TSO shall contribute to coordinate a methodology within the ENTSO-E, to evaluate the uncertainties of active power flows on AC Interconnections as the basis for the determination of reliability margins used for security analysis. This methodology shall be transparent and based on a well-defined and described approach, e.g. statistical data of the real-time flows versus forecast flows at the different timescales, taking into account historic evidence and future expectations. In their approach to security analysis, each TSOs shall contribute to develop sensitivity studies and scenarios, for example: assess the sensitivity to Operational Security Limits from a 5% increase in the forecast demand levels.

4. Each TSO shall prepare Remedial Actions to cope with the identified violations of the power flow Operational Security Limits in N-Situation and (N-1)-Situation. The effectiveness of Remedial Actions shall be evaluated and if necessary the TSO shall coordinate Remedial Actions with neighbouring or other relevant TSOs, which shall deliver all necessary information to enable this cooperation and coordination. In case of violation of the power flow Operational Security Limits in N-Situation, the TSO shall activate Remedial Actions immediately.

5. If after a Fault (Contingency), when the steady-state operation is re-established, Transmission System is not compliant with the (N-1)-Criterion, the TSO shall initiate Remedial Actions to recover compliance with the (N-1)-Criterion as soon as reasonably practicable. The acceptable duration of non-compliance with the (N-1)-Criterion depends on the gravity of consequences of the next most onerous Contingency. If there is a risk of a post Contingency disturbance propagation involving neighbouring TSOs or enhanced probability of further Faults, the TSO shall initiate Remedial Actions as soon as possible. Non-compliance with the (N-1)-Criterion is temporary acceptable:

   a) During switching sequences;

   b) If it only has local consequences within the TSO Responsibility Area;

   c) During the time period required to activate the Remedial Actions.

6. Each TSO shall be entitled to Re-Dispatch available Generating Units and Demand Facilities if it is necessary to prevent violations of the power flow Operational Security limits. This Re-Dispatch shall be in accordance with the applicable mechanisms, agreements and market rules applicable. Each Generator which can be included in re-dispatch shall provide to the TSO all relevant information concerning their available active power reserve. This information shall include real-time data and forecast changes of active power.

7. Each TSOs shall contribute to coordinating re-dispatch measures in order to increase Social Welfare. If adjustments of the applicable mechanisms, agreements and market

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rules are required for that, these adjustments shall be done in cooperation of the responsible authorities, TSOs and System Users.

8. Unless market based pricing for Re-Dispatch exists, affected System Users shall ex-ante provide Re-Dispatch costs to the relevant TSOs (and DSO if applicable)s. This information shall be treated in a confidential way and be shared between the relevant TSOs and (if applicable) DSOs for re-dispatch purposes only.

9. Each System User that is a provider of active power reserve shall provide to the TSO all relevant information concerning their available active power reserve. This information shall include real-time data and forecast changes of active power supply capabilities in due time before the changes are expected.

10. In cases where the real-time availability of the information according to Article 27 is prohibitive (e.g. large numbers of small generating units, etc.) each TSO shall decide whether and which System Users might be exempted from providing the real-time information, and if the data of such System Users need to be delivered by responsible DSOs in an aggregated form.

11. Each Type B, C and D Generator according to the Network Code on Requirements for Grid Connection Applicable for All Generators, shall provide its TSO (or DSO, if connected to DSO, in which case the DSO shall provide the data to the TSO) the data regarding its availability for adjustment of its active power (downward or upward reserves), and shall execute the instructions given by the TSO (or DSO if DSO is in charge of implementing such instructions) to maintain Operational Security, in due time, as required by the TSO or DSO.

12. Each TSO shall monitor power flows within its Responsibility Area and on its interconnections based on the real-time telemetry and measurements from its own Control Area and from the Control Areas of the TSOs within its Observability Area.

13. TSO shall define Operational Security limits for power flows on each network element within its own Responsibility Area. The neighbouring TSOs shall define together the Operational Security Limits for power flows on common Interconnections in a coordinated and coherent way, throughout the Synchronous Area and between the Synchronous Areas where the neighbouring TSOs are located in different Synchronous Areas.

14. Each TSO shall use for Operational Security analyses of power flows in real-time, a Transmission System model based on real-time measurements of voltages, currents, power flows, injections and withdrawals of:
    a) Transmission system elements;
    b) Generators;
    c) Consumers connected to Transmission System;
    d) DSOs;

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from their own Observability Area.

15. In the (N-1)-Situation after a Fault (Contingency), each TSO shall only allow system parameters outside the Operational Security Limits if the violations are within the Transitory Admissible Overloading and if Remedial Actions are available to remove those violations within the time allowed for transitory overloads.

16. Each TSO shall in due time inform neighbouring TSOs in case of significant changes of the network configuration in their Observability Area.

Article 9

VOLTAGE CONTROL AND REACTIVE POWER MANAGEMENT

1. Each TSO shall ensure that voltage levels and reactive power flows of the Transmission System are monitored, controlled and maintained in real-time within Operational Security Limits to protect equipment and maintain Voltage Stability of the Transmission System. Adequate instantaneous reactive power reserve shall be available in spinning generators, reactors and capacitors, High-Voltage DC lines and static VAR compensators in order to secure the technical functioning of the Transmission System and to restore the Normal State after disturbances.

2. Each TSO shall specify operational voltage and reactive power limits at the connection between the Transmission System and System Users' installation – Generator, Consumer or Distribution System – and the Transmission System to be maintained by each System User. In relation to the detailed aspects of grid connection, the provisions from the Network Code on Requirements for Grid Connection Applicable for All Generators and the Network Code for Demand Connection shall apply.

3. Each System User (Generator, Consumer or DSO) shall maintain voltage and / or reactive power limits at the connection point between the System User's installation and the Transmission (or Distribution) System in the range required by the TSO or DSO, in line with the applicable legal provisions, market rules and grid connection codes.

4. Notwithstanding the provisions of the Article 9.3, a distribution and consumption facility shall automatically disconnect at specified voltages in the specified timeframe if required to do so by the relevant TSO or DSO. The terms and settings for automatic disconnection shall be agreed with the relevant TSO or DSO, in compliance with the applicable laws, market rules and grid codes, under approval by the responsible regulatory authorities and respecting the principles of transparency, public involvement and non-discrimination.

5. Each TSO shall utilize all available reactive power resources to ensure effective reactive power management within its Responsibility Area and within the Operational Security Limits for the voltage and reactive power management.

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6. Each TSO shall prepare Remedial Actions to cope with the identified violations of the voltage Operational Security Limits. The effectiveness of Remedial Actions shall be evaluated, Remedial Actions shall be modified if found ineffective, or Pre-Fault actions shall be applied. Remedial Actions shall when launched re-establish Normal State as soon as reasonably practical.

7. When preparing and launching Remedial Actions each TSO shall consider not only the actions in its own Transmission System but also coordinate with other TSOs the actions outside the own Transmission System. Neighbouring TSOs shall deliver all necessary information to enable cooperation and coordination of Remedial Actions.

8. Neighbouring TSOs shall define and mutually respect voltage and reactive power flow limits on the Interconnections between their networks in order to utilize the reactive power resources in the most effective way and ensure adequate Voltage Control.

9. Each TSO shall verify the respecting of operational voltage limits within its Observability Area, using a Transmission System model based on real-time measurements of at least three of the following quantities (required to estimate the System State and calculate all other relevant parameters): voltages, currents, power flows, injections and withdrawals on the:
   a) Transmission System elements;
   b) Generators connected to Transmission;
   c) Consumers connected to Transmission ;
   d) DSOs;

   from their own Observability Area.

10. Each TSO shall operate or direct the operation of reactive power resources within its Responsibility Area including generation of reactive power, Transmission Lines' switching, capacitors and reactors, High Voltage DC Lines, Static VAR Compensators or Demand Facilities when applicable and if necessary Load Shedding, in order to maintain Operational Security Limits, to prevent out-of-limit voltage variations and to prevent voltage collapse.

11. Each TSO shall coordinate Voltage Control actions with the System Users and with neighbouring TSOs, in order to prevent a contrary effect to the Operational Security which might be caused by individual actions. The TSOs and DSOs shall be entitled to direct their System Users in a coordinated way to follow Voltage Control instructions if and where this is relevant for the voltage and reactive power management.

12. DSOs shall support TSOs in Voltage Control and reactive power management at the interconnection points between the transmission and distribution systems. This shall include blocking of automatic voltage/reactive power control of transformers in case of voltage deterioration and directing the users of the distribution system to follow other Voltage Control instructions in order to comply with this requirement.

13. Each System User that is a provider of reactive power reserve shall provide to the TSO all relevant information concerning their available reactive power reserve. This information shall include real-time data and forecast changes of reactive power supply capabilities in due time before the changes are expected.

14. In cases where the real-time availability of the information according to Article 27 is prohibitive (e.g. large numbers of small generating units, etc.) each TSO shall decide whether and which System Users might be exempted from providing the real-time information and if the data of such System Users need to be delivered by responsible DSOs in an aggregated form, with the approval of its regulatory authority.

Article 10

SHORT-CIRCUIT CURRENT MANAGEMENT

1. Each TSO shall operate Transmission System within its Responsibility Area in a manner such that the short-circuit current does not exceed the limits of the short-circuit capability of circuit breakers and other equipment. This condition has to be fulfilled for all Fault types, under all tripping conditions and for all protection equipment.

2. Each TSO shall endeavour to operate the Transmission System within its Responsibility Area in a manner such that the short-circuit current is not lower than the current required for selectivity of the protection system at any time.

3. Each TSO shall to perform the calculation of the short-circuit current and power according to IEC 60909. If the calculation is not based on IEC 60909 the TSO shall perform short-circuit simulations for different fault levels, using available data and best practice approaches.

4. All generators of the type D from the ENTSO-E Network Code on Requirements for Grid Connection Applicable for All Generators, shall provide the data for short-circuit calculation to their directly connecting TSO or DSO. The directly connecting TSO or DSO shall determine at least the sum effect of all short-circuit currents and, in case of DSO, also report to the TSO to which DSO is connected.

5. For assessment of compliance with the limits according to Article 10.1 each TSO shall consider realistic operational conditions that provide the highest conceivable level of short-circuit current, considering also the short-circuit contribution from other Transmission and Distribution Systems.

6. Each TSO shall evaluate the impact of neighbouring Transmission Systems and connected Distribution Systems on the short-circuit current level. If the impact is significant, the Distribution System has to be modelled in the transmission short-circuit

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calculations with a sufficient level of detail, using where applicable the equivalents with sufficient degree of detail and accuracy.

7. The respect of the limits according to Article 10.1 is required at all steady state topologies. The time period of a switching sequence between different topologies shall be as short as technically possible.

8. Each TSO shall apply operational measures to prevent or relieve a violation of short-circuit limits according to Article 10.1 and 10.2.

9. In order to fulfil the provisions of the Articles 10.1 and 10.2 each TSO shall define the maximum limits of admissible short-circuit current of equipment.

10. Each TSO shall inform neighbouring TSOs in the event of changing the network configuration in the Observability Area (e.g. outage of elements or unusual busbar operation) for network elements included in the operational planning Transmission System model and the real-time operations Transmission System model.

11. Each TSO shall communicate data updates according to the Articles 10.10 with neighbouring TSOs and System Users. This applies also to the updates by the System Users to be provided to the TSO.

Article 11

DYNAMIC STABILITY MANAGEMENT

1. Each TSO shall assess its Transmission System for potential stability problems by means of Dynamic Stability Assessment (DSA) studies on Voltage, Rotor Angle or Frequency Stability. These studies can be offline. In their approach to DSA TSOs shall develop sensitivity studies and scenarios, for example: assess the sensitivity to voltage collapse from a 5% increase in the forecast demand levels.

2. Where a TSO detects a mutual influence of dynamic stability, with other interconnected Transmission Systems, the affected TSOs shall contribute to coordination of approaches to the Dynamic Stability Assessment (DSA).

3. In deciding the approach for DSA, each TSO shall apply the following rules:
   a) If with respect to the Contingency List, steady state Operational Security Limits are reached before Stability Limits, the TSO may base its DSA only on the offline stability studies carried out in the longer term operational planning phase.
   b) If under planned outage conditions, with respect to the Contingency List, steady state limits and Stability Limits are close to each other or Stability Limits are reached before steady state limits in some operational situations, the TSO shall perform DSA in the short term operational planning phase whilst these outage

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conditions remain. The TSO shall prepare Remedial Actions to be used in real-time operation if necessary.

If under intact network conditions, with respect to the Contingency List, Stability Limits are reached before steady state limits, the TSO shall perform DSA in all phases of operational planning and have a capability to re-assess the Stability Limits within day.

Article 12

CONTINGENCY ANALYSIS AND HANDLING

1. Each TSO shall ensure that no operational disturbance (Fault) identified within the Contingency Analysis in its Control Area endangers Operational Security of its own Transmission System nor the interconnected Transmission Systems. However, local consequences of operational disturbances maybe accepted if the impact on interconnected Transmission Systems is negligible.

2. Each TSO shall base its risk assessment of operational disturbances and preparation of Remedial Actions on Contingency Analysis and the (N-1)-Criterion, simulating each contingency of its Contingency List, and checking the respect of the Operational Security Limits in the (N-1)-Situation. The starting point for the Contingency Analysis – N-Situation – shall at any time be the forecast or actual topology of the Transmission System, including planned outages.

3. In Normal State each TSO shall analyse ordinary contingencies according to Article 12.11.a. In addition each TSO shall analyse exceptional contingencies which have a high impact or a high probability of occurrence, according to Article 12.11.b.

4. Each TSO shall perform Contingency Analysis based on the forecast and real-time system operation parameters.

5. Temporary non-compliance with the (N-1)-Criterion is allowed only in accordance with Article 8.7.

6. Each TSO shall prepare Remedial Actions to cope with any Contingency from its Contingency List, for which Security Criteria violation is identified. Remedial actions shall when launched re-establish Normal State as soon as reasonably practical. Each TSO shall assess the effectiveness of Remedial Actions in advance using Transmission System models and simulation.

7. When preparing and launching Remedial Actions each TSO shall consider the actions applied in and outside its own Transmission System, evaluating the effectiveness of Remedial Actions and coordinating with neighbouring TSOs in order to increase Social Welfare. Neighbouring TSOs shall deliver all necessary information to enable coordination of Remedial Actions.

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8. Each TSO shall monitor the course of the planned and actual operation of its Transmission System, if necessary reassess the contingencies to be taken into account in Normal State and readjust the prepared Remedial Actions.

9. Each TSO shall apply Pre-Fault Remedial Actions when there is a danger of not being able to cope efficiently and in a timely manner with the conditions occurring after a Contingency.

10. Each TSO shall apply Post-Fault Remedial Actions to cope with and to relieve the conditions occurring after Contingency, within the time allowed for Transitory Admissible Overloads of the Transmission System elements.

11. When establishing a Contingency List and performing contingency analysis, each TSO shall differentiate between Ordinary, Exceptional and Out-of-Range Contingencies and between Internal and External Contingencies. For this, the following rules shall apply:
    a) The classification of Contingencies (Ordinary, Exceptional, Out-of-Range) shall be defined specifically for each Control Area, based on the practical experience of the responsible TSO and agreed by their relevant regulatory authority;
    b) When a TSO recognizes that the probability of an Exceptional Contingency is significantly increased due to unusual conditions (e.g. severe weather), the TSO shall consider this Exceptional Contingency as if it were an Ordinary Contingency whilst these unusual conditions remain;
    c) When a TSO recognizes that the probability of an Out of Range Contingency is significantly increased due to very unusual conditions (e.g. very severe weather), the TSO shall analyse the impact of this Out of Range Contingency as if it were an Exceptional Contingency. The TSO shall use this analysis to determine the Pre-Fault or Post-Fault Remedial Actions to remain within Operational Security Limits or to mitigate the impact of this Out of Range Contingency as far as reasonably practical, whilst these unusual conditions remain;
    d) When determining the Ordinary Contingencies, the current topology shall be taken into account (e.g. a double line, with one circuit under maintenance shall be considered as the Ordinary Contingency);
    e) When determining the Exceptional Contingencies, the Current topology shall be taken into account (e.g. a substation with two busbars of which one is under maintenance shall be considered as the Exceptional Contingency);
    f) Each TSO shall take all Ordinary Contingencies both Internal or External into account in Contingency Analysis in Normal State;
    g) Each TSO shall analyse Exceptional Contingencies both Internal or External with particular emphasis on impact from neighbouring Transmission Systems to their own System and probability of occurrence;
    h) In order to account for Exceptional Contingencies with high impact on neighbouring Transmission Systems or high probability of occurrence, each TSO shall include such Exceptional Contingencies in its Contingency List. The included

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Exceptional Contingencies shall be reassessed and if necessary the Contingency List readjusted in significantly changed operational conditions;

12. Each TSO shall use in its Contingency Analysis a Transmission System model gathering information on its own network, loads and generation and the network elements of the neighbouring Transmission Systems which make up External Contingencies to be analysed in Normal State. In order to be able to perform Contingency Analysis and other Operational Security analyses, each TSO shall prepare and use the consumption and generation forecast for its Control Area.

13. Each TSO shall ensure the observability of its Transmission System model used for Contingency Analysis based upon a sufficient amount of accurate real-time data.

14. Each System User is obliged to cooperate and to deliver all necessary information for Contingency Analysis, including forecast and real-time data.

15. Each TSO shall coordinate its analysis of External Contingencies with the neighbouring TSOs. Each neighbouring TSO shall cooperate and deliver all necessary information including forecast and real-time data.

16. While performing Contingency Analysis in coordination with other TSOs, each TSO shall use a Common Grid Model (CGM) in order to ensure accuracy of calculations. This shall comprise:
    a) Its own Transmission System,the relevant parts of Distribution Systems in its Control Area and relevant parts of neighbouring and nearby Transmission Systems;
    b) Equivalents of the Transmission and Distribution Systems beyond the boundaries of the included ones.

17. Each TSO shall contribute with the forecast data to the observability of the Common Grid Model and ensure the usability of its own contribution to the CGM.

18. Each TSO shall inform the neighbouring TSOs about its External Contingencies taken into account in Normal State.

19. For each Interconnection, the TSO shall inform the neighbouring TSOs about the Operational Security Limits from its system. The applicable Operational Security Limits for the Interconnection shall be coordinated and agreed as the most restrictive one defined by both TSOs.

20. Each TSO shall inform the neighbouring TSOs in case it operates a network element that is taken into account as an External Contingency of these neighbouring TSOs, outside the Operational Security Limits.

21. Each TSO shall inform neighbouring TSOs of the changes to the planned topology of its Transmission System as regards the parts included in the Transmission System models

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of the neighbouring TSOs, used for Contingency Analysis, immediately after such changes are decided upon. If necessary for maintaining Operational Security of interconnected system, the TSOs are obliged to coordinate and adjust the changes.

22. Each type B, C and D Generating Unit connected to Transmission or Distirbution System or with significant impact on Transmission System but connected to Distribution System, shall after a de-synchronisation obtain the permission from its TSO prior to re-synchronisation. If the Generating Unit is ready to resynchronise immediately after the tripping, the TSO may only call for a short notice.

23. Each TSO shall collaborate to establish a Common Grid Model within it synchronous area. Each TSO shall provide the data for the Common Grid Model according to the defined quality and within the defined timeframes. Each System User shall provide and update regularly the data required by their TSO for the CGM in accordance with Articles 20 through 30.

Article 13

PROTECTION

1. Each TSO shall verify and update its setting of protection relays, if the conditions change. Each TSO shall analyse and when necessary change the functioning of its protection relays or review the protection concept.

2. Each TSO shall operate a protection system concept with Set-Points that ensure selectiveness of fault isolation, including backup protection for fault isolation in case of malfunction of the main protection system or primary equipment.

3. Each TSO shall coordinate with affected TSOs the relevant protection concepts and Set-Points for the Interconnections.

4. If a TSO is using a System Protection Scheme (SyPS) or a Special Protection Scheme (SPS) it shall:
   a) Perform security analyses in order to ensure that each SPS and / or SyPS acts selectively, and effectively. In the analysis of SPS and / or SyPS, the TSO shall evaluate the consequences for the Transmission System in the event of an incorrect SPS and / or SyPSfunction, taking into account the interaction with affected TSOs;
   b) Ensure that the SPS and / or SyPS used have the same reliability as those applicable to primary equipment relay protection;
   c) Operate the SPS and / or SyPS within the Operational Security limits determined for this specific purpose;
   d) Coordinate SPS and / or SyPS functions, activation principles and Set-Points with affected TSOs and affected System Users.

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5. Each TSO shall in coordination with the respective DSOs develop an Under-Frequency Load Shedding Scheme in line with the requirements of the Demand Connection Network Code. Each DSO shall implement the scheme in its area of responsibility and shall inform the TSO in case of change of the conditions and settings.

Article 14

FREQUENCY CONTROL MANAGEMENT

1. Each TSO shall operate its Transmission System with sufficient upward and downward active power reserve to face demand / generation unbalance within its Control Area and shall keep the Area Control Error (or an equivalent parameter) at the Set-Point value in order to reach the required frequency quality within the Synchronous Area in cooperation with the TSOs in the same Synchronous Area.

2. Each TSO shall procure the required amount of active power reserves according to the provisions of the Electricity Balancing Markets Integration Network Code.

3. The TSO shall be entitled to procure the necessary reserve within and from outside of its Control Area, taking into account the respective provisions of the Electricity Balancing Markets Integration and Load-Frequency Control and Reserves Network Codes.

4. Each TSO shall activate, or set up conditions to guarantee the activation of, active power reserves at different timeframes, in order to maintain:
   a) The demand / supply balance of its Control Area;
   b) Its Area Control Error (or an equivalent parameter) at the Set-Point value;
   c) The frequency within the range defined for its Synchronous Area.

5. Each TSO shall ensure that the Transmission System is continuously in balance and all kinds of active power reserves are in line with the provisions of the Load-Frequency Control Network Code.

6. Each TSO shall monitor in real-time the frequency and respecting of the Area Control Error (or an equivalent parameter).

7. In case of exchange of reserves between TSOs, the TSO provider(s) of the reserve, the TSO receiver(s) of the reserve and other affected TSOs shall carry out a common Security Analysis to check that the expected cross-border flows are compatible with the Operational Security Limits.

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8. In case of forecasting violations of the required amounts of active power reserves, the TSO shall prepare Remedial Actions in accordance with legal provisions and market rules, in order to ensure sufficient active power reserve.

9. In case of detecting violations of the required amounts of active power reserves, the TSO shall immediately apply Remedial Actions to restore active power reserve in accordance with legal provisions and market rules.

10. The TSO shall be able to decide the implementation of Remedial Actions other than activating reserve, like e.g. Load Shedding within its Responsibility Area, in line with the applicable laws and market rules.

11. Each TSO shall monitor and ensure within its Control Area that the provision of Frequency Containment Reserve, Frequency Restoration Reserve and Replacement Reserve is in line with the provisions of the Load Frequency Control Network Code, taking into account the specific characteristics of its Transmission System. For monitoring, each TSO shall use real-time measurements of frequency, demand, generation and inter-area exchange.

12. Notwithstanding the provisions of Article 14.10, a Generator, DSO or Consumer shall automatically disconnect at specified frequencies, if required by the relevant TSO or DSO. The terms and settings for automatic disconnection shall be agreed with the relevant TSO or DSO under the conditions and within the framework approved by the responsible regulatory authority and respecting the principles of transparency, public involvement and non-discrimination.

13. All type B, C and D Generators and Demand Facilities providing demand side response shall be considered as potential suppliers of reserves in accordance with the mechanisms, agreements and market rules applicable in the given Control Area.

14. Each TSO shall plan to operate its system in Normal State, maintaining Operational Security Limits of frequency according to Table 2 in Network Code on Requirements for Grid Connection Applicable for All Generators.

15. Each TSO shall have the right to impose restrictions on ramping of Generating Units, Demand Facilities and HVDC Interconnectors, when necessary to ensure frequency quality, in collaboration with other TSOs in the Synchronous Area or between the Synchronous Areas.

16. Each TSO shall collaborate with other TSOs of its Synchronous Area according to the Load-Frequency Control Network Code in order to jointly determine the upward and downward Frequency Containment Reserves (FCR) required within the Synchronous Area and for each TSO to automatically stabilize the frequency at a steady-state value within its normal range in the timeframe of seconds, without the need for Load Shedding or disconnection of Generating Units in case of generation / demand unbalances.

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17. Each TSO shall collaborate with other TSOs of its Synchronous Area according to the Load Frequency Control Network Code in order jointly determine the upward and downward Frequency Restoration Reserves (FRR) required within the Synchronous Area and for each TSO to automatically and manually restore the frequency to its reference value in the time frame of minutes thus relieving the FCR.

18. Each TSO shall collaborate with other TSOs of its Synchronous Area according to the Load Frequency Control Network Code in order to jointly determine the Replacement Reserves (RR) required within the Synchronous Area and for each TSO to manually or automatically restore the balance of generation, demand and exchange in the time frame of several minutes, thus relieving the FRR.

19. Each FCR provider shall provide the TSO with the following data for each unit:
    a) Droop (R) (power-frequency characteristic of the unit);
    b) Controller dead band in mHz for the FCR;
    c) Controller insensitivity in mHz.

20. Each FRR provider shall provide the TSO with the following data for each unit:
    a) Regulation area, if exists, which the reserve provider belongs to;
    b) Status signal of FRR regulation (on/off);
    c) Maximum/minimum active power regulation limits;
    d) Real-time active power;
    e) Upward and downward admissible ramps in MW/time.

21. Each RR provider shall provide the TSO with the following data for each unit:
    a) Required start-up time;
    b) Replacement Reserve available;
    c) Upward and downward admissible ramps in MW/time;
    d) Status signal of FRR regulation (on/off).

22. Each TSO that receives or provides cross-border active power reserves or shared active power reserves, shall provide to potentially affected TSOs the information on maximum active power reserve to be exchanged.

Article 15

OPERATIONAL TESTING, MONITORING AND INVESTIGATION

1. Each TSO, DSO and System User shall continuously monitor their areas of responsibility, perform operational testing, and participate in the investigation of system events in order to:

a) Ensure correct functioning of elements of Transmission System, Distribution System or Generating Units;
b) Maintain and develop operational procedures;
c) Ensure the fulfilment of Ancillary Services;
d) Train staff;
e) Acquire information about system and equipment behaviour under abnormal conditions;
f) Test involving the controlled application of frequency or voltage variations aimed at gathering information on Transmission System behaviour;
g) Test standard procedures for Alert and Emergency States.

2. The TSO, DSO or System User responsible for the test shall establish a test plan for each intended test. The test plan shall be robust yet flexible, including an appropriate margin for emergencies and look at the impact on the system as a whole.

3. For each test, the TSO, DSO or System User responsible for the test shall adhere to all relevant provisions from Network Code on Grid Connection Requirements Applicable for All Generators and Demand Connection Network Code.

4. Prior to connecting to the Transmission or Distribution System each System User shall be compliant with the requirements of Network Code on Requirements for Grid Connection Applicable for All Generators and Demand Connection Code and shall carry out tests specified by the relevant TSO or DSO to confirm that their plant and apparatus meets the requirements for connection to the Transmission or Distribution System. With the agreement of the TSO or DSO, verified achievement of the standards specified by the TSO or DSO, by methods other than testing, may be sufficient.

5. After connection, each System User shall carry out the tests specified by the relevant TSO or DSO to confirm that their plant and apparatus still meets all the requirements for connection to the Transmission or Distribution System and that the System User is complying with its declared availability and supply of Ancillary Services.

6. Each TSO shall carry out the necessary analysis and planning to ensure that tests in its Responsibility Area are carried out in a manner that minimizes the impact to Operational Security and economic operation of the interconnected Transmission Systems.

7. Operational Security of its own Transmission System and Control Area shall be each TSO's main concern during testing. Any test may be delayed, postponed or interrupted due to unplanned system conditions occurring, as assessed by the TSO.

8. During testing the system shall remain in Normal State. Any degradation in the System State shall be corrected and the system returned to the Normal State as soon as possible. If a TSO or a System User is conducting a test influencing a neighbouring TSO

and the affected TSO changes to Alert or Emergency State, the TSO or System User conducting the test shall cease all testing immediately.

9. Each TSO and DSO shall perform operational monitoring, continuously, or periodically for subsequent periods of time by data recording, examination and analysis, for the evaluation of a System User's compliance with its connection and operating conditions, declared availability and contracted provisioning of Ancillary Services. It does not require advance notification from a TSO or DSO to System Users.

10. Each TSO shall regularly monitor the quality of the response of Generating Units to active and reactive power set points and the response of Generating Units providing Frequency Containment Reserve to frequency deviations and Faults.

11. Each TSO shall use in its assessment of and planning for a test, Common Grid Model of its Synchronous Area. To ensure the accuracy of Operational Security calculations this model shall comprise:
    a) Its own power Transmission System and relevant parts of Distribution Systems on lower voltage levels within its Responsibility Area;
    b) Equivalents of the Transmission and Distribution Systems beyond the boundaries of the included ones.

12. Each TSO may request additional tests if they are deemed necessary to maintain and develop operational procedures, to train staff, or to acquire information of Transmission System or equipment behaviour under certain system conditions.

13. Each System User requesting a test shall provide all necessary information and allow reasonable time for the TSO or DSO to plan for the test taking into account the impact on system operation, the scope of and procedure for the test.

14. Each TSO shall ensure timely and effective co-ordination of tests in its Responsibility Area with neighbouring TSOs if they are affected.

15. After any significant incident, the TSOs involved shall carry out a joint investigation to analyse the reasons for the incident and to adjust the existing operational procedures, if required.

16. Each TSO shall carry out investigations to acquire or verify information relating to events on the Transmission System at the Responsibility Area level. Involved TSOs and System Users shall provide all information required to fully complete the investigation.

17. Each TSO shall classify system incidents based on a common incidents classification scale cf. Article 8.3.(a) of the Regulation (EC) 714/2009 in order to correctly rank the events based on their level of importance with regard to Operational Security.

18. System Users shall provide to the TSO at least the following information on the test:

a) The intended timing and duration of the test;
b) The active and reactive power profiles during the proposed testing period;
c) Details of each test to be carried out during the testing period, including the purpose of the test, the risk of tripping during each test and the availability of the affected unit during the test;
d) Contact details of the onsite personnel.

19. TSO shall provide to affected TSO at least the following information on the test:
a) Details and timing of test;
b) Expected Transmission System conditions;
c) Plans for accommodation of test.

20. If necessary – to fully investigate both Local and Wide Area system incidents – the TSO may require additional data from System Users. Affected TSOs shall co-operate in the provision of this data.

Article 16

OPERATIONAL TRAINING AND CERTIFICATION

1. Each TSO shall include in its training programmes knowledge of the transmission equipment, operation of the Transmission System, use of the on-the-job systems and processes, inter-TSO operations and market arrangements. Each TSO shall also include recognizing and responding to exceptional situations as defined by the TSO.

2. To maintain and extend the System Operators' skills, each TSO shall carry out continuous training. The detailed contents and frequency of the training for all relevant roles shall be defined in the training programme of each TSO. The training shall address (but not be limited to) at least:
a) Basics of electrical power engineering;
b) Basics of the European Internal Electricity Market;
c) Safety and security for humans and equipment in operating Transmission System;
d) Transmission System control in Normal and Alert State;
e) Emergency control and restoration;
f) Inter-TSO cooperation and coordination in real-time and in operational planning at the level of main control centre (this part of the training shall, if not otherwise specified and agreed, be in English language);

3. Each TSO shall prepare and carry out training plans for all trainee System Operators. The training plans shall be tailored to suit each individual. They must be structured and detailed and take account of the trainees background and experience relative to the

position they are being trained for. Adequate records of System Operators' training plans shall be retained by the TSO for a period not less than 3 years.

4. The training plans shall comprise:
   a) An initial program, to be followed by a trainee System Operator before certification;
   b) A continuous development program, to be followed between renewals of certification for each System Operator.

5. Each TSO shall appoint an experienced training coordinator, who is responsible for designing, monitoring and updating the complete training process. The training coordinator shall be responsible for defining:
   a) Qualifications for System Operators;
   b) Training required for certification;
   c) Processes with documentation for initial and continuous training;
   d) Process for certification of System Operator;
   e) Process for renewal of a certification;
   f) Competences for on-the-job trainers and training of trainers in teaching and mentoring skills.

6. Each TSO shall define the skills and the level of competence of the on-the-job trainers. This shall include the necessary practical experience. System Operators acting as trainers shall be registered by each TSO and their on-the-job trainer status reviewed at the same time as their certification renewal is assessed.

7. Each TSO shall review training programmes at least annually or following any significant system changes and update them to reflect changing operational circumstances, market rules, network configuration and system characteristics, with particular focus on new transmission and generation technologies, changing generation patterns and market evolution.

8. Each TSO shall ensure the training includes on-the-job training and training offline. On-the-job training must be carried out under the supervision of an experienced System Operator. Offline training must, as far as practicable, resemble the actual control room equipment with network modelling details appropriate to the role being trained for.

9. Each TSO shall ensure that the training is based on a comprehensive national database model with respective data from neighbouring networks at a sufficient level to replicate inter-TSO operational issues. Where relevant, the role of neighbouring TSOs, connected DSOs and Generators and directly connected Consumers must also be simulated in the offline training.

10. TSO shall co-ordinate with DSOs, Generators and directly connected Consumers to ensure TSO offline training regarding the impact of users' systems is as comprehensive

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as reasonably practical and reflects the latest developments in systems and equipment. TSOs and System Users may run joint offline training simulations or training workshops for their System Operators to enhance co-operation and understanding.

11. Each TSO shall ensure that System Operators have a certification, issued by a nominated representative from their TSO, for the role they are to perform before they can work unsupervised in the control room.

12. Each TSO shall actively participate in the inter-TSO training at a defined frequency taking into account the level of mutual influence with neighbouring systems.

13. Each TSO shall define the level of competence and process to gain a certification for each relevant role within the control room. The certification shall only be awarded to the trainee System Operator following the passing of a formal assessment.

14. Each TSO shall record the period of validity of the certification issued to any System Operator. The maximum period of any certification, shall be defined by each TSO. The renewal of the certification before expiry shall be based on criteria defined by each TSO, including the System Operator's participation in a continuous training programme, including sufficient practical experience.

15. Each TSO shall collaborate with each neighbouring TSO to determine a common language for contacts between their System Operators. If not otherwise specified and agreed, the language shall be English. Each TSO shall train the relevant System Operators to achieve a sufficient skill in this language to carry out their tasks.

16. Each TSO shall exchange operational experiences with their neighbouring TSOs, including facilitating visits and exchange of experiences between System Operators. There must be regular training between neighbouring TSOs to improve the knowledge of the characteristics of neighbouring Transmission Systems and communication and coordination between System Operators of neighbouring TSOs. This inter TSO training must include awareness of co-ordinated actions required under Normal, Alert and Emergency States and other (also exceptional) conditions.

17. Each TSO shall collaborate with each neighbouring TSO to determine the need and frequency for holding joint training sessions and the minimum content and scope of those sessions taking into account the level of mutual influence and operational cooperation needed. This inter-TSO training may include, but should not be limited to, joint training workshops and joint training simulator sessions.

18. Each TSO shall ensure that each System Operator as a part of their initial training undergo training in interoperability issues between neighbouring systems based upon operational experiences and feedback from the joint training carried out with their neighbouring TSOs. This part of the initial training regarding interoperability issues

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must include awareness of co-ordinated actions required under Normal, Alert, Emergency States and other exceptional conditions.

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Chapter 2

DATA EXCHANGE

Article 17

GENERAL REQUIREMENTS

1. Each TSO shall be entitled to gather the information on generation, consumption, commercial and physical schedules, balance positions and its own forecasts, required for the Operational Security analyses and based upon its own Transmission System model. This information shall be transformed into the nodal injections and withdrawals of its part of the Common Grid Model.

Article 18

STRUCTURAL AND FORECAST DATA EXCHANGED BETWEEN TSOs

1. Each TSO shall agree with the neighbouring TSOs about its Observability Area comprising own Transmission System and those parts of the neighbouring Transmission Systems which are needed to determine the operational state of the own Transmission System accurately and efficiently.

2. Neighbouring TSO shall exchange the structural information related to the Observability Area agreed in Article 18.1. The information shall comprise at least:
   a) Substations' regular topologies and other relevant data by voltage level;
   b) Transmission lines;
   c) Transformers towards the DSOs, Consumer Facilities and block-transformers of Generating Units;
   d) Phase-shifting transformers;
   e) High Voltage DC lines;
   f) Reactors, capacitors and Static VAR Compensators.

3. Neighbouring TSOs shall exchange the protection Set-Points to allow protection coordination between the different Transmission Systems.

4. In order to support coordinated security analyses, each TSO shall exchange with all other relevant TSOs in ENTSO-E at least the following data:
   a) Topology of the 220 kV and higher voltage Transmission System within its Responsibility Area;
   b) An equivalent of the Transmission Systems of significant impact on the network mentioned in Article 18.4.a);

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c) The forecast sum of load injection in every node of the Transmission System mentioned in Article 18.4.a) for the different timeframes.

Article 19

REAL-TIME DATA EXCHANGED BETWEEN TSOs

1. Each TSO shall exchange with all other TSOs in its Synchronous Area, via a common awareness system the necessary data to inform about its operational state:
   a) Frequency;
   b) Area Control Error or an equivalent parameter;
   c) Measured active power exchanges;
   d) Generation infeed where needed ;
   e) System State in terms of the provisions in Article 7.

2. Each TSOs shall exchange with its neighbouring TSOs the following data of the agreed Observability Area:
   a) Actual topology;
   b) Active and reactive power in line bay;
   c) Active and reactive power in transformer bay;
   d) Active and reactive injections and withdrawals of generation, demand and subsequent DSOs;
   e) TAP positions of transformers, including phase-shifting transformers;
   f) Busbar voltage (measured or estimated);
   g) Reactive power in reactor and capacitor bay or from a Static VAR Compensator;
   h) Restrictions on active and reactive power supply capabilities with respect to the Observability Area.

Article 20

STRUCTURAL DATA EXCHANGED BETWEEN TSOs AND DSOs WITHIN THE TSO's RESPONSIBILITY AREA

1. Each TSO shall define the Observability Area of the Distribution Systems connected to its Transmission System, which are relevant for the determination of the operational state of the Transmission System accurately and efficiently.

2. Each DSO connected to the Transmission System, shall provide to its TSO the structural information related to the Observability Area defined in Article 20.1, comprising (but not limited to) at least:
   a) Substations by voltage;

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b) Lines;
c) Transformers;
d) Generating Units and Demand Facilities;
e) Reactors and capacitors.

3. Each DSO connected to the TSO, shall update the structural information of the elements of the Observability Area every time it changes.

Article 21

REAL-TIME DATA EXCHANGED BETWEEN TSOs AND DSOs WITHIN THE TSO's RESPONSIBILITY AREA

1. Each DSO connected to the Transmission System, shall provide in real-time to its TSO the information related to the Observability Area defined in Article 20.1 comprising:
   a) Actual topology;
   b) Active and reactive power in line bay;
   c) Active and reactive power in transformer bay;
   d) Active and reactive power injection of generators;
   e) Active and reactive power withdrawals and injections of any subsequent DSOs and of Demand Facilities;
   f) Tap positions of transformers;
   g) Busbar voltages;
   h) Reactive power in reactor and capacitor bay.

Article 22

STRUCTURAL DATA EXCHANGED BETWEEN TSOs, INTERCONNECTION OWNERS AND GENERATORS DIRECTLY CONNECTED TO THE TRANSMISSION SYSTEM

1. Each type D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators, directly connected to the Transmission System shall send the following data to the TSO:
   a) General data of the power plant;
   b) Frequency Containment Reserve data for plants that participate in this service;
   c) Frequency Restoration Reserve data for plants that participate in this service;
   d) Protection data;
   e) Reactive power control capability.

2. Each type D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall send the following data to the TSO:

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a) General data of the power plant;
b) Turbine and Generating Unit data including time for cold and warm start;
c) Block transformer data;
d) Frequency Containment Reserve data;
e) Frequency Restoration Reserve data for plants that participate in this service;
f) Data necessary for Restoration;
g) Protection data;
h) Reactive power control capability.

3. TSO may request any Generator directly connected to the Transmission System to provide further data needed for Operational Security analyses.

4. Each Interconnector owner (where the owner is not the TSO) shall provide the following data to the TSO:
   a) General data of the Interconnector (HVDC or AC);
   b) Transformers data;
   c) Data on filters;
   d) Reactive compensation data.

Article 23

SCHEDULED DATA EXCHANGED BETWEEN TSOs, INTERCONNECTION OWNERS AND GENERATORS DIRECTLY CONNECTED TO THE TRANSMISSION SYSTEM

1. Each type D Generator (and type B and C Generator directly connected to the Transmission System) according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide to the TSO its scheduled unavailability or active power restriction, forecast scheduled active power output, active power reserves amount and availability.

2. Each type D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide to the TSO any forecasted restriction in the reactive power control capability, reactive power reserves amount and availability.

3. Each Interconnector owner (where the owner is not the TSO) shall provide the following data to the TSOs:
   a) Its scheduled unavailability or active power restriction;
   b) Its scheduled unavailability or forecast restrictions of filter banks or reactive compensation that forms part of the interconnector;
   c) Scheduled active power transfers and reactive output levels.

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Article 24

REAL-TIME DATA EXCHANGED BETWEEN TSOs, INTERCONNECTION OWNERS AND GENERATORS DIRECTLY CONNECTED TO THE TRANSMISSION SYSTEM

1. Each type D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide to the TSO in real-time or periodically with time stamping the following information:
   a) Position of the circuit breakers;
   b) Active and reactive power at the high voltage side of the transformer;
   c) Active power reserve;
   d) Times required for the cold and warm start.

2. Each Interconnector owner (where the owner is not the TSO) shall provide the following data to the TSOs in real time:
   a) Position of the circuit breakers;
   b) Active and reactive power.

Article 25

STRUCTURAL DATA EXCHANGED BETWEEN DSOs AND GENERATORS CONNECTED TO THE DISTRIBUTION SYSTEM

1. Each type B Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide the following data to the DSO:
   a) General data of the power plant;
   b) Frequency Containment Reserve data;
   c) Frequency Restoration Reserve data for plants that participate in this service;
   d) Data necessary for Restoration;
   e) Protection data;
   f) Reactive power control capability.

2. Each type C and D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide the following data to the DSO:
   a) General data of the power plant;
   b) Turbine and generator data including necessary time for cold/ warm start;
   c) Transformer data;
   d) Frequency Containment Reserve data;
   e) Frequency Restoration Reserve data for plants that participate in this service;

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f) Data necessary for Restoration;

g) Protection data;

h) Reactive power control capability.

Article 26

SCHEDULED DATA EXCHANGED BETWEEN DSOs AND GENERATORS CONNECTED TO THE DISTRIBUTION SYSTEM

1. Each type B, C and D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide to the DSO its scheduled unavailability, active power restriction and its forecast scheduled active power output.

2. Each type B, C and D Generator according to Article 3 in Network Code on Requirements for Grid Connection Applicable for All Generators shall send to the DSO any forecasted restriction in the reactive power control capability.

Article 27

REAL-TIME DATA EXCHANGED BETWEEN DSOs AND GENERATORS CONNECTED TO THE DISTRIBUTION SYSTEM

1. Each type B, C and D Generator according to Article 3 of Network Code on Requirements for Grid Connection Applicable for All Generators shall provide to the DSO in real-time the following information:

   a) Position of the circuit breakers;

   b) Active and reactive power at the high voltage side of the transformer.

Article 28

DATA EXCHANGED BETWEEN TSOs AND GENERATORS CONNECTED TO THE DISTRIBUTION SYSTEM

1. Generators and DSOs shall provide to the TSO all the information described in Articles 25, 26 and 27 if requested by the TSO.

2. TSO may request further data from any Generator connected to the Distribution System, if this is necessary for Operational Security analyses, or if – after aggregation of data – the significance of a particular Generator or type of Generators is raised in terms of Operational Security.

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Article 29

DATA EXCHANGED BETWEEN TSOs AND CONSUMERS DIRECTLY CONNECTED TO THE TRANSMISSION SYSTEM

1. Consumers directly connected to the Transmission System shall provide the following structural data to the TSO:
   a) Electrical data of the transformers connecter to the Transmission System;
   b) Characteristics of the load of the Demand Facility;
   c) Characteristics of the reactive power control.

2. Each Consumer directly connected to the Transmission System shall send to the TSO its scheduled active and reactive consumption on the Day-1 and Intraday (changes) basis.

3. Each Consumer directly connected to the Transmission System shall send the TSO any forecasted restriction in the reactive power control capability.

4. Each Consumer directly connected to the Transmission System that participates in curtailment shall communicate to the TSO the minimum and maximum power to be curtailed.

5. Each Consumer directly connected to the Transmission System shall send to the TSO in real-time the following information:
   a) Active and reactive power at the high voltage side of the transformer;
   b) Minimum and maximum power to be curtailed.

Article 30

DATA EXCHANGED BETWEEN TSOs AND CONSUMERS CONNECTED TO THE DISTRIBUTION SYSTEM

1. Each consumer connected to the Distribution System that participates in curtailment, shall communicate to the TSO the minimum and maximum active power which can be curtailed.

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Title 3

COMPLIANCE

Chapter 1

COMPLIANCE MONITORING

Article 31

RESPONSIBILITY OF THE SYSTEM USER

1. Each System User (Generator, Consumer or DSO) shall ensure that its facilities are compliant with the requirements from this Network Code. This compliance shall be maintained throughout the lifetime of the facility.

2. Planned modifications of the technical capabilities of the System Users facilities, with possible impact on its compliance to the requirements under this Network Code shall be notified to the relevant TSO or DSO by System User before initiating such modification.

3. Any operational incidents or Faults of a facility of the System User that have impact on its compliance to the requirements of this Network Code or national legislation including the national codes, shall be notified to the relevant network operator by System User as soon as possible without any delay after the occurrence of such an incident.

4. Any foreseen test schedules and procedures to verify compliance of a facility of the System User with the requirements of this Network Code, shall be notified to the relevant TSO or DSO by System User in due time and prior to their launch and shall be approved by the relevant TSO or DSO. The purpose of this is to allow the relevant TSO or DSO to evaluate and mitigate where necessary the risks to the Transmission and Distribution Systems and their users.

5. The relevant TSO or DSO shall be facilitated to participate in such tests and may record the performance of the facilities of the System Users.

Article 32

TASKS OF THE TRANSMISSION AND DISTRIBUTION SYSTEM OPERATORS

1. While respecting the principles of transparency, proportionality and non-discrimination, Member States shall ensure that a competent entity has been

appointed or identified to perform and assume responsibility for the function of Transmission System Operator (TSO).

2. Operational Security shall be the sole responsibility of Transmission System Operators.

3. The relevant TSO or DSO shall regularly assess the compliance of a System User's facility with the requirements under this Network Code, national legislation including national codes throughout the lifetime of the System Users' facility.

4. The relevant Transmission or Distribution System Operator shall have the right to request that the System User carries out compliance tests and simulations at least once in three years, throughout the lifetime of the System User's facility and in particular after any Fault, modification or replacement of any equipment that may have impact on the System User's facility compliance with the requirements under this Network Code.

5. The relevant TSO or DSO shall make publicly available the list of information and documents to be provided as well as the requirements to be fulfilled by the System User in the frame of the compliance process. Such list shall at least cover the following information, documents and requirements:
   a) All documentation and certificates to be provided by System User;
   b) Details of the technical data of the System User facility with relevance for the system operation;
   c) Requirements for models for steady-state and Dynamic Stability system studies;
   d) Studies by the System Users for demonstrating expected steady-state and Dynamic Stability performance;

6. The relevant TSO or DSO shall make publicly available the allocation of responsibilities of the System User and of the TSO or DSO for compliance testing and monitoring.

7. The relevant TSO or DSO may partially or totally delegate the performance of its compliance monitoring to third parties.

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Title 4

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 33

REGIONAL VARIANCES OF THE REGION BALTIC

1) Baltic Region is operating synchronously in the IPS/UPS Synchronous Area with the centralised frequency regulation approach.

2) Baltic TSOs shall not comply with the following provisions from this Network Code:
   a) tbd …

Article 34

REGIONAL VARIANCES OF THE REGION CONTINENTAL EUROPE

tbd if applicable …

Article 35

REGIONAL VARIANCES OF THE REGION IRELAND

tbd if applicable …

Article 36

REGIONAL VARIANCES OF THE REGION NORDIC

1) At present there is no load-frequency control in the sense of ENTSO-E Region Continental Europe, in the Nordic Region. Balancing is provided through the Nordic balancing market.

Article 37

REGIONAL VARIANCES OF THE REGION GREAT BRITAIN

tbd if applicable …

Article 38

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SPANISH ISOLATED SYSTEMS

1. In Spanish isolated systems (SEIE) scheduling of Generating Units is performed by the relevant Transmission and Distribution System Operator based on recognized costs of the Generating Units, however Consumers benefit from prices of the Spanish mainland electric market and the difference between generation cost in Spanish isolated systems and Consumers' payment is socialized.

2. In the case of Spanish isolated systems), when this Network Code refers to market it has to be interpreted as SEIE rules.

Article 39

FRENCH ISOLATED SYSTEMS

tbd …

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Title 5

LIABILITY

Article 40

LIABILITY OF TRANSMISSION SYSTEM OPERATORS

1. Relevant Transmission System Operators are only liable for wilful misconduct or gross negligence. In these cases the liability of the relevant Transmission System Operator for loss of network users connected to its network or to the network of a third relevant Transmission System Operator or for loss of another TSO arising from any infringement of this NC is limited to a maximum amount of 5 Million Euro for any single incident or series of related incidents.

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Title 6

FINAL PROVISIONS

Article 40

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.

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