RULES ON TRANSMISSION SYSTEM OPERATION

December, 2025

Pursuant to Article 116 of the Energy Law (*The Official Gazette of the Republic of Serbia,* Nos. 145/14, 95/18 – other law, 40/21, 35/23 – other law, 62/23, 94/24 and 109/25 – other laws) and Article 28, Paragraph 1, Item 29 of Statute of the Joint Stock Company "Elektromreža Srbije" Belgrade (*The Official Gazette of the Republic of Serbia*" No. 88/16), with all other amendments, the General Assembly of the Joint Stock Company "Elektromreža Srbije" Belgrade, at its 180th extraordinary session held on 22 December 2025, shall hereby adopt the following:

RULES ON TRANSMISSION SYSTEM OPERATION

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CHAPTER 1: GENERAL PROVISIONS

1.1. SUBJECT OF THE RULES ON TRANSMISSION SYSTEM OPERATION

1.1.1. The Rules on Transmission System Operation (hereinafter referred to as: the Rules) shall regulate the following:

1) planning of transmission system development, including the content of the plan, the planning procedure, and the content of the investment plan;
2) conditions for the secure and reliable operation of the transmission system;
3) obligations of system users necessary for the secure and reliable operation of the system;
4) obligations of system users and the transmission system operator in the functional testing and commissioning of parts of the 110 kV distribution system managed by the transmission system operator, as well as in elements of the power system of generation facilities and end-users affecting the secure and reliable operation of the transmission system, including the testing of protection and control devices following significant operational events or system operation disturbances;
5) obligations of system users and the transmission system operator in functional testing for the purpose of providing ancillary services;
6) content of facility operation agreement concluded with the customer, generator, distribution system operator, and closed distribution system operator;
7) use and maintenance of facilities;
8) parameters and methods for controlling electricity quality;
9) planning of transmission system operation;
10) procedure for the submission and confirmation of the work programme by balance responsible parties;
11) types and scope of ancillary services;
12) operational procedures and transmission system management under normal conditions and in the event of disturbances;
13) criteria and methods for applying operational limits;
14) access to the transmission system, instruments for securing payment, and criteria for determining the amounts and periods for which security is required, except in cases where the owner of the transmission system operator and the energy entity is the same legal person;
15) metering procedures with defined required measuring equipment, criteria for selecting the accuracy class of measuring devices and characteristics of accompanying devices and equipment, procedures for testing and controlling measuring equipment, commissioning of measuring equipment, measurement data, use of measurement data, depending on the location of the metering point in the system and the type of system user;
16) frequency and methods of verifying the correctness of the metering point, measuring and control devices in the function of measurement, content of inspection reports, and methods for detecting unauthorised consumption;

17) measures to be undertaken in the event of disturbances in the operation of the power system, as well as due to maintenance and expansion works of the power system;
18) training of operator and system user personnel in operational procedures, aimed at ensuring the secure and reliable operation of the transmission system;
19) other matters necessary for the operation of the transmission system.

1.2. TRANSMISSION SYSTEM AND SCOPE OF APPLICATION OF THE RULES

1.2.1. The transmission system operator (hereinafter referred to as: EMS AD), in addition to the transmission system, shall also manage parts of the distribution system, which as a rule includes 110 kV busbar fields, 110 kV overhead or cable line fields, and 110 kV busbars, as well as 110 kV transformer fields when they serve the function of overhead or cable line fields, in accordance with the categorisation of power system elements set out in Sections 1.2.2–1.2.4.

1.2.2. Power system elements of 400 kV, 220 kV, and 110 kV shall, as a rule, be classified according to the voltage level of the facility and the element's impact on the secure operation of the transmission system and interconnections, according to the following general categorisation criteria:

- Group One: power system elements of 400 kV and 220 kV voltage levels, and 110 kV interconnection lines with the corresponding field;
- Group Two: 110 kV power system elements that are essential for the reliable operation of electricity generation facilities and 110 kV interconnection lines;
- Group Three: 110 kV power system elements not falling under the criteria for Group One or Two, managed by EMS AD;
- Group Four: power system elements not managed by EMS AD.

1.2.3. EMS AD shall prepare the document *Categorisation of 400 kV, 220 kV and 110 kV Power System Elements* (hereinafter: *Categorisation*), which shall include a list of all overhead lines, cables, mixed lines, transformer substations, switchyards, and connection switchyards, with the full name, numbering, and categorisation of elements of transmission system facilities and system users' facilities of 400 kV, 220 kV, and 110 kV. The detailed categorisation criteria shall be established by EMS AD. EMS AD shall be responsible for maintaining a unified register of facilities and elements of the 400 kV, 220 kV, and 110 kV power system, with regular updates to the *Categorisation* and provision of the updated information to system users upon any modification.

1.2.4. The scope of application of these Rules, in addition to the transmission system itself, shall include 400 kV, 220 kV, and 110 kV power system elements classified in the *Categorisation* under Group One, Two, or Three, which are not part of the transmission system.

1.3. UNFORESEEN CIRCUMSTANCES

1.3.1. Should circumstances arise during the application of the Rules which could not have been foreseen, or the occurrence of which could not have been prevented, and the effect of which may result in altered technical conditions of transmission system use and cause consequences for system users, EMS AD shall be authorised to take measures for unforeseen circumstances.

1.3.2. The measures referred to in Section 1.3.1 shall be taken by EMS AD in agreement with the system users affected by the altered technical conditions of system use. EMS AD shall,

immediately upon determining the possible ways to mitigate the consequences of unforeseen circumstances, notify the affected system users and propose the measures that may be undertaken, including the time frame within which such measures shall be implemented.

1.3.3. Should an agreement between EMS AD and the system users regarding the implementation of measures within the available time frame not be reached, EMS AD shall decide on the application of measures to prevent or mitigate the consequences of the unforeseen circumstances. EMS AD shall apply such measures as shall minimise the consequences for system users to the greatest extent possible.

1.3.4. A system user shall comply with all instructions received from EMS AD for the purpose of implementing the appropriate measures during the duration of unforeseen circumstances.

1.3.5. EMS AD shall prepare a report on the implementation of measures for unforeseen circumstances, in the manner and according to the procedure for preparing extraordinary reports on the operation of the transmission system, which shall, *inter alia*, indicate the causes of the unforeseen circumstances, the measures undertaken, and the consequences of the unforeseen circumstances. The report shall be delivered to the affected system users and the competent authorities, in accordance with the Rules.

1.3.6. EMS AD shall, no later than 45 days from the occurrence of the unforeseen circumstances, prepare and submit for consideration and harmonisation a proposal for amendment or supplement of the Rules in order to regulate the matter, should the amendment of the Rules resolve the cause of the unforeseen circumstances.

1.4. COMMITTEE FOR MONITORING THE APPLICATION OF THE RULES ON TRANSMISSION SYSTEM OPERATION

1.4.1. The Committee for Monitoring the Application of the Rules on Transmission System Operation (hereinafter referred to as: the Committee) shall be the body responsible for monitoring the application of the Rules and considering proposals for the amendment or supplementation of the Rules.

1.4.2. EMS AD shall provide the conditions necessary for the operation of the Committee.

1.4.3. The members of the Committee shall include:

- six representatives of EMS AD, one of whom shall serve as the Chair of the Committee;
- two representatives of electricity generators whose facilities are connected to the transmission system;
- one representative of electricity storage operators whose facility is connected to the transmission system;
- one representative of privileged electricity generators whose facility is connected to the transmission system;
- two representatives of distribution system operators;
- one representative of a closed distribution system operator connected to the transmission system;
- one representative of the guaranteed supplier;
- two representatives of suppliers;
- two representatives of end-users whose facilities are connected to the transmission system;
- one representative of producer-customers whose facility is connected to the transmission system;
- one representative of aggregators whose facilities are connected to the

transmission system.

1.4.4. A representative of the Energy Agency of the Republic of Serbia (hereinafter: the Agency) shall participate in the work of the Committee without voting or decision-making rights.

1.4.5. A Committee member representing a group of transmission system users shall be appointed for a period of two years.

1.4.6. Within the group, a Committee member shall be designated according to a ranking list prepared based on:

- the licence number from the Register of Issued Licences of the Agency, for system users for whom Agency licences shall be issued;
- the serial number in the Register of privileged electricity generators of the ministry responsible for energy affairs;
- the alphabetical order of the facilities of system users or aggregators for whom Agency licences shall not be issued.

1.4.7. The Committee shall adopt Rules of Procedure, regulating its mode of operation, and in particular:

- the organisation and manner of operation of the Committee;
- the organisation and conduct of meetings;
- the course of meetings;
- the preparation and submission of minutes of meetings, decisions, conclusions, opinions, proposals, recommendations, etc.;
- the keeping of materials produced in the work of the Committee and other matters of importance for the Committee's functioning.

CHAPTER 2: GLOSSARY

2.1. TERMS

2.1.1. The terms used in the Rules shall have the meanings defined in the energy legislation, except for the following:

Adequacy of generation – Assessment of the capability of generating units within a given control area to supply the electricity demand and balance the system. The transmission system operator shall assess the mid-term and short-term adequacy of generation for its control area in accordance with the Rules on Interconnection Operation. Short-term adequacy shall, as a rule, cover the next seven days, whereas mid-term adequacy shall cover a period of up to ten years.

Automatic frequency restoration control (secondary control) – A centralised automatic function which regulates generation within the control area in order to:

- maintain active power flows between control areas in accordance with the exchange programme with all other control areas simultaneously;
- restore frequency to its set value in the event of deviations caused by the control area (particularly in the event of a larger frequency deviation caused by the control area following the outage of a major generating unit), thereby freeing the active power capacity engaged for frequency control.

Automatic frequency restoration control is implemented by engaging selected generating units equipped and included in this type of control.

Automatic frequency restoration reserve (secondary reserve) – Part of the range of automatic frequency control between the operating point of units in regulation and the maximum or minimum value (positive or negative reserve) of the active power of this regulation.

Active power – The average value of the instantaneous power measured over one fundamental period.

Balancing (of the transmission system) – Includes all actions and processes, across all time frames, through which the transmission system operator ensures the continuous maintenance of system frequency within a predefined stability range and in accordance with the quantity of reserves required to meet quality standards.

Balance group – A virtual area which may receive or deliver electricity, serving for the purposes of settlement and financial reconciliation from the perspective of balancing responsibility. It shall include all points of electricity transfer in the transmission and distribution systems, as well as the receipt and delivery of energy based on electricity exchange blocks.

Balance responsible party – A participant in the electricity market who is responsible for the deviations of a balance group and who has concluded a balancing responsibility agreement with the transmission system operator.

Dead-time (no-voltage pause) – The time interval between the operation of protection and the provision of a trip impulse to the issuance of a closing impulse by a device (function) for automatic reclosure (AR). Dead-time does not include the breaker opening or closing time.

Black start capability of a generating unit – The capability of a generating unit to return from a disconnected state to operational status and commence power delivery when the part of the transmission system to which it is connected is in a no-voltage state.

Electricity exchange block – A scheduled exchange of electricity between two balance groups within the same bidding zone, or between a balance group and a partner from another bidding zone (inter-zone exchange), during a defined time interval, with a specified block value and trade direction.

Meter – A device for measuring and recording electricity and power. A meter performs multiple functions: measuring active and reactive electricity by tariff items; recording load diagrams of active and reactive power; controlling switching between tariff registers.

Validation – The verification of the validity of metering data obtained via remote or local acquisition, conducted according to defined programme algorithms and analysis of event logs recorded in meters.

Wind power plant – A module of an energy park comprising a unified set of devices (wind turbines, wind generators, block transformers, cable network, and energy transformers) that uses wind energy for electricity generation.

Force majeure – An event or circumstance, or series of events or circumstances, that cannot be avoided, foreseen, or mitigated, resulting in the impossibility of fulfilling part or all obligations.

Line – A collective term for an overhead line, cable, or mixed line.

Intervention reclosure time – The time required for a power system element that has been disconnected due to works to be safely reclosed, measured from the moment the urgent reclosure order is issued.

Control area error – The instantaneous difference (ΔP) between the measured real-time exchange power (P) andthe planned control area exchangepower (P_0), adjusted for the frequency component of that control area (the product of the control area's regulation constant (K factor) and the frequency deviation (Δf) from the nominal value).

Remote acquisition – Remote collection of metering data from meters by the competent metering data centre.

Daily schedule of the organised electricity market – An electronic document containing the results of trading on the day-ahead or intraday organised electricity market in the form of electricity exchange blocks. This document shall be submitted to EMS AD by the electricity market operator or by a legal entity authorised by such operator to submit the daily schedule on behalf of its balance group.

Daily disconnection of a power system element – The disconnection of a power system element due to works on it or near it, whereby the element is reconnected at the end of each day after completion of works.

Allocated transmission capacity – The total transmission capacity between bidding zones that the transmission system operator has duly allocated for use by market participants.

Work permit – A type of work document issued prior to commencement of works on or near power system elements.

Permissible operating current – The maximum current with which a power system element may be continuously loaded, taking into account the characteristics and conditions of the element, as well as seasonal climatic operating conditions. The first-stage over-current protection setting shall be adopted with reference to this value. For the efficient operation of the transmission system, the first-stage over-current protection setting may, in the case of overhead lines, be dynamically adjusted using a conductor temperature monitoring system.

Operation (utilisation) of facilities – Activities aimed at optimally utilising existing, already constructed power system facilities and the power system as a whole through the application of technical and economic methods. In other words, it is a set of control actions (manual or

automatic) undertaken to satisfy the needs of system users while ensuring normal operation of the transmission system and minimising operational costs.

Power plant – A single technical-technological unit in which electricity is generated.

Power system facility (facility) – A construction-electromechanical entity used for the generation, transmission, distribution, consumption, or storage of electricity.

Power system (electricity system) – A set of mutually interconnected power system facilities constituting a single technical-technological unit.

Power system element (PSE) – Overhead line, cable, mixed line, line bay, cable bay, transformer, transformer bay, busbar system, switchyard, metering bay, disconnector, etc. Such an element has been categorised into a group under the *Categorisation of 400 kV, 220 kV, and 110 kV Elements*.

EIC Z code – A unique identification code for each metering point. This code consists of 16 alphanumeric characters describing the metering point and voltage level. EMS AD shall generate these codes for connection metering points.

Emission – Electromagnetic disturbances emitted by a device, equipment, system, or installation that cause deviations from normal system operation.

Emission level of voltage quality parameter – The level of the observed emission, assessed and measured in accordance with technical standards regulating voltage quality.

Protection device (protection) – A device that protects a power system element from operating conditions beyond the limits of normal operation. Protection shall be executed by alarming and disconnecting the protected element.

Bidding zone – The largest geographical area within which market participants may exchange electricity without allocating transmission capacity.

Intervention works – Works on power system elements, or near such elements, that are not foreseen by the corresponding disconnection plans (as a rule, these works are carried out due to an actual or potential fault on a power system element, or due to increased risk to human safety and health, fire hazard, or threat to property).

Interconnection (synchronous area) – A system consisting of two or more individual transmission systems connected by interconnecting lines and operating synchronously. Within a synchronous area, the system frequency is uniform under steady-state conditions.

Outage – An unexpected disconnection of one or more power system elements due to a malfunction or other causes.

Single-phase AR – An operation cycle of the protection and device (function) for automatic emergency reclosure which disconnects single-phase earth faults one phase at a time (only the affected phase) and reconnects that same phase after a dead-time.

Capacity – The nominal continuous load of a generating unit, electricity storage, transmission element, or other electrical equipment.

Characteristic day – A calendar day determined by EMS AD in accordance with the Rules on Interconnection Operation.

Categorisation of power system elements (PSE) – The procedure by which EMS AD shall classify each 400 kV, 220 kV, and 110 kV PSE into one of four groups (categories), in accordance with categorisation criteria issued by EMS AD and published in the document *Categorisation of 400 kV, 220 kV, and 110 kV Elements of the Power System of the Republic of Serbia*. The purpose of categorising power system elements is to define the control areas of EMS AD and system users' control centres, and to regulate the obligations of EMS AD and system users in the operation of transmission system facilities.

Fault – A random event, of internal or external origin, occurring on equipment that results in the cessation of the equipment's function and the outage of that equipment, including any associated apparatus. Faults may be transient or permanent in nature.

Control area – An agreed portion of an interconnected transmission system (interconnection) managed by a single system operator, comprising the connected physical consumption and generation units.

Control block – One or more control areas that jointly perform specific functions in accordance with interconnection operation rules and a mutual control block agreement.

Meter configuration – The procedure of setting metering and tariff parameters in meters. Meter configuration may be: Primary configuration, when the calculation constant of the metering point is entered as one of the parameters; or Secondary configuration, when the calculation constant is not entered.

Transmission system user – A generation unit, end-consumer whose facility is connected to the system, a prosumer (producer-consumer), electricity storage facility, aggregator, supplier, wholesale electricity supplier, or any other system operator whose facilities are connected to the transmission system.

System user – For the purposes of these Rules, a system user is either a transmission system user or a user whose facility is connected to the 110 kV part of the distribution system managed by the transmission system operator.

"N-1" security criterion – A rule according to which transmission system elements remaining in operation after the outage of an element from a predefined outage list for the control area capable of adapting to the new operating conditions without exceeding operational limits.

Prosumer – An end-consumer who has connected its own renewable energy generation facility to its internal installations, using the generated electricity for its own consumption, while any surplus electricity is delivered to the transmission system, distribution system, or closed distribution system.

Outage list – A list of transmission system elements whose failure is considered when checking compliance with the "N-1" security criterion.

Local acquisition – The collection of metering and data logger measurements at the metering point. Local acquisition may be performed visually (reading meter or data logger registers) or via local communication through the optical or serial port of meters and data loggers.

Local automatic frequency restoration equipment – Equipment located at a power plant or energy park module that transmits a control signal or setpoint for active power to the turbine regulator of a generating unit.

Manual frequency restoration (tertiary regulation) – The activation of the manual frequency restoration reserveto restore the automatic frequency restoration regulation rangeor for redispatch purposes.

Manual frequency restoration reserve (tertiary reserve) – A reserve that can be activated at any time within 15 minutes. This reserve shall be classified as: Positive reserve: increase of generation, import of electricity from other control areas, or reduction of consumption. Negative reserve: reduction of generation, export of electricity to other control areas, or increase of consumption.

Transmission reliability margin – The portion of transmission capacity between bidding zones required to ensure the reliable operation of the transmission system due to uncertainties regarding planned system operation. These uncertainties primarily arise from the operation of automatic frequency restoration, the need for contingency energy exchanges, and deviations of real-time operation from planned schedules.

Point of delivery/receipt – The location at which electricity is delivered or received, where data on delivered or received electricity in the settlement period can be established. This data shall be determined based on electricity measurements in each settlement period (from one or more meters, applying reduction coefficients where necessary). Points of delivery/receipt shall include, in particular the following: the point of delivery of electricity to an end-consumer;the point of delivery of electricity from the transmission system to the distribution system; the point of receipt of electricity from a generator; the point of delivery of electricity from the distribution system to the transmission system; the aggregated point of delivery of electricity to the transmission system operator for compensation of transmission losses; the aggregated point of delivery of electricity to the distribution or closed distribution system operator for coverage of distribution losses; the point of receipt or delivery of electricity at an interconnection line.

Metering data – Measured values of metering quantities recorded in the memory registers of meters. These include data on registered active and reactive energy, active and reactive power diagrams, as well as the date and time of maximum load. Each metering data entry shall be accompanied by a timestamp that temporally identifies the measurement.

Metering point – The electrical location where voltage and current transformers are connected to supply the associated meters for the measurement of exchanged electricity between the transmission system user facility and the transmission network.

Energy park module – A unit or set of units for electricity generation connected to the network either asynchronously or via power electronic devices, with a single point of connection to the transmission system.

400 kV, 220 kV and 110 kV network – Transmission system elements classified in the first, second, and third groups of the *Categorisation*. It comprises the transmission network and those parts of user facilities through which electricity is transmitted.

Network model – A mathematical model of power system elements, their interconnections, and the corresponding set of technical characteristics for various types of energy analyses based on iterative power flow calculations.

Voltage collapse – The occurrence of a rapid voltage drop in the transmission system due to insufficient reactive power.

Voltage reductions – Reduction of operating voltage in distribution networks supplied from the transmission network to 95% of the nominal distribution network voltage.

Undesired deviation – The deviation of the realised sum of cross-border electricity exchanges included in the control area exchange programme from the planned sum of these exchanges.

Voltage (current) asymmetry – A condition in a multi-phase system in which the RMS values of phase-to-phase voltages or currents (fundamental component) or the phase angles between adjacent phase voltages or currents are not all equal. The degree of unbalance is usually expressed as the ratio of inverse and zero components to the direct component of voltage or current.

Net transfer capacity (NTC) – The maximum total scheduled exchange between two neighbouring control areas, or between sub-areas within one control area. It shall be calculated in accordance with interconnection operation rules.

Normal operation of the transmission system – Operation in which all transmission system security conditions and stability conditions are satisfied, and there is no interruption of electricity supply from the transmission system due to causes within the transmission system.

Notice of completion of works – A work document issued following the completion of works on a PSE or in the vicinity of PSEs.

OBIS code – A unique code for all quantities in meter registers according to *IEC 62056-61/2002*.

Calculation constant – A dimensionless number obtained by multiplying the transformation ratios of voltage and current metering transformers at the metering point, used to convert secondary values of energy and power measured at the meter into actual primary values of energy and power.

Maintenance of facilities – All activities aimed at maintaining the continuous technical integrity of power system facilities. Maintenance includes the following: inspections, checks, overhauls, and repairs.

Operational limits – Temporary reduction of active power at the connection point to ensure secure operation of the transmission system.

Frequency control range – The range of regulation reserve for frequency control within which frequency controllers can provide automatic regulation in both directions in response to frequency deviations.

Automatic frequency restoration range – The power setpoint range on the automatic frequency restoration controller within which this regulation can operate automatically within a specified time in both directions from its current active power operating point.

Island operation – Operation of a facility in a part of the transmission system that is disconnected from the rest of the transmission system operating in synchronism with the interconnection.

Electricity exchange plan and programme – The electricity exchange plan represents the sum of exchange blocks between bidding zones in each time interval and exchange direction. The electricity exchange programme represents the scheduled planned electricity exchange in each time interval for a control area, between two control areas, or for control blocks.

Planned voltage quality parameter level – The disturbance level in a given environment adopted as a reference value for limiting emissions from a facility in a system, in order to coordinate these limits with all limits established for equipment and installations to be connected to the system.

Disturbance – An unplanned event (outage of a PSE, generation or consumption unit, electromagnetic interference, etc.) that may cause the transmission system to operate outside normal conditions or lead to further system degradation.

Disturbed operation – A condition of the transmission system that meets at least one of the following criteria:

- the frequency deviation exceeds ±200 mHz;
- voltages at certain nodes are outside the normal operating voltage limits;
- load currents of certain transmission network elements exceed the permitted operating values for those elements;
- the system is unbalanced and the total balancing reserve capacity is insufficient;
- short-circuit currents at certain nodes exceed the maximum permissible values for the equipment installed at the respective node;
- one of the measures provided for in the Defence Plans has been activated (operation of under-frequency protection, over-frequency protection, limitation of electricity supply, voltage reductions);
- there is unavailability of key electronic systems for transmission system control, in accordance with the interconnection operation rules, for a period exceeding 30 minutes.

Disturbed access – An operating condition at the point of connection in which the effective (RMS) value of at least one phase voltage is higher or lower than the prescribed range for normal operating voltages, or where the frequency value is outside the range of 49.5–50.5 Hz (transient phenomena in the transmission system shall not be taken into account). Where a system user has multiple points of connection within a single facility, disturbed access shall not be deemed to exist if the total transmission capacity of the points of connection operating under normal conditions exceeds the approved capacity of that system user.

Generating unit – A synchronous generating unit or a power park module.

Facility – A collective term for a substation, switchyard or connection switchyard.

Potential fault – A random event of internal or external origin occurring on equipment and resulting in reduced operational reliability of the equipment (there is a significant probability of the equipment, as well as associated equipment, being disconnected from operation).

Consumption (net consumption) – Electrical energy or power withdrawn from the transmission network or a part thereof.

Reliability – The ability of transmission system elements to deliver electricity to the relevant transmission system users, within accepted standards and in the required amount, over a specified period of time. Reliability at the transmission level may be measured by the frequency, duration and magnitude (or probability) of adverse effects on electricity consumption, transmission or generation.

Interconnection operation rules – Rules which transmission system operators, as members of *ENTSO-E*, are obliged to implement pursuant to European regulation and the internal acts of that organisation.

Prequalification procedure – A procedure for verifying the compliance of a balancing service provider with the requirements determined by the transmission system operator.

Compliance assessment – A procedure for verifying the technical characteristics of facilities and the operational procedures applied by a system user in its operations. The compliance assessment shall be carried out in accordance with: the issued connection approval, or the designed technical characteristics for existing system user facilities for which no connection approval exists; contracted ancillary services; these Rules; the rules governing the connection of facilities to the transmission system; the interconnection operation rules; and network codes relating to the connection of facilities.

Connection switchyard – A power system facility through which a transmission system user's facility is connected to the transmission network.

Frequency containment regulation (primary control) – represents an automatic, decentralised function of the turbine governor by which the output power of a generating unit is adjusted as a result of frequency deviations within the synchronous area. This regulation should be distributed as evenly as possible among the units in operation within the synchronous area.

Frequency containment controller – A controller that adjusts the output power of a generating unit based on rotational speed, i.e. frequency.

Frequency containment reserve (primary reserve) – represents the part of the frequency containment regulation range from the operating point of a regulating unit up to the maximum or minimum active power level of such regulation. It may be positive (increase of active power generation) or negative (decrease of active power generation).

Reserve capacity – The amount of frequency containment reserves, frequency restoration reserves, or replacement reserves that must be available to the transmission system.

Balancing service providing resource – A resource or a group of resources for the provision of balancing services that have successfully completed the pre-qualification procedure and

participate in the balancing market. A balancing service providing resource may be: an individual generating unit; a group of generating units within a single generation facility; controllable demand represented by a reversible hydropower plant or a pumped-storage power plant operating in pumping mode; controllable demand of an active customer – a customer facility capable of regulating energy withdrawal from or injection into the system at the request of the transmission system operator; an electricity storage facility; and a combination of generating units, controllable demand and electricity storage aggregated by an aggregator.

Transmission system collapse – An operating condition in which a significant part of the load (at least 50%) within a control area is without supply, or where a total loss of voltage occurs throughout the entire control area for a period exceeding 3 minutes, as a result of which the System Restoration Plan is activated.

Available transmission capacity – The difference between the net transmission capacity and the transmission capacity allocated to electricity market participants.

Availability – A condition in which a generating unit, electricity storage facility or power system element is capable of performing its intended function, regardless of whether it is actually in operation.

Switchyard – A facility comprising only one voltage level (400 kV, 220 kV or 110 kV).

Reactive power – The imaginary part of the product of complex voltage and the complex conjugate of current. Reactive power creates and maintains the electromagnetic fields of alternating current equipment. Reactive power must be supplied to devices the operation of which requires an electromagnetic field, such as engines and transformers. Reactive power is generated by generating units, synchronous compensators or electrostatic equipment such as capacitors, and it directly affects voltage levels in the power system. Reactive power is also generated by overhead lines when they are loaded below their natural power.

Voltage control – A coordinated control action encompassing the management of the generation or absorption of reactive energy in generating units, synchronous compensators and power electronic devices, as well as the control of reactive power flows in the 400 kV, 220 kV and 110 kV network by changing transformer tap ratios and by switching network elements of the 400 kV, 220 kV and 110 kV network on or off.

Automatic frequency restoration controller – A single centralised facility of the transmission system operator in each control area that supports the operation of automatic frequency restoration regulation.

Excitation controller – A decentralised, locally installed control device for regulating the excitation current of a synchronous generating unit.

Regional Coordination Centre – A body responsible for coordinating the activities of transmission system operators within a specific European region with the aim of enhancing the security and coordination of transmission system operation.

Redispatching – A measure, including the curtailment of electricity supply, activated by one or more transmission system operators or distribution system operators by modifying the generation pattern, the consumption pattern, or both, in order to change physical power flows in the power system and reduce physical congestion or otherwise ensure system security.

Operator – A person at a power facility responsible for supervising the operation of the facility and executing instructions issued by the competent control centre relating to that facility.

Works supervisor – A person with whom the authorised person of the competent control centre opens a Permit to Work, after which this person verifies that the basic safety measures at the work site have been implemented and carries out further measures for safe working; this person

also notifies the authorised person of the competent control centre of the completion of the works.

Secure operation of the transmission system – Operation of the transmission system in which the following conditions are met:

1. voltages at all nodes are within normal operating limits;
2. frequency deviation does not exceed the following values:
   - ±200 mHz;
   - ±100 mHz for a duration exceeding 5 minutes;
   - ±50 mHz for a duration exceeding 15 minutes;
3. load currents of all transmission network elements do not exceed the permitted operational values for those elements;
4. short-circuit currents at all nodes do not exceed the maximum permitted values for the equipment installed at the respective node;
5. an adequate range of balancing reserves has been provided;
6. the "N-1" security criterion is met, and in the event of its violation, restoration is possible in the shortest possible time;
7. all synchronous generating units operate within their respective capability curves.

Synchronous time – A fictitious time based on the system frequency within the synchronous area, once set in relation to astronomical time. If synchronous time is ahead of astronomical time, this indicates that the system frequency has been, on average, higher than 50 Hz, and vice versa.

Synchronous generating unit – An indivisible set of equipment (turbine, generator and the necessary auxiliary equipment) capable of generating electrical energy such that the frequency of the generated voltage, the rotational speed of the generator and the frequency of the network voltage are in a constant relation and therefore synchronised.

SCADA system – A system for the acquisition and processing of data delivered in real time from transmission system facilities and system user facilities. It is used for operational monitoring, remote control and other aspects of transmission system management.

System protection schemes – Underfrequency protection, overfrequency protection, overload protection, protection against sustained current asymmetry, power swing protection and voltage protection. These protection schemes primarily serve to preserve the security of transmission system operation.

Electricity storage facility – Facilities for deferring the use of electrical energy relative to the moment at which it is generated, i.e. facilities for converting electrical energy into other forms of energy and storing such energy for subsequent reconversion into electrical energy.

Solar power plant – An energy park module consisting of an indivisible set of equipment (solar panels (strings), inverters, block transformers, cable network and power transformers) that uses solar energy as the source for electricity generation (this definition does not apply to so-called concentrating solar power plants that use solar energy to heat water vapour, which is then used to generate electricity – such a generating unit is treated as a turbo-generator unit).

Auxiliary consumption – The portion of a facility's consumption necessary for its reliable operation. This consumption is usually separated from the remaining consumption and supplied via dedicated busbars within the facility. It is also common practice for this consumption to be provided with separate connections to the transmission network or distribution network, as well as independent power supply sources.

Stability – Transmission system stability is the ability of the system, for a given initial operating condition, to regain a state of operating equilibrium after being subjected to a disturbance, with most system variables remaining within limits such that the transmission system remains intact.

Transmission System States – In accordance with the interconnection operation rules, the transmission system may be in one of the following states:

- – normal operation;
- – endangered normal operation;
- – disturbed operation;
- – transmission system blackout;
- – transmission system restoration.

Technical Losses in the Transmission Network – Power losses, i.e. electrical energy losses, resulting from energy dissipation due to heating of transmission network elements caused by active resistance in those elements (Joule losses), hysteresis losses, eddy current losses, leakage current losses in insulation, *Covid-19* losses and dielectric losses.

Technical Control System – A system for the exchange and processing of data transmitted between facilities and control centres, as well as between control centres themselves, for the purpose of enabling the management of the transmission system.

Three-Phase Automatic Reclosing (Three-Phase AR) – An operating cycle of protection and automatic reclosing equipment (AR function) in which multiphase faults (short circuits and earth faults) are cleared by three-phase tripping and, after a dead time, all three phases are reclosed.

Permanent Disconnection of a Power System Element – Disconnection of a power system element due to works carried out on or in the vicinity of that element, whereby the element is not re-energised on a daily basis after completion of works, but only after all works have been completed.

Substation – A power facility containing transformers and enabling the transmission of electrical energy between networks of different voltage levels. A substation comprises several installations of different voltage levels.

Market Model – A mathematical model of the power system composed of technical and economic characteristics of power system elements, used for calculating the economically optimal dispatch of generating modules.

Turbine Governor – A decentralised, locally installed control device for regulating the position of turbine valves in a turbo-generator unit, or the guide vane position in a hydro-generating unit.

Endangered Normal Operation of the Transmission System – A state of the transmission system in which all conditions for secure operation are met, except that:

- the “N-1” security criterion is not met and cannot be restored within the shortest possible time;
- the frequency deviation exceeds ±100 mHz for longer than 5 minutes or ±50 mHz for longer than 15 minutes, but does not exceed ±200 mHz;
- more than 20% of the total required balancing reserve is unavailable for longer than 30 minutes.

Total Transfer Capacity (TTC) – The transfer capacity between bidding zones calculated in accordance with the interconnection operation rules, representing the sum of the net transfer capacity and the transmission reliability margin.

Transmission System Operation – A set of actions providing the functioning of the transmission system under normal operating conditions, or the restoration of the system to normal or secure

operation following a disturbance. Transmission system operation shall be carried out from the control centres of the transmission system operator. Transmission system operation includes frequency and exchange power control, voltage control, monitoring of transmission system operation, disturbance mitigation, data acquisition and other activities.

Controllable Demand – Demand that may, upon instruction of the transmission system operator, be connected, disconnected, or whose power level may be adjusted.

Transmission System Restoration – A state of the transmission system which is in disturbed operation or blackout, in which the transmission system restoration plan has been activated.

Power Factor – The cosine of the phase angle difference between voltage and current.

Flicker – Voltage waveform distortion that causes an unpleasant sensation in the human visual system exposed to lighting equipment supplied by fluctuating voltage.

Frequency-Sensitive Limited Operation Mode – Overfrequency – An operating mode of a generating module that results in a reduction of active power output in response to the system frequency exceeding a specified value.

Frequency-Sensitive Limited Operation Mode – Underfrequency – An operating mode of a generating module that results in an increase of active power output in response to the system frequency falling below a specified value.

Functional Tests – Tests performed by the transmission system operator or the system user under the supervision of the transmission system operator, within system maintenance and development activities, as well as within the process of connecting facilities to the transmission system.

Major Failure (Accident) – A large-scale fault, a significant functional disturbance or substantial damage to a facility, part of a facility or an element of the transmission system. Major failures arise as a result of faults or damage to installed high-voltage and other equipment, natural disasters and accidents, or other unforeseeable and sudden events. Major failures as a rule result in reduced reliability and security of equipment or of the transmission system, which may endanger human safety and health, as well as property, and therefore require urgent elimination of the causes and consequences of the failure.

Harmonic Component (Harmonic / Higher-Order Harmonic) – Any component having a harmonic frequency.

Transmission System User Control Centre – A dispatch centre, electrical control room or other facility staffed by personnel authorised to operate a facility or a part of the power system under the responsibility of the system user. The competence of this centre is established by the law, relevant secondary legislation and applicable contracts.

Centralised Automatic Voltage Control – Voltage control in the transmission system performed from the transmission system operator's control centre by sending reference values to local voltage controllers.

2.2. ABBREVIATIONS

2.2.1. Cyrillic abbreviations used in the Rules shall have the following meaning:

АПУ – Automatic Reclosing (AR)

ЕЕС – Power System (PS)

ЕМС АД – Joint-Stock Company "Elektromreža Srbije", Belgrade (EMS AD)

ПУБ – Balancing Service Provider (BSP)

CPIIC – Designation for standards and related documents issued by the Institute for Standardisation of Serbia (ISS)

2.2.2. Latin abbreviations used in the Rules shall have the following meaning:

CIGRE – Conseil International des Grands Réseaux Électriques (International Council on Large Electric Systems);

ENTSO-E – European Network Transmission System Operators – Electricity;

EIC – ENTSO-E Identification Code;

IEC – International Electrotechnical Commission;

IEEE – Institute of Electrical and Electronics Engineers;

MMS – Market Management System;

OBIS – Object Identification System;

SCADA – Supervisory Control and Data Acquisition;

FCR – Frequency Containment Reserve;

FRR – Frequency Restoration Reserve;

aFRR – Automatic Frequency Restoration Reserve;

mFRR – Manual Frequency Restoration Reserve;

RR – Replacement Reserve;

TYNDP – Ten-Year Network Development Plan;

RegIP – Regional Investment Plan;

ERAA – European Resource Adequacy Assessment;

ENS – Energy not supplied;

AIT – Average Interruption Time.

CHAPTER 3: CONDITIONS FOR SAFE AND RELIABLE OPERATION OF THE TRANSMISSION SYSTEM

3.1. INTRODUCTION

3.1.1. This chapter of the Rules shall regulate the technical conditions for the safe and reliable operation of the transmission system, network transmission capacity, voltage, frequency, the "N-1" security criterion, as well as the types of stability analysed by EMS AD.

3.1.2. The conditions for safe and reliable operation of the transmission system shall be general criteria that EMS AD shall follow when performing all technical functions based on applicable law and other general legal documents.

3.1.3. The conditions for safe and reliable operation of the transmission system shall be applied in the processes of transmission system development planning, connection of facilities to the transmission system, operation planning of the transmission system, and transmission system management. Depending on specific circumstances, the conditions may be defined more precisely for each of the mentioned processes.

3.2. TRANSMISSION CAPACITY

3.2.1. The permissible operating current, i.e., the thermal loading of all lines and transformers in the 400 kV, 220 kV, and 110 kV network, shall be calculated based on:

- technical specifications;
- expected operating conditions;
- techno-economic operating conditions;
- the actual state of the lines or transformers.

3.2.2. The calculation of transmission capacity for elements of the 400 kV, 220 kV, and 110 kV network shall be carried out by EMS AD in accordance with:

- the values of permissible operating currents for the lines;
- the rated power or current values for the transformers.

3.2.3. All auxiliary equipment connected in line, cable, or transformer fields in the 400 kV, 220 kV, and 110 kV network (such as current transformers, disconnectors, circuit breakers, and other equipment) shall be dimensioned so as not to limit the transmission capacity in the planned operational state, determined in accordance with provision 3.2.2.

3.2.4. In the event that it is determined that equipment in line, cable, or transformer fields in the 400 kV, 220 kV, and 110 kV network constitutes a limitation on transmission capacity, i.e., for establishing optimal operational regimes, and such equipment is owned by a system user, it shall be adapted or replaced by the system user in accordance with harmonised development and investment plans, within the timeframe agreed between EMS AD and the system user.

3.2.5. EMS AD shall establish the short-term permissible loadings of individual elements of the transmission network based on the construction characteristics of the elements and anticipated operating conditions, including atmospheric conditions.

3.3. VOLTAGE

3.3.1. The nominal voltage levels in the transmission network of the Republic of Serbia shall be: 400 kV, 220 kV, and 110 kV.

3.3.2. The voltage in normal operating conditions at any point in the 400 kV, 220 kV, and 110 kV network shall be within the following ranges:

- 400 kV network: between 360 kV and 420 kV;
- 220 kV network: between 198 kV and 245 kV;
- 110 kV network: between 99 kV and 123 kV.

3.3.3. Voltage quality parameters shall be divided into planned values and emission values. Planned values of voltage quality parameters shall be defined in Item 5.3.2.3 of these Rules. Emission levels of voltage quality parameters shall be defined in the rules governing the connection of facilities to the transmission system.

3.4. FREQUENCY

3.4.1. The nominal frequency shall be 50 Hz. When the transmission system of the Republic of Serbia operates within the interconnection, the permissible deviations from the nominal frequency in the transmission network shall be those specified in the interconnection operation rules.

3.4.2. In the event that the transmission system of the Republic of Serbia operates in isolation from neighbouring transmission systems, the permissible frequency in the transmission network in quasi-stationary conditions shall be 50 Hz ± 0.5 Hz.

3.5. "N–1" SECURITY CRITERION

3.5.1. The "N–1" security criterion shall verify whether the operating variables (current, voltage) of network elements remain within permissible limits following contingencies included in the outage lists.

3.5.2. The "N–1" security criterion shall be verified on models that, in addition to the EMS AD transmission system, shall include models of other transmission systems, in accordance with interconnection operation rules.

3.5.3. The "N–1" security criterion shall not apply to radially supplied loads or to transmission system elements that radially connect a power plant to a facility in the transmission system.

3.5.4. Outage lists shall include network elements in the EMS AD control area, as well as network elements in neighbouring transmission systems located in the external observability zone. Outage lists shall be divided into: standard outage list, additional outage list, and exceptional outage list. EMS AD shall prepare the outage lists in accordance with interconnection operation rules and based on its own risk assessment.

3.5.5. The standard outage list shall be mandatorily applied when verifying compliance with the "N–1" security criterion, in a manner that shall examine the individual outage of each of the following elements:

- 400 kV, 220 kV, and 110 kV lines, taking into account Item 3.5.3;
- 400/220 kV/kV, 400/110 kV/kV, 220/110 kV/kV transformers;
- phase-shifting transformers;
- a generating module connected to the transmission system or to the 110 kV distribution system under EMS AD control;

- an element through which a group of generating modules is connected to the transmission system or to the 110 kV distribution system under EMS AD control;
- reactive power compensation and voltage control facilities;
- electrical energy storage facilities;
- energy transfer points from the transmission system.

3.5.6. In cases of exceptional operating conditions (adverse weather, landslides, floods, complex maintenance works, etc.), when there is a significant increase in the probability of outages in the transmission system, the additional outage list shall be applied when verifying compliance with the "N–1" security criterion. The additional list shall include simultaneous outages of:

- elements that may fail together in the event of certain network faults (busbars, coupling fields, circuit breakers, measuring transformers, etc.);
- 400 kV, 220 kV, and 110 kV lines constructed on the same towers;
- 400 kV, 220 kV, and 110 kV cables installed in the same trench;
- a facility connected to the transmission system that is technologically coupled with another facility, such that an outage in one facility may lead to an outage in the other;
- elements in the network or facilities connected to the transmission system that simultaneously fail as a result of a special protection scheme;
- multiple generating modules connected to 110 kV and higher voltage levels (including solar and wind plants) due to voltage drops in the network or frequency deviations.

3.5.7. The exceptional outage list shall be used, where applicable, for system users whose prolonged interruption of supply may endanger the environment or human health (chemical industry, radiation, underground exploitation, and similar production processes). The exceptional outage list shall include simultaneous outages of two or more of the following elements:

- 400 kV, 220 kV, and 110 kV lines;
- 400 kV, 220 kV, and 110 kV busbars;
- 400/220 kV/kV, 400/110 kV/kV, 220/110 kV/kV transformers;
- phase-shifting transformers;
- reactive power compensation and voltage control facilities;
- energy transfer points in the facilities of transmission system users.

3.6. SHORT-CIRCUIT CURRENTS

3.6.1. Equipment in EMS AD facilities and in system users' facilities shall comply with the calculated short-circuit current values.

3.6.2. In the event of a short circuit in the transmission system, the stable operation of the transmission system must not be compromised.

3.6.3. EMS AD shall monitor short-circuit current levels and shall take appropriate measures and procedures in a timely manner to limit excessive short-circuit currents, in order to prevent damage or destruction of PS elements and to avoid hazardous situations for people and the environment.

3.7. STABILITY

3.7.1. In order to ensure that the transmission system operates under conditions of satisfied stability, EMS AD shall analyse the following types of stability:

- rotor angle stability when the system is exposed to small and large disturbances over a short time interval;
- frequency stability over short and long time intervals;
- voltage stability when the system is exposed to small and large disturbances over short and long time intervals;

in accordance with *IEEE/CIGRE* definitions and classifications. For short-term intervals, the first 3–5 seconds after the occurrence of a disturbance shall be adopted, or 10–20 seconds for very large systems with dominant inter-area oscillations. For long-term intervals, the first 30 seconds shall be considered for synchronising power oscillations between machines, or 15 minutes after the disturbance for transient processes of automatic frequency restoration control.

CHAPTER 4: TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.1. INTRODUCTION

4.1.1. This Chapter of the Rules shall regulate the planning of transmission system development, including the content of the development plan, the method of planning, the content of the investment plan, and the data and inputs used for transmission system development planning, i.e., medium-term generation adequacy, calculation of automatic and manual frequency restoration reserves, stability assessment, and calculation of minimum and maximum short-circuit currents.

4.1.2. Transmission system development planning shall consider the necessary development of the transmission system and a list of scenarios according to which the system will operate in the forthcoming period, in order to determine measures for enabling normal operation of the transmission system.

4.1.3. Planned construction, reconstruction, and extension of transmission system elements shall provide the conditions for connecting planned generation and distribution capacities, developing the electricity market, and ensuring reliable electricity supply for the forecasted demand.

4.1.4. In addition to technical criteria for transmission system development planning, EMS AD shall take into account the costs of transmission system development.

4.2. TECHNICAL CRITERIA IN TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.2.1. This section shall specify the manner of applying the technical conditions for safe and reliable operation of the transmission system referred to in Chapter 3, which EMS AD shall follow when preparing the Transmission System Development Plan.

4.2.2. The "N–1" security criterion shall be applied in development planning by checking outages from pre-defined outage lists, which include the outages referred to in Section 3.5.5.

4.2.3. For facilities where a prolonged interruption of supply may endanger the environment or human health, the outage list referred to in Section 3.5.7 shall be applied in accordance with the risk assessment legal document of the competent authority.

4.2.4. The "N–1" security criterion shall be considered met in development planning if the identified unacceptable deviations in voltage and operational currents can be mitigated through available operational measures, including redispatching, provided that their application is economically more viable than constructing new transmission system infrastructure.

4.2.5. The "N–1" security criterion shall also be considered met in the 110 kV transmission network in cases where a change in the switching scheme for double-fed end-user facilities is possible, i.e., when one line is in operation and the other is disconnected in the facility but energised from the other supply side.

4.2.6. For distribution system operator facilities fed through a single transmission system line, the fulfilment of the "N–1" security criterion shall be ensured as a priority during transmission system development planning for those facilities having two or more 110/x kV transformers. Compliance with the "N–1" security criterion for radially fed distribution system operator

facilities may be waived if compliance with the “N–1” security criterion can be fully ensured from the medium-voltage distribution network of neighbouring 110/x kV transformer stations.

4.2.7. For new 400 kV lines, it shall be examined, as necessary, whether operational modes exist that allow maintenance works within a defined duration without compromising system access for users and without violating the technical conditions for safe and reliable operation, in accordance with these Rules.

4.2.8. Equipment installed in EMS AD facilities and user facilities shall be designed to satisfy the calculated maximum and minimum short-circuit current values.

4.3. METHOD OF TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.3.1. EMS AD shall prepare and publish the Transmission System Development Plan in accordance with the provisions of the law governing the energy sector. The Transmission System Development Plan shall be prepared for a minimum period of the forthcoming ten years.

4.3.2. The development of the transmission system shall be planned so as to enable the most flexible possible operation of generation facilities under all foreseeable operating conditions of the transmission system.

4.3.3. Transmission system planning shall take into account the requirements for meeting the forecast demand of all transmission system users, including transmission system losses, as well as the forecast generation to be injected into the transmission system.

4.3.4. Transmission system planning shall also meet the requirements for electricity exchange on the electricity market.

4.3.5. The Transmission System Development Plan shall include a forecast of total demand trends and an overview of the development of generation capacities, with particular emphasis on significant changes, the commissioning of new facilities or the decommissioning of existing system user facilities, as well as an overview of the development of electricity storage capacities.

4.3.6. The primary objective of the Transmission System Development Plan shall be to provide existing and potential system users, electricity market participants and competent authorities with:

- – a comprehensive overview of the development of the transmission system over the given time period;
- – an overview of the main changes in the transmission system (a list, locations and basic characteristics of transmission system facilities to be reconstructed, expanded, constructed or decommissioned, including interconnection lines).

4.3.7. EMS AD shall cooperate with the distribution system operator in the preparation of the Transmission System Development Plan. In doing so, in addition to compliance with technical criteria in the transmission system, due consideration shall be given to:

- – the quality of electricity supply to distribution facilities radially connected to the transmission system;
- – the existence or provision of backup supply routes for radially supplied distribution facilities within the distribution system.

4.3.8. EMS AD shall cooperate with European transmission system operators in the preparation of the pan-European Ten-Year Network Development Plan (*TYNDP*), the Regional Investment Plan (*RegIP*), and the European Resource Adequacy Assessment (*ERAA*).

4.3.9. Based on recorded historical data, data submitted by system users, and data on facilities undergoing the process of connection to the transmission system, EMS AD shall prepare generation and demand forecasts for all connection points. In forecasting generation and demand, EMS AD may prepare several different scenarios reflecting different economic development pathways of the Republic of Serbia.

4.3.10. Based on transmission system parameters, EMS AD shall model the transmission system. This model shall take into account actual current limits on all transmission system elements and system protection settings. Network models shall be used for analyses including power flow calculations, voltage profile calculations, verification of the "N–1" security criterion, short-circuit parameter calculations and stability analyses. Market models shall be used for calculations of generation adequacy parameters and the optimal dispatch of power plants, electricity storage capacities and system balance.

4.3.11. Analyses shall be performed on network models which, in addition to the EMS AD transmission system, include models of other transmission systems, for all hours in selected planning reference years, or alternatively on models representing characteristic operating conditions of the winter and summer periods.

4.3.12. Under characteristic summer operating conditions, the utilisation of wind power plants in network models shall amount to 85%, while under winter operating conditions it shall amount to 100% of installed capacity (maximum active power), provided that utilisation shall not exceed the approved capacity. For solar power plants, under characteristic winter maximum, summer maximum and summer minimum operating conditions, utilisation levels in network models shall amount to 70%, 100% and 70% of installed capacity (maximum active power), respectively, provided that utilisation shall not exceed the approved capacity.

4.3.13. In modelling generation, EMS AD shall take into account generation facilities that are already connected, as well as those for which it has issued a decision on the conditions and possibilities for connection to the transmission system at 400 kV, 220 kV and 110 kV. For the preparation of the required adequacy analyses, as well as the market and network calculations referred to in Item 4.3.10, in addition to the aforementioned generation facilities, generation facilities connected to the distribution network, those for which connection conditions have been issued, and the distribution system operator's estimate of installed capacity by generation type to be connected to the distribution network for the target planning years shall also be taken into account in aggregate by generation type. Furthermore, for the purposes of network calculations, EMS AD shall take into account recorded operational limitations of generating units that deviate from specified parameters, as well as their unavailability.

4.3.14. In modelling electricity storage capacities, EMS AD shall take into account capacities already connected to the transmission system, as well as those holding valid Connection Studies and a concluded connection agreement. This shall not apply to simulation models required for adequacy analyses, as simulation models for adequacy analyses shall be prepared exclusively in accordance with the provisions of the law governing the use of renewable energy sources in the Republic of Serbia.

4.3.15. Based on the results of market simulations, EMS AD shall determine the dispatch of generating units and exchanges with neighbouring control areas, which shall be incorporated into the analyses carried out for the purpose of planning the development of the transmission system.

4.3.16. When preparing market simulations, information on planned unavailabilities and outages of generating units shall be taken into account.

4.3.17. When preparing the Transmission System Development Plan, the conclusions of studies on the connection of facilities to the transmission system shall be taken into account.

4.3.18. By 15 January of the year preceding the first year to which the Transmission System Development Plan applies, EMS AD shall notify all system users (including future transmission system users to whom the transmission system operator has issued a decision on the conditions and possibilities of connection to the transmission system) of the data to be submitted to EMS AD for the purpose of preparing the Transmission System Development Plan. Information on the set of standard data required for development planning shall be available on the official website of EMS AD. The data shall be submitted in the format specified by EMS AD. For the preparation of the Transmission System Development Plan, an agreed set of input data shall be obtained.

4.3.19. At the specific request of EMS AD, system users shall submit additional data required for modelling system user facilities and/or parts of the distribution network. In the case of modelling facilities of the distribution system operator, the scope and content of the data shall be mutually agreed between the transmission system operator and the distribution system operator.

4.3.20. System users for whom EMS AD determines such a need, in accordance with the Grid Connection Rules and the Interconnection Operational Rules, shall submit to EMS AD updated and validated simulation models of their facilities, which accurately simulate the behaviour of those facilities under steady-state and dynamic conditions, in the format and within the deadline specified by EMS AD. The validation of simulation models shall be confirmed during functional testing in accordance with Item 7.6 of these Rules.

4.3.21. System users shall submit all requested data to EMS AD no later than 31 March of the year preceding the first year to which the Transmission System Development Plan applies.

4.3.22. EMS AD, in cooperation with the distribution system operator, shall harmonise the Transmission System Development Plan and the Distribution System Development Plan with regard to projects requiring activities by both system operators. EMS AD, in cooperation with the distribution system operator, shall harmonise the Transmission System Development Plan and the Distribution System Development Plan by 15 October of the year preceding the first year to which the Transmission System Development Plan applies.

4.3.23. EMS AD shall submit the Transmission System Development Plan to the Agency by 30 November of the year preceding the first year to which the ten-year plan applies, for the purpose of obtaining approval. Upon obtaining approval, the Transmission System Development Plan shall be published on the official website of EMS AD.

4.4. CONTENT OF THE TRANSMISSION SYSTEM DEVELOPMENT PLAN

4.4.1. INTRODUCTION

4.4.1.1. The Transmission System Development Plan shall in particular include:

- a description of the existing state and the results of analyses of the condition of transmission system facilities and equipment;
- a description of strategic development objectives of the transmission system, as well as the analysed development scenarios of the power system;
- a forecast of electricity consumption and peak demand by year for the analysed reference years;
- a list of projects for the construction, reconstruction or extension of transmission system facilities, by year for the planning period;
- the planned years of commencement and completion of projects or investments;

- a list of connection projects for facilities for which connection requests have been submitted, by year for the planning period;
- a list of projects for the connection of distribution system operator facilities to the transmission system, by year for the planning period, harmonised with the distribution system operator;
- a development plan for the supporting transmission system infrastructure (telecommunications system, technical control system, electricity metering system and others);
- an analysis of generation and transmission system adequacy;
- voltage control analyses;
- stability analyses;
- analyses of maximum and minimum short-circuit currents;
- measures for the reduction or elimination of implemented operational constraints;
- changes compared to the previous Transmission System Development Plan (new projects or investments, activated projects or investments, changes to the planned start and completion years of projects or investments, and other changes).

4.4.2. METHODOLOGY FOR PREPARING THE TRANSMISSION SYSTEM DEVELOPMENT PLAN

4.4.2.1. The first step in preparing the Transmission System Development Plan shall be an analysis of the existing state of the transmission network (age of facilities, reliability of individual transmission network elements, identified congestions and recorded operational events), as well as security analyses for such a state of the transmission network. The second step shall comprise analyses of the transmission network using simulation models of prospective states, developed taking into account the identified development of the transmission system and forecast changes in demand. Based on these analyses, projects for the construction of new transmission system facilities, as well as projects for the reconstruction and increase of the transmission capacity of existing transmission network elements, shall be determined.

4.4.2.2. New interconnection lines shall be planned on the basis of the results of the system needs identification process within the *TYNDP* package, as well as based on system studies and feasibility studies assessing the broader impact of the planned lines. The decision on the construction of these transmission network elements shall be taken on the basis of the study results and subject to the consent of neighbouring transmission system operators.

4.4.2.3. The final Transmission System Development Plan shall include a plan for the construction of new transmission system facilities, the reconstruction of existing transmission system facilities and the construction of new interconnection lines for the analysed years, as well as descriptions of all other necessary investment activities within the transmission system.

4.4.2.4. The Transmission System Development Plan shall also include, as information of particular importance, data on locations of potential congestions in the transmission network (a list of transmission system elements assumed to be exposed to frequent overloads). This information shall represent one of the main criteria for planning the development of the transmission system.

4.4.2.5. Where it is assessed that auxiliary equipment connected to a line or transformer in the transmission network constitutes a limitation to power flows under normal operating conditions (all transmission network elements in operation) or following the outage of a transmission network element from a predefined outage list, EMS AD shall include in the Transmission System Development Plan data on equipment located in system user facilities that limits power

flows through the transmission network. EMS AD shall agree with the system user on measures for the elimination of such limitations.

4.4.3. VOLTAGE CONTROL

4.4.3.1. If potential voltage control issues are identified during operational operation or in the process of analysing voltage conditions, EMS AD shall include in the Transmission System Development Plan development measures falling within the competence of EMS AD, by which the identified issues shall be eliminated or mitigated.

4.4.3.2. Where EMS AD concludes that voltage control issues originate from the influence of neighbouring transmission systems, EMS AD shall endeavour to identify a joint solution together with the operators of those transmission systems.

4.4.4. STABILITY

4.4.4.1. As required, and at least once every four years, EMS AD shall include transmission system stability calculations in the Transmission System Development Plan.

4.4.4.2. If the results of stability analyses indicate potential deficiencies in excitation systems, frequency control regulators, local automatic frequency restoration equipment or protection settings, EMS AD shall undertake the necessary measures within the transmission network (installation, adjustment of protection settings, etc.) or shall agree on the necessary measures with transmission network users (installation of power system stabilisers on generating units, adjustments and installation of frequency and voltage regulators, setting of automatic frequency restoration regulators, etc.).

4.4.5. SHORT-CIRCUIT CURRENTS

4.4.5.1. Maximum and minimum short-circuit currents in the 400 kV, 220 kV and 110 kV network shall be calculated in the course of preparing the Transmission System Development Plan.

4.4.5.2. Where EMS AD assesses that the calculated maximum short-circuit current values (as a result of transmission system development) may endanger existing installed equipment in transmission system facilities and system user facilities, EMS AD shall undertake measures in transmission system facilities and shall agree on measures to be undertaken in system user facilities with the facility users. These measures shall primarily include the preparation of plans for the replacement of endangered equipment, the determination of new switching configurations in the transmission network and system user facilities, and the establishment of real-time monitoring of short-circuit currents.

4.4.5.3. Where EMS AD assesses that the calculated minimum short-circuit current values may result in improper operation or non-selective operation of protection systems, EMS AD shall undertake measures in transmission system facilities and shall agree on measures to be undertaken in system user facilities with the facility users.

4.4.6. ASSESSMENT OF GENERATION AND TRANSMISSION SYSTEM ADEQUACY

4.4.6.1. The adequacy assessment of the generation and transmission system shall be an analysis prepared by EMS AD in accordance with the law governing the energy sector and the law governing the use of renewable energy sources.

4.4.6.2. The objectives of the generation and transmission system adequacy assessment over a ten-year horizon shall be:

- the assessment of the amount of electricity not supplied to transmission system users;
- the assessment of the number of hours during which such supply interruptions occur;
- the identification of potential risks to security of supply arising from a high share of generation from variable renewable energy sources;
- the calculation of available reserves within the territory of the Republic of Serbia and the assessment of the required balancing reserves in accordance with Chapter 6.2 of these Rules.

4.4.6.3. The assessment of the required balancing reserve within the generation and transmission system adequacy analysis shall be prepared taking into account all facilities for which requests for the conclusion of a contract for the preparation of a connection study have been submitted to EMS AD, as well as all facilities for which requests for the issuance of design and connection conditions to the distribution system have been submitted to the distribution system operator.

4.4.6.4. Within the generation and transmission system adequacy analysis, the following shall be presented:

- a list of connection projects for which a contract for the preparation of a facility connection study has been concluded with EMS AD, or for which conditions for the design and connection of power plants have been issued by the distribution system operator or closed distribution system operator, and the connection of which cannot be postponed;
- an overview of historical data on contracted and actually secured balancing reserves for the system over the relevant period;
- the methodology for assessing available reserves and required balancing reserves for the system;
- an assessment of the required balancing reserve for the system within the control area;
- an assessment of the currently available balancing reserve for the system within the control area;
- an assessment of whether, and to what extent, balancing reserves would be insufficient in the event of connection of all power plants currently in the connection process that use variable renewable energy sources;
- indicators of generation system adequacy for meeting demand obtained on the basis of calculations (assessment of the amount of electricity not supplied and the number of hours per year during which electricity supply interruptions occur);
- a conclusion on risks to the secure operation of the power system and on the need to postpone the connection of power plants using variable renewable energy sources, with the exception of the power plants referred to in the first Item of this Paragraph.

4.4.6.5. Where, in the course of assessing the amount of electricity not supplied, a shortage or a significant surplus of electricity generation relative to demand is identified, this information shall be specifically highlighted.

4.4.6.6. A shortage of balancing reserve shall be deemed to exist where the calculated available reserve is lower than the assessed required reserve.

4.4.6.7. In the event of a shortage of balancing reserve resulting in system balancing problems due to a high share of generation from variable renewable energy sources, EMS AD shall implement the measures defined by the law governing the use of renewable energy sources.

4.4.7. OPERATIONAL CONSTRAINTS

4.4.7.1. Based on data on implemented operational constraints, EMS AD shall include in the Transmission System Development Plan a list of measures necessary to reduce or eliminate operational constraints for facilities for which operational constraints defined during the connection procedure have been applied to a significant extent. As a rule, these measures shall include a list of planned infrastructure (construction of new infrastructure or reconstruction or adaptation of existing infrastructure) within the network that affects operational constraints, as well as an assessment of the reduction in the application of operational constraints.

4.5. CONTENT OF THE TRANSMISSION SYSTEM INVESTMENT PLAN

4.5.1. In accordance with the law governing the energy sector, EMS AD shall prepare, on an annual basis, a Transmission System Investment Plan for a period of up to three years, aligned with the investment plans of distribution systems and ongoing connection procedures.

4.5.2. EMS AD shall submit the Transmission System Investment Plan to the Agency by 30 November for approval. EMS AD may initiate an amendment to the Transmission System Investment Plan where this is required due to the importance and implementation dynamics of the project for which the amendment is initiated.

4.5.3. The Transmission System Investment Plan shall, in particular, include:

- the titles of projects and investments together with investment codes;
- a brief description of projects and investments;
- the total estimated budgetary value of each project or investment, together with the corresponding basis on which the estimated value has been determined;
- the investment schedule for each investment for the following three years, by sources of financing;
- realised investments in projects that are under implementation;
- technical data for each project or investment (project category, voltage level, type of facility, etc.);
- a list of all transmission system connection projects, by year for the planning period, agreed with the distribution system operator;
- changes compared to the previous Transmission System Investment Plan (new projects or investments, activated projects or investments, and other changes).

4.5.4. For all connection projects, the conclusion of a connection agreement shall be a necessary condition for the inclusion of the project in the Transmission System Investment Plan.

CHAPTER 5: ACCESS TO THE TRANSMISSION SYSTEM

5.1. INTRODUCTION

5.1.1. This Chapter of the Rules shall further regulate access to the transmission system, payment security instruments and the criteria for determining their amount and period of application, the obligations of system users necessary for the secure and reliable operation of the system, access to transmission capacities between bidding zones, access via facilities, parameters and methods for controlling electricity quality, the content of the Transmission System Access Agreement, as well as the establishment of facts relating to disturbed access.

5.1.2. Access to, or use of, the transmission system shall include:

- access to transmission capacities between bidding zones;
- access via facilities connected to the transmission system.

5.2. ACCESS TO TRANSMISSION CAPACITIES BETWEEN BIDDING ZONES

5.2.1. INTRODUCTION

5.2.1.1. Access to transmission capacities between bidding zones shall be implemented through the following procedures:

- establishment of transmission capacities between bidding zones in cooperation with neighbouring transmission system operators or the regional coordination centre;
- allocation of rights to use transmission capacities between bidding zones to electricity market participants, in the manner governed by the rules on the allocation of rights to use transmission capacities between bidding zones;
- enabling electricity market participants to exercise the allocated right to use transmission capacities between bidding zones, in the manner governed by the rules on the allocation of rights to use transmission capacities between bidding zones.

5.2.1.2. The conditions for refusal of access to transmission capacities between bidding zones shall be governed by the regulations regulating the field of energy, the rules on the allocation of rights to use transmission capacities between bidding zones, and these Rules, in the part referring to the operation of the transmission system.

5.2.2. ESTABLISHMENT OF TRANSMISSION CAPACITY BETWEEN BIDDING ZONES

5.2.2.1. EMS AD shall, in harmonisation with neighbouring transmission system operators, establish the following:

- total transfer capacity;
- net transfer capacity;
- transmission reliability margin;

for each border, in both directions, on an annual, monthly, weekly and daily basis.

5.2.2.2. When determining the net transfer capacity and the transmission reliability margin, account shall be taken of the forecast operating states of transmission systems in the region for the relevant time period, the technical criteria set out in Section 3.2 of these Rules, and the relevant procedures governed by the rules on the operation of the interconnection.

5.2.2.3. EMS AD shall notify balance responsible parties of the required data and data format to be submitted in accordance with the rules on the operation of the interconnection, for the calculation of transmission capacities between bidding zones for month M, no later than the first day of month M-2. Balance responsible parties shall submit the specified data to EMS AD by the fifteenth day of month M-2. For the calculation of transmission capacities between bidding zones on a daily basis, for day D, balance responsible parties shall submit the data on day D-2 by 10:00 a.m., in the format prescribed by EMS AD.

5.2.2.4. EMS AD shall cooperate with the regional coordination centre in the calculation of transmission capacities between bidding zones for the day-ahead and intraday time horizons. The regional coordination centre and EMS AD shall participate in the regional calculation of transmission capacities between bidding zones in accordance with the rules on the operation of the interconnection, while the final validation and harmonisation of these values shall be carried out by EMS AD.

5.2.3. EXERCISE OF THE ALLOCATED RIGHT TO TRANSMISSION CAPACITY BETWEEN BIDDING ZONES

5.2.3.1. Following the allocation of rights to use transmission capacity between bidding zones to electricity market participants, such participants shall be entitled, within the preparation of the Daily Transmission System Operation Plan or the intraday amendment thereof, to report electricity exchanges between bidding zones within the scope of the allocated right.

5.2.3.2. All procedures relating to electricity exchanges between bidding zones shall be governed by these Rules, in the part relating to the operation of the transmission system.

5.3. ACCESS TO THE TRANSMISSION SYSTEM VIA FACILITIES

5.3.1. INTRODUCTION

5.3.1.1. System users connected via facilities connected to the transmission system, or facilities connected to the 110 kV voltage level of the distribution system operated by EMS AD, shall have a continuous right of access to the transmission system under the conditions stipulated in the connection legal document and the regulations governing the field of energy.

5.3.1.2. Refusal of access to the transmission system for system users, via facilities connected to the transmission system or facilities connected to the 110 kV voltage level of the distribution system operated by EMS AD, shall be carried out in the manner determined by the regulations governing the field of energy.

5.3.1.3. In order to regulate the conditions of access to the transmission system for system users via facilities connected to the transmission system or facilities connected to the 110 kV voltage level of the distribution system operated by EMS AD, it shall be necessary to establish:

- measures of quality of supply and delivered electrical energy;
- the method for establishing facts relating to disturbed access.

5.3.1.4. EMS AD shall be obliged to monitor the conditions of access to the transmission system via facilities. Where it is established that the values referred to in Items 5.3.2.2, 5.3.2.3 and 5.3.2.4 have been exceeded, EMS AD shall assess the causes of the disturbed access and shall decide on the measures to be taken in order to align the quality of supply and delivered electrical energy with the prescribed values. Such measures shall include the regulation of operating conditions of transmission system facilities, system user facilities, or the development of the transmission system.

5.3.2. PARAMETERS AND METHOD OF MONITORING THE QUALITY OF ELECTRICAL ENERGY

5.3.2.1. Introduction

5.3.2.1.1. The quality of electricity supply shall be assessed on the basis of the values of electricity supply reliability parameters.

5.3.2.1.2. The quality of delivered electrical energy shall be assessed on the basis of:

- voltage quality;
- frequency quality.

5.3.2.2. Quality of Electricity Supply

5.3.2.2.1. An interruption in the supply of electrical energy from the transmission system may be classified as:

- a planned interruption, which has been agreed in advance and for which system users have been duly notified in a timely manner;
- an unplanned interruption caused by permanent or transient faults.

5.3.2.2.2. The reliability of electricity supply from the transmission system shall be monitored through the following parameters:

- ENS – total undelivered electrical energy due to interruptions during the reporting period, calculated as the sum of undelivered electrical energy (ENSp) for all interruptions (p) of the relevant category (depending on the type and cause of the interruption);

$$ENS = \sum_{p} ENS_p \quad p = 1,\ldots P$$

- AIT – average interruption duration during the reporting period, calculated as the ratio of undelivered electrical energy due to interruptions during the reporting period to the average power, where the average power shall be calculated as the ratio of delivered electrical energy during the reporting period (E_i) to the duration of the reporting period (T_p), expressed in minutes.

$$AIT = \frac{ENS}{\frac{E_i}{T_p}}$$

5.3.2.2.3. EMS AD shall prepare monthly and annual reports on the reliability of electricity supply from the transmission system.

5.3.2.2.4. EMS AD may, without prior notice, temporarily limit or interrupt the supply of electrical energy to system users due to a fault in the transmission system, overloads, or other unforeseen circumstances, for a duration of up to two hours.

5.3.2.2.5. Exceptionally, EMS AD may, without prior notice, limit or interrupt the supply of electrical energy to system users for a duration exceeding two hours in cases of *force majeure* and other unforeseen circumstances which EMS AD could not have foreseen or the consequences of which it cannot eliminate.

5.3.2.2.6. In the event of temporary limitation or interruption of electricity supply for the reasons referred to in Item 5.3.2.2.5, the supply of electrical energy to system users may be temporarily limited or interrupted for a maximum of 12 hours within a 24-hour period.

5.3.2.2.7. At the connection point, interruptions in the supply of electrical energy due to causes within the transmission system may occur for a total duration within one calendar year of:

- 2 hours for connection points of generating modules at voltage levels of 400 kV, 220 kV and 110 kV;
- 4 hours for other connection points at voltage levels of 400 kV, 220 kV and 110 kV;
- 6 hours for other connection points at voltage levels below 110 kV.

The duration of planned outages in the transmission system shall not be included in the aforementioned time limits.

5.3.2.2.8. In the case of planned maintenance works on power facilities or planned works related to the expansion and development of the transmission system, EMS AD may apply a measure of limitation or interruption of electricity supply for a duration of up to 72 hours within one calendar year, provided that the limitation or interruption of supply has been announced at least 15 days in advance.

5.3.2.3. Voltage Quality

5.3.2.3.1. Voltage quality at the connection point of a system user's facility shall be determined by measurement and monitoring of the RMS value, as well as voltage waveform quality parameters, including higher harmonics, voltage unbalance and flicker, in accordance with the technical standards governing voltage quality (*SRPS IEC*).

5.3.2.3.2. The level of RMS values of individual higher voltage harmonics shall not exceed, in 95% of measurements of 10-minute intervals, the planning values defined in Table 5.1.

Table 5.1.

Odd harmonics not divisible by 3		Odd harmonics divisible by 3		Even harmonics	
Order of higher harmonic h	Higher voltage harmonic [%]	Order of higher harmonic h	Higher voltage harmonic [%]	Order of higher harmonic h	Higher voltage harmonic [%]
5	2	3	2	2	1.4
7	2	9	1	4	0.8
11	1.5	15	0.3	6	0.4
13	1.5	21	0.2	8	0.4
$17 \leq h \leq 49$	$1.2 \cdot 17/h$	$21 < h \leq 45$	0.2	$10 \leq h \leq 50$	$0.19 \cdot 10/h + 0.16$

5.3.2.3.3. Under normal operating conditions, the planning level of total voltage harmonic distortion (THD) in the 110 kV, 220 kV and 400 kV transmission network shall not exceed 3%.

5.3.2.3.4. The planning level of voltage unbalance shall not exceed, in 95% of measurements of 10-minute intervals, the values defined in Table 5.2.

Table 5.2.

Voltage level	Planning level of unbalance (%)
110 kV, 220 kV	1.4
400 kV	0.8

5.3.2.3.5. The planning level of short-term flicker severity shall not exceed $P_{st} = 0.8$. The specified value of short-term flicker severity shall apply to 95% of measurements of 10-minute intervals under normal operating conditions.

5.3.2.3.6. The planning level of long-term flicker severity must not exceed P_{lt} = 0.6. The specified value of long-term flicker severity shall apply to 95% of measurements of 120-minute intervals under normal operating conditions.

5.3.2.4. Frequency Quality

5.3.2.4.1. Frequency quality at the connection point shall be defined in Section 3.4 of these Rules.

5.3.2.5. Measurement of the Quality of Delivered Electrical Energy

5.3.2.5.1. Measurement of the quality of delivered electrical energy at connection points shall be carried out in accordance with the technical standards governing voltage quality (*SRPS IEC*).

5.3.2.5.2. Measurement of the quality of delivered electrical energy shall be performed continuously under normal operating conditions for a minimum period of seven days at any time during the year. The measurement period shall include the period during which the maximum voltage waveform distortion is expected.

5.3.2.5.3. Where, during the measurement of the quality of delivered electrical energy, it is established that a transmission system user's facility exceeds the maximum emission values defined in the document on connection to the transmission system, EMS AD and the transmission system user shall define the measures to be taken in order to eliminate the causes of non-compliance, as well as the deadline for the implementation of such measures. The transmission system user shall be obliged to inform EMS AD, within the agreed time limit, of the results of the implementation of the said measures.

5.3.2.5.4. Where, during the measurement of the quality of delivered electrical energy, it is established that the prescribed parameters of the quality of delivered electrical energy are not met at the connection point of a distribution system operator's facility, as a result of the impact on power quality caused by a user whose facility is connected to the part of the distribution system at the 110 kV voltage level managed by EMS AD, the procedure referred to in Item 5.3.2.5.3 shall be applied to the user whose facility is connected to the part of the distribution system at the 110 kV voltage level managed by EMS AD, in coordination with the distribution system operator.

5.3.3. ESTABLISHMENT OF FACTS RELATED TO DISTURBED ACCESS

5.3.3.1. The moment of commencement of disturbed access, in cases of deviation of the RMS voltage value, shall be deemed to be the moment when the deviation is recorded in the software tools forming part of the technical control system. Exceptionally, in cases of deviation of the RMS voltage value where the system user's facility is not integrated into the transmission system technical control system, the commencement of disturbed access shall be deemed to be the moment when the system user's control centre notifies (verbally or in writing) the relevant EMS AD control centre.

5.3.3.2. The data taken into account when determining the facts related to disturbed access of system users via facilities shall include:

- data from facilities (data on protection operations, chronological event recorders, data from specialised devices for measuring electrical quantities in the network, operating logs, audio recordings of communications with control centres, and other data);
- data from control centres (*SCADA* system data, operating logs, audio recordings of communications with control centres and facilities, and other data).

5.3.3.3. For the purpose of credibility, the data referred to in Item 5.3.3.2 shall be ranked in the following order:

1. data exchanged in real time between EMS AD and the system user whose facility experienced disturbed access, as well as other data to which EMS AD and the system user have equal access;
2. data from the *SCADA* system, facilities and control centres of EMS AD not covered by Item 1;
3. data from the technical control systems of facilities and control centres of the system user whose facility experienced disturbed access not covered by Item 1;
4. data from facilities and control centres of other system users.

5.3.3.4. EMS AD, or the system user, may request, by official written notice, within 15 working days following the disturbed access, the submission of the data referred to in Item 5.3.3.2 from the other party. The deadline for submission of the said data shall be 15 days.

5.4. AGREEMENT ON ACCESS TO THE TRANSMISSION SYSTEM

5.4.1. The system user shall be obliged to regulate access to the transmission system for each delivery point.

5.4.2. Access to the transmission system shall be regulated by an Agreement on Access to the Transmission System concluded between EMS AD and the system user.

5.4.3. EMS AD shall conclude an Agreement on Access to the Transmission System with the supplier for the delivery points of system users for which a full supply agreement has been concluded.

5.4.4. The Agreement on Access to the Transmission System shall, in particular, regulate:

- the billing period;
- the type, amount, characteristics and validity period of the payment security instrument;
- the method of electricity measurement;
- meter reading and data acquisition from electricity meters;
- the calculation of the transmission system access service;
- the invoicing procedure and the method of payment for the transmission system access service;
- the duration of the agreement;
- conditions for amendment and supplementation of the agreement;
- the method of termination and expiry of the agreement;
- the method of dispute resolution.

Where the system user is not obliged to pay for the transmission system access service, the Agreement on Access to the Transmission System shall not contain provisions relating to the type, amount, characteristics and validity period of the payment security instrument, nor provisions relating to the invoicing procedure and the method of payment for the transmission system access service.

5.4.5. The Model Agreement on Access to the Transmission System shall be published by EMS AD on its website.

5.4.6. EMS AD may unilaterally terminate the Agreement on Access to the Transmission System in the event that:

- the system user fails to submit an appropriate payment security instrument, or fails to extend the validity of the payment security instrument in accordance with the deadlines specified in Section 5.5;

- the system user fails to fulfil its obligations in accordance with the regulations governing the energy sector.

5.4.7. The Agreement on Access to the Transmission System shall be deemed terminated on the day following the day on which EMS AD delivers to the system user, or to its supplier in the case referred to in Item 5.4.3, the notice of unilateral termination of the Agreement.

5.5. PAYMENT SECURITY INSTRUMENT FOR ACCESS TO THE TRANSMISSION SYSTEM

5.5.1. The obligations assumed by concluding the Agreement on Access to the Transmission System shall be secured by the system user – the obligor for payment of the transmission system access service (hereinafter: the obligor) by means of a financial payment security instrument, except in cases where EMS AD and the energy entity are owned by the same legal person.

5.5.2. The provision of the agreed financial payment security instrument shall constitute an essential element of the Agreement on Access to the Transmission System and a suspensive condition for the legal effect of the Agreement.

5.5.3. The amount of the financial payment security instrument shall be equal to the determined value of risk.

5.5.4. EMS AD shall determine the value of risk and the period for which the value of risk is calculated. As a rule, the period for which the value of risk is calculated shall be one year. The value of risk shall be equal to:

- twice the value of the product of the invoiced quantities from the highest monthly invoice for access to the transmission system in the preceding 12 months (for delivery points for which the obligor is a final customer or an energy entity engaged in market-based energy activities) and the currently applicable price for access to the transmission system, except where EMS AD and the energy entity are owned by the same legal person;
- 10% of twice the value of the product of the invoiced quantities from the highest monthly invoice for access to the transmission system in the preceding 12 months (for delivery points for which the obligor is an energy entity engaged exclusively in regulated energy activities) and the currently applicable price for access to the transmission system, except where EMS AD and the energy entity are owned by the same legal person.

5.5.5. The value of risk for a new delivery point shall be determined on the basis of twice the value of the product of the planned energy quantities under the transmission system access tariffs, calculated on the basis of the planned average monthly quantities of active and reactive energy and the approved capacity, as submitted by the obligor upon the conclusion of the Agreement on Access to the Transmission System, and the currently applicable price for access to the transmission system.

5.5.6. EMS AD shall determine the value of risk for the subsequent period for each obligor no later than 30 days prior to the expiry of the existing period for which the value of risk was calculated.

5.5.7. EMS AD shall recalculate the value of risk for the obligor every three months as twice the value of the product of the invoiced quantities from the highest monthly invoice for access to the transmission system in the preceding 12 months and the currently applicable price for access to the transmission system.

5.5.8. Where the change in the value of risk exceeds 10%, EMS AD shall determine a new value of risk and require the obligor to submit a new payment security instrument equal to the newly determined value of risk. Exceptionally, in the event of a reduction in the value of risk, the obligor may retain the right not to apply the reduced value of risk.

5.5.9. The collection of receivables, in the event of the obligor's failure to fulfil payment obligations for access to the transmission system, shall be secured by one of the following payment security instruments:

- a bank guarantee issued by a bank domiciled in the Republic of Serbia and licenced by the National Bank of Serbia;
- a dedicated (guarantee) deposit on a revolving basis with a bank domiciled in the Republic of Serbia and licenced by the National Bank of Serbia.

5.5.10. The obligor shall opt for one of the aforementioned payment security instruments, which shall be stipulated in the Agreement on Access to the Transmission System concluded between EMS AD and the obligor.

5.5.11. The obligor shall have the right to change the type of payment security instrument. The existing payment security instrument shall remain valid until the newly selected payment security instrument becomes effective. The obligor shall submit a new or extend the existing payment security instrument 65 days prior to the expiry date of the existing payment security instrument.

5.5.12. In the event of a change in the value of risk referred to in Items 5.5.4, 5.5.5, 5.5.6, 5.5.7 and 5.5.8, the obligor shall provide an appropriate payment security instrument within 30 days from the conclusion of the Agreement on Access to the Transmission System or the annex thereto, which shall be signed no later than 30 days from the date of receipt of the request for submission of a new payment security instrument. Exceptionally, in the event of a reduction in the value of risk, the system user may retain the right to maintain the payment security instrument at the existing value of risk.

5.5.13. The bank guarantee shall be irrevocable, unconditional, payable on first demand, without the right to objection and without protest, with a validity period extending 60 days beyond the expiry date of the determined period for which the value of risk was calculated.

5.5.14. EMS AD, in the event of the obligor's failure to fulfil payment obligations for access to the transmission system, shall proceed with the collection of the outstanding receivable increased by the calculated statutory default interest, by calling the bank guarantee, of which it shall notify the obligor at least two working days prior to initiating the calling of the guarantee.

5.5.15. The validity period of the bank guarantee shall extend 60 days beyond the date of termination of the Agreement on Access to the Transmission System or the date of calculation of a new value of risk.

5.5.16. A dedicated (guarantee) deposit on a revolving basis shall constitute a payment security instrument whereby the obligor deposits funds into a dedicated account with a bank domiciled in the Republic of Serbia and licenced by the National Bank of Serbia. The obligor shall deposit the funds into the dedicated account in favour of EMS AD in the amount of the determined value of risk, for a period not shorter than the determined period for which the value of risk was calculated, extended by 60 days.

5.5.17. The obligor, the bank and EMS AD shall conclude an agreement on the opening and administration of the dedicated deposit.

5.5.18. In the event of the obligor's failure to fulfil payment obligations for access to the transmission system, EMS AD shall, upon first written demand addressed to the bank, collect the amount of the outstanding receivable increased by the calculated statutory default interest,

of which it shall notify the obligor in writing in advance. The obligor shall replenish the dedicated (guarantee) deposit on a revolving basis within the deadline specified in the agreement on the opening and administration of the dedicated deposit.

5.5.19. The validity period of the dedicated (guarantee) deposit on a revolving basis shall extend 60 days beyond the date of termination of the Agreement on Access to the Transmission System.

CHAPTER 6: OPERATION OF THE TRANSMISSION SYSTEM

6.1. INTRODUCTION

6.1.1. This Chapter of the Rules shall regulate in more detail the conditions for the safe and reliable operation of the transmission system, the types and scope of ancillary services, the obligations of system users and EMS AD in functional testing for the purposes of providing ancillary services, the planning of transmission system operation, operational procedures for the control of the transmission system under normal operating conditions and in the event of disturbances , the measures that shall be taken in the event of disturbances in the operation of the power system, as well as procedures related to maintenance works and the expansion of the power system, procedures for the submission and confirmation of schedules of balance responsible parties, the operation of protection systems, the operation of the communication system, and reporting on the operation of the transmission system.

6.1.2. By procuring ancillary services in the prescribed volume, EMS AD shall provide the mechanisms necessary for planning the operation and managing the transmission system.

6.1.3. The Transmission System Defence Plans and the Transmission System Restoration Plan shall constitute the basis for actions to be taken in the event of disturbances and during the restoration of the system following a partial or complete collapse of the transmission system.

6.1.4. Through transmission system operation planning, the requirements for electricity generation, consumption and exchange, as well as for the execution of works on transmission system elements, shall be harmonised in compliance with the normal operation criteria.

6.1.5. The transmission system shall be managed in real time so that, to the greatest extent possible, its operation is carried out in accordance with the planned operating regime, while allowing electricity market participants the possibility to modify their initial generation, consumption and electricity exchange schedules.

6.1.6. Transmission system management shall also imply particular attention to ensuring that the transmission system operates under normal conditions, and, in the event of a disturbance, the undertaking of all available measures that shall lead to the fastest possible elimination of the disturbance and the restoration of the system to normal operating conditions.

6.1.7. By reporting on the operation of the transmission system, based on the analyses performed, the necessary feedback information shall be provided which, *inter alia*, may have an impact on:

- transmission system development planning;
- technical conditions for the connection of facilities;
- the manner of transmission system operation planning;
- management of the 400 kV, 220 kV and 110 kV network;
- the concept and content of technical standards and procedures.

6.2. TYPES AND SCOPE OF ANCILLARY SERVICES

6.2.1. INTRODUCTION

6.2.1.1. EMS AD shall procure ancillary services comprising balancing ancillary services and non-frequency ancillary services, excluding congestion management.

6.2.1.2. Balancing ancillary services shall include:

- frequency containment reserve;
- automatic frequency restoration reserve;
- manual frequency restoration reserve.

6.2.1.3. Non-frequency ancillary services shall include services for:

- steady-state voltage control;
- black-start capability;
- island operation capability of a part of the system.

6.2.1.4. EMS AD shall procure the ancillary services referred to in Items 6.2.1.2 and 6.2.1.3 from ancillary service providers which, in accordance with the law governing the energy sector, may include an electricity producer, an electricity storage operator, an active customer, or an aggregator. An ancillary service provider may provide ancillary services from facilities connected to the transmission system or the distribution system.

6.2.1.5. EMS AD shall conclude an ancillary services provision agreement with the ancillary service provider in accordance with the rules governing the operation of the electricity market. Only balancing service resources that have fulfilled the requirements of prequalification or qualification testing, in accordance with Section 6.2.7, may be covered by this agreement.

6.2.1.6. An ancillary service provider that has concluded an agreement with EMS AD pursuant to Item 6.2.1.5 shall be obliged to maintain in proper working condition all equipment necessary for the provision of ancillary services and to notify EMS AD without delay of any change in its capacities affecting the availability or quality of the provision of such services.

6.2.1.7. An ancillary service provider may, within a single time period, contract the provision of frequency containment reserve, automatic frequency restoration reserve, or manual frequency restoration reserve on a single balancing service resource with only one system operator.

6.2.1.8. A user of the transmission or distribution system that is obliged to offer an ancillary service to EMS AD shall provide such service in accordance with the law governing the energy sector, these Rules, the rules governing the connection of facilities to the transmission system, the rules governing the operation of the distribution system, and the legal document approving the connection to the system. A system user that is not obliged to offer a specific ancillary service may offer it to EMS AD after fulfilling the requirements of prequalification or qualification testing of its facility.

6.2.1.9. The minimum technical requirements to be met by a balancing service resource, or a group of such resources, in the case of frequency containment reserve shall be as follows:

- compliance with the requirements laid down in the rules governing the connection of facilities to the transmission system relating to frequency control, connection of the facility to the EMS AD technical control system, and real-time data exchange;
- dead-band of ±10 mHz;
- the service provision time for the declared reserve shall be unlimited, except for resources with limited energy reservoirs in the event of long-lasting frequency deviation in the same direction, in which case the minimum duration shall be 30 minutes;
- the minimum reserve capacity shall be 1 MW.

6.2.1.10. The minimum technical requirements to be met by a balancing service resource, or a group of such resources, in the case of automatic frequency restoration reserve shall be as follows:

- compliance with the requirements laid down in the rules governing the connection of facilities to the transmission system relating to connection to the EMS AD technical control system and real-time data exchange;
- the activation delay of a unit or group in automatic frequency restoration control shall not exceed 30 seconds;
- the activation time of the full reserve capacity shall be less than 5 minutes;
- the minimum service provision time for the declared reserve shall be 4 hours;
- the minimum reserve capacity shall be 5 MW;
- the minimum ramp rate shall be 3 MW/min.

6.2.1.11. The minimum technical requirements to be met by a balancing service resource, or a group of such resources, in the case of manual frequency restoration reserve shall be as follows:

- compliance with the requirements laid down in the rules governing the connection of facilities to the transmission system relating to connection to the EMS AD technical control system and real-time data exchange;
- the activation time of the full reserve capacity shall be less than 15 minutes;
- the minimum service provision time for the declared reserve shall be 4 hours;
- the minimum reserve capacity shall be 5 MW;
- the minimum ramp rate shall be 1 MW/min.

6.2.1.12. The minimum technical requirements for the provision of non-frequency ancillary services shall be deemed to be the requirements laid down in the rules governing the connection of facilities to the transmission system referring to:

- non-frequency ancillary services;
- connection of the facility to the EMS AD technical control system.

6.2.1.13. Balancing ancillary services may also be provided by distribution system users under the abovementioned conditions, subject to the additional requirement that they are able, directly or indirectly (for example, through an aggregator or the distribution system operator), to exchange the necessary signals with the EMS AD technical control system.

6.2.1.14. EMS AD may contract with other transmission system operators mechanisms for the exchange of balancing energy and the joint use of balancing reserves, in accordance with the interconnection operation rules.

6.2.2. ESTABLISHMENT OF THE TOTAL AMOUNT OF FREQUENCY CONTAINMENT RESERVE IN THE CONTROL AREA

6.2.2.1. The competent *ENTSO-E* body shall, based on the interconnection operation rules, prescribe the annual amount of mandatory frequency containment reserve for the EMS AD control area.

6.2.3. ESTABLISHMENT OF THE TOTAL AMOUNT OF AUTOMATIC AND MANUAL FREQUENCY RESTORATION RESERVES IN THE CONTROL AREA

6.2.3.1. The minimum required aggregate amount of automatic and manual frequency restoration reserves shall be calculated in accordance with the interconnection operation rules.

6.2.3.2. The minimum required aggregate amount of automatic and manual frequency restoration reserves shall be calculated using two different methods:

- by the probabilistic method;
- by the method of the maximum possible imbalance.

6.2.3.3. Under the probabilistic method, for a preceding period of at least 12 months, 15-minute average values of control deviations shall be calculated in accordance with the following equation:

$$ACE_{ol} = ACE + aFRR_{act} + mFRR_{act} + RR_{act} + IN + aFRR_{xb} + mFRR_{xb} + RR_{xb}$$

where:

- ACE_{ol} shall mean the average value of the control deviation over a fifteen-minute time interval;
- ACE shall mean the average value of the area control error over a fifteen-minute time interval;
- $aFRR_{act}$ shall mean the average value of activated power in automatic frequency restoration control over a fifteen-minute time interval;
- $mFRR_{act}$ shall mean the average value of activated power in manual frequency restoration control over a fifteen-minute time interval;
- RR_{act} shall mean the average value of activated power from replacement reserve within the control area over a fifteen-minute time interval;
- IN shall mean the average value of power exchanged via imbalance netting platforms over a fifteen-minute time interval;
- $aFRR_{xb}$ shall mean the average value of activated power in automatic frequency restoration control exchanged with other control areas over a fifteen-minute time interval;
- $mFRR_{xb}$ shall mean the average value of activated power in manual frequency restoration control exchanged with other control areas over a fifteen-minute time interval;
- RR_{xb} shall mean the average value of activated power from replacement reserve exchanged with another control block over a fifteen-minute time interval.

The minimum required aggregate amount of automatic and manual frequency restoration reserve shall be determined by excluding 1% of the highest values from the set of ACE_{ol} values and adopting the highest remaining value. The minimum required aggregate amount of automatic and manual frequency restoration reserve shall cover 99% of control deviations over the year. Using this method, the required upward reserve shall first be calculated and, subsequently, using the same method, the required downward reserve shall be calculated for the control block to which the EMS AD control area belongs.

6.2.3.4. The method of the maximum possible imbalance shall consist of determining the maximum expected instantaneous imbalance that may occur within the control block to which the EMS AD control area belongs. The maximum possible positive imbalance and the maximum possible negative imbalance shall be determined separately.

6.2.3.5. Where the minimum required aggregate automatic and manual frequency restoration reserve has been calculated using both methods referred to in Item 6.2.3.2, the higher of the obtained values shall be adopted. The calculation shall be performed separately for upward regulation and separately for downward regulation.

6.2.3.6. The obtained minimum required aggregate amount of automatic and manual frequency restoration reserve shall be shared with other transmission system operators in accordance with the interconnection operation rules, where the EMS AD control area operates within a control block comprising more than one control area.

6.2.3.7. Where the maximum possible disturbance exceeds the value obtained by the probabilistic method, the reserve corresponding to the difference between these two values may be secured through reserve sharing agreements with neighbouring control blocks.

6.2.3.8. The minimum automatic frequency restoration reserve in the EMS AD control area shall be calculated in accordance with the following empirical formula:

$$R = \sqrt{10L_{max} + 150^2} - 150$$

where L_{max} shall mean the maximum demand (MW) over the past 12 months.

6.2.3.9. The required manual frequency restoration reserve in the EMS AD control area shall be calculated separately in two directions, upward and downward:

- the upward manual frequency restoration reserve shall be equal to the difference between the total automatic and manual upward frequency restoration reserve in the EMS AD control area determined in accordance with Items 6.2.3.3 to 6.2.3.7 and one half of the automatic frequency restoration reserve determined in accordance with Item 6.2.3.8;
- the downward manual frequency restoration reserve shall be equal to the difference between the total automatic and manual downward frequency restoration reserve in the EMS AD control area determined in accordance with Items 6.2.3.3 to 6.2.3.7 and one half of the automatic frequency restoration reserve determined in accordance with Item 6.2.3.8.

6.2.3.10. The values of automatic and manual frequency restoration reserves for year Y+1 in the EMS AD control area shall be defined by EMS AD no later than October of year Y, in cooperation with other transmission system operators within the control block.

6.2.3.11. The defined values of automatic and manual frequency restoration reserves in the EMS AD control area shall be submitted by EMS AD to the Agency by 30 November of year Y for year Y+1. These values shall be published on the EMS AD website.

6.2.4. ESTABLISHMENT OF BALANCING RESERVE AMOUNTS OF SERVICE PROVIDERS

6.2.4.1. Frequency containment reserve in the EMS AD control area shall be provided from generating modules or electricity storage facilities, whereas automatic and manual frequency restoration reserves shall be provided from generating modules, controllable demand, and electricity storage facilities.

6.2.4.2. A frequency containment reserve service provider shall offer this reserve to EMS AD on a single or a group of balancing resources corresponding to a frequency deviation of □200 mHz.

6.2.4.3. An automatic frequency restoration reserve service provider shall offer to EMS AD the reserve (the automatic frequency restoration control range comprising both positive and negative reserve) up to an amount corresponding to the lower of the following two values:

1) 5 min · ΔP/Δt, where ΔP/Δt shall mean the rate of change of active power generation of the unit expressed in MW/min;
2) $P_{max} - P_{min}$, where P_{max} and P_{min} shall mean, respectively, the maximum and minimum active power that the unit may deliver to the network while operating in automatic frequency restoration control.

6.2.4.4. The positive manual frequency restoration reserve of a generating unit or an electricity storage facility shall be calculated as the lower of the following two values:

1) 15 min · ΔP/Δt, where ΔP/Δt is the rate of increase of active power generation of the generating unit or electricity storage facility, expressed in MW/min (rate of change of power);

2) P_{max} – P, where P is the scheduled active power and P_{max} is the maximum active power that the generating unit or electricity storage facility can deliver to the network during operation in manual frequency restoration control.

6.2.4.5. The negative manual frequency restoration reserve of a generating unit or an electricity storage facility shall be calculated as the lower of the following two values:

1)15 min · ΔP/Δt, where ΔP/Δt is the absolute value of the rate of decrease of generated active power of the generating unit or electricity storage facility, expressed in MW/min;

2) P – P_{min}, where P is the scheduled active power and P_{min} is the minimum active power that the generating unit or electricity storage facility can deliver to the network during operation in manual frequency restoration control.

6.2.4.6. The positive manual frequency restoration reserve of controllable demand shall be calculated as the lower of the following two values:

1) 15 min · ΔP/Δt, where ΔP/Δt is the absolute value of the rate of decrease of the active power of controllable demand, expressed in MW/min;
2) P – P_{min}, where P is the scheduled active power and P_{min} is the minimum active power that the controllable demand can draw from the network during operation in manual frequency restoration control.

6.2.4.7. The negative manual frequency restoration reserve of controllable demand shall be calculated as the lower of the following two values:

1) 15 min · ΔP/Δt, where ΔP/Δt is the absolute value of the rate of increase of the active power of controllable demand, expressed in MW/min;
2) P_{max} – P, where P is the scheduled active power and P_{max} is the maximum active power that the controllable demand can draw from the network.

6.2.5. VOLTAGE CONTROL

6.2.5.1. The ancillary service of voltage control shall be provided by all system users whose facilities are connected to the transmission system or to distribution system facilities at the voltage level of 110 kV operated by EMS AD, in accordance with the technical connection requirements defined in the connection approval. In the event that no connection approval exists, the provision set out in Item 10.1.4 shall apply until such approval is issued.

6.2.5.2. For the purposes of voltage control in the transmission system, the ancillary service provider may increase the absorption or delivery of reactive power from its facility beyond the values specified in the legal document regulating the connection of that facility to the transmission system, provided that technical capabilities exist for the required period and in accordance with the needs of the transmission system and the concluded operational agreements.

6.2.5.3. Voltage control may be performed individually at the level of a synchronous generating unit, collectively at the power plant level, or collectively at the level of an energy park module or an electricity storage facility.

6.2.5.4. Voltage control may be carried out centrally and automatically from the control centre of EMS AD. The voltage control service provider must have the technical capability to participate in such voltage control, in accordance with the rules governing the connection of facilities to the transmission system.

6.2.6. BLACK START AND ISLAND OPERATION

6.2.6.1. The ancillary service of black start and island operation shall be provided by all generating units connected to the transmission system that possess appropriate technical characteristics.

6.2.6.2. A generating unit providing the black start and island operation service shall be ready to provide this service at all times, in accordance with the characteristics defined by the rules governing the connection of facilities to the transmission system or in accordance with the ancillary services agreement.

6.2.7. PREQUALIFICATION PROCEDURE FOR BALANCING ANCILLARY SERVICES

6.2.7.1. The prequalification procedure for potential providers of balancing ancillary services shall include the verification of compliance of the facilities of potential ancillary service providers with the technical requirements set out in Items 6.2.1.9 to 6.2.1.11.

6.2.7.2. EMS AD shall define a protocol for the prequalification procedure for the provision of a specific balancing ancillary service, which shall be published on the website of EMS AD. This protocol shall contain the procedure and technical conditions for the prequalification process.

6.2.7.3. As a rule, the prequalification procedure shall comprise: submission and processing of the application for prequalification testing, alignment of the protocol, establlishment of the schedule for prequalification testing, performance of prequalification testing, and preparation of a prequalification test report.

6.2.7.4. EMS AD shall agree with the potential ancillary service provider on the plan, method and timing of prequalification testing for an individual resource for the provision of a specific ancillary service.

6.2.7.5. If, during the prequalification procedure for the provision of a specific ancillary service, the facility of the ancillary service provider does not meet the prescribed conditions, such a facility shall not be permitted to provide the relevant ancillary service until the deficiencies are remedied and verified through a repeated prequalification procedure. EMS AD and the ancillary service provider shall define the measures to be undertaken in order to eliminate the causes of the deficiencies, as well as the deadline for the implementation of such measures.

6.2.7.6. For facilities being connected to the transmission system and equipped to provide a specific ancillary service under these Rules, the initial prequalification procedure may be carried out jointly with the verification of compliance with the technical connection requirements, in accordance with the rules governing the connection of facilities to the transmission system.

6.2.7.7. Where a facility of an ancillary service provider is connected to the distribution system, EMS AD shall conduct the prequalification procedure in cooperation with the distribution system operator.

6.2.7.8. Re-verification of the technical capabilities established in the previous prequalification procedure shall be carried out periodically in accordance with the rules on the operation of the interconnection, at least once every five years, or earlier if technical requirements regarding availability change, equipment at the facility is modified, or the ancillary service provider fails to meet the defined technical requirements or the quality criteria of the provided ancillary service.

6.2.7.9. Failure to meet the quality of the provided ancillary service refers to the level of delivery of the contracted ancillary service, whereby the availability of the contracted balancing reserve shall not be less than 95% on a monthly basis, and the amount of the provided reserve

shall not, on average, be less than 80%. Furthermore, two activations with a response of less than 80% of the instructed order within the settlement period shall be deemed as failure to meet the quality of the provided ancillary service. If the ancillary service provider fails to meet the specified criteria, a repeated prequalification procedure shall be conducted, and until its completion, the provider shall not be permitted to provide the ancillary service for which it had been prequalified.

6.2.7.10. EMS AD shall monitor the compliance of the ancillary service provider with the defined technical requirements and quality criteria of the provided ancillary service. If, in the cycle between two prequalification procedures, EMS AD determines that there have been no deviations from the defined requirements, the prequalification procedure for a specific ancillary service may be recognised, for a facility or a group of facilities, without conducting prequalification testing, based on compliance monitoring.

6.2.8. QUALIFICATION FOR NON-FREQUENCY ANCILLARY SERVICES

6.2.8.1. The qualification of providers of non-frequency ancillary services shall include the verification of compliance of facilities during the process of connection to the transmission system or during the provision of such services.

6.2.8.2. EMS AD shall verify the compliance of facilities at the time of their connection to the system, in accordance with the rules and procedures governing the connection of facilities to the transmission system.

6.2.8.3. EMS AD shall verify the compliance of facilities with the technical connection requirements during the provision of non-frequency ancillary services and through functional testing, in accordance with Section 7.6.

6.2.8.4. During the compliance verification process at connection for the ancillary service of voltage control, EMS AD shall verify the operating diagram (P/Q) of the facility and the reactive power control range. During the operation of the facility, EMS AD shall monitor whether the facility responds to voltage control commands in accordance with the defined reactive power control range.

6.2.8.5. For the ancillary service of black start capability, EMS AD shall test the compliance of the facility with the relevant technical characteristics at the time of connection and periodically during operation, at least once every three years.

6.2.8.6. For the non-frequency ancillary service of island operation capability, EMS AD shall carry out simulation-based verification during the process of connecting the facility to the transmission system. EMS AD may also verify this ancillary service under real operating conditions, provided that the consent of all involved transmission system users to the island operation testing programme is obtained in due time.

6.2.9. METHOD FOR DETERMINING PRICES OF NON-FREQUENCY ANCILLARY SERVICES

6.2.9.1. Prices of non-frequency ancillary services may be market-based or regulated, in accordance with the law governing energy.

6.2.9.2. Where market-based pricing is applied, EMS AD shall apply the following procedure:

- where necessary, define parts of the control area (zones) in which the procurement of non-frequency ancillary services is carried out on a market basis;
- where necessary, further specify the technical characteristics of the non-frequency ancillary service;

- determine the total capacity of the non-frequency ancillary service for each zone in which procurement of the non-frequency ancillary service is carried out on a market basis;
- determine the time period for which the procurement of non-frequency ancillary services is conducted;
- determine the criteria for ranking bids for non-frequency ancillary services.

6.2.9.3. If EMS AD assesses that the provision of non-frequency ancillary services on a market basis is not economically justified, that there is no sufficient number of relevant potential service providers, or that the secure and reliable operation of a part of the power system may be jeopardised, it shall notify the Agency thereof.

6.2.9.4. In the case referred to in Item 6.2.9.3 of these Rules, where the Agency issues an opinion that the procurement of non-frequency ancillary services for the following year cannot be carried out on a market basis, the prices of non-frequency ancillary services shall be determined on the basis of the methodology for determining prices of non-frequency ancillary services adopted by the Agency, in accordance with the law governing energy.

6.2.9.5. EMS AD may procure a non-frequency ancillary service on a market basis in one zone, in accordance with Item 6.2.9.2, and in another zone on the basis of a regulated price, in accordance with Item 6.2.9.4.

6.3. DEFENCE PLANS AND TRANSMISSION SYSTEM RESTORATION PLAN

6.3.1. INTRODUCTION

6.3.1.1. The Transmission System Defence Plans and the Transmission System Restoration Plan shall aim to establish technical and organisational prerequisites in order to preserve the secure operation of the system in the event of major disturbances, and to enable the normalisation of the situation.

6.3.1.2. In the worst-case scenario, in the event of a partial or total collapse of the transmission system, the Transmission System Restoration Plan shall prescribe procedures that shall lead to the fastest possible restoration of the transmission system.

6.3.1.3. The Transmission System Defence Plans shall include:
- the Underfrequency Protection Plan;
- the Overfrequency Protection Plan;
- electricity supply limitation plans;
- the Transmission System Voltage Collapse Protection Plan.

6.3.1.4. EMS AD shall prepare the Transmission System Defence Plans and the Transmission System Restoration Plan in cooperation with transmission system users.

6.3.1.5. System users shall provide all data necessary for the preparation of these plans within the deadlines and in the formats specified by EMS AD.

6.3.1.6. All participants involved in the implementation of the Transmission System Defence Plans and the Transmission System Restoration Plan shall be familiarised with the content of the plans and shall train their personnel for their effective implementation.

6.3.1.7. The Transmission System Defence Plans and the Transmission System Restoration Plan shall be harmonised with the requirements of the interconnection operation rules.

6.3.2. UNDERFREQUENCY PROTECTION PLAN

6.3.2.1. EMS AD shall prepare the Underfrequency Protection Plan, which shall serve as

system protection of the transmission system in the event of reduced frequency, with the aim of protecting the transmission system from large-scale collapse and the disconnection of a significant portion of generating modules and electricity storage facilities.

6.3.2.2. The Underfrequency Protection Plan shall include:

- a plan for automatic load shedding in the event of low frequency;
- settings for frequency-limited sensitive operating mode – underfrequency – of generating modules and electricity storage facilities;
- parameters for changing the operating mode of battery storage systems in the event of low frequency.

6.3.2.3. The Underfrequency Protection Plan shall be implemented in several stages, when the frequency reaches the following values:

1. – 49.8 Hz – alerting of operational personnel in control centres and major transmission system facilities and facilities of system users;
2. – 49.0 Hz – activation of the first stage of underfrequency protection (disconnection of 5% of load);
3. – 48.8 Hz – activation of the second stage of underfrequency protection (disconnection of an additional 5% of load);
4. – 48.6 Hz – activation of the third stage of underfrequency protection (disconnection of an additional 10% of load);
5. – 48.4 Hz – activation of the fourth stage of underfrequency protection (disconnection of an additional 10% of load);
6. – 48.2 Hz – activation of the fifth stage of underfrequency protection (disconnection of an additional 10% of load);
7. – 48.0 Hz – activation of the sixth stage of underfrequency protection (disconnection of an additional 10% of load);
8. – 47.5 Hz – disconnection of generating modules shall be permitted in order to protect them against permanent damage.

6.3.2.4. When the frequency drops within the range 49.2 Hz – 49.8 Hz, additional stages of underfrequency protection shall be provided by disconnecting motor-generators in reversible hydropower plants when operating in pumping mode, or pumps in pumping installations, from the network. For this purpose, EMS AD shall prescribe the underfrequency protection settings for such facilities.

6.3.2.5. When the frequency drops within the range 49.2 Hz – 49.8 Hz, battery storage facilities connected to the transmission or distribution system that, at the moment of frequency decline, are operating in electricity storage mode shall automatically switch to electricity generation mode and supply power to the system. If a battery storage facility operating in storage mode is unable to switch to electricity generation mode, the battery storage facility shall be automatically disconnected from the network. In accordance with the Underfrequency Protection Plan, EMS AD shall define the frequency value at which the operating mode is automatically changed or the battery storage facility is disconnected from the network, the set active power value, and the set time for this operation.

6.3.2.6. In the Underfrequency Protection Plan, for generating modules with an active frequency-limited sensitive operating mode – underfrequency – in accordance with the rules governing connection to the transmission system, EMS AD shall define the following values, which may be adjusted over time:

- the frequency value at which the frequency-limited sensitive operating mode is automatically activated;
- the droop value of the frequency-limited sensitive operating mode.

The frequency-limited sensitive operating mode – underfrequency shall have priority over other operating modes.

6.3.2.7. The Distribution System Operator shall participate in the Underfrequency Protection Plan, including the prescribed load amounts within the distribution system.

6.3.2.8. EMS AD shall include in the Underfrequency Protection Plan final customers whose facilities are connected to the transmission system or to the part of the distribution system at the 110 kV voltage level operated by EMS AD, in accordance with the possibilities for separating supply feeders of the load that may be included in this plan.

6.3.2.9. The Underfrequency Protection Plan shall be subject to regular annual revisions. For this purpose, the following procedure shall be implemented:

- by 31 May, EMS AD shall submit to system users a request for the provision of data (a request shall be submitted to the distribution system operator to define the list of distribution feeders to be included in the Underfrequency Protection Plan);
- by 30 June, system users shall submit the requested data to EMS AD;
- by 31 July, EMS AD shall verify whether the data submitted by system users comply with the criteria set out in Item 6.3.2.1;
- by 31 August, EMS AD shall harmonise the data and remedy deficiencies with system users who have not met the criteria for the preparation of the Underfrequency Protection Plan;
- by 5 October, EMS AD shall submit the Underfrequency Protection Plan to system users, in the part relating to those users.

6.3.2.10. The revised Underfrequency Protection Plan shall enter into force by 15 October.

6.3.2.11. The accuracy of frequency measurement for load shedding and the maximum response time of underfrequency protection shall be governed by the rules on the operation of the interconnection.

6.3.2.12. The maintenance of frequency protection devices in proper working condition shall be the responsibility of the owners or the holders of usage rights to such devices.

6.3.2.13. EMS AD and system users shall, within their respective competences, ensure that underfrequency protection operates in accordance with the Underfrequency Protection Plan.

6.3.3. OVERFREQUENCY PROTECTION PLAN

6.3.3.1. EMS AD shall prepare the Overfrequency Protection Plan in accordance with the requirements set out in the rules on the operation of the interconnection, with the aim of protecting the transmission system against the tripping of a large share of generating modules and electricity storage facilities and against large-scale system separation in the event of high frequency occurrence.

6.3.3.2. The Overfrequency Protection Plan shall contain:

- settings for the frequency-limited sensitive operational mode – overfrequency of generating modules;
- a plan for the automatic disconnection of generation in the event of high frequency (where necessary);
- parameters for changing the operating mode of battery storage systems in the event of high frequency.

6.3.3.3. In the Overfrequency Protection Plan, for generating modules with an active frequency-limited sensitive operating mode – overfrequency – in accordance with the rules governing connection to the transmission system, EMS AD shall define the following values, which may be adjusted over time:

- the frequency value at which the frequency-limited sensitive operating mode is automatically activated;
- the droop value of the frequency-limited sensitive operating mode.

The frequency-limited sensitive operating mode – overfrequency shall have priority over other operating modes.

6.3.3.4. Where, within the control area, the frequency-limited sensitive operational mode – overfrequency is not available to the extent prescribed by the rules on the operation of the interconnection, EMS AD shall additionally include in the Overfrequency Protection Plan a plan for the automatic disconnection of generation in the event of high frequency.

6.3.3.5. Automatic disconnection of generation in the event of high frequency shall be implemented linearly in stages. EMS AD shall determine the frequency settings for staged disconnection of generating modules in accordance with the following general principles:

- priority shall be given to generating modules that recorded a significant number of operating hours in the previous calendar year and for which no prolonged outage beyond normal expectations is planned for the following year;
- generating modules within a single power plant shall be disconnected in several overfrequency protection stages, as agreed between EMS AD and the respective transmission system user;
- turbogenerator generating modules shall not be included in lower overfrequency protection stages, unless otherwise agreed between EMS AD and the respective transmission system user.

6.3.3.6. Battery energy storage systems connected to the transmission or distribution system which, at the moment of high frequency occurrence, are operating in electricity generation mode shall automatically switch to electricity storage (charging) mode from the system. Battery energy storage systems shall change their operating mode within the specified time defined in the Overfrequency Protection Plan. Where a battery energy storage system operating in generation mode is unable to switch to electricity storage mode within the specified time, such an electricity storage system shall be automatically disconnected from the grid. EMS AD shall define the frequency value at which the operating mode is automatically changed or the battery energy storage system is disconnected from the grid, as well as the specified time for this operation.

6.3.3.7. The Overfrequency Protection Plan shall be subject to regular annual revisions. For this purpose, the following procedure shall be implemented:

- by 31 July, EMS AD shall prepare a draft Overfrequency Protection Plan and submit it to the transmission system users participating in the plan for review;
- by 31 August, EMS AD and the participating transmission system users shall harmonise the Overfrequency Protection Plan;
- by 5 October, EMS AD shall submit the Overfrequency Protection Plan to the participating transmission system users, in the part relating to those users.

6.3.3.8. The revised Overfrequency Protection Plan shall enter into force by 15 October.

6.3.3.9. EMS AD and transmission system users shall, within their respective competences, ensure that overfrequency protection operates in accordance with the Overfrequency Protection Plan.

6.3.4. PLANS FOR LIMITATION OF ELECTRICITY SUPPLY

6.3.4.1. Plans for limitation of electricity supply shall determine:

- the measures to be undertaken prior to limiting the electricity supply;
- the manner in which such limitations are implemented.

6.3.4.2. Plans for limitation of electricity supply shall comprise:

- Immediate limitations of electricity supply;
- Emergency electricity supply limitation plan;
- Long-term electricity supply limitation plan.

6.3.4.3. EMS AD shall prepare the Plans for Limitation of Electricity Supply in consultation with system users.

6.3.4.4. Immediate limitations of electricity supply are measures applied in the event of high-intensity disturbances where, due to the required response speed, it is not possible to apply emergency or long-term electricity supply limitation plans. Selectivity shall not be taken into account when applying such limitations. Immediate limitations of electricity supply shall be implemented by remote disconnection of the following elements in EMS AD facilities: – 400/110 kV/kV, 220/110 kV/kV and 110/x kV/kV transformers (x < 110), as well as lines supplying system users' facilities. When applying immediate limitations of electricity supply, efforts shall be made to switch, as soon as possible after system stabilisation, to the application of emergency or long-term electricity supply limitation plans.

6.3.4.5. The Emergency Electricity Supply Limitation Plan is intended for disturbances of lower intensity, where limitation of electricity supply may be postponed. This plan has partial selectivity and includes a list and sequence for the disconnection of 110/x kV/kV transformers (x<110), i.e. high-voltage and medium-voltage feeders equipped with remote control and monitoring capabilities. Following stabilisation of the power system when applying the Emergency Electricity Supply Limitation Plan, the Long-Term Electricity Supply Limitation Plan shall be applied within the shortest possible time.

6.3.4.6. The Distribution System Operator shall include at least 35% of consumption within the distribution system in the Emergency Electricity Supply Limitation Plan.

6.3.4.7. The Long-Term Electricity Supply Limitation Plan shall be prepared for disturbances lasting longer than two hours. Accordingly, this plan shall take into account the selectivity of disconnection of final customers connected at medium voltage levels (35 kV, 20 kV, 10 kV).

6.3.4.8. The Long-Term Electricity Supply Limitation Plan shall also serve as the basis for limiting electricity supply in the event of a general shortage of electricity, where energy saving and rational consumption measures adopted pursuant to energy legislation fail to ensure the security of transmission system operation.

6.3.4.9. The Distribution System Operator shall include at least 60% of total distribution system consumption in the Long-Term Electricity Supply Limitation Plan, taking into account the priority level of final customers, the risk of general danger, and the potential for causing large-scale material damage.

6.3.4.10. Plans for Limitation of Electricity Supply shall include closed distribution system operators and other transmission system users (final customers) connected to the transmission system or to the part of the distribution system at the 110 kV voltage level operated by EMS AD, taking into account the priority level of final customers, the risk of general danger, and the potential for causing large-scale material damage, in accordance with applicable primary and secondary legislation.

6.3.4.11. System users referred to in Item 6.3.4.10 shall, at the request of EMS AD, propose the amount of their consumption that may be included, in a specified manner, in the Long-Term Electricity Supply Limitation Plan.

6.3.4.12. The duration of electricity supply limitations shall be time-limited in accordance with regulations governing the energy sector.

6.3.4.13. Plans for Limitation of Electricity Supply shall be subject to regular annual revisions. For this purpose, the following procedure shall be implemented:

- by 31 May, EMS AD shall submit to system users a request for the submission of a list of feeders, parts of consumption, or power amounts by groups and sub-groups to be disconnected at electricity delivery points, proposed by the user for inclusion in the plans (depending on the type of plan);
- by 30 June, system users shall submit the requested data to EMS AD;
- by 31 July, EMS AD shall verify whether the submitted data comply with the criteria set out in Items 6.3.4.6 and 6.3.4.9;
- by 31 August, EMS AD shall harmonise the data and remedy deficiencies with system users who have not met the criteria for the preparation of the Plans for Limitation of Electricity Supply;
- by 5 October, EMS AD shall submit the Plans for Limitation of Electricity Supply to system users, in the part relating to those users.

6.3.4.14. The revised Plans for Limitation of Electricity Supply shall enter into force by 15 October.

6.3.5. TRANSMISSION SYSTEM VOLTAGE COLLAPSE PROTECTION PLAN

6.3.5.1. The Transmission System Voltage Collapse Protection Plan is based on the application of voltage reductions implemented on transformers of system users and EMS AD transformers with voltage ratios of 220/x kV/kV and 110/x kV/kV (x □ 110), and shall contain:

- a list of transformers on which voltage reductions are applied;
- the method of blocking the operation of the on-load tap changer / automatic voltage regulation (locally or remotely);
- the competent control centre of the system user to which the order for voltage reduction is issued;
- where necessary, notes on consumption characteristics, in particular regarding voltage-sensitive consumers.

6.3.5.2. Voltage reductions shall not be applied on 110/x kV transformers supplying significant system users, including underground mining facilities and plants engaged in the production and processing of explosive materials.

6.3.5.3. Voltage reductions shall be implemented by blocking automatic voltage regulation and setting a specific position on the automatic voltage regulator, i.e. by reducing the operating voltage on the transformers referred to in Item 6.3.5.1, either remotely from the competent control centre or locally at the facility where the relevant transformers are located.

6.3.5.4. After blocking the automatic voltage regulation, the competent control centre or the operator at the facility shall maintain the voltage at 95% of the nominal network voltage on the low-voltage side of the transformers referred to in Item 6.3.5.1.

6.3.5.5. An order for the implementation of voltage reductions shall be executed within 15 minutes from its issuance by the competent EMS AD control centre for facilities under remote control or staffed facilities, or within a maximum of 30 minutes for other facilities.

6.3.5.6. During the period of voltage reductions, EMS AD and system users shall take all measures to ensure that reactive power absorption from the transmission system remains within the limits prescribed by the rules governing connection to the transmission system.

6.3.5.7. The Transmission System Voltage Collapse Protection Plan shall be subject to regular annual revisions. For this purpose, the following procedure shall be implemented:

- by 31 July, EMS AD shall submit to system users a request for the submission of a list of transformers referred to in Item 6.3.5.1 that meet the necessary technical

requirements for the application of voltage reductions, possible methods of controlling the automatic voltage regulator, and notes on consumption characteristics;
- by 31 August, system users shall submit the requested data to EMS AD;
- by 5 October, EMS AD shall submit the Transmission System Voltage Collapse Protection Plan to system users participating in the plan.

6.3.5.8. The revised Transmission System Voltage Collapse Protection Plan shall enter into force by 15 October.

6.3.6. TRANSMISSION SYSTEM RESTORATION PLAN

6.3.6.1. The Transmission System Restoration Plan shall include several basic scenarios, so as to be applicable in the event of any system collapse.

6.3.6.2. In preparing this plan, EMS AD shall ensure that a sufficient number of generating units within its control area provide black start capability and island operation services, in order to enable rapid restoration of the transmission system in all foreseeable situations.

6.3.6.3. All system users shall be included in the Transmission System Restoration Plan in accordance with the technical characteristics of their facilities.

6.3.6.4. Parts of the Transmission System Restoration Plan shall be harmonised with neighbouring transmission system operators, in order to ensure their compatibility, based on the rules governing interconnection operation.

6.3.6.5. EMS AD shall verify the Transmission System Restoration Plan by means of computer simulation.

6.3.6.6. EMS AD shall carry out a regular review of the Transmission System Restoration Plan at least once every two years.

6.3.6.7. In the event of amendments to the Transmission System Restoration Plan, EMS AD shall submit the plan to all system users, in the part relating to their facilities, at least 15 days prior to the plan's entry into force.

6.4. PLANNING OF TRANSMISSION SYSTEM OPERATION

6.4.1. INTRODUCTION

6.4.1.1. Planning of transmission system operation shall comprise planning activities relating to a time horizon ranging from one year ahead down to intraday planning.

6.4.1.2. The most significant activities carried out within the framework of transmission system operation planning shall include:
- preparation of the Annual Transmission System Operation Plan;
- preparation of the Daily Transmission System Operating Schedule;
- preparation of outage plans in the 400 kV, 220 kV and 110 kV network;
- establishment of transmission capacities between bidding zones (in accordance with Section 5.2.1. of these Rules);
- assessment of short-term generation adequacy.

6.4.2. ANNUAL TRANSMISSION SYSTEM OPERATION PLAN

6.4.2.1. The Annual Transmission System Operation Plan shall be prepared for the purpose of analysing whether the basic preconditions for normal operation of the transmission system have been met, including an assessment of whether difficulties in the provision of ancillary services may be expected or whether problems may arise in achieving the electricity energy balance of

the Republic of Serbia.

6.4.2.2. EMS AD shall prepare the Annual Transmission System Operation Plan by 30 November of the year preceding the year for which the Plan is prepared.

6.4.2.3. The Annual Transmission System Operation Plan shall include, on a monthly basis:

- a plan of electricity consumption, generation and exchange;
- a plan for providing balancing reserves;
- the planned quantity of electricity for covering technical losses in the transmission network;
- the planned value of net transfer capacity;
- capacities of transmission system elements, the state of the transmission system and a list of facilities planned to be commissioned;
- electricity consumption, generation and exchange during the hour of maximum monthly load;
- a plan of unavailability of generating units and electricity storage facilities for each day, including reasons for unavailability;
- transmission system operation plans for specific days.

6.4.2.4. EMS AD shall plan the amounts of technical losses in the transmission network using historical data on calculated technical losses in the previous period, taking into account the planned consumption, generation and electricity exchange with other control areas, as well as expected changes in transmission system topology in the forthcoming period.

6.4.2.5. The operation plan for a specific day referred to in Item 6.4.2.3 shall include data in accordance with the rules on interconnection operation. EMS AD shall notify balance responsible parties of the dates considered as specificc days no later than 30 days prior to the deadline for submission of data referring to specific days.

6.4.2.6. Balance responsible parties shall submit to EMS AD the annual operation plan of their balance groups by 20 September of the year preceding the year for which the Annual Transmission System Operation Plan is prepared. Such plans shall include, on a monthly basis:

- a plan of total active electricity consumption;
- a plan of active electricity consumption of individual facilities, upon a specific request of EMS AD (e.g. consumption of a distribution area located in another control area);
- a plan of active electricity consumption for pumping purposes;
- a plan of active electricity generation (at the transmission interface) of facilities connected to the transmission system;
- a plan of total generation of facilities connected to the distribution system, by type of primary energy source;
- a plan of active electricity exchange both within the EMS AD control area and at its borders (procurement and delivery shall be presented separately);
- plans of available capacities for the provision of contracted ancillary services;
- a plan of unavailability of generating units and electricity storage facilities connected to the transmission system for each day, including reasons for unavailability;
- all plans referred to in lines 1–7 of this item for the hour of maximum load on a specific day.

EMS AD shall determine the format for submission of the abovementioned plans and shall publish it on its website no later than 30 days prior to the submission deadline.

6.4.2.7. If, based on analyses for specific days, EMS AD assesses that conditions for normal operation have not been met, i.e. that conditions for the implementation of frequency

containment, automatic and manual frequency restoration control, and voltage control have not been met, EMS AD shall contact the balance responsible parties and request appropriate amendments to the submitted operation plans.

6.4.2.8. EMS AD shall conduct regular verification or correction of the Annual Transmission System Operation Plan by the 25th day of month M-1, whereby such verification or correction shall apply to all months from month M until the end of the year.

6.4.2.9. In the event of unforeseen changes to the operation plan of a balance group that could not have been identified prior to the deadline referred to in Item 6.4.2.8, the balance responsible party shall immediately notify EMS AD thereof. Such correction shall not apply to the part of the plan that has already been implemented.

6.4.3. DAILY OPERATING SCHEDULES

6.4.3.1. Introduction

6.4.3.1.1. Daily Operating Schedules shall include:

- daily operating schedules of balance groups;
- daily operating schedule of the transmission system.

6.4.3.1.2. For the submission, processing and acceptance of daily operating schedules of balance groups, the *MMS* system shall be used. EMS AD shall ensure redundancy of this system.

6.4.3.1.3. EMS AD shall publish instructions for the use of the *MMS* system on its website.

6.4.3.1.4. EMS AD and balance responsible parties shall ensure redundancy of the communication channel for the purposes of submission and preparation of daily operating schedules.

6.4.3.1.5. EMS AD shall be obliged to define data formats and procedures for the submission, processing and acceptance of daily operating schedules of balance groups under normal circumstances, as well as under conditions of unavailability of the EMS AD information system, and to publish them on its website.

6.4.3.1.6. EMS AD shall be obliged to notify balance responsible parties, as soon as possible, of the unavailability of the information system or of the restoration of its normal operation.

6.4.3.1.7. Each balance responsible party shall designate at least one person who shall be continuously available for communication with EMS AD regarding the preparation of daily operating schedules of balance groups.

6.4.3.1.8. The submission of the daily operating schedule of a balance group shall be performed by its balance responsible party.

6.4.3.1.9. The basic time interval within daily operating schedules shall be defined by the rules governing the operation of the electricity market.

6.4.3.1.10. With the introduction of common rules for the allocation of transmission capacities between bidding zones with neighbouring transmission system operators, different rules relating to the submission of electricity exchange schedules between bidding zones may be adopted for certain borders.
These rules shall be regulated by an agreement with the neighbouring transmission system operator and shall be available on the EMS AD website.

6.4.3.1.11. The submission, processing and acceptance of daily operating schedules of balance groups, as well as intraday amendments to daily operating schedules of balance groups during the suspension and restart of market activities, shall be carried out in accordance with the rules governing the suspension and restart of market activities.

6.4.3.2. Procedure for the Submission and Confirmation of the Daily Operating Schedule of a Balance Group

6.4.3.2.1. A balance responsible party shall submit to EMS AD the daily operating schedule of its balance group that includes resources for the provision of balancing services on day D-2 no later than 10:00 a.m. for day D, for the purpose of calculations in accordance with the interconnection operation rules, in the format and manner required by EMS AD.

6.4.3.2.2. A balance responsible party shall submit to EMS AD the daily operating schedule of its balance group for day D, in accordance with the instructions for the use of the *MMS* system, no later than 2:30 p.m. on day D-1 for day D.

6.4.3.2.3. A balance responsible party may amend the submitted daily operating schedule for day D of its balance group that does not include resources for the provision of balancing services, for lines 1–3 of Item 6.4.3.2.5, or of a balance group that includes resources for the provision of balancing services, for lines 1–7 and 9–10 of Item 6.4.3.2.6, no later than 3:30 p.m. on day D-1 for day D.

6.4.3.2.4. A balance responsible party may amend the submitted electricity exchange blocks between bidding zones referred to in Items 6.4.3.2.5 and 6.4.3.2.6 in the daily operating schedule of its balance group for day D until 2:30 p.m. on day D-1, and from 2:30 to 3:30 p.m. on day D-1 only in the event of a mismatch with the partner's submission from another bidding zone received by EMS AD from the neighbouring transmission system operator.

6.4.3.2.5. The daily operating schedule of a balance group that does not include resources for the provision of balancing services, depending on the role assigned to the balance responsible party for the purpose of submitting daily operating schedules, as regulated by the balancing responsibility agreement, shall contain the following:

- a plan of total electricity generation in each time interval, which shall not exceed the sum of the approved capacities of individual generating units and electricity storage facilities belonging to the balance group;
- a plan of total electricity consumption in each time interval, which shall not exceed the sum of the approved capacities of controllable demand, consumption of the facilities of that balance group and electricity storage facilities, or a consumption plan for specific facilities at the specific request of EMS AD (e.g. consumption of a distribution area in another control area);
- a plan of electricity exchange blocks in each time interval.

6.4.3.2.6. The daily operating schedule of a balance group that includes resources for the provision of balancing services, depending on the role assigned to the balance responsible party for the purpose of submitting daily operating schedules, as regulated by the balancing responsibility agreement, shall contain the following:

- a plan of electricity generation individually for each resource for the provision of balancing services, which in each time interval shall not exceed the approved capacity for that resource;
- the maximum and minimum power values for each resource for the provision of balancing services;
- the maximum power value for each generating unit, electricity storage facility and pumped-storage unit in each time interval, which shall not exceed the approved capacity;
- availability of generating units, electricity storage facilities and pumped-storage units in each time interval;
- a plan of controllable electricity consumption individually for each resource for the provision of balancing services in each time interval, which shall not exceed

the approved capacity for that resource;

- a plan of electricity consumption of the facilities of the balance group that includes resources for the provision of balancing services, or a consumption plan for specific facilities at the specific request of EMS AD (e.g. consumption of a distribution area in another control area) in each time interval;
- a plan of electricity exchange blocks in each time interval;
- resources that will provide the contracted frequency containment reserve and their activation order for the purpose of frequency containment regulation;
- resources for the provision of balancing services that will provide the contracted automatic frequency restoration reserve, the operation of which is planned within the regulation range, their activation order, the number of generating units per balancing service resource and the amount of provided automatic frequency restoration reserve, or, for balancing service resources for which not all generating units in operation participate in reserve provision, the additionally defined amount of reserve for that resource;
- resources for the provision of balancing services that will provide the contracted manual frequency restoration reserve and their activation order for the purpose of manual frequency restoration regulation in accordance with the market operation rules.

6.4.3.2.7. The daily operating schedule of a balance group that does not contain resources for the provision of balancing services must be balanced in every time interval, i.e., the algebraic sum of the power values of all lines referred to in Item 6.4.3.2.5 must be equal to zero in each time interval.

6.4.3.2.8. The daily operating schedule of a balance group that contains resources for the provision of balancing services must be balanced in every time interval, i.e., the algebraic sum of the power values of lines one, five, six, and seven referred to in Item 6.4.3.2.6 must be equal to zero in each time interval.

6.4.3.2.9. If a balance group's daily operating schedule, except for the daily operating schedule of the organised electricity market, becomes unbalanced as a result of the activities referred to in Items 6.4.3.2.13 to 6.4.3.2.16 and Item 6.4.3.2.19, EMS AD shall allow the balance group to rebalance its daily operating schedule through the intraday process in accordance with section 6.4.3.3. A balance responsible party whose daily operating schedule remains unbalanced even after the intraday process shall be responsible as defined in the balance responsibility agreement.

6.4.3.2.10. For each time interval and direction of exchange within a bidding zone, only one electricity exchange block between two balance groups shall be submitted.

6.4.3.2.11. Electricity exchanges between participants in the electricity market within the same balance group shall not be submitted to EMS AD.

6.4.3.2.12. Electricity exchange blocks between two balance groups shall be submitted by the balance responsible parties of those balance groups. If one balance responsible party has not submitted an electricity exchange block within the bidding zone, EMS AD shall notify the balance responsible party whose daily operating schedule contains such a block of the irregularity.

6.4.3.2.13. If a balance responsible party that is not a balance responsible party of the organised electricity market fails to correct the irregularity referred to in Item 6.4.3.2.12 within the time limit for modifying the daily operating schedule (in accordance with Item 6.4.3.2.3), EMS AD shall determine that the value of the submitted electricity exchange block is zero in each time interval.

6.4.3.2.14. If the balance responsible party referred to in Item 6.4.3.2.12 is a balance responsible party of the organised electricity market, then after the expiration of the deadline for modifying the daily operating schedule (in accordance with Item 6.4.3.2.3), EMS AD shall determine that the values of the submitted electricity exchange block are accepted in each time interval and shall impose an identical electricity exchange block on the other balance responsible party involved in the exchange.

6.4.3.2.15. Electricity exchange blocks between two balance groups, neither of which is part of the organised electricity market, shall be identical. If this is not the case, i.e., if there are different power values in some time intervals that can only be detected after submission of both balance groups' daily operating schedules, EMS AD shall promptly notify both balance responsible parties in accordance with the *MMS* system user manual. If the balance responsible parties do not correct the irregularity within the deadline for modifying the daily operating schedule (in accordance with Item 6.4.3.2.3), EMS AD shall accept the lower power value from the respective daily operating schedules in the disputed time intervals as binding.

6.4.3.2.16. Electricity exchange blocks between two balance groups, one of which belongs to the organised electricity market, shall be identical. If this is not the case, i.e., if there are different power values in some time intervals, EMS AD shall notify both balance responsible parties in accordance with the *MMS* system user manual. If the balance responsible party that is not part of the organised electricity market does not correct the irregularity within the deadline for modifying the daily operating schedule (in accordance with Item 6.4.3.2.3), EMS AD shall accept the value from the organised electricity market's daily operating schedule as binding in those time intervals.

6.4.3.2.17. The submitted power value of the electricity exchange block between bidding zones in a balance group's daily operating schedule in all time intervals may be equal to or less than the value of the right to use the allocated transmission capacity between bidding zones and shall be an integer value. If this value exceeds the right to use the allocated transmission capacity between bidding zones, EMS AD shall immediately notify the irregularity and reject the submitted electricity exchange block between bidding zones. If information on the allocated transmission capacity between bidding zones is not available in the *MMS* system at the time of submission of the balance group's daily operating schedule, EMS AD shall inform the balance responsible party and shall wait for the expiration of the deadline for modifying the daily operating schedule (in accordance with Item 6.4.3.2.4). If, within the deadline defined for the modification of the daily operating schedule (in accordance with Item 6.4.3.2.4) EMS AD concludes that the value of the reported power exceeds the right to use the allocated transmission capacity between bidding zones, or that such a right has not been allocated, it shall determine that the value of power exchange between bidding zones is zero for all time intervals.

6.4.3.2.18. Each balance responsible party that owns allocated transmission capacity between bidding zones shall have access, via the *MMS* system, to information on the values of the rights to use the allocated transmission capacity between bidding zones, as well as the identification of such rights, in accordance with the time defined in the rules for the allocation of transmission capacities between bidding zones.

6.4.3.2.19. The power exchange block between bidding zones reported by a balance responsible party using the values of the right to use the allocated transmission capacity between bidding zones available in the *MMS* system, shall be identical in the daily operating schedule to the power exchange block reported by the partner in the other bidding zone, as received by EMS AD from the neighbouring transmission system operator. In case of discrepancies in power values for any time interval, EMS AD shall notify the balance responsible party of the irregularity and allow it to eliminate it. If the balance responsible party fails to eliminate the

irregularity within the deadline for modifying the daily operating schedule (in accordance with Item 6.4.3.2.4), or if EMS AD does not receive information from the neighbouring transmission system operator regarding changes in the partner's report from the other bidding zone, EMS AD, in cooperation with the neighbouring transmission system operator, shall determine the binding reported lower power value for the relevant power exchange block between bidding zones, based on the interconnection operation rules and mutually concluded agreements.

6.4.3.2.20. A power exchange block between bidding zones reported by a balance responsible party in its daily operating schedule by 2:30 p.m. on day D-1 for day D, using the values of the right to use the allocated transmission capacity between bidding zones available in the *MMS* system and agreed with the neighbouring transmission system operator, may not be modified during the period from 2:30 to 3:30 p.m. on day D-1 for day D.

6.4.3.2.21. Each balance responsible party that does not contain resources for the provision of balancing services and has the role of the responsible party for reporting electricity generation shall report a daily operating schedule containing line 1 of Item 6.4.3.2.5.

6.4.3.2.22. Each balance responsible party that contains resources for the provision of balancing services and has the role of the responsible party for reporting electricity generation shall report a daily operating schedule containing line 1 of Item 6.4.3.2.6.

6.4.3.2.23. Each balance responsible party that does not contain resources for the provision of balancing services and has the role of the responsible party for reporting electricity consumer shall report a daily operating schedule containing line 2 of Item 6.4.3.2.5.

6.4.3.2.24. Each balance responsible party that contains resources for the provision of balancing services and has the role of the responsible party for reporting electricity consumption shall report a daily operating schedule containing lines 5 and 6 of Item 6.4.3.2.6.

6.4.3.2.25. If a balance responsible party with the role of responsible party for reporting electricity generation or electricity consumption fails to report a daily operating schedule in accordance with Items 6.4.3.2.21–6.4.3.2.24 by the deadline for the submission and modification of daily operating schedules for day D (in accordance with Item 6.4.3.2.3), EMS AD shall consider the values of the schedules in Items 6.4.3.2.21 to 6.4.3.2.24 as zero for all time intervals.

6.4.3.2.26. In the event of irregularities in the submitted daily operating schedules containing the lines specified in Items 6.4.3.2.5–6.4.3.2.6, in particular related to the specific situations in Items 6.4.3.2.13.–6.4.3.2.16. and 6.4.3.2.19., the balance responsible party may modify its daily operating schedule of its balance group within the deadlines defined in Items 6.4.3.3 and 6.4.3.4.

6.4.3.2.27. A balance responsible party shall not cancel, either partially or fully, a power exchange block between bidding zones in an accepted daily operating schedule.

6.4.3.2.28. EMS AD shall provide to a balance responsible party without balancing service resources the accepted daily operating schedules for power exchange blocks, the accepted total electricity generation plan, and the accepted total electricity consumption plan for day D by 3:45 p.m. on day D-1. Exceptionally, EMS AD may extend the period in case of information system unavailability or delayed receipt of required data from neighbouring transmission system operators, about which EMS AD shall inform the balance responsible party in due time.

6.4.3.2.29. EMS AD shall provide to a balance responsible party containing balancing service resources the accepted daily operating schedules for power exchange blocks between bidding zones, the accepted total electricity generation plan based on the reported line 1 of Item 6.4.3.2.6., and the accepted total electricity consumption plan based on the reported lines 5 and 6 of Item 6.4.3.2.6. for day D by 3:45 p.m. on day D-1. Exceptionally, EMS AD may extend

the period in case of information system unavailability or delayed receipt of required data from neighbouring transmission system operators, about which EMS AD shall inform the balance responsible party in due time.

6.4.3.2.30. A balance responsible party shall have the right to modify its daily operating schedule in the cases referred to in Items 6.4.3.2.13.–6.4.3.2.17., 6.4.3.2.19., and 6.4.3.2.25., in accordance with Section 6.4.3.3.

6.4.3.3. Intraday Modifications of a Balance Group's Daily Operating Schedule

6.4.3.3.1. A balance responsible party may submit an intraday modification of a balance group's daily operating schedule for day D on day D-1 starting from 6:00 p.m. , and on the same day D to which the schedule relates, at the latest 45 minutes before the beginning of the time period to which the modification relates.

6.4.3.3.2. In case of information system unavailability or delayed receipt of required data from neighbouring transmission system operators, EMS AD shall suspend the submission time for intraday modifications referred to in Item 6.4.3.3.1. until the issue is resolved.

6.4.3.3.3. An intraday modification of a balance group's daily operating schedule shall be accepted if:

- the reported power exchange blocks between bidding zones are identical to the exchanges provided by the neighbouring transmission system operator;
- the reported power exchange blocks are identical to the reports of the balance responsible parties concerned;
- the value of planned generation for each balancing service resource, for available generating units and energy storage facilities, is within the minimum and maximum power limits for those resources;
- the planned generation of the balance group is lower than the sum of the approved individual capacities for each balancing service resource;
- the planned electricity consumption controllable demand for each balancing service resource, for available pumped-storage units, is within the minimum and maximum power limits for that resource;
- the planned consumption of balance group facilities, or the planned consumption for specific facilities at EMS AD's special request (e.g., consumption of a distribution area in another control area), is lower than the approved capacity.

6.4.3.3.4. In case of intraday submission of a power exchange block between bidding zones, the reported value must be identical to the acquired right to transmission capacity between bidding zones within the day. At the end of each month, EMS AD shall verify whether the reported power exchange value between bidding zones is identical to the acquired right to transmission capacity between bidding zones within the day. In case of irregularities, EMS AD shall act in accordance with the rules for the allocation of transmission capacities between bidding zones.

6.4.3.3.5. EMS AD shall confirm an intraday modification of a balance group's daily operating schedule for power exchange blocks, total electricity generation plan, and total electricity consumption plan no later than 15 minutes before the beginning of the time period to which the modification relates.

6.4.3.3.6. During an intraday modification of a balance group's daily operating schedule, power exchange blocks between two balance groups, neither of which is an organised electricity market, must be identical. If this is not the case, i.e., if there are discrepancies in the power values in the exchange blocks for some time intervals, which can only be recorded after the intraday modification of the daily operating schedules of both balance groups, EMS AD shall

urgently notify both balance responsible parties in accordance with the *MMS* system user manual. If the balance responsible parties do not correct the irregularity within the deadline for the intraday modification of the daily operating schedule (in accordance with Item 6.4.3.3.1.), EMS AD shall accept the lower power value in the exchange blocks from the mentioned daily operating schedules for the disputed time intervals as binding.

6.4.3.3.7. During an intraday modification of a balance group's daily operating schedule, power exchange blocks between two balance groups shall be reported by the balance responsible parties of those balance groups. If one balance responsible party has not reported a power exchange block within a bidding zone, EMS AD shall notify the balance responsible party that entered such a block in the intraday modification of the daily operating schedule of the irregularity.

6.4.3.3.8. If a balance responsible party that is not a balance responsible party of the organised electricity market fails to correct the irregularity referred to in Item 6.4.3.3.7. within the time limit for intraday modification of the daily operating schedule (in accordance with Item 6.4.3.3.1.), EMS AD shall determine that the value of the submitted electricity exchange block is zero in each time interval.

6.4.3.3.9. During an intraday modification of a balance group's daily operating schedule, power exchange blocks between two balance groups, one of which is an organised electricity market, must be identical. If there are different power values in the electricity exchange blocks in any time interval, EMS AD shall notify both balance responsible parties about it in accordance with the *MMS* system user manual. If the balance responsible party that is not a balance responsible party of the organised electricity market fails to correct the irregularity within the deadline for intraday modification (in accordance with Item 6.4.3.3.1.), EMS AD shall accept the value from the modified intraday schedule of the organised electricity market as binding for those time intervals.

6.4.3.4. Daily Transmission System Operating Schedule

6.4.3.4.1. EMS AD shall draft the Daily Transmission System Operating Schedule.

6.4.3.4.2. The Daily Transmission System Operating Schedule shall be prepared based on:

- available transmission capacities between each pair of neighbouring bidding zones in both directions;
- accepted daily operating schedules of balance groups;
- forecasted electricity consumption;
- forecasted technical losses in the transmission system;
- planned amount of system balancing reserve;
- availability of generating units, controllable demand, and electricity storage, i.e., resources for providing balancing services.

6.4.3.4.3. The Daily Transmission System Operating Schedule shall comprise the following hourly data:

- electricity consumption plans of balance groups;
- transmission system-level consumption plan prepared by EMS AD based on internal methodologies;
- electricity consumption plan for pumping purposes;
- electricity exchange block plan between bidding zones of balance groups and EMS AD;
- active electricity generation plan of resources providing balancing services;
- renewable electricity generation plan from wind and solar power plants prepared by EMS AD based on internal methodologies;
- calculated values of frequency containment reserve for resources providing

balancing services that are scheduled to operate or are available in the list of balance reserve engagements for frequency containment control;
- calculated values of automatic frequency restoration reserve for resources providing balancing services that are scheduled to operate or are available in the list of engagements in automatic frequency restoration control;
- calculated values of manual frequency restoration reserve for resources providing balancing services that are scheduled to operate or are available in the list of engagements in manual frequency restoration control;
- availability plan of resources for balancing services and the list of balance reserve engagements in manual frequency restoration control;
- plan for compensation of technical losses in the transmission network;
- frequency programme provided by the competent coordination centre in the interconnection;
- data on net and available transmission capacity, as well as on the reliable transmission margin for each bidding zone.

6.4.3.4.4. The Daily Transmission System Operating Schedule shall be prepared to meet conditions for normal operation, and, if not possible, for secure operation.

6.4.3.4.5. EMS AD shall conduct analyses in accordance with the rules for interconnection operation based on the Daily Transmission System Operating Schedule.

6.4.3.4.6. If the analyses referred to in Item 6.4.3.4.5. show that the submitted daily schedules of balance groups do not provide conditions for normal operation, EMS AD shall assess which of the submitted daily schedules most affect the violation of normal operation conditions and shall contact the submitters of these schedules to request their amendment.

EMS AD shall take appropriate measures in the following order, as far as possible in each case:
- plan reconfiguration of the 400 kV, 220 kV, and 110 kV network;
- plan application of operational limits;
- plan application of redispatch;
- cancel planned outages in the 400 kV, 220 kV, and 110 kV network;
- plan reduction of active generation using the feed-in tariff right.

In addition to the measures above, EMS AD shall analyse the impact of electricity exchanges between bidding zones and, if necessary, agree on appropriate electricity exchange blocks between bidding zones in accordance with agreements with other transmission system operators.

6.4.3.4.7. Measures referred to in Item 6.4.3.4.6. that do not affect neighbouring transmission system operators shall be implemented by EMS AD independently; otherwise, implementation of measures shall be coordinated at the regional level, which may also include restriction or refusal of electricity exchanges between bidding zones. Coordination of measures at the regional level shall be carried out in accordance with the rules for interconnection operation and agreements with neighbouring transmission system operators.

6.4.3.5. Criteria and Method of Applying Operational Limits

6.4.3.5.1. Operational limits shall be applied, for the purpose of providing secure transmission system operation, to system users to whom they are defined in the connection procedure in accordance with the energy law and the regulation governing electricity supply and delivery conditions. Operational limits may be applied by direct and indirect principles.

6.4.3.5.2. EMS AD shall apply operational limits by the direct principle by physically reducing the active power of all system users to whom the limits are defined in the connection procedure and who contribute to the overloading of defined transmission system elements. The reduction

of active power for each system user shall be carried out proportionally to their contribution to the overload that necessitated the application of the operational limit.

6.4.3.5.3. EMS AD, in addition to applying the operational constraint referred to in Item 6.4.3.5.2, may apply operational constraints based on the indirect principle, while respecting the principle that the total imbalance arising from the application of operational constraints shall be minimised, by physically reducing active power only for certain system users for whom such constraints are defined in the connection procedure, whose contribution to the overload is significantly greater than the contribution of other system users affecting the same overload. The reduction of active power only for certain system users shall be carried out in such a manner as to eliminate the overload that is the cause of the application of the operational constraint.

6.4.3.5.4. The total imbalance arising from the application of operational constraints based on the indirect principle referred to in Item 6.4.3.5.3. shall be redistributed among all system users for whom an operational constraint is defined in the connection procedure, in the form of electricity exchange blocks, proportionally to their contribution to the overload that is the cause of the application of the operational constraint, regardless of whether a physical reduction of active power has been applied to them.

6.4.3.5.5. EMS AD shall apply operational constraints in accordance with the following procedure:

- prepares security analyses for the relevant time period referred to in Item 6.4.3.4.5., or performs them in real time using the SCADA/EMS system;
- if the analyses indicate an overload (an overload identified in the base case of the network, i.e. without simulation of a network element outage) or a potential overload (an overload identified through simulation of an outage of a network element from the relevant contingency list), it shall assess which generating facilities or storage facilities contribute to the overload or potential overload and to what extent;
- preliminarily notifies the balance responsible party of the balance group to which the facility with a defined operational constraint for the overloaded network element belongs;
- applies and records the operational constraints.

6.4.3.5.6 Operational constraints shall be applied under the following criteria:

- the application of operational constraints at a facility with a defined operational constraint shall relieve the network element that is overloaded or potentially overloaded;
- if the application of operational constraints at several facilities can relieve the overloaded or potentially overloaded network element, EMS AD shall allocate the operational constraints among these facilities in accordance with Items 6.4.3.5.2. and 6.4.3.5.3.;
- if operational constraints are applied at facilities connected to the same transmission system facility, the total reduction of active power for these facilities shall first be determined in accordance with the previous criterion, and this reduction shall then be allocated among those facilities proportionally to their generation.

6.4.3.5.7. EMS AD shall preliminarily notify the balance group to which the facility with a defined operational constraint for the overloaded or potentially overloaded network element belongs, as identified in the security analyses referred to in Item 6.4.3.4.5. This notification

shall include the amount of the overload of the network element and the contribution of the facility to that overload, and shall be delivered by 10:00 p.m. on Day D-1 if the overload is identified on Day D-1. The balance responsible party may amend its daily operating schedule for Day D in accordance with Item 6.4.3.3. of these Rules.

6.4.3.5.8. In the event of application of the operational constraint referred to in Item 6.4.3.5.3., EMS AD shall subsequently introduce amendments to the daily operating schedules of the relevant balance groups by imposing an electricity exchange block with EMS AD, in accordance with the following procedure:

- EMS AD shall calculate the value of the electricity exchange block between the balance group to which the facility subject to the operational constraint belongs and EMS AD, or between EMS AD and the balance group to which a facility belongs to which the operational constraint has not been physically applied but for which an operational constraint is defined in the connection procedure for the overloaded or potentially overloaded network element;
- EMS AD shall provide the relevant balance responsible parties, as well as the generators or storage operators to which these exchange blocks relate, with information on the value of the electricity exchange block and the direction of exchange between EMS AD and the relevant balance groups comprising generators or storage facilities, no later than three working days after the day on which the operational constraint was applied.

6.4.3.5.9. The calculation of the value of the electricity exchange block referred to in Item 6.4.3.5.8. shall be carried out on the principle of proportionality of the contribution of the power plant or storage facility to the loading of the network elements due to which operational constraints are applied. EMS AD shall prepare a detailed procedure for the calculation of these electricity exchange blocks in consultation with interested parties and shall publish it on its website.

6.4.3.5.10. EMS AD shall implement operational constraints in real time by notifying system users of the need to apply an operational constraint on active power in a specified amount, either by issuing verbal instructions to the facility control centre or by setting a set point (active power setpoint) for the facility from the EMS AD control centre.

6.4.3.5.11. EMS AD shall keep records of: 1) system users for whom operational constraints are defined in the connection procedure, and 2) the application of operational constraints.

6.4.3.5.12. EMS AD shall have the right to amend initially determined operational constraints in accordance with newly arising circumstances in the transmission system. In the event of disturbed operation and an urgent need to apply operational constraints, or significant deviation from the planned network state, EMS AD may apply the indirect principle referred to in Item 6.4.3.5.3. without respecting the principle of minimising the total imbalance arising from the application of operational constraints. In such a case of application of operational constraints, Item 6.4.3.5.8. shall also apply.

6.4.3.5.13. The method of settlement and recording of system imbalance arising from the application of operational constraints shall be defined in the rules governing the electricity market.

6.4.3.6. Method of Application of Redispatching

6.4.3.6.1. EMS AD shall determine redispatching in operational planning in such a manner as to minimise the total costs of relieving overload or potential overload, based on energy prices from bids submitted for situations endangering the security of transmission system operation, in accordance with the rules governing the electricity market. This means that, when

redispatching is applied, EMS AD shall not be required to comply with the order of activation of balancing service resources from the priority list in accordance with the rules governing the electricity market.

6.4.3.6.2. EMS AD may also apply redispatching for the purpose of relieving overload or potential overload at the regional level, in accordance with agreements concluded with other transmission system operators and the interconnection operation rules.

6.4.3.7. Method of Application of Active Power Reduction at Facilities Entitled to a Feed-in Tariff

6.4.3.7.1. EMS AD shall allocate the reduction of active power among facilities entitled to a feed-in tariff in such a way as to minimise the total reduction of active power across all facilities at which active power is reduced.

6.4.4. OUTAGE PLANS IN THE 400 KV, 220 KV AND 110 KV NETWORK

6.4.4.1. General Rules for Outage Planning

6.4.4.1.1. EMS AD shall prepare outage plans for elements of the power system (PS) in coordination with system users, neighbouring transmission system operators and regional coordination centres, in accordance with the interconnection operation rules.

6.4.4.1.2. EMS AD shall prepare annual, quarterly and weekly outage plans for PS elements of the first, second and third groups of the *Categorisation*. System users shall, as necessary, prepare outage plans for PS elements of the fourth group of the *Categorisation*.

6.4.4.1.3. Outage plans shall include outages of PS elements required for the performance of works under de-energised conditions carried out in the third safety zone, within the meaning of regulations governing general occupational safety and health measures, on PS elements at voltage levels of 400 kV, 220 kV and 110 kV, as well as on lower-voltage elements that form an integral part of those elements (transformer tertiaries, transformer neutral points, etc.), and other works requiring the outage of PS elements.

6.4.4.1.4. When preparing outage plans, EMS AD shall be obliged to harmonise outages in the 400 kV, 220 kV and 110 kV network with the operating plans of generating units and electricity storage facilities, in order to preserve the conditions for normal operation or, where this is not possible, secure operation during the execution of outages.

6.4.4.1.5. EMS AD may determine (impose) an operating scedule for generating units and electricity storage facilities in order to ensure normal operating conditions of the transmission system during planned outages of transmission system elements, up to a maximum of:

- 100 hours per synchronous generating unit in thermal power plants using coal or gas as primary fuel;
- 250 hours for hydropower plants;
- 100 hours per each of the other types of generating units;
- 100 hours per electricity storage facility;

within one calendar year, in accordance with the technical characteristics of these units. The operating schedule thus determined for day D shall be delivered by EMS AD to the generator during periods when the availability of the generating unit has been planned, as follows:

- by 12:00 p.m. on day D-3 for synchronous generating units in thermal power plants;
- by 08:30 a.m. on day D-1 for hydropower plants, other generating units and electricity storage facilities.

6.4.4.1.6. Outage plans shall include, in addition to proposed outage plans for network maintenance works, proposed outage plans resulting from the implementation of investments by EMS AD and transmission system users.

6.4.4.1.7. Outages of PS elements that are assets of system users (overhead line bays or cable bays, coupling bays, busbars, transformer bays, etc.) and which require outages of transmission system lines shall be planned by the system user during the periods when EMS AD has planned outages of the relevant lines.

6.4.4.1.8. Transmission system operators shall, on the basis of a methodology derived from the interconnection operation rules, draw up a list of PS elements subject to coordinated regional outage planning between transmission system operators. EMS AD shall duly notify the transmission system user of its PS elements that are subject to coordinated regional outage planning.

6.4.4.1.9. EMS AD and system users shall inform each other of the responsible persons in charge of outage planning, in accordance with the provisions of the operation agreements. EMS AD shall define the method for the exchange of notifications regarding the responsible persons in charge of outage planning.

6.4.4.1.10. PS elements in the outage planning process may have the following statuses, in accordance with the interconnection operation rules: available, permanent outage, daily outage.

6.4.4.1.11. As a rule, EMS AD and system users shall plan the execution of works on PS elements requiring permanent outages in the period from 1 March to 30 November.

6.4.4.1.12. For the purposes of outage planning, EMS AD may request indicative data from system users on planned outages of generating units, electricity storage facilities and PS elements referred to in Item 6.4.4.1.8., up to two years in advance.

6.4.4.1.13. Detailed procedures for the preparation of outage plans, notification of appointed responsible persons for outage planning, issuance of approvals for outages of PS elements, and implementation of basic measures for securing workplaces on PS facility elements, as well as the form, structure and content of documents (requests, approvals, etc.) based on which outages are approved, shall be regulated by EMS AD in cooperation with system users, and shall be appropriately incorporated into operation agreements.

6.4.4.2. Duration of Regular Outages

6.4.4.2.1. For the duration of outages due to regular annual maintenance, the values set out in Table 6.1. for overhead lines and Table 6.2. for other PS elements shall be applied.

Table 6.1.

Description of overhead line	Maximum outage duration
Single-circuit 110 kV line, per 10 km	1 day
Single-circuit 220 kV line, per 10 km	1.1 days
Single-circuit 400 kV line, per 10 km	1.25 days
Double-circuit lines*	1.2 × single-circuit duration × 1.2
Each line crossing over a river	+ 1 day

*Duration applies to the entire line (both circuits simultaneously) in an de-energised state.

6.4.4.2.2. Maintenance work on block transformers and other PS elements the outage of which is required during the downtime of the corresponding generating unit or energy storage shall be carried out during the downtime of that generating unit or storage.

Table 6.2.

PS element description	Maximum outage duration
Busbar system	1 day

110/x kV/kV transformer	3 days
220/x kV/kV transformer	5 days
400/x kV/kV transformer	6 days
All types of switchyard fields	3 days

6.4.4.3. Annual Outage Plan and Annual Regional Interconnection Outage Plan

6.4.4.3.1. The Annual Outage Plan is prepared as a day-by-day outage plan, or, if not feasible, by quarters or months. It includes PS elements of the first, second, and third Categorisation Groups.

6.4.4.3.2. The Annual Outage Plan shall be coordinated with the Annual Regional Interconnection Outage Plan, which is prepared in accordance with the Interconnection Operation Rules, and includes PS elements determined as described in Section 6.4.4.1.8.

6.4.4.3.3. The basis for preparing the Annual Outage Plan and the Annual Regional Interconnection Outage Plan shall be outage proposals for PS elements in the facilities of system users and downtime proposals for generating units and energy storage facilities, submitted to EMS AD by these system users:

- By the deadline in the Interconnection Operation Rules for PS elements covered by the Annual Regional Interconnection Outage Plan;
- By 20 September of the current year for the following year for PS elements covered only by the Annual Outage Plan.

6.4.4.3.4. EMS AD and system users shall align the outage plan of PS elements in user facilities for the purpose of preparing the Annual Regional Interconnection Outage Plan.

6.4.4.3.5. EMS AD shall provide the draft Annual Outage Plan to system users by 5 December of the current year for the following year, containing the part of the aligned Annual Regional Interconnection Outage Plan related to PS elements of system users. EMS AD and system users shall harmonise and finalise this plan by 20 December of the current year for the following year. The Annual Outage Plan shall be delivered to system users no later than 5 days after its completion.

6.4.4.3.6. Modifications to the outage plan of PS elements covered by the Annual Regional Interconnection Outage Plan shall be made in accordance with the Interconnection Operation Rules.

6.4.4.3.7. EMS AD may amend the Annual Outage Plans on its own initiative or upon a system user`s request if justified and with the consent of affected system users. Changes apply from the occurrence of circumstances requiring the amendment until the end of the year for which the plan was adopted. Amendments may be made only for parts of the Annual Plan for which a quarterly outage plan has not been issued, unless EMS AD and affected system users agree otherwise. System users may submit a request for a plan change to EMS AD no later than the 25th day of month M-2 for month M. If the outage of elements of one Categorisation Group requires additional outage of elements from another group, the additionally disconnected elements shall be included in the outage plans of that other Categorisation Group.

6.4.4.4. Quarterly Outage Plan

6.4.4.4.1. Quarterly outage plans shall be prepared based on the Annual Outage Plan and submitted requests for amendments to the Annual Outage Plan, except for the first quarter, which shall be prepared together with the Annual Outage Plan. Quarterly outage plans shall be prepared on a daily basis.

6.4.4.4.2. Quarterly proposals of generating unit and electricity storage outage plans, quarterly proposals of electricity distribution facility outage plans, and proposals of quarterly outage

plans for PS elements of other system users shall be submitted to EMS AD no later than 30 days prior to the deadline for preparation of the quarterly plan, except for the first quarter, which shall be submitted within the deadlines applicable to the Annual Outage Plan.

6.4.4.4.3. The quarterly outage plan for PS elements of the first, second and third Categorisation Groups shall be prepared no later than 15 days prior to the start of the period to which the plan referes, except for the first quarter, which shall be prepared together with the Annual Outage Plan. EMS AD shall deliver the quarterly outage plans to system users no later than 5 days from the date of preparation.

6.4.4.4.4. EMS AD may amend quarterly outage plans on its own initiative or at the request of system users, provided that justified reasons exist and with the consent of all affected system users. Such amendments shall apply to the period from the occurrence of the circumstances requiring the amendment until the end of the quarter for which the outage plan was adopted. Amendments shall only be made to those parts of the quarterly outage plan for which a weekly outage plan has not yet been adopted, unless otherwise agreed between EMS AD and the system users affected by the amendment. System users may submit requests for amendments to EMS AD no later than Wednesday at 10:00 a.m. in week W-2 for week W. If the outage of PS elements of one Categorisation Group requires additional outage of elements from another group, the additionally disconnected elements shall be included in the outage plans of that other Categorisation Group.

6.4.4.5. Weekly Outage Plan

6.4.4.5.1. Weekly outage plans shall be prepared on a daily and hourly basis.

6.4.4.5.2. Weekly outage plans previously determined by the quarterly outage plan for the relevant week shall be adjusted in accordance with approved requests for extensions of ongoing works, requests for works postponed based on orders issued by EMS AD control centres, requests for outages due to an occurred or identified potential fault, or requests for emergency works, as well as newly defined outage terms for postponed or extended works.

6.4.4.5.3. If planned works on any PS element cannot be performed or completed within the time limits specified in the weekly outage plan for justified reasons, the system user shall propose a new outage term to EMS AD. The new outage term shall be proposed in a manner that does not compromise the adopted quarterly outage plan. If it is not possible to provide an additional outage term within the current quarter, the outage shall be planned in one of the following quarters. EMS AD shall be responsible for determining the new outage term for postponed or extended works in coordination with the system user.

6.4.4.6. Submission and Approval of Outage Requests

6.4.4.6.1. For the purpose of prescribing the procedure for submission and approval of outage requests, EMS AD shall define a standard form for PS elements of the first, second and third Categorisation Groups, in cooperation with system users, and such form shall be mandatory for all system users.

6.4.4.6.2 If the execution of works on PS elements of the fourth Categorisation Group requires outages of PS elements of the first, second or third Categorisation Groups, EMS AD shall define the procedure for such cases in cooperation with system users.

6.4.4.6.3. The regular exchange of lists of authorised persons entitled to complete the form referred to in Item 6.4.4.6.1. between EMS AD and system users shall be carried out annually by 1 March. EMS AD shall define the format of such lists and the method of exchange.

6.4.4.6.4. An outage request shall be submitted on one of the following grounds:

- for works on PS elements;
- for works in the vicinity of PS elements;

- for works not requiring basic workplace safety measures.

6.4.4.6.5. System users shall submit outage requests to EMS AD for planned works by Wednesday at 10:00 a.m. of the current week for the following week. Outage requests submitted due to an already occurred fault may be submitted immediately after the occurrence of the fault (emergency works).

6.4.4.6.6. When submitting an outage request for planned works, the requester shall specify whether a permanent or daily outage is requested, including information on whether the elements will be disconnected during weekends. In addition, the requester shall provide information on the time required for emergency re-energisation, if applicable.

6.4.4.6.7. Approval for outages due to planned works shall be issued by EMS AD to the requester by Thursday at 3:00 p.m. of the current week for outages planned for the following week, while approval for emergency works shall be issued within 60 minutes from receipt of the outage request.

6.4.4.6.8. Approval for an outage resulting in a system user being left without supply shall be issued by EMS AD only after prior consent has been obtained from the system user or after the affected transmission system users or the public have been informed at least 15 days in advance.

6.4.5. ADDITIONAL DATA FOR INTERCONNECTION OPERATION PLANNING

6.4.5.1. Upon request by EMS AD, the balance responsible party shall submit additional data required for operation planning in accordance with the interconnection operation rules.

6.4.5.2. EMS AD shall, in a timely manner, inform balance responsible parties of the format and type of data referred to in Item 6.4.5.1., as well as the deadlines for their submission, together with an explanation of the purpose and the legal grounds on which such data are requested.

6.4.5.3. Modules of energy parks and energy storage facilities shall submit to EMS AD planned and realised data in accordance with the interconnection operation rules, within defined time intervals and in the format, type and method of data submission specified by EMS AD.

6.4.6. SHORT-TERM GENERATION ADEQUACY ASSESSMENT

6.4.6.1. EMS AD shall assess the short-term adequacy of electricity generation on a daily basis, in accordance with the interconnection operation rules, as a rule for the following 7 days, based on data on the availability of generating units and energy storage facilities, the total volume of balancing reserve, demand forecasts, forecasts of electricity generation from renewable energy sources, and the values of transmission capacities between bidding zones.

6.4.6.2. Where insufficient short-term generation adequacy is identified, EMS AD shall assess the probability, expected duration and the amount of undelivered electrical energy resulting from such occurrence.

6.4.7. UNINTENDED CONTROL AREA DEVIATIONS

6.4.7.1. EMS AD shall be responsible for the financial settlement of unintended deviations within its control area, calculated in accordance with the interconnection operation rules.

6.4.8. REGIONAL COORDINATION CENTRE

6.4.8.1. EMS AD shall cooperate with regional coordination centres in accordance with regulations governing the energy sector and the interconnection operation rules.

6.4.9. COOPERATION WITH THE DISTRIBUTION SYSTEM OPERATOR IN TRANSMISSION SYSTEM OPERATION PLANNING

6.4.9.1. The distribution system operator (DSO) shall submit the following data to EMS AD for the purpose of preparing network models:

- updated monthly data on all generation facilities, including active customers and prosumer facilities, relating to the type of generation facility, installed capacity, geographical location, and the distribution facility connected to the transmission system whose consumption area the generation facility belongs to;
- seasonal, weekly and daily (monthly) generation plans of generation facilities, where such plans have previously been submitted to the DSO by a generator connected to the distribution system in accordance with applicable regulations;
- forecasts of generation and consumption of facilities connected to the distribution system for Type C and Type D generation facilities, where such forecasts are prepared by the DSO.

6.4.9.2. The data referred to in lines 2 and 3 of Item 6.4.9.1. may be submitted individually for each generation facility or in aggregated form for generation facilities connected to a single distribution facility connected to the transmission system. EMS AD shall define the format and method of data submission in cooperation with the DSO.

6.4.9.3. Based on the data referred to in Item 6.4.9.1., EMS AD shall update network models and calculate power flows at the boundary between the transmission and distribution systems. Where such power flows exceed the limits for the transfer of electricity from the distribution system to the transmission system as defined by the legislation governing energy or the use of renewable energy sources, EMS AD shall notify the DSO accordingly. The said limit shall be jointly determined by EMS AD and the DSO for each DSO facility connected to the transmission system and shall not be lower than the value prescribed by the aforementioned legislation.

6.4.9.4. Where security analyses for a specific time period referred to in Item 6.4.3.4.5., or security analyses performed by EMS AD in real time using the *SCADA/EMS* system, indicate that power flows at the transmission–distribution system boundaries referred to in Item 6.4.9.3. cause a violation of transmission system security criteria, EMS AD and the DSO shall jointly apply the following procedure, in the order listed and where feasible, until permitted injection into the transmission system and compliance with transmission system security criteria are restored:

1) modification of topology in the distribution system;
2) modification of topology in the transmission system, excluding the cancellation of planned works in the transmission system;
3) cancellation of planned works in the distribution system;
4) application of operational constraints in the distribution system;
5) application of redispatching in the distribution system;
6) cancellation of planned works in the transmission system;
7) application of operational constraints in the transmission system;
8) application of redispatching in the transmission system.

6.4.9.5. Measures referred to in Sub-Items 3), 4) and 5) of Item 6.4.9.4. shall be used primarily to restore compliance with the permitted injection criterion into the transmission system, and the costs of such measures shall be governed by the rules regulating the electricity market or the operation of the distribution system. Measures referred to in Sub-Items 3), 4) and 5) of Item

6.4.9.4. shall be preceded by measures referred to in Sub-Items 1) and 2) of Item 6.4.9.4., which as a rule do not entail costs.

6.4.9.6. If the distribution system operator succeeds in reducing the injection to within the permissible limits by applying the measures referred to in Item 6.4.9.5., but the transmission system security criterion is not thereby restored, EMS AD shall apply the measures referred to in Sub-Items 6), 7) and 8) of Item 6.4.9.4, and the costs of measure 8) shall be borne by EMS AD. Additionally, in this case, EMS AD may require the distribution system operator to apply measure 5), in which case the costs shall be borne by EMS AD.

6.4.9.7. If the distribution system operator fails to reduce the injection to within the permissible limits by applying the measures referred to in Item 6.4.9.5., but the transmission system security criterion is restored, EMS AD and the distribution system operator shall not take further measures.

6.4.9.8. If the distribution system operator fails to reduce the injection to within the permissible limits by applying the measures referred to in Item 6.4.9.5., and the transmission system security criterion is also not restored, EMS AD shall apply further measures referred to in Sub-Items 6), 7) and 8) of Item 6.4.9.4. The costs of measure 8) referred to in Item 6.4.9.4. shall be borne jointly by EMS AD and the distribution system operator, whereby the distribution system operator shall bear the share of costs determined in accordance with the following formula:

$$T = Ut \cdot \Sigma[(I_i - G_i - A_i) \cdot PTDF_{ie}]/P_e, \text{ where:}$$

- T – is the share of costs of the measures borne by the distribution system operator;
- U_t – are the total costs of restoring the transmission system security criterion (including redispatching and, if applicable, system balancing following the application of redispatching) in order to relieve the overloaded transmission system element “e”;
- Σ – is the sum of contributions to the overload of the transmission system element “e” from all injection points into the transmission system from the distribution system prior to the application of the measures referred to in this Item, where the condition $I_i > G_i + A_i$ is met (it is assumed that this sum is lower than P_e);
- I_i – is active power injection into the transmission system from distribution transformer substation “i” prior to the application of the measures referred to in this Item [MW];
- G_i – is the limit for electricity delivery from distribution transformer substation “i” referred to in Item 6.4.9.3. [MW];
- A_i – is activated active power in the distribution system [MW] in the area of distribution transformer substation “i” for system balancing or redispatching upon instruction of EMS AD prior to the application of the measures referred to in this Item (positive value in the case of an instruction to increase active power, and *vice versa*);
- $PTDF_{ie}$ – is the factor representing the share of active power injection from distribution transformer substation “i” that is transmitted through the overloaded transmission system element “e” (calculated with respect to the remote balancing node);
- P_e – is the overload of the transmission system element “e” [MW] prior to the application of the measures referred to in this Item.

The remaining costs of the measures referred to in this Item shall be borne by EMS AD.

6.4.9.9. The allocation of costs referred to in Item 6.4.9.8. shall be determined for power flows on the relevant elements for the higher overload resulting from the following two cases:

- the simulated most critical contingency from the contingency list (the

contingency causing the highest overload on the observed transmission system element);
- the base case (without contingency simulation).

The allocation of costs shall be determined based on the latest network model used for the decision to apply the measures referred to in Item 6.4.9.8. during the operational planning phase, or based on a system snapshot from the *SCADA/EMS* system, if the decision was made in real time.

6.4.9.10. EMS AD shall calculate the share of costs borne by the distribution system operator referred to in Item 6.4.9.8. and shall submit this calculation to the distribution system operator. Together with the calculation, EMS AD shall provide all relevant supporting documentation, including the network models based on which the decision to apply the measures referred to in Item 6.4.9.8. was made.

6.5. MANAGEMENT OF THE TRANSMISSION SYSTEM UNDER NORMAL CONDITIONS AND IN THE EVENT OF DISTURBANCES

6.5.1. INTRODUCTION

6.5.1.1. EMS AD shall manage the transmission system in a manner that ensures:
- preservation of normal operation of the transmission system;
- reliable supply of electricity to transmission system users;
- optimal utilisation of available transmission capacities;
- achievement of the maximum possible economic efficiency in the operation of the transmission system as a whole under the given conditions.

6.5.1.2. Transmission system management shall be performed from EMS AD control centres established at two levels:
- at the level of the National Dispatching Centre, which manages the 400 kV and 220 kV transmission network, as well as 110 kV interconnection lines;
- at the level of Regional Dispatching Centres, which manage the 110 kV transmission network, excluding 110 kV interconnection lines.

6.5.1.3. Transmission system facilities and facilities of system users shall be operated in accordance with the technical characteristics of such facilities provided by the equipment supplier, as verified during technical inspection and, where applicable, trial operation, and in accordance with the operational status of the facility and the contract governing the operation of the facility.

6.5.2. MANAGEMENT UNDER NORMAL OPERATING CONDITIONS

6.5.2.1. Issuance of Orders

6.5.2.1.1. Orders shall be issued by telephone or by other means in accordance with the facility operation agreement concluded between EMS AD and the system user.

6.5.2.1.2. Orders shall be issued by dispatchers of EMS AD control centres. These orders shall be executed without delay.

6.5.2.1.3. All system users shall be obliged to comply with the orders of the competent EMS AD control centres pertaining to electricity generation, electricity consumption, switching status in the 400 kV, 220 kV and 110 kV network, as well as equipment and device settings under the competence of EMS AD, in the manner prescribed by the Rules and the relevant contracts. System users shall not independently change the switching status in parts of their facilities operated by EMS AD in accordance with Item 1.2.2., but exclusively upon an order

or with the prior consent of the competent EMS AD control centre.

6.5.2.1.4. Resources for the provision of balancing services shall, independently (without an order from EMS AD), implement the last accepted daily operating schedule of the balance group in the part pertaining to that resource. In doing so, a pumped-storage hydropower plant shall notify the competent EMS AD control centre at least 15 minutes in advance of the synchronisation and disconnection of the generating unit or controllable demand from the network. In the event that the daily operating schedule cannot be implemented, the balancing service resource shall immediately inform the competent EMS AD control centre thereof.

6.5.2.1.5. EMS AD control centres shall issue orders for balancing and redispatching of balancing service resources. These orders shall be issued in a timely manner in advance (taking into account the time required for implementation in accordance with the technical characteristics of the generating unit, storage facility or controllable demand) and shall include the start and end time of validity of the order, the amount of change in the power of the balancing service resource relative to the last accepted daily operating schedule of that resource, and the value of the new daily operating schedule of that resource.

6.5.2.1.6. If the competent EMS AD control centre issues an order that could jeopardise the safety of people or facilities, operators at transmission system facilities or personnel at system users' control centres may refuse to execute the order, providing an explanation of the reasons for such refusal. At the same time, such personnel may propose control actions to the superior EMS AD control centre based on the information at their disposal, provided that they take full responsibility for the accuracy of such information.

6.5.2.1.7. In the event that an order is issued verbally, the recipient of the order shall repeat the order to the issuer, and the issuer shall confirm its accuracy, or the order-issuing procedure shall be repeated.

6.5.2.1.8. EMS AD control centres shall keep Operating Logs. Operating Logs shall be kept in chronological order. All data relevant for the operation of the transmission system shall be entered into the Operating Logs, in particular:

- – issued and received orders;
- – outages and faults of elements of the 400 kV, 220 kV and 110 kV network;
- – switching operations in the 400 kV, 220 kV and 110 kV network;
- – generation-related issues;
- – issues relating to the security of operation of the 400 kV, 220 kV and 110 kV network;
- – implementation of electricity supply limitations;
- – issues relating to the operation of control equipment;
- – protection-related issues in the 400 kV, 220 kV and 110 kV network;
- – issued or revoked work permits;
- – received telegrams;
- – other information relevant to the operation of the transmission system.

6.5.2.2. Frequency and Exchange Power Control

6.5.2.2.1. Frequency and exchange power control shall be carried out through the following activities:

- by the action of frequency containment control;
- by the action of automatic frequency restoration control;
- by the action of manual frequency restoration control;
- by providing additional electricity exchanges through the activation of balancing reserves from suppliers or other transmission system operators;
- by netting control deviations with other transmission system operators.

6.5.2.2.2. EMS AD shall be obliged to ensure at all times the frequency containment reserve as defined by the Rules.

6.5.2.2.3. In order to ensure secure operation of the transmission system, EMS AD shall have the right to connect or disconnect a generating unit from participation in frequency containment control, in cooperation with the service provider, as regulated by the ancillary services provision agreement.

6.5.2.2.4. Each system user providing frequency containment control services shall, upon an order from EMS AD, activate or deactivate the frequency containment controllers. If a generating unit providing frequency containment control has an energy source that does not temporally limit its ability to provide this service, frequency containment control of that generating unit shall remain active for the entire duration of the frequency deviation.

6.5.2.2.5. EMS AD shall be obliged to enable continuous operation of automatic frequency restoration control and to ensure at all times the automatic frequency restoration reserve defined by the Rules.
EMS AD may exchange control energy from the automatic frequency restoration reserve with neighbouring transmission system operators in accordance with the interconnection operation rules and concluded agreements.

6.5.2.2.6. Each system user providing the automatic frequency restoration service shall, upon an order issued by EMS AD, include its generating units declared for operation in automatic frequency restoration into this type of regulation.

6.5.2.2.7. If the control area error is such that it cannot be eliminated by full activation of the automatic frequency restoration reserve, EMS AD shall, in a timely manner, issue an order for the activation of the available manual frequency restoration reserve through the balancing market, in accordance with the rules governing the operation of the electricity market.

6.5.2.2.8. EMS AD shall issue orders for the engagement of resources for the provision of balancing services, taking into account that the initial activation time of the resources shall be feasible in accordance with their technical characteristics and the currently available capacity of the resources on the balancing market.

6.5.2.2.9. EMS AD shall record all orders for the engagement of resources for the provision of balancing services electronically through appropriate systems. These orders shall include the following data:

- time of issuance of the order;
- reason for the engagement of resources for the provision of balancing services (system balancing, endangered system security, other);
- *EIC* identification code of the engaged resource for the provision of balancing services;
- activation time interval;
- direction of manual frequency restoration (positive or negative);
- required power change in MW relative to the applicable daily operating schedule of the balancing service resource.

6.5.2.2.10. EMS AD shall keep records of the activated balancing reserve. The recorded data shall include the following:

- amount of activated balancing reserve in MW;
- activation time interval;
- balancing reserve provider.

6.5.2.2.11. In the event that the manual frequency restoration reserve is lower than the minimum level defined by the Rules, EMS AD shall undertake measures to secure the missing reserve. These measures shall include:

- issuing orders for the start-up or de-loading of generating units or electricity storage facilities;
- arranging electricity exchange with other control areas.

6.5.2.2.12. In the event that a neighbouring transmission system operator requests electricity exchange from EMS AD for the purpose of balancing its system, EMS AD may agree to such exchange if the available balancing reserve in the EMS AD control area exceeds the minimum level defined by the Rules, and in exceptional cases even if this condition is not met, provided that a significant regulatory deviation of the neighbouring system has been recorded or forecast.

6.5.2.3. Voltage Control

6.5.2.3.1. Voltage control shall be carried out on the basis of the Daily Transmission System Operating Schedule and the actual operating conditions of the transmission system, with the aim of maintaining voltage within the prescribed limits.

6.5.2.3.2. Voltage shall primarily be controlled by issuing appropriate orders for the generation or absorption of reactive power by all generating units in operation, electricity storage facilities in operation and capable of providing voltage control, synchronous condensers, and static compensation installations that have a contractual obligation to provide the ancillary service of voltage control.

6.5.2.3.3. In addition to the generation or absorption of reactive power, voltage shall also be controlled by managing reactive power flows in the 400 kV, 220 kV and 110 kV networks, by changing tap positions on regulating transformers and by changing the switching state of the transmission network.

6.5.2.3.4. If, for the purpose of voltage control, it is necessary to reduce active power generation at certain generating units due to reactive power generation, EMS AD shall apply redispatching.

6.5.2.3.5. EMS AD shall issue orders to change tap positions on block transformers of generating units in order to maintain voltage within the prescribed limits.

6.5.2.3.6. At facilities from which interconnection lines originate, voltage shall be maintained within the range defined with the neighbouring transmission system operator.

6.5.2.3.7. If, during operational work or in the process of analysing voltage conditions, problems related to voltage control are identified that are caused by the operation of system users' facilities deviating from the parameters prescribed by the rules governing connection to the transmission system (impermissible load power factor, deviations from defined technical characteristics, permanent limitations of generating units compared to their designed parameters, and similar), EMS AD shall require such system users to bring their operation within the technically defined limits.

6.5.2.4. Monitoring of Transmission System Operation

6.5.2.4.1. EMS AD control centres shall monitor the operation of the transmission system in real time. Monitoring shall be performed using the *SCADA* system and by telephone communication with the personnel of transmission system facilities, as well as with the control centres and facilities of system users.

6.5.2.4.2. EMS AD shall provide the following real-time information at its control centres:

- system frequency;
- control area error (National Dispatch Centre only);
- indication and alarm signals at transmission system facilities and at facilities of transmission system users;

- active and reactive power flows, as well as current values in the 400 kV, 220 kV and 110 kV network and at system users' facilities (of relevance to the operation of the 400 kV, 220 kV and 110 kV network);
- active and reactive power of generating units and electricity storage facilities;
- switching equipment status;
- tap positions on regulating transformers;
- voltage values at busbars of facilities in the 400 kV, 220 kV and 110 kV network and on transmission lines;
- alarms and signalling pertaining to the validity of measured values, operation of protection devices, communication status, and etc.

6.5.2.4.3. EMS AD shall define, in contracts with neighbouring transmission system operators, the necessary information to be exchanged in real time, in accordance with the interconnection operation rules.

6.5.2.4.4. EMS AD control centres shall be equipped with the necessary telecommunication and computer equipment for the collection and processing of data required for the analysis of transmission system operational security.

6.5.2.4.5. The competent EMS AD control centres shall monitor power flows, voltage levels and switching states at 110 kV distribution transformer stations connected to the transmission system and shall assess the impact of the distribution system on the operational security of the transmission system.

6.5.2.4.6. If the competent EMS AD control centre observes that impermissible power flows at the boundary between the transmission and distribution systems endanger the operational security of the transmission system, it shall immediately notify the competent control centre of the distribution system operator in order to undertake the necessary measures defined in Items 6.4.9.4.–6.4.9.7., so that such impermissible flows are reduced to the defined limits.

6.5.2.4.7. System users shall continuously monitor the operation of their facilities and shall timely inform the competent EMS AD control centres of all changes occurring on elements of the first, second and third groups defined in the *Categorisation*.

6.5.2.4.8. EMS AD shall timely inform the system user of changes occurring on elements of the first, second and third groups defined in the *Categorisation* that affect the facilities of that system user.

6.5.2.5. Execution of Works in the 400 kV, 220 kV and 110 kV Network

6.5.2.5.1. EMS AD and system users shall comply with the planned switching state of power system elements under their ownership or right of use, as well as with the scheduled emergency outage times.

6.5.2.5.2. The outage of power system elements shall be carried out based on an outage approval issued by EMS AD following outage requests referred to in Item 6.4.4.6., in accordance with weekly outage plans or emergency outages.

6.5.2.5.3. The work permit and the notification of completion of works for works performed on power system elements of the first, second and third groups of the *Categorisation* shall be consolidated into a single form prescribed by the owner of the power system elements or by the holder of the right of use, whether a system user or EMS AD.

6.5.2.5.4. The sections of the form referred to in Item 6.5.2.5.3. may be completed by authorised persons of EMS AD and system users. Regular exchange of lists of authorised persons entitled to complete the form between EMS AD and system users shall be carried out annually by 1 March of the current year. EMS AD shall define the format of such lists and the method of exchange.

6.5.2.5.5. For works on PS elements owned by EMS AD or for which EMS AD holds the right of use, the works supervisor whose name is specified in the outage request shall notify the competent EMS AD control centre of the works at least 30 minutes prior to the time specified in the outage request and shall request the execution of switching operations.

6.5.2.5.6. If works are performed on PS elements owned by a system user or for which the system user holds the right of use, the competent control centre of the system user shall notify the competent EMS AD control centre of the works at least 30 minutes prior to the time specified in the outage request and shall request the execution of switching operations.

6.5.2.5.7. If, for justified reasons, the works cannot be performed, the works supervisor shall be obliged to notify the competent control centre thereof at least 30 minutes prior to the scheduled commencement of the works (as specified in the outage request form) and to state the reasons why the works cannot be carried out. In the case of works at system users' facilities, the system user's control centre shall forward this information to the competent EMS AD control centre.

6.5.2.5.8. For works on PS elements and works carried out in the vicinity of PS elements owned by EMS AD or for which EMS AD holds the right of use, following the implementation of basic measures to secure the workplace, the competent control centre and the works supervisor shall complete the work permit, whereby the work permit shall be deemed opened. Completion of the work permit implies the issuance of an appropriate statement by the dispatcher of the competent control centre and receipt of that statement by the works supervisor. Upon completion of the works, the works supervisor and the competent control centre shall complete the notification of completion of works, whereby the work permit shall be deemed closed. Completion of the notification of completion of works implies the issuance of an appropriate statement by the works supervisor and receipt of that statement by the dispatcher of the competent control centre.

6.5.2.5.9. For works on PS elements and works carried out in the vicinity of PS elements owned by a system user or for which the system user holds the right of use, the work permit and the notification of completion of works shall be completed by an authorised person of the competent control centre of the system user and by the works supervisor. After completion of the work permit or the notification of completion of works, the competent control centre of the system user shall immediately inform the competent EMS AD control centre of the unavailability or availability of the power system element.

6.5.2.5.10. For works that do not require the implementation of basic measures for securing the workplace on PS elements, following the execution of the necessary switching operations, the competent control centre shall inform the responsible person of the switching state of the relevant PS elements and shall authorise the execution of the works. Upon completion of the works, the responsible person shall inform the competent control centre that the works have been completed. In this case, the work permit and the notification of completion of works shall not be completed.

6.5.2.5.11. For PS elements owned by a system user or for which the system user holds the right of use, in the case of works that do not require basic measures for securing the workplace, after authorising the responsible person to carry out the works or after receiving information that the works have been completed, the competent control centre of the system user shall immediately inform the competent EMS AD control centre of the period of unavailability or availability of the PS element.

6.5.2.5.12. Works envisaged by the outage request shall be completed by the scheduled time specified in the form. If the works cannot be completed within that time limit, the works supervisor, in coordination with the owner or the holder of the right of use of the energy facility,

shall timely inform the competent control centre with which the work permit was completed, inform it of the status of the works, and request an extension of the works. If this has been done with the control centre of a system user, that control centre shall forward the information to the competent EMS AD control centre. The competent EMS AD control centre shall decide on the extension of the works.

6.5.2.5.13. The competent EMS AD control centre shall have the right to issue an order for the interruption or postponement of planned outages if the normal or secure operation of the transmission system is endangered.

6.5.2.6. Data Collection

6.5.2.6.1. EMS AD shall collect all data necessary for the planning and analysis of transmission system operation within the basic time unit used for transmission system operation planning, including:

- active and reactive power generation of all generating units and electricity storage facilities connected to the transmission network;
- generation and consumption plans and forecasts for facilities connected to the distribution system, available to the distribution system operator;
- reactive power generation of compensation installations connected to the transmission network;
- availability of generating units and electricity storage facilities;
- voltage values at facilities of the 400 kV, 220 kV and 110 kV network;
- frequency deviation and synchronous time deviation;
- current active and reactive power flows for specific time intervals;
- electricity exchanges over interconnection lines;
- configuration of the 400 kV, 220 kV and 110 kV network;
- condition of high-voltage equipment at transmission system facilities and at system users' facilities;
- volume and duration of secured and activated ancillary services;
- recording of exceedances of permissible loadings of lines and transformers, or deviations of voltage or frequency from prescribed limits;
- meteorological data (inflows, reservoir levels, reservoir status, wind speed and direction, temperature, air pressure, solar irradiation);
- other data necessary for the planning and analysis of transmission system operation.

System users shall submit to EMS AD the abovementioned data pertaining to their facilities, in the manner and format determined by EMS AD.

6.5.3. OPERATION UNDER DISTURBANCE CONDITIONS

6.5.3.1. Introduction

6.5.3.1.1. EMS AD shall undertake all measures at its disposal to prevent a disturbance.

6.5.3.1.2. EMS AD control centres shall have the capability to identify a disturbance and its characteristics based on received information, in order to determine appropriate control actions for eliminating or limiting the disturbance.

6.5.3.1.3. In the event of a disturbance, EMS AD shall, within the shortest possible time, undertake all necessary technical measures to prevent the spread of the disturbance, in order to restore all parameters in the 400 kV, 220 kV and 110 kV network to the prescribed limits and to restore the supply of electricity to transmission system users that have lost supply. In addition to the measures referred to in Item 6.4.3.4, these measures shall include:

- attempts to reconnect tripped elements in the 400 kV, 220 kV and 110 kV

network;
- changing tap positions on regulating transformers;
- interrupting ongoing works and reconnecting disconnected elements in the 400 kV, 220 kV and 110 kV network;
- arranging appropriate electricity exchanges;
- cancelling or reducing existing electricity exchanges (where changes in generation and the arrangement of new electricity exchanges cannot be implemented, or where the results of such control actions are insufficient to resolve the disturbance);
- application of the Transmission System Defence Plans and the Transmission System Restoration Plan;
- other measures prescribed by laws and secondary legislation.

When selecting the given measures, EMS AD shall apply the principle of minimum cost, while seeking to ensure that the applied measures have the minimum possible impact on the electricity market.

6.5.3.1.4. Where a disturbance has occurred and there is a need to apply operational restriction measures in order to restore normal operation of the transmission system, the procedures set out in Section 6.4.3.5. shall apply.

6.5.3.1.5. Where a disturbance has occurred and there is a need to apply redispatch measures in order to restore normal operation of the transmission system, the procedures set out in Section 6.4.3.6. shall apply.

6.5.3.1.6. Where a disturbance has occurred and there is a need to apply measures for the reduction of active power generation at facilities benefiting from the feed-in tariff, in order to restore normal operation of the transmission system, the procedures set out in Section 6.4.3.7. shall apply.

6.5.3.1.7. EMS AD shall keep records of the applied operational restrictions, redispatch measures and reductions of active power generation at facilities benefiting from the feed-in tariff.

6.5.3.2. Prevention and Elimination of Disturbances

6.5.3.2.1. In the event of overloads of lines, transformers or any other element of the 400 kV, 220 kV and 110 kV network, or potential overloads identified through security analyses, the competent control centre of EMS AD shall take measures to relieve the load on the respective element. EMS AD shall have the right to amend the originally defined corrective measures established under the operational planning procedures for transmission system operation referred to in Section 6.4.3.5., in accordance with real-time circumstances.

6.5.3.2.2. Temporary blocking of overload protection is permitted for the purpose of prevention and elimination of disturbances; however, the loading of such elements shall not exceed values that could cause damage to elements of the 400 kV, 220 kV and 110 kV network or adjacent facilities.

6.5.3.2.3. In the event of an outage of an element in the 400 kV, 220 kV and 110 kV network, the operational staff of EMS AD control centres shall collect signalling and data on protection operation, based on which decisions shall be rendered regarding the control actions to be implemented.

6.5.3.2.4. Control centres of system users shall submit to the competent EMS AD control centre signalling and data on protection operations from all elements of their facilities classified in the first, second or third group of the *Categorisation*, as well as elements galvanically connected to such elements. In the event of a line outage, these data shall include:

- name of the facility;
- name of the line (voltage level, number and direction);
- type of protection that operated;
- type of fault (single-phase, two-phase, etc.);
- phases affected by the fault;
- extent to which the protection operated;
- information on the operation of the auto-reclosing device (AR) and whether the auto-reclosing attempt was successful;
- distance to the fault location (fault locator data).

In the event of a transformer outage, the data shall include:

- name of the facility;
- transformer designation;
- all types of protective devices that operated;
- transformer loading immediately prior to the outage;
- ambient, oil and winding temperatures immediately prior to the outage;
- operation of the fixed fire protection system (where installed).

The system user's control centre shall also inform the competent EMS AD control centre of other circumstances accompanying the outage, such as:

- additional operation of primary equipment;
- switching operations within the facility;
- works being carried out at the facility;
- visible traces of faults in the substation (electric arc, smoke, fire, unusual odours, etc.);
- atmospheric discharges in the vicinity of the facility and other weather conditions.

The given data shall be submitted via the *SCADA* system and through direct telephone communication between the competent EMS AD control centre and the system user's control centre.

6.5.3.2.5. In the event of a permanent outage of line circuit breakers caused by the operation of line protection at both ends of the line, the EMS AD control centre may issue one instruction for line energisation at least 3 minutes after the outage, provided that an unsuccessful auto-reclosing attempt was recorded during the outage or that no auto-reclosing operation occurred. Line energisation shall be performed from the side where lower fault currents are expected, except in the case of a line connecting a power plant facility, where the energisation attempt shall be carried out towards the power plant facility. If a repeated outage of the line occurs due to protection operation indicating the existence of a permanent fault on the line, the line shall not be energised until the fault has been eliminated. Exceptionally, the EMS AD control centre may repeat the instruction for line energisation in the following cases:

- outages of lines connected in a star configuration;
- outages of lines without circuit breakers;
- non-selective outages;
- other outages where network sectionalisation enables identification of the network element affected by the fault through re-energisation;
- icing of lines or other situations where meteorological conditions, vegetation or buildings affect the line, following receipt of field information from the competent person.

6.5.3.2.6. In the event of a cable or mixed line outage caused by protection operation, an energisation attempt shall not be permitted until cable testing or cable repair has been carried out. Where, in the case of a mixed line, it is established that the fault is located on the overhead

section of the line, energisation of the cable shall be permitted without testing.

6.5.3.2.7. System users shall, as soon as possible and upon instruction of the EMS AD control centre, energise the tripped elements of the transmission system within their facilities, unless protection signals indicate the existence of a fault within the facility, in which case the system user shall be permitted to carry out a visual inspection of the installation as soon as possible, based on which further decisions on disturbance mitigation shall be taken.

6.5.3.2.8. The competent EMS AD control centre may request a modification of protection settings for the purpose of establishing a switching scheme that ensures the most reliable supply of electrical energy to transmission system users' facilities during the duration of a fault on an element of the 400 kV, 220 kV and 110 kV network.

6.5.3.2.9. System users shall inform the competent EMS AD control centre of the condition of their facilities and of potential faults that may cause an outage of the facility or part thereof.

6.5.3.2.10. Where the operational staff of EMS AD control centres receive information on a potential fault from an authorised person (from EMS AD or a transmission system user), such staff shall undertake the following activities to:

- assess the consequences of disconnection or outage of the respective element;
- assess control actions necessary to maintain normal and secure operation of the transmission system in the event of disconnection or outage of the element;
- where deemed necessary, disconnect the element on which a potential fault has been identified;
- where it is assessed that the necessary disconnection would jeopardise normal operation of the transmission system, issue an instruction to authorised EMS AD personnel for the emergency mobilisation of teams to eliminate the fault.

6.5.3.2.11. Where a permanent or potential fault has occurred on an element of the power system of a system user, the competent EMS AD control centre shall contact the respective user and agree on fault elimination.

6.5.3.2.12. In the event of a permanent or potential fault on an element of the PS of a system user, the transmission system user shall urgently inform the competent EMS AD control centre of:

- the cause of the fault;
- the expected time required to eliminate the fault;
- the impact of the fault on the availability of other PS elements of that system user.

6.5.3.2.13. Where EMS AD establishes that a permanent or potential fault on a PS element of a system user may jeopardise normal operation of the transmission system, EMS AD shall urgently inform the user of the time after which normal operation of the transmission system cannot be ensured without the return to operation of the specified PS element. The system user shall inform EMS AD of its ability to meet the specified fault elimination time and shall provide appropriate justification to EMS AD where this is not possible.

6.5.3.2.14. EMS AD shall cooperate with neighbouring transmission system operators within the interconnection for the purpose of coordinated operation and avoidance of incidents on interconnection lines, as well as where assistance of a neighbouring transmission system operator is required to resolve issues in the transmission system and *vice versa*, including agreements on the exchange of electrical energy between control areas in accordance with concluded agreements and the Interconnection Operation Rules.

6.5.3.3. Restriction of Electricity Supply and Voltage Reductions

6.5.3.3.1. In the event of a shortage of active power in the transmission system, a shortage of reactive power in the system or voltage collapse, overload of an element of the 400 kV, 220

kV and 110 kV network, or any other disturbance posing a threat to normal operation of the transmission system, voltage reductions may be applied through implementation of the Transmission System Voltage Collapse Protection Plan, or electricity supply may be restricted in the entire system or in specific parts thereof through implementation of Electricity Supply Restriction Plans, after all possible measures to avoid the application of such plans have been exhausted. In such cases, the competent EMS AD control centre shall decide which type of plan shall be applied.

6.5.3.3.2. If a system user refuses to implement the Electricity Supply Restriction Plan in the amount specified by EMS AD, EMS AD shall be authorised to disconnect parts of, or entire facilities of, that system user up to the specified amount, provided that the system user's non-compliance is unjustified.

6.5.3.3.3. EMS AD shall timely inform system users and competent authorities of planned and expected disturbances and interruptions in electricity supply, except where this is not possible due to the need for rapid response in order to prevent the collapse of part or the entire transmission system.

6.5.3.4. Restoration of the Transmission System

6.5.3.4.1. In the event of a partial or total collapse of the transmission system, the competent EMS AD control centres and system users shall restore the transmission system in accordance with the Transmission System Restoration Plan.

6.6. OPERATION OF THE PROTECTION SYSTEM

6.6.1. INTRODUCTION

6.6.1.1. The protection system, technical requirements, selection of protection types, functional testing of the protection system and the protection setting plan for the 400 kV, 220 kV and 110 kV network, as well as the obligations of EMS AD and system users during the planning of development, reconstruction, operation and exploitation of the transmission system, shall be implemented in accordance with these Rules and the rules governing the connection of facilities to the transmission system.

6.6.2. DOCUMENTATION AND TECHNICAL INSTRUCTIONS

6.6.2.1. EMS AD shall maintain up-to-date documentation pertaining to the types of protection and protection setting plans in transmission system facilities, as well as protection setting plans in system users' facilities, for the 400 kV, 220 kV and 110 kV network.

6.6.2.2. The system user shall submit to EMS AD up-to-date documentation on functional changes or reconstructions of the protection system in its facilities that affect the transmission of electrical energy.

6.6.2.3. EMS AD shall define the basic technical requirements and conditions for the protection system and the protection setting plans for lines and power transformers in the 400 kV, 220 kV and 110 kV transmission network.

6.6.3. PROTECTION SETTINGS, REPLACEMENT AND MAINTENANCE

6.6.3.1. Protection setting and replacement plans in system users' facilities that affect the operation of the 400 kV, 220 kV and 110 kV network shall be implemented subject to the prior consent of EMS AD, through amendments to the protection setting plan, in accordance with the rules governing the connection of facilities to the transmission system.

6.6.3.2. The system user shall inform EMS AD of any changes made to existing protection

settings or of protection replacement, no later than three working days following the implementation of such changes to the protection systems in its facility.

6.6.3.3. EMS AD and the system user shall carry out periodic inspection and maintenance of protection systems in their respective facilities, in accordance with the rules defining technical standards for the maintenance of power system facilities.

6.6.3.4. Protection on interconnection lines shall be re-set in accordance with agreements concluded with neighbouring transmission system operators.

6.6.4. SELECTIVITY OF PROTECTION OPERATION

6.6.4.1. Protection systems shall operate selectively, so as to disconnect only the limited part of the transmission system affected by a fault. The principle of overlapping protection zones shall be mandatory, in order to ensure reliable protection operation and to provide backup protection for each part of the transmission system.

6.6.4.2. Protection selectivity shall also take into account:

- the topology and operating conditions of the transmission system user's facility;
- the technical conditions at the point of connection;
- switching states corresponding to the outage of a single transmission system element.

6.6.5. FAULT CLEARING TIMES

6.6.5.1. Fault clearing times in the 400 kV, 220 kV and 110 kV network shall be determined by EMS AD. In order to selectively disconnect only the transmission system element affected by the fault, protection operation shall be time-graded.

6.6.5.2. Fault clearing times for electrically close faults (except those with a high share of fault resistance or developing faults) on lines, which are cleared in the first protection stage, shall not exceed:

- 150 ms in the 400 kV transmission network;
- 150 ms in the 220 kV transmission network;
- 150 ms in the 110 kV transmission network.

6.6.5.3. Electrically remote faults on lines, as well as faults on adjacent busbars (except those with a high share of fault resistance or developing faults), shall generally be cleared in the second stage of distance protection, with maximum clearing times of:

- 350 ms in the 400 kV transmission network where no simultaneous tripping system is used, or 150 ms where such a system is used;
- 500 ms in the 220 kV transmission network where no simultaneous tripping system is used, or 150 ms where such a system is used;
- 500 ms in the 110 kV transmission network where no simultaneous tripping system is used, or 150 ms where such a system is used.

6.6.5.4. Faults on power transformers shall be cleared within a maximum of 100 ms by the main transformer protections, which include electrical protections against internal transformer faults (differential protection and restricted earth fault protection, or alternative "tank" protection), as well as mechanical transformer protections (transformer Buchholz relay, on-load tap-changer Buchholz relay, pressure relief relay). Following the operation of these transformer protections, the necessary checks and tests shall be carried out prior to returning the transformer to operation.

6.6.5.5. Busbar faults shall be cleared within a maximum of:

- 100 ms where busbar differential protection (local protection) is active;

- a time equal to the clearing time of the second stage of line distance protection, as such faults are eliminated by disconnecting the feeding lines in adjacent substations (remote protection), or a time equal to the clearing time of the multi-stage bi-directional distance protection of the transformer connected to the respective busbars.

6.6.6. AUTOMATIC RECLOSING

6.6.6.1. Automatic reclosing (AR) functions shall be applied on overhead lines in the transmission network, with the following operating cycles:

- single-pole AR in the 400 kV, 220 kV and 110 kV transmission network, with a dead time typically of 1 s;
- three-pole AR in the 220 kV and 110 kV transmission network, and only exceptionally in the 400 kV transmission network, with a dead time typically of 1 s;
- on certain lines, depending on proximity to generating facilities, on interconnection lines, or on lines where the age and operating condition of primary equipment may affect AR operation, a dead time shorter or longer than 1 s may be used in order to ensure more reliable system operation or to coordinate with neighbouring systems.

6.6.6.2. Three-pole AR and manual circuit breaker closing in the 400 kV, 220 kV and 110 kV transmission network shall be applied subject to verification of synchronisation conditions. Verification of synchronisation conditions, in the case of three-pole AR and manual circuit breaker closing in the 220 kV and 110 kV transmission network, shall be applied where analyses of system operation or conducted studies determine that three-pole AR or manual breaker closing on certain lines may result in transmission system stability issues or excessive inrush currents (which may cause immediate outage following energisation). EMS AD shall issue an instruction to activate the synchronisation check function on such lines.

6.6.7. REAL-TIME OPERATION

6.6.7.1. EMS AD shall coordinate protection operation for all system users in order to ensure compliance with the maximum permissible fault clearing times specified in the rules governing the connection of facilities to the transmission system. Deviations from the maximum permissible fault clearing times shall be allowed only due to technological obsolescence of installed circuit breakers or protection devices, provided that such deviations do not exceed 10%.

6.6.7.2. Where analysis of a disturbance in the 400 kV, 220 kV and 110 kV network indicates non-selective operation of protection systems in system users' facilities, EMS AD shall take measures within its competence to eliminate such irregularities as soon as possible.

6.6.7.3. In the event of unavailability of the main line protection device or one of several main protections of a power transformer, time-limited operation of the protected element with only backup protection devices, or the remaining main protections, shall be permitted, in accordance with the measures and procedures applicable to the operation of protection and automatic devices in the 400 kV, 220 kV and 110 kV network, as defined by EMS AD.

6.6.8. OVERLOAD PROTECTION SETTING PLAN

6.6.8.1. EMS AD shall prepare and implement an Overload Protection Setting Plan for lines for the winter and summer seasons.

6.6.8.2. The Overload Protection Setting Plan for lines shall take into account the technical

characteristics of the lines and the associated high-voltage equipment in overhead line bays and cable bays, in accordance with expected seasonal meteorological conditions, with the aim of providing effective protection of lines and associated high-voltage equipment against permanent deformation caused by thermal stress due to excessive current loading.

6.6.8.3. The Overload Protection Setting Plan for lines shall cover all 400 kV and 220 kV lines, as well as those 110 kV lines where overloads may be expected.

6.7. OPERATION OF THE COMMUNICATION AND TECHNICAL CONTROL SYSTEMS

6.7.1. COMMUNICATION SYSTEM

6.7.1.1. EMS AD shall, through its communication system, ensure continuous communication with system users, participants in the electricity market, and other transmission system operators in accordance with the rules governing the operation of the interconnection.

6.7.1.2. In the event of a failure of communication devices or channels with system users, the procedure for communication via public networks, as defined in the operation agreement with the system user's facility, shall be applied.

6.7.1.3. In the event of a failure of communication devices or channels with electricity market participants, the procedure defined in Items 6.4.3.1.4. to 6.4.3.1.7. of these Rules shall be applied.

6.7.1.4. In the event of a failure of communication devices or channels with other transmission system operators, communication shall be carried out in accordance with bilateral agreements concluded between neighbouring transmission system operators and the rules governing the operation of the interconnection.

6.7.1.5. Communication shall be provided for telephone calls, normal operation of the technical control system, and protection devices.

6.7.1.6. System users and EMS AD shall, within their respective competences, provide continuous exchange of real-time data with the relevant EMS AD control centres.

6.7.1.7. All communication systems, channels, and devices shall have appropriate backup in the event of an outage.

6.7.1.8. All telephone calls made from EMS AD control centres shall be recorded and retained for at least 30 days.

6.7.2. TECHNICAL CONTROL SYSTEM

6.7.2.1. The technical control system shall be designed and used so that EMS AD can fulfil all obligations related to the operation of the 400 kV, 220 kV, and 110 kV network in accordance with these Rules.

6.7.2.2. The competent EMS AD control centres shall have clearly and comprehensibly displayed real-time data of significance for the operation of the 400 kV, 220 kV, and 110 kV transmission networks.

6.7.2.3. The competent EMS AD control centres, as well as other critical facilities, shall be provided with adequate and reliable continuous backup power supply for the technical control system.

6.7.2.4. Verification of the accuracy of data necessary for the calculation of the control area error, within the technical control system, shall be carried out periodically at least once per year.

6.7.2.5. All interconnection lines shall be equipped with devices for telemetry of active and reactive power, active and reactive energy, as well as devices for telemetry of redundant measurements of active and reactive power, and the corresponding measured values shall be transmitted to the competent EMS AD control centres.

6.7.2.6. EMS AD shall archive real-time data from the technical control system necessary for analysing the operation of the transmission system, the operation of generating modules, and for preparing reports on the operation of the transmission system.

6.7.2.7. A redundant configuration of the control system shall, as a rule, be used in transmission system facilities.

6.7.3. TEMPORARY UNAVAILABILITY OF EMS AD CONTROL CENTRES

6.7.3.1. In the event of the temporary unavailability of any regional dispatch centre, its responsibilities shall be assumed by the National Dispatch Centre. The National Dispatch Centre shall have access to the necessary documentation, real-time data, and applications of the technical control system required for the temporary assumption of responsibilities for the operation of the unavailable regional dispatch centre.

6.7.3.2. In the event of the temporary unavailability of the National Dispatch Centre, its functions shall be assumed by the backup National Dispatch Centre.

6.7.4. MAINTENANCE OF COMMUNICATION AND CONTROL EQUIPMENT

6.7.4.1. EMS AD and system users shall maintain their equipment used for communication and for the control of the 400 kV, 220 kV, and 110 kV network in proper condition.

6.7.4.2. Maintenance works on communication and control equipment for the 400 kV, 220 kV, and 110 kV network shall be planned so as not to compromise the normal operation of the transmission system. In planning such maintenance works, EMS AD shall cooperate with system users and neighbouring transmission system operators.

6.7.5. REQUIREMENTS FOR SYSTEM USERS

6.7.5.1. Communication equipment at system users' facilities, in accordance with these Rules, shall comprise the equipment necessary for communication between EMS AD control centres and the respective facility.

6.7.5.2. System users shall exchange, via EMS AD's technical control system, the real-time information necessary for the control of the transmission system in accordance with the technical requirements set out in the rules governing the connection of facilities to the transmission system, or in the relevant operation agreement for the facility.

6.7.5.3. The distribution system operator, or the closed distribution system operator, shall, in addition to the data referred to in Item 6.7.5.2., provide EMS AD with available real-time data on total generation and consumption in the distribution system or closed distribution system.

6.7.5.4. The system user shall provide documentation relating to the communication and transmission system control equipment installed at its facility. At the request of EMS AD, the system user shall make the documentation referred to in this section available for inspection.

6.7.5.5. In the event of a fault in communication or transmission system control equipment, the system user shall, upon detection of the fault or receipt of information regarding the fault, notify EMS AD without delay and shall be obliged to take all reasonable measures to eliminate the fault in the shortest possible time.

6.7.5.6. Prior to disconnecting communication or transmission system control equipment, the system user shall request the consent of EMS AD for the disconnection at least three days in advance.

6.8. OPERATION OF POWER SYSTEM STABILITY DEVICE

6.8.1. The power system stability device shall be active during normal operation and operation under disturbed system conditions, where so required by EMS AD. In the case of a pumped-storage hydro power plant, EMS AD may require that such device be active in both generating mode and pumping mode.

6.8.2. A system user may temporarily deactivate the power system stability device solely during the start-up or shut-down process of a synchronous generating module.

6.8.3. If stability analyses indicate that the installation of oscillation damping systems is necessary, EMS AD and the owner or the holder of the right of use of the synchronous generating module shall initiate activities for the installation of such systems.

6.8.4. All modifications to system stability devices at system users' facilities, or on synchronous generating modules that affect the stability of the transmission system, shall be agreed with EMS AD.

6.9. REPORTING ON TRANSMISSION SYSTEM OPERATION

6.9.1. INTRODUCTION

6.9.1.1. EMS AD shall monitor and analyse the operation of the transmission system on the basis of operational data relating to individual parts, i.e. elements, of the transmission system, which shall be collected through:

- the technical control system;
- remote measurement and signalling devices;
- oral and written communications submitted by system users.

6.9.1.2. Reports on the operation of the transmission system shall comprise regular and extraordinary reports. System users shall submit to EMS AD all data necessary for the preparation of the reports referred to in this section, within the deadlines and in the format specified by EMS AD.

6.9.1.3. In the preparation, submission and publication of reports, EMS AD shall pay particular attention to the confidentiality of the information contained therein.

6.9.2. REGULAR REPORTS

6.9.2.1. EMS AD shall prepare regular reports on the operation of the transmission system. Regular reports shall include data on:

- realised electricity consumption in terms of energy and power;
- realised electricity generation;
- energy consumed for pumping;
- electricity offtaken from the distribution system;
- electricity exchanges with other control areas, i.e. between market areas;
- technical losses in the transmission system;
- voltage levels at characteristic nodes of the 400 kV, 220 kV and 110 kV network;
- participation of system users in ancillary services;
- unavailable generation units and electricity storage facilities, including the causes of unavailability;

- generation, exchange and consumption diagrams;
- outages and faults in the 400 kV, 220 kV and 110 kV network;
- disconnections and reconnections, in the 400 kV, 220 kV and 110 kV network;
- balancing and redispatching;
- implemented generation curtailments at facilities with defined operational constraints during the connection process;
- secured reserves in accordance with ancillary services contracts;
- analysis of the operation of units providing automatic frequency restoration control;
- significant operational events;
- connections of facilities to the transmission system;
- major refurbishments and extensions of transmission system installations and system users' facilities;
- other data relevant to the operation of the transmission system.

6.9.2.2. Regular reports shall be prepared on a daily, weekly, monthly and annual basis and shall contain the relevant data referred to in item 6.9.2.1., in accordance with the content of each report.

6.9.2.3. No later than 31 March of the current year, EMS AD shall prepare a regular annual report on the operation of the transmission system relating to the preceding year and shall publish it on its official website.

6.9.3. EXTRAORDINARY REPORTS

6.9.3.1. EMS AD shall prepare and submit to the competent authorities and the affected system users an extraordinary report on operational events and events in the transmission system in cases where an interruption of electricity supply from the transmission system has occurred, or an interruption of offtake into the transmission system, where a reduction or suspension of electricity exchanges contracted by EMS AD has occurred, or where EMS AD assesses that the consequences of an operational event may jeopardise the normal operation of the transmission system in the forthcoming period and the functioning of the electricity market, within three working days following the occurrence of the event. Where more time than specified is required for the analysis of a disturbance, a preliminary report shall be submitted within the specified timeframe, and the final report shall be submitted within fifteen working days following the occurrence of the event.

6.9.3.2. At the request of EMS AD, a system user shall, without undue delay, submit to EMS AD all data relating to an operational event at its facility which affected the operation of the transmission system.

6.9.3.3. EMS AD shall prepare and submit an extraordinary report to the competent authorities if it assesses that difficulties in the supply of electricity to end users and in the functioning of the electricity market may be expected in the forthcoming period.

6.9.3.4. EMS AD and the system user shall be obliged to ensure efficient exchange of real-time information and archived data, and shall provide, without undue delay, information on significant operational events.

CHAPTER 7: USE AND MAINTENANCE OF FACILITIES

7.1. INTRODUCTION

7.1.1. This Chapter of the Rules lays down, in greater detail, the use and maintenance of facilities, the content of facility operation agreements concluded with end users, generators, distribution system operators and closed distribution system operators, the obligations of system users and EMS AD in the functional testing and commissioning of parts of the distribution system at the 110 kV voltage level operated by EMS AD, as well as the obligations relating to elements of the electric power system within the facilities of generators and end users that have an impact on the secure and reliable operation of the transmission system. Furthermore, this Chapter regulates the testing of the operation of protection and control equipment following significant operational events or disturbances in the operation of the transmission system, as well as the training of personnel of system operators and system users in the field of operational procedures, with the aim of ensuring the secure and reliable operation of the transmission system.

7.1.2. The system user shall ensure that the technical conditions for the connection of its facility to the transmission system, or to the part of the distribution system at the 110 kV voltage level operated by EMS AD, as stipulated by applicable regulations and the connection approval act, are complied with throughout the entire period of operation of the facilities. Where any non-compliance with the said conditions is identified, the system user shall take the necessary measures to remedy such non-compliance within the time limit defined by EMS AD, in accordance with Section 7.6. of these Rules.

7.1.4. In accordance with applicable regulations, the owner of the facility, or the holder of the right of use of the facility, shall ensure that maintenance works on the facility are duly carried out. Regular, extraordinary and specialist inspections and testing of facilities may also be performed by other legal entities that meet the prescribed requirements with regard to qualified personnel and technical equipment necessary for the performance of such activities.

7.1.5. In the event of a fault in the transmission system facilities, EMS AD shall undertake the following actions:

- notify the competent authorities of the fault;
- temporarily mitigate the consequences of the facility fault;
- provide the necessary goods, services, and works to eliminate all consequences of the fault and restore the affected facility to its designed condition.

7.2. GENERAL CONDITIONS FOR THE USE OF FACILITIES

7.2.1. The general conditions for the use of transmission system facilities and system user facilities shall define the technical and organisational requirements for the operation of these facilities, which are relevant for the normal operation of both the transmission system and the facilities themselves.

7.2.2. All technical and organisational requirements prescribed by these Rules, as well as by the rules governing the connection of a facility to the transmission system, shall be considered as the general conditions for the use of transmission system facilities and system user facilities.

7.2.3. If the use of facilities occurs outside the general conditions defined by these Rules and the act governing the connection of the facility to the transmission system, the system user, or

EMS AD shall, in accordance with its obligations, take measures to ensure that the use of the facility is brought into compliance with the provisions of the aforementioned rules or act.

7.2.4. If a system user requests special conditions for the use of their facility, which are approved by EMS AD, or if the measures set out in Item 7.2.3. cannot be implemented, all such special conditions for use shall be incorporated into the facility operation agreement.

7.2.5. Special conditions for the use of a system user's facility shall not compromise the normal operation of the transmission system.

7.2.6. Special conditions for the use of one system user's facility shall not result in additional costs for other system users.

7.2.7. A generating unit within the energy park shall not inject active power into the network exceeding the value of the approved capacity. In the event of unavailability of the limiter installed in accordance with the rules governing the connection of the facility to the transmission system, EMS AD shall limit the power at the point of connection to the approved capacity value.

7.3. CONTENT OF THE FACILITY OPERATION AGREEMENT

7.3.1. The facility operation agreement, in addition to the general elements of a contract in accordance with the law governing contractual obligations, shall specifically include information on:

- the facilities to which the agreement applies;
- ownership limits of primary, secondary, and other equipment;
- the competent control centres of EMS AD and the system user;
- authorised personnel for technical cooperation;
- EMS AD personnel entitled to access transmission system facilities;
- technical characteristics of the facility;
- exchange of technical documentation;
- technical parameters related to the measurement of electrical energy;
- charging parameters on the basis of which charges for access to the transmission system are calculated;
- the operation of protection devices, telecommunications equipment, and control equipment;
- monitoring of electricity quality parameters and measuring devices related to the assessment of electrical energy quality;
- planning of outages and execution of works on power elements;
- planning of transmission system operation in accordance with the rules on interconnection operation, including the format and method of data submission;
- signals exchanged in real time between the EMS AD technical control system and the system user;
- methods for controlling the quality of supplied electrical energy;
- technical parameters of installed equipment required for modelling in the EMS AD technical control system;
- participation of facilities in Defence Plans and Transmission System Establishment Plans;
- confidential technical information.

7.3.2. In addition to the information listed in Item 7.3.1., the facility operation agreement may also include special operating conditions of the facilities, provisions relating to occupational

health and safety, as well as rules for the substitution of missing data for electricity settlement purposes.

7.3.3. 7.3.3. For system users for whom EMS AD determines a requirement, based on the network connection rules and interconnection operation rules, and in accordance with the technical characteristics of the facilities, an obligation is defined to provide valid and up-to-date simulation models of the facilities that accurately simulate the behaviour of these facilities under both steady-state and dynamic conditions, as well as the format in which they are to be submitted.

7.3.4. The facility operation agreement is non-restrictive with respect to the general conditions of use, i.e., the standard services provided by EMS AD.

7.3.5. For facilities connected to the part of the 110 kV distribution system operated by EMS AD, a tripartite agreement shall be concluded between EMS AD, the system user, and the distribution system operator.

7.4. AUTHORISED PERSONNEL

7.4.1. For the efficient use of transmission system facilities and system user facilities, it is necessary for EMS AD and system users to authorise personnel for technical cooperation.

7.4.2. Personnel for technical cooperation shall be appointed for the following activities:

- planning the operation of the transmission system;
- managing the transmission system;
- planning outages and execution of works on power system elements in the 400 kV, 220 kV, and 110 kV network;
- operation of the protection system;
- operation of the metering and electricity settlement system;
- operation of the electricity quality system;
- operation of the communications system;
- operation of the technical control system;
- operation of local regulation equipment for frequency maintenance and for automatic frequency restoration;
- provision of technical standards, procedures, and documentation;
- occupational health and safety, as required.

7.4.3. For the appointed personnel, the following information shall be provided:

- first name and surname;
- company name;
- organisational unit of the company;
- address of the company’s organisational unit;
- telephone number;
- mobile phone number;
- e-mail address.

The format and deadlines for the exchange of the above information shall be determined by EMS AD.

7.4.4. EMS AD and system users shall process the personal data of employees referred to in Item 7.4.3. i.e. personal information, in accordance with the applicable data protection legislation regulating that area.

7.4.5. In the event of changes to the information referred to in Section 7.4.3, EMS AD and the system user shall in due time notify the other party of any changes to their lists of authorised personnel, including the corresponding data.

7.5. ACCESS TO FACILITIES FOR EMS AD PERSONNEL

7.5.1. 7.5.1. Upon timely notification by EMS AD, the system user shall guarantee access to its facility, under the conditions defined by the system user's internal acts and the facility operation agreement, as soon as possible and under all circumstances, to EMS AD personnel appointed for the following activities:

- verification of the correctness and settings of protection devices on elements of the first, second, and third Categorisation groups, as well as on elements galvanically connected to these elements;
- verification of the accuracy of meters and associated measuring equipment;
- collection of disturbance and fault records, as well as chronological event logs from protection and control devices;
- collection of information from the *SCADA* system of the system user facility;
- verification of the correct operation of communication devices relevant for transmission system communication;
- verification of the proper functioning of devices for real-time data acquisition and exchange with the EMS AD technical control system;
- verification of the proper functioning and adjustment of frequency maintenance regulators and local equipment for automatic frequency restoration;
- verification and adjustment of voltage regulators;
- disconnection of electricity supply;
- permanent disconnection of the facility from the transmission system.

Access to a system user facility shall not authorise the appointed EMS AD personnel to perform works on the system user's equipment.

For facilities of distribution system operators, the aforementioned activities shall be additionally coordinated in accordance with the prescribed responsibilities and duties of the transmission and distribution system operators.

The system user shall have the right to be present during the aforementioned activities.

7.5.2. Access to sealed parts of metering equipment shall be granted exclusively to EMS AD representatives, except in cases where the safety of personnel or equipment is at risk. The owner, or holder of the right to use the facility containing the metering equipment, shall report such cases to EMS AD within 24 hours of seal breakage.

7.5.3. The system user shall provide access to the facility to the appointed EMS AD personnel for the purpose of carrying out the scheduled functional testing of the system user facility, as referred to in Section 7.6. of these Rules.

7.6. FUNCTIONAL TESTING OF SYSTEM USER FACILITIES

7.6.1. Functional testing shall be conducted on system user facilities in the following cases:

- mandatory upon commissioning of the facilities, as part of the verification of compliance with the conditions specified in the connection approval, in accordance with the rules governing the connection of facilities to the transmission system;
- periodically during the operational lifetime of the facility, in cases and at intervals specified by the interconnection operation rules, particularly

regarding the pre-qualification or qualification process for the provision of ancillary services, i.e. the network rules relating to the connection of facilities, in order to verify facility compliance;

- as required:
  - after significant operational events or disturbances in the operation of the transmission system;
  - after observed irregularities in the operation of the facility;
  - after large-scale maintenance works or changes to the settings of operational parameters of equipment relevant to the transmission system;
  - due to the needs of the transmission system user.

7.6.2. The procedures for carrying out functional tests at the time of connection of a facility to the transmission system, as well as the criteria for the successful completion of such functional tests, are governed by the rules regulating the connection of facilities to the transmission system.

7.6.3. The method of conducting functional tests within the prequalification and qualification processes for the provision of ancillary services is regulated in Section 6.2.7. of these Rules.

7.6.4. For facilities of system users that are in operation, EMS AD shall periodically carry out verification of compliance of the technical characteristics of the facilities and the operational procedures implemented by the system user with the issued act on connection approval, these Rules, the rules governing the connection of facilities to the transmission system, the interconnection operation rules, and/or the applicable network rules relating to the connection of facilities. For facilities that do not hold a connection approval decision, compliance verification shall be conducted on the basis of the available technical documentation.

7.6.5. Compliance verification shall be carried out at least once every 10 years, or earlier in the event of changes to technical requirements relating to availability, changes to equipment, or following the identification of operational irregularities of the facility.

7.6.6. EMS AD shall define a compliance verification protocol for facilities, which shall be published on the official website of EMS AD.

7.6.7. EMS AD and the system user shall agree on the scope, plan, methodology and timing of the compliance verification of the facility.

7.6.8. If, during the compliance verification, the facility does not meet the prescribed requirements, EMS AD and the system user shall agree on the measures to be undertaken in order to eliminate the causes of non-compliance, as well as on the deadline for the implementation of such measures. The system user shall be obliged to inform EMS AD, within the agreed timeframe, of the measures implemented to achieve compliance. Following the implementation of appropriate measures to remedy the non-compliance, a repeat compliance verification of the system user's facility shall be carried out in order to confirm that the previously identified non-compliance has been resolved. In the event that the identified non-compliances are not remedied within the agreed timeframe, EMS AD shall act in accordance with the regulations governing the energy sector.

7.6.9. If, during the compliance verification, it is determined that the operation of the system user's facility endangers other system users, EMS AD shall define all available measures, including the suspension of delivery or offtake of electrical energy, in order to eliminate such risk in the shortest possible time.

7.6.10. The compliance verification of facilities referred to in Item 7.6.4. shall not include the verification carried out within the prequalification or qualification process referred to in

Section 6.2.7. These two processes may be carried out in parallel where this is acceptable to both the system user and EMS AD.

7.7. TECHNICAL STANDARDS, PROCEDURES AND DOCUMENTATION

7.7.1. In the performance of its activities, EMS AD shall apply the technical standards, procedures and documentation of the system user.

7.7.2. The system user shall be responsible for the accuracy of its standards, procedures and documentation and shall timely inform EMS AD of all relevant amendments thereto. Failing this, the system user shall bear full responsibility for any consequences arising from the failure to inform EMS AD in a timely manner.

7.7.3. At the request of EMS AD, the system user shall provide, for existing facilities, the following:

- a single-line diagram of the facility, including basic data on the installed equipment;
- parameters required for real-time data exchange;
- procedures to be applied in the event of unavailability of its control centre;
- other standards, procedures and documentation relevant to the operation of the facility, as deemed necessary by EMS AD;

in the format required by EMS AD.

7.7.4. The system user shall submit to EMS AD the basic operating instructions for its facility operation (instructions relating to the operation of the facility, the execution of switching operations within the facility, and similar matters).

7.7.5. If such instructions are not provided, EMS AD shall not be responsible for any consequences arising from the lack of such information.

7.7.6. EMS AD shall timely inform the system user of the current content of and any amendments to:

- the Rules;
- documents (including the Categorisation and similar documents) governing the operation of the transmission system that are relevant to the use of the system user's facilities;
- technical documentation of transmission system facilities relevant to the use of the system user's facilities.

7.7.7. The system user shall be obliged to implement, within its facilities, all newly introduced amendments relating to the labelling of power system elements, as defined in the Categorisation, immediately upon receipt of notification from EMS AD. Such labelling shall be implemented as supplementary to the labels defined in the facility's technical documentation and shall thereafter be used in the operation of the facility.

7.8. TRAINING OF EMS AD AND SYSTEM USERS' PERSONNEL

7.8.1. EMS AD shall train its personnel in operational procedures in accordance with the company's internal acts, the interconnection operation rules, and these Rules.

7.8.2. The programme, method, scope, type of training, and the persons authorised to deliver training to the transmission system operator's personnel shall be adopted and determined by EMS AD through its internal acts.

7.8.3. At the request of a system user, EMS AD may provide training to the personnel of such system users, in accordance with the company's internal acts and under the conditions and in the manner mutually agreed between EMS AD and the system user.

CHAPTER 8: ELECTRICAL ENERGY METERING

8.1. INTRODUCTION

8.1.1. This Chapter of the Rules lays down, in greater detail, the metering procedures, including the required metering equipment, the criteria for selecting the accuracy class of metering devices and the characteristics of associated devices and equipment, the procedures for testing and control of metering equipment, the commissioning of metering equipment; metering data and the use of metering data, depending on the position of the metering point within the system and the category of the system user, as well as the frequency and methodology for verifying the correctness of metering points, metering devices and other equipment used for metering purposes, the content of control reports, and the method for determining unauthorised consumption.

8.2. SCOPE OF APPLICATION

8.2.1. Provisions of these Rules shall apply to metering points at all points of delivery and offtake of electrical energy within EMS AD transmission facilities, facilities of system users connected to the transmission system, and the part of the 110 kV distribution system operated by EMS AD.

8.2.2. The provisions of these Rules shall also apply to metering points in 400/x kV/kV and 220/x kV/kV transformer bays on the lower-voltage side within the transmission network.

8.2.3. Provisions of these Rules shall also apply to metering points in line bays of 400/x kV/kV, 220/x kV/kV and 110/x kV/kV facilities within the transmission network.

8.2.4. Provisions of these Rules shall also apply to metering points for own consumption within EMS AD facilities, except for those for which the distribution system operator or the closed distribution system operator is responsible.

8.2.5. Provisions of these Rules shall also apply to metering points at medium voltage in the distribution network, if the line is used for the delivery of electrical energy to a neighbouring power system and where electricity meters installed at such points are read and maintained by EMS AD.

8.2.6. The location of each metering point, together with the required parameters of the metering equipment at each metering point, for the purposes of settlement metering or control metering of electrical energy, shall be defined by the rules governing the connection of facilities to the transmission system.

8.2.7. The technical requirements for instrument transformers, meters, metering circuits and associated equipment to be met by metering equipment used for settlement metering of electrical energy in the facilities of system users that are in operation shall be defined by the rules governing the connection of facilities to the transmission system.

8.3. USE OF METERING DATA

8.3.1. In accordance with the provisions of these Rules, data obtained from metering constitute the key inputs for the following business operations:

- the balance of measured electrical energy flows at all entry points into the transmission network and at all exit points from the transmission network within

the relevant settlement period, specified by metering points and voltage levels, and, in the case of interconnections, with physical flows reduced to the interconnection boundary;

- the calculated power diagram or the energy injected into the transmission network within the relevant settlement period, obtained as the aggregate of the registered load diagrams (15-minute average power values) of all measured entry points into the transmission network, whereby this diagram is disaggregated into the power, or respectively energy, diagram of generation unit, the diagram of all electrical energy inputs into the transmission network via interconnection lines, and the diagram of all electrical energy inputs from the distribution network into the transmission network;
- the calculated power and energy diagram of electrical energy delivered from the transmission network, obtained as the aggregate of the registered load profiles (15-minute average power values) of all measured exit points from the transmission network within the relevant settlement period, with this diagram disaggregated into the energy diagram of all internal outputs (net consumption) and the diagram of all electrical energy outputs from the transmission network via interconnection lines;
- the calculated energy or power diagram of technical losses in the transmission network within the relevant settlement period;
- the calculation and invoicing of access to the transmission system for each transmission system user;
- the harmonisation of settlement data relating to electricity exchanges over interconnection lines with neighbouring control areas;
- the determination of the total monthly amount of energy corresponding to technical losses in the transmission network for the purposes of planning the procurement of electrical energy to cover transmission network technical losses;
- the calculation of balancing deviations of participants in the electricity market;
- the issuance of guarantees of origin.

8.3.2. EMS AD shall provide the metering data of a system user, without the system user's consent or prior notification, to:

- the system user's supplier, in the case of a full supply contract;
- the balance responsible party that is balance responsible for that system user;
- competent institutions, for the purposes of monitoring and ensuring transparency of the electricity market, in accordance with the regulations governing the energy sector.

8.4. METERING DATA

8.4.1. Meters at each metering point shall measure and register the following electrical quantities:

- active energy received (A+);
- active energy delivered (A-);
- reactive energy received (R+);
- reactive energy delivered (R-);
- maximum active power during the settlement period – import direction (A+);
- maximum active power during the settlement period – export direction (A-).

8.4.2. The transaction direction — import (+) or export (–) shall be considered from the perspective of the system user.

8.4.3. At each metering point, a load diagram shall be recorded in the form of 15-minute average active power or reactive power values for each interval within the settlement period.

8.4.4. Metering data, together with an associated timestamp (minute, hour, day, year), shall be stored in the meter registers.

8.4.5. The daily period for metering points on interconnection lines shall begin at 00:00 Central European Time and end at 24:00 CET. For all other metering points, the daily period shall begin at 07:00 local time and end the following day at 07:00 local time.

8.4.6. The settlement period for all interconnection metering points shall correspond to the calendar month, with readings of settlement and control meters taken at 00:00 on the first day of the month and at 24:00 on the last day of the month. The settlement period for all other metering points within the transmission network shall begin with the reading of settlement and control meters at 07:00 on the first day of the month and end with the reading of meters at 07:00 on the first day of the following month.

8.4.7. The acquired data on delivered and received electrical energy for the settlement period, obtained from the energy registers of the meters, together with the data on 15-minute load diagrams of delivered or received electrical energy, shall constitute the primary settlement metering data used for the calculations referred to in Section 8.3. of these Rules.

8.4.8. In the event of a dispute regarding remotely read data, the values recorded in the corresponding meter registers, read locally via the optical port of the meter or via the RS232 serial port, shall be considered as the authoritative values.

8.4.9. At each metering point, it shall be possible to read the following data on the meter display:

- the current cumulative values of active energy registers in kWh (secondary configuration) or in kWh or MWh (primary configuration) and reactive energy in kvarh or Mvarh for each configured direction of power flow;
- the last frozen snapshot of energy registers, as well as the current register values, in metering units;
- the maximum 15-minute average active and reactive power for each configured direction of power flow in W, kW or MW, and var, kvar or Mvar, for both the current and the previous settlement periods;
- the current time and date on the meter;
- the quadrant of the current active and reactive power directions;
- the presence of metering voltages;
- the corresponding *OBIS* code of the measured quantity;
- any fatal alarm;
- the currently active tariff (if energy is registered per tariff directly on the meter).

8.5. COMMISSIONING OF METERING EQUIPMENT

8.5.1. Following any works on metering equipment or the replacement of metering equipment, EMS AD shall perform the following activities:

- review of metering equipment characteristics;
- verification of compliance tests carried out by the supplier;
- configuration of the meter and data registers;
- verification of the meter's accuracy class;
- inspection of correct galvanic connections (of all metering and communication circuits) of the meter;

- verification of the availability of local and remote readings of the registered values from the meter;
- control of the integrity of seals on the metering equipment;
- recording of metering equipment identifications.

8.5.2. Upon completion of the activities listed in Item 8.5.1., EMS AD shall prepare a compliance report of the metering point, indicating whether the metering point complies with the technical requirements set out in the rules governing the connection of facilities to the transmission system and other relevant regulations governing settlement metering of electrical energy, as well as identifying any deficiencies that the system user shall rectify, if applicable.

8.5.3. The system user shall act in accordance with the compliance report of the metering point referred to in Item 8.5.2.

8.5.4. After commissioning, no modifications to the metering equipment shall be carried out without prior written consent from EMS AD.

8.5.5. In the event that works are required on equipment that forms part of the metering assembly after commissioning, the system user shall notify EMS AD no later than five working days before the planned commencement of the works, or immediately upon identifying the need for urgent intervention. For each modification to the metering equipment, a repeat verification and commissioning shall be performed for all functions listed in Item 8.5.1.

8.6. METERING EQUIPMENT CONFIGURATION

8.6.1. Metering equipment configuration shall mean:

- the selection and definition of the transformation ratios of metering transformers installed at the metering point;
- the selection of the quadrant in which electrical energy shall be measured and registered, depending on the possible direction of electrical energy;
- the configuration of the meter at the metering point in accordance with the requirements for transmission system access settlement and other electricity settlements.

8.6.2. The transformation ratios of the metering transformers shall be defined by EMS AD according to the voltage level, point of connection, and the transmission capacity of the equipment.

8.6.3. Meter configuration shall mean the determination of the internal parameters of the meter in accordance with the technical characteristics of the metering point and the requirements specified by EMS AD. The meter configuration may be primary or secondary, depending on whether the meter displays primary or secondary values of the settlement quantities. Each meter configuration shall have a unique label (name).

8.6.4. The system user may request that EMS AD configure the meter so as to allow monitoring of other quantities measured by the meter, in addition to the settlement quantities.

8.6.5. A list of all applied transformation ratios of metering transformers and meter configurations at all metering points shall be recorded in the relevant document, in accordance with the agreement between EMS AD and the system user.

8.6.6. For each metering point, EMS AD shall define and implement meter configuration parameters required for their operation, data registers, device supervision, and communication links, in order to ensure:

- measurement in accordance with the required accuracy class;
- recording of measured values in the form of 15-minute time intervals;

- availability of local and remote communication to all authorised parties entitled to access metering data.

8.6.7. Only EMS AD shall be authorised to change the configuration of the metering equipment.

8.6.8. EMS AD shall be responsible for maintaining and updating the metering equipment configuration so that it is always compatible with the characteristics of the connection point.

8.6.9. EMS AD shall notify the system user in writing of any changes to the meter configuration.

8.6.10. Settlement constants for electrical energy and power shall be appropriately entered into the settlement applications and may only be modified through a specific written order issued by EMS AD based on a settlement constant change report prepared jointly by authorised representatives of EMS AD and the system user.

8.6.11. EMS AD shall provide the working meter configuration to the system user as a document upon request.

8.6.12. EMS AD shall record and archive all data justifying the working meter configuration.

8.7. METERING EQUIPMENT TESTING AND CONTROL

8.7.1. METERING EQUIPMENT TESTING

8.7.1.1. EMS AD shall test the correctness and accuracy of metering equipment at each metering point during operation, with meters being tested at least once per year.

8.7.1.2. During the procedure for testing the correctness and accuracy of metering equipment, the following activities shall be performed:

- inspection of the correctness and integrity of all seals on the metering equipment;
- visual inspection of the transformation ratios of current and voltage transformers;
- verification of all connections from metering transformers to the meter;
- verification of correct meter operation, including standard testing;
- verification of the meter's status and configuration;
- verification of the display of the meter;
- verification of the functioning of meter output contacts;
- verification of local and remote communication with the meter.

8.7.1.3. In the event that the test results indicate that one or more components of the metering equipment no longer comply with the technical requirements set out in the act on connection approval, the owner or the holder of the right to use such component shall replace the faulty component as soon as possible upon receipt of the test results. In the case of equipment failure for which redundancy exists, this period shall not exceed 30 days.

8.7.1.4. Following the replacement of old metering equipment or the installation of new metering equipment, EMS AD shall perform an on-site testing of the newly installed equipment.

8.7.1.5. If EMS AD or the system user suspects that the metering equipment is not operating correctly, EMS AD shall organise testing of this equipment as soon as possible from the moment EMS AD is notified of the suspected malfunction.

8.7.2. METER CONTROL

8.7.2.1. EMS AD shall carry out controls of installed meters at least once per year.

8.7.2.2. Meter controls under operational conditions (at the point of measurement) shall be carried out using test standards of a higher accuracy class than that of the meter being tested. The test standard shall generate a report containing the date and time of the test, as well as the measured meter error.

8.7.2.3. For the purpose of meter control, EMS AD shall perform the following activities:

- Visual inspection of the meter's proper operation and the display of metering data on the meter registers;
- Visual inspection of the integrity of all seals on the meter;
- Comparison of the energy values recorded by the settlement meter with the energy values recorded by the control meter (if installed at the specific measurement point) – any deviation shall remain within the limits defined by the accuracy classes of both the billing and control meters;
- Acquisition of signals from supervisory devices;
- Analysis of signals and alarms recorded in the meter event logbooks;
- Analysis of phase voltage values supplied to the meter at the point of measurement;
- Analysis of the phasor diagram of instantaneous voltages and currents and verification of their correct sequence at the point of measurement;
- Verification of the meter measurement error under operational conditions against measurements performed with a portable reference standard;
- Preparation of a meter control report.

8.7.2.4. The owner, or the holder of the right to use the facility, shall ensure the verification of correct meter operation within the facility through on-site supervision and signal readings. In the event of an alarm or signal indicating a deviation from proper meter operation, the system user shall immediately notify EMS AD.

8.7.3. CONTROL OF METERING TRANSFORMERS

8.7.3.1. EMS AD and the owner of the metering transformers shall carry out control of installed metering transformers within periods defined by the acts governing the metering activities, or whenever deemed necessary (extraordinary control), provided that the conditions for successful control are met (e.g., during facility maintenance or disconnection of the metering circuit).

8.7.3.2. For the purpose of metering transformer control, the following activities shall be performed:

- Visual examination of the metering transformers;
- Verification of the integrity of all seals on the metering transformers;
- Verification of the conformity of primary-side connections of current metering transformers with the documentation available at the facility and that held by EMS AD;
- Measurement of the transmission ratio of the metering transformer;
- Measurement of the secondary load of the metering transformer;
- Acquisition of signals from supervisory devices;
- Analysis of signals and alarms recorded in the event logbooks at the facility;
- Analysis of phase voltage and current values.

8.7.3.3. The owner, or the holder of the right to use the metering transformers, shall control the correct operation of the metering transformers at the facility through on-site supervision and signal readings. In the event of a malfunction or a signal indicating a deviation from proper operation of the metering transformers, the system user shall immediately notify EMS AD. The owner of the metering transformer and EMS AD shall jointly analyse the event and determine whether replacement of the metering transformer is required.

8.7.3.4. If it is determined that a metering transformer is defective, the owner, or the holder of the right to use the metering transformer, shall carry out the replacement of the equipment. The defective metering transformer shall be replaced in agreement with EMS AD as soon as possible from the moment the owner, or the holder of the right to use the metering transformer, is notified of the suspected malfunction. The replacement shall be executed with a metering transformer of the same or similar type, based on standard delivery times provided by the supplier, and in accordance with the capabilities of the transmission system to perform the replacement.

8.7.4. CONTENT OF THE METER CONTROL REPORT

8.7.4.1. Upon completion of the control of a meter at the point of measurement, EMS AD shall submit a meter control report to the transmission system user. The meter control report shall, as a rule, include the following:

- Date and time of the control;
- Identification of the point of measurement;
- Identification, type, manufacturer, and year of manufacture of the meter;
- Controlled metering quantities (active, reactive power);
- Data on the measured quantities during the meter control;
- Measured meter error;
- Statement on whether the meter complies with the declared accuracy class, and any additional comments if necessary;
- Signatures of the authorised representatives of EMS AD and the transmission system user.

8.8. METERING PROCEDURE

8.8.1. METERING DATABASE

8.8.1.1. EMS AD shall maintain a database of meters, as well as the measured values from these devices, to which the provisions of the Rules apply.

8.8.1.2. The database shall contain the identification of metering equipment in accordance with the unique *EIC Z* code, which shall enable the determination of the following:

- Location of the connected, or associated facility;
- Connection or associated point;
- Data on the system user;
- Data on the current supplier, as well as previous suppliers of the system user;
- Data on the balance responsible party;
- Settlement constant for each user's point of measurement;
- Composition of metering equipment, configuration and results of maintenance activities;
- Identification and values measured and recorded at the connection or associated point;
- Access rights to data and measures taken to prevent unauthorised access.

8.8.1.3. It is necessary at all times and under all conditions to know the source of each metering value used in accordance with the purpose and requirements of the Rules.

8.8.1.4. EMS AD shall update the database within a maximum period of two weeks from the date of commissioning a meter or from any modifications to metering equipment.

8.8.1.5. The metering database shall contain original values collected remotely or locally from meters, adjustments for data corrected for technical losses of electrical energy in transmission

and transformation and substituted values in accordance with Item 8.8.4. The database shall enable:

- Identification of the metering equipment corresponding to each quantity and value obtained from the metering equipment, in accordance with its database code;
- Determination of the type of measurement (kW, kWh, MWh, kvar, kvarh, Mvarh) for each value;
- Clear and unambiguous identification of the original value, the loss-adjusted value, and substituted value;
- Link to the original value for each corrected or substituted value;
- Timestamp indicating the date of acquisition of the original values and the date of data substitution.

8.8.1.6. EMS AD shall make the measured and calculated values from the metering database available to system users for facilities through which electricity is delivered to or offtaken from them, as well as to their suppliers, in accordance with the act governing the procedure for the exercise of end users' rights to access data on their own electricity consumption.

8.8.1.7. System users and their suppliers shall access metering and settlement data through an online platform, which displays all data obtained via remote meter readings, as well as all settlement results for the user. Through this platform, users shall be able to view and download only data related to their use of the transmission system, while suppliers shall be able to download only data related to the metering points of the users they supply. Exceptionally, at the request of a distribution system operator, EMS AD may grant access to data for a distribution system user whose facility is connected to a part of the 110 kV distribution system operated by EMS AD.

8.8.1.8. The metering database shall contain all relevant data related to the metering equipment operation for the last five years.

8.8.1.9. Data older than five years shall be stored in the database archive. Archiving of the metering database shall be carried out regularly in order to preserve data, with archived data retained for a period of ten years.

8.8.2. REMOTE DATA ACQUISITION

8.8.2.1. EMS AD shall be responsible for the remote acquisition of metering data recorded locally by meters in order to populate the metering database.

8.8.2.2. Such remote data collection shall be carried out in accordance with the communication protocols specified in the rules governing the connection of facilities to the transmission system, through the communication medium and communication interface with the metering equipment.

8.8.2.3. In the event of a prolonged communication interruption, EMS AD shall perform local meter readings and shall transfer the recorded data directly to the database. This procedure shall be carried out within a timeframe that ensures all necessary metering data are available for settlement purposes.

8.8.2.4. EMS AD shall regularly read metering data at each facility at specified time intervals. The reading period shall be determined in accordance with the needs for transmission system access settlement, the requirements for imbalance settlement, and the obligations assumed under contractual agreements, taking into account the time required to perform data validation and substitution processes.

8.8.2.5. The reading interval shall be one day. If conditions on the communication lines do not allow the collection of metering data, EMS AD shall review the acquisition periods with a view to implementing more frequent meter readings.

8.8.3. DATA VALIDATION

8.8.3.1. EMS AD shall verify and confirm the plausibility of the acquired metering data and perform data validation prior to the entry of metering data into the database.

8.8.3.2. The purpose of the procedure for verifying the validity of data obtained from measurements shall be as follows:

- to verify whether any data are missing or whether any information is incomplete following meter reading;
- to verify whether the metering equipment was subject to inspection, repair, or any local intervention during the period for which meter readings were performed;
- to determine whether the monitoring device indicates the absence of auxiliary power supply on the days on which data were read;
- to confirm that no deviation of the meter's local time from the reference time occurred throughout the entire settlement period;
- to determine whether all collected data are plausible and consistent with the feasible load levels at the respective metering point.

8.8.3.3. During the validation process, the metering data obtained from settlement meters shall be compared with data obtained from control meters. Subsequently, the energy calculated on the basis of the difference in energy register readings shall be compared with the energy derived from the load diagram. Furthermore, the acquired data shall be compared with data from the previous settlement period, as well as with data for the same settlement period in previous years.

8.8.3.4. The permissible difference between values registered by the settlement meter and the control meter shall be within the limits of the declared accuracy class of the meters.

8.8.3.5. The permissible difference between the electrical energy calculated on the basis of the load diagram and the energy calculated on the basis of the initial and final meter register readings shall be less than 0.1%.

8.8.4. DATA SUBSTITUTION

8.8.4.1. In the event of data invalidity or the identification of a measurement error, EMS AD shall perform the substitution of invalid metering data. i.e. missing metering data.

8.8.4.2. EMS AD shall substitute invalid or missing metering data taking into account the following order of precedence:

- by using data registered by the control meter, where such a meter forms an integral part of the metering equipment and where the accuracy of such data has been verified;
- by estimation based on a similar previous period of electrical energy exchange over the transmission network;
- alternatively, by using data obtained from the EMS AD *SCADA* system, where data for the relevant metering point are available.

8.8.4.3. In cases prescribed by the act governing the conditions for the supply of electrical energy, the substitution of metering data shall be carried out in accordance with that regulation.

8.8.4.4. EMS AD shall document the substitution of metering data for the purposes of internal audit and settlement control.

8.8.4.5. If , during testing, regular or extraordinary control of the metering equipment, it is established that measurement or registration of metering data was incorrect, the metering data shall be replaced in the database in accordance with the substitution rules set out in this Section, for the period:

- from the date of occurrence of the fault until the moment of fault rectification, if the time of occurrence of the fault can be reliably determined, provided that such period shall not exceed the maximum period defined in the regulation governing the conditions for the delivery and supply of electrical energy;
- determined on the basis of an analysis of the available data, provided that such period shall not exceed the maximum period defined in the regulation governing the conditions for the delivery and supply of electrical energy.

8.8.4.6. If the substitution of metering data is carried out after settlement has been completed, a correction of the settlement shall be performed, and the substituted data, together with the method used for their determination, shall be provided to the user.

8.9. ACCESS TO METERING DATA

8.9.1. Direct access to metering data from meters via remote and local communication shall be permitted only to authorised EMS AD personnel responsible for data configuration, maintenance, validation, substitution and acquisition, as well as to metering data users. Metering data users shall include:

- the system user or its authorised representatives, for the purpose of inspection and collection of data relating to its metering point;
- the system user's supplier;
- other persons, in accordance with applicable regulations.

8.9.2. EMS AD shall be responsible for organising and issuing appropriate authorisations for access to metering data and for defining access right levels, while at the same time ensuring the security of local data at the facility and within the database.

8.9.3. EMS AD shall ensure the delegation of remote access rights to metering data at the meter by defining a list of authorised metering data users, with the aim of avoiding conflicts between authorised parties. EMS AD shall allocate access time to metering data, taking into account the data acquisition requirements of EMS AD and metering data users, in accordance with the principle of non-discrimination.

8.9.4. Failure to comply with the provisions governing the allocation of access time to metering data shall result in the revocation of access rights to metering data.

8.9.5. EMS AD shall ensure the security of locally registered data on meters, as well as the security of the metering data database and meter registers.

8.9.6. EMS AD may modify data read from the meter solely for the duration of meter testing. For each meter test, a test report shall be prepared, containing information on unregistered or incorrectly registered electrical energy.

8.10. METHOD FOR DETERMINING UNAUTHORISED CONSUMPTION

8.10.1. EMS AD shall determine unauthorised consumption based on regular or extraordinary control of the metering point, i.e. based on the meter control, testing of metering equipment, inspection of the metering point and connection site, as well as analysis of other available data and information in accordance with applicable energy regulations.

8.10.2. EMS AD shall calculate unauthorised consumption for the period during which the unauthorised electricity consumption was identified, in accordance with the act governing the calculation of unauthorised consumption.

CHAPTER 9: CONNECTION TO EMS AD TECHNICAL SYSTEMS FOR THE PURPOSE OF PROVIDING BALANCING ANCILLARY SERVICES

9.1. INTRODUCTION

9.1.1. This chapter defines the technical requirements for connection to:

- the EMS AD telecommunications system;
- the EMS AD remote meter reading system;

so that distribution system users connected at voltages below 110 kV, closed distribution system users, and aggregators can participate in the market for balancing ancillary services in accordance with regulations governing the energy sector (hereinafter referred to as Balancing Service Providers – BSPs).

9.1.2. Facilities connected to the transmission system, as well as the part of the 110 kV distribution system managed by EMS AD for the provision of balancing ancillary services, shall fulfil the technical requirements for connection in accordance with the rules for connection of facilities to the transmission system.

9.2. CONNECTION TO THE EMS AD TELECOMMUNICATIONS SYSTEM

9.2.1. METHOD OF CONNECTION TO THE TELECOMMUNICATIONS SYSTEM

9.2.1.1. Connection to the EMS AD telecommunications system shall be implemented in the following cases:

- connection of a BSP facility for the provision of frequency containment reserve and manual frequency restoration reserve;
- connection of a BSP facility for the provision of automatic frequency restoration reserve;
- connection of an aggregator control centre.

9.2.1.2. The cases of connection to the EMS AD telecommunications system referred to in Item 9.2.1.1. shall be addressed from the following perspectives:

- the data and signals exchanged between EMS AD and the balancing service providers;
- the telecommunications topology and the method of connection to the EMS AD technical control system;
- the infrastructure for real-time data exchange between EMS AD and BSPs;
- the protocols for real-time data and signal exchange;
- the application of cybersecurity standards.

9.2.1.3. For the purposes of meeting cybersecurity requirements, in all cases considered for connection to the EMS AD telecommunications system referred to in Item 9.2.1.1., the requirements of the rules governing the connection of facilities to the transmission system shall apply.

9.2.1.4. The BSP shall be obliged to provide two independent voice communication lines to the EMS AD control centres.

9.2.1.5. The BSP shall bear all costs associated with connection to the EMS AD telecommunications system, which, depending on the method of connection, may include equipment at its facility, provision of the transmission path to the EMS AD telecommunications system or to the distribution system operator or closed distribution system operator, as well as the procurement of additional data transmission equipment necessary for the provision of balancing ancillary services.

9.2.2. DATA AND SIGNALS EXCHANGED BETWEEN EMS AD AND BSPS

9.2.2.1. For the purpose of providing frequency containment reserve, the BSP facility and the aggregator control centre shall be equipped to exchange the following data and signals:

Type	Data Name	Data Description
Measurement	Three-phase active power	MW (– consumption, + generation)
Measurement	Base active power	MW
Measurement	Information on the current value of the active power setpoint	MW
Measurement	Frequency control droop	%
Measurement	Frequency control deadband	mHz
Measurement	Frequency control limiter	MW
Alarm	Frequency control status	On, Off

9.2.2.2. For the purpose of providing automatic frequency restoration reserve, the BSP facility and the aggregator control centre shall be equipped to exchange the following data and signals:

Type	Data Name	Data Description
Measurement	Three-phase active power	MW (– consumption, + generation)
Measurement	Ramp rate of power change in automatic frequency restoration control	MW/min (+ increase of power)
Measurement	Target active power	MW
Measurement	Maximum active power in automatic frequency restoration control	MW
Measurement	Minimum active power in automatic frequency restoration control	MW
Alarm	AGC status	On, Off
Pulse	AGC pulses / setpoint	higher / lower / MW
Command	Instruction for participation in automatic frequency restoration control	On, Off

9.2.2.3. For the purpose of providing manual frequency restoration reserve, the BSP facility and the aggregator control centre shall be equipped to exchange the following data and signals:

Type	Data Name	Data Description
Measurement	Three-phase active power	MW (– consumption, + generation)
Measurement	Generator base active power	MW
Measurement	Maximum active power in manual frequency restoration control	MW
Measurement	Minimum active power in manual frequency restoration control	MW

Measurement	Information on the current value of the active power setpoint at the generating unit	MW
Setpoint	Active power setpoint	MW (– consumption, + generation)
Alarm	Active power setpoint indication	Local, remote
Measurement	Active power setpoint feedback	MW (– consumption, + generation)

9.2.3. CONNECTION OF A BSP FACILITY FOR PROVISION OF FREQUENCY CONTAINMENT RESERVE AND MANUAL FREQUENCY RESTORATION RESERVE

9.2.3.1. If a BSP facility is connected to the telecommunications system of a distribution system operator or the closed distribution system operator, communication between the EMS AD control centre and the BSP facility shall be conducted indirectly via the telecommunications system of the distribution system operator or the closed distribution system operator, provided that the technical capabilities for such communication are defined by the rules governing the operation of the distribution system or the closed distribution system.

9.2.3.2. EMS AD and the distribution system operator or the closed distribution system operator shall agree on their mutual activities to ensure communication between the BSP facility and the EMS AD control centre for the case described in Item 9.2.3.1.

9.2.3.3. If the BSP facility is not connected to the telecommunications system of the distribution system operator or the closed distribution system operator, or if communication cannot be established as described in Item 9.2.3.1., the connection method described in Item 9.2.4.2. shall be used.

9.2.4. CONNECTION OF A BSP FACILITY FOR PROVISION OF AUTOMATIC FREQUENCY RESTORATION RESERVE

9.2.4.1. If a BSP facility provides the service of automatic frequency restoration reserve, communication between its facility and the EMS AD control centre shall be established in accordance with the facility's compliance with the response time requirements to control pulses, as set out in the rules governing the connection of facilities to the transmission system.

- - If the required response speed can be achieved via the connection method described in Item 9.2.3.1, this method shall be used for providing the automatic frequency restoration reserve;
- Otherwise, the facility shall be connected to the EMS AD telecommunications system via public telecommunications service providers.

9.2.4.2. If the facility is connected to the EMS AD telecommunications system via public telecommunications service providers, the BSP shall ensure redundant data transmission from its facility to the EMS AD control centre in one of the following two ways:

- Using two different public telecommunications service providers if the same data transmission technology is applied, utilising separate telecommunications infrastructures as shown in Figure 9.1.;
- Using a single public telecommunications service provider if two different data transmission technologies are applied (leased lines, optical fibres, radio-relay links, mobile network – GSM, xDSL…), as shown in Figure 9.2.

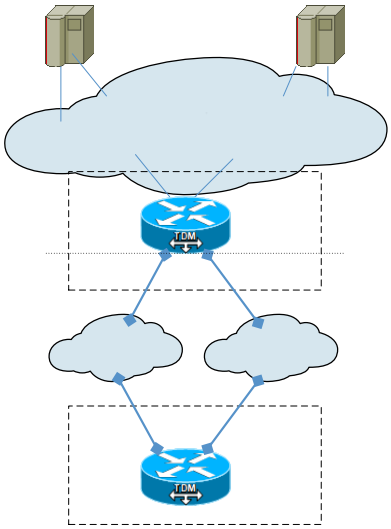

Figure 9.1. – Connection to the EMS AD telecommunications system via two public telecommunications service providers

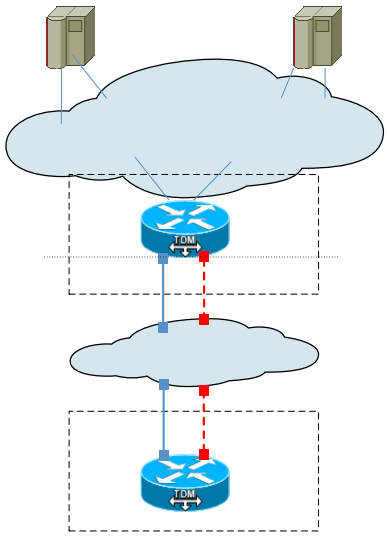

Figure 9.2. – Connection to the EMS AD telecommunications system via one public telecommunications service provider

9.2.4.3. EMS AD shall determine the connection point to its telecommunications system and define the requirements for the telecommunications infrastructure, equipment and services, which shall be compatible with the EMS AD telecommunications system.

9.2.4.4. To establish the connection between the BSP facility and the EMS AD control centre, in both cases described in Item 9.2.4.2., only Ethernet network technology and the IEC 60870-5-104 protocol for real-time data exchange shall be used.

9.2.5. CONNECTION OF AN AGGREGATOR CONTROL CENTRE

9.2.5.1. The aggregator control centre shall be connected to the EMS AD telecommunications system depending on its location and the type of ancillary service for which the aggregator seeks prequalification, as follows:

- As a system user facility, with connection requirements defined in the rules governing the connection of facilities to the transmission system;

- As a distribution system user facility, connected to the telecommunications system of the distribution system operator, in accordance with the rules governing the operation of the distribution system and Section 9.2.1. of these Rules;
- As a distribution system user facility, connected to the EMS AD telecommunications system, in accordance with Section 9.2.4., provided that the primary communication path shall be established using fixed telecommunications technologies, such as: optical fibres, telecommunications lines, xDSL, or similar technologies.

9.2.5.2. The aggregator control centre shall be equipped and staffed to operate continuously.

9.2.5.3. The aggregator control centre shall be equipped to possess:

- at least two independent voice connections to EMS AD control centres (primary and backup), whereby one of the connections is established via the EMS AD telecommunications system;
- an e-mail address;
- an appropriate technical control system for monitoring the operation of facilities participating in the provision of balancing services (which shall include supervision of the signals referred to in Section 9.2.2. whereby the aggregator shall provide aggregated measurements covering all members of the aggregator group and individual measurements for all facilities with installed capacity greater than 1 MW).

9.3. CONNECTION TO THE REMOTE METER READING SYSTEM

9.3.1. GENERAL REQUIREMENTS FOR METERS

9.3.1.1. A user of the transmission, distribution, or closed distribution system providing balancing ancillary services, either directly or via an aggregator, shall, at its own expense, install a separate electricity meter that shall record its response in the function of a BSP to an activation request. This meter shall be installed adjacent to the existing settlement meter provided by the system operator to which the user is connected.

9.3.1.2. The electricity meter used to record the provided ancillary service shall comply with metrological and technical requirements in accordance with the regulations governing metrology and the following standards:

- SRPS EN IEC 62053-22 – Static meters for active energy (accuracy classes 0.1S, 0.2S, and 0.5S);
- SRPS EN 50470-3 – Static meters for active energy (class index C);
- SRPS EN IEC 62053-23 – Static meters for reactive energy (accuracy classes 2 and 3).

9.3.1.3. The meter shall bear the seal of the transmission system operator, affixed to the cover of the meter's connection terminals and to the meter's reset button.

9.3.2. METER ACCURACY CLASS

9.3.2.1. The declared accuracy class of meters shall depend on the voltage level of the metering point and shall be shown in the following table:

Table 9.1.: Meter Accuracy Class

Metering Point	Meter Accuracy Class:	
	Active energy metering	Reactive energy metering
High voltage (110 kV – 400 kV)	0.2S	2

Medium voltage (6 kV – 35 kV)	0.2S	2
Low voltage (below 6 kV)	0.5S	3

9.3.3. METER POWER SUPPLY

9.3.3.1. The meter shall be supplied from the voltage metering circuits at the meter terminals and from the auxiliary power source. These two power sources shall be galvanically separated.

9.3.3.2. In the event of failure of both power sources, the meter's internal battery shall provide power to the devices's time base for at least the following three months.

9.3.4. DATA RECORDING IN METERS

9.3.4.1. Meters used for the registration of provided ancillary services shall be configured to record active and reactive power diagrams in all four quadrants, with a measurement resolution of 1 minute.

9.3.4.2. The internal memory of the meter shall store the register states of active and reactive power diagrams for at least the previous two months, after which cyclic overwriting shall take place: the third month shall overwrite the first month, and so forth. Metering data stored in the internal memory shall be retained even in the event that the meter is not powered.

9.3.5. TIME BASE IN METERS

9.3.5.1. Each meter shall be equipped with an internal time base. These internal clocks shall be set to the locally applicable official time. The time base shall support automatic seasonal time adjustment as applied within the territory of the Republic of Serbia.

9.3.5.2. In the absence of an external synchronisation signal, the internal clock shall not deviate by more than 15 seconds per month.

9.3.5.3. Synchronisation of the internal clock shall be performed either via remote communication with the meter through the distribution of signals from the system operator's reference time base, or via distribution of signals from a local device providing accurate time distribution.

9.3.5.4. The meter shall be equipped with a configurable synchronisation window. The default synchronisation window setting shall be ±9 seconds.

9.3.5.5. EMS AD shall remotely synchronise the time bases of meters, which shall take priority over local synchronisation.

9.3.6. METER COMMUNICATION

9.3.6.1. Communication Protocol

9.3.6.1.1. All values registered by the meters shall be read:

- locally via the optical port in accordance with IEC 62056-21;
- remotely via the dlms/cosem protocol in accordance with IEC 62056-42/46/53/61/62.

9.3.6.1.2. Remote communication between meters and the remote meter reading system shall be implemented via the meter's RS-485 serial port.

9.3.6.2. Communication Medium

9.3.6.2.1. For the purposes of remote meter reading, one of the following communication media shall be provided:

- Optical fibre integrated within the overhead line earth wire, if available (OPGW/Ethernet);

- GPRS mobile network, LTE, and 5G.

9.3.6.2.2. A single communication line may serve multiple meters and may also be used for several metering points, provided that the meters are grouped approximately at the same location and differently addressed, using exclusively the RS-485 communication port.

9.3.6.2.3. The communication medium shall ensure continuous availability of the meters for remote reading purposes.

9.3.6.3. Communication Interface

9.3.6.3.1. To enable connection to the communication medium, meters shall incorporate communication interfaces compatible with supporting devices such as modems, communication splitters, multiplexers, optical cable termination equipment, and other auxiliary equipment.

9.3.6.3.2. Communication units may be internal (integrated into the meter) or external, as separate communication devices.

9.3.6.3.3. For external communication devices, the connection to the meters shall be realised via the RS 485 serial port.

CHAPTER 10: TRANSITIONAL AND FINAL PROVISIONS

10.1. Until the transfer of ownership rights over transmission system facilities that are owned by transmission system users, EMS AD shall manage parts of the facilities of end users and generators, in accordance with Items 1.2.2.–1.2.4. of these Rules.

10.2. EMS AD shall adopt an Over-Frequency Protection Plan by 31 December 2025.

10.3. For facilities of transmission system users which, at the date of entry into force of these Rules, provide ancillary services referred to in Section 6.2., but have not completed the prequalification procedure, verification of prequalification of the technical capability to provide the relevant ancillary service shall be conducted by 31 December 2028. Until then, the prequalification procedure for the provision of balancing ancillary services shall be deemed fulfilled.

10.4. Facilities of transmission system users which, prior to the entry into force of these Rules, have provided voltage control ancillary services and do not hold an issued connection approval, shall provide voltage control services in accordance with their technical capabilities. Technical capabilities shall be determined by EMS AD through verification of technical parameters relevant to voltage control for such facilities, based on the achieved performance parameters during the provision of the service, which shall be deemed to constitute the technical requirements for voltage control, within six months from the date of entry into force of these Rules. The defined technical requirements shall not be amended until the issuance of the connection approval.

10.5. EMS AD and the distribution system operator shall jointly determine the threshold for the transfer of electrical energy from the distribution system to the transmission system for each distribution system operator facility connected to the transmission system, in accordance with the law governing energy sector, i.e. the use of renewable energy sources, within six months from the date of entry into force of these Rules.

10.6. The provisions of Item 8.2.5. of these Rules shall apply until the metering point is taken over by the distribution system operator, within the timeframe defined by the law governing the energy sector.

10.7. At the request of EMS AD, transmission system users, whose facilities are connected to the transmission system at the date of entry into force of these Rules, and for which verified simulation models have not been submitted, shall be obliged to submit updated and validated simulation models of their facilities within a maximum of two years from the date of entry into force of these Rules. Such models shall accurately simulate the behaviour of the facilities under steady-state and dynamic conditions, in a format specified by EMS AD.

10.8. For facilities of transmission system users which, at the date of entry into force of these Rules, provide balancing ancillary services, EMS AD shall, at its own expense, install the meters referred to in Item 9.3.1.1. by 31 December 2030.

10.9. Upon the entry into force of these Rules, the Rules on Transmission System Operation, number: 000-00-ROU-18/2023-003 from 07/11/2023 shall cease to apply.

10.10. Upon obtaining the approval of the Energy Agency of the Republic of Serbia, these Rules shall be published on the official website of EMS AD and shall enter into force on the date of its publication.

CHAIRMAN OF THE ASSEMBLY

Milun Trivunac, MSc in Economics

(*Illegible signature*)

An elliptical stamp affixed hereto, containing the following: Joint Stock Company "Elektromreža Srbije", Belgrade

EMS AD BELGRADE
ASSEMBLY
Classification Code: 1-4-0
Number: 000-00-ROU-20/2025-002
Belgrade 22/12/2025