UNOFFICIAL ENGLISH TRANSLATION

TRANSMISSION GRID CODE

November, 2023

Pursuant to Article 116 of the Energy Law ("Official Gazette of RS", no. 145/2014, 95/18-other law, 40/21, 35/23-other law and 63/23) and Article 28, paragraph 1, point 29 of the Statute of Joint Stock Company Elektromreža Srbije Belgrade ("Official Gazette of RS", no. 88/16), the General Assembly of the Joint Stock Company Elektromreža Srbije Belgrade at its 126th extraordinary session held on 7/11/20203 adopted the following:

TRANSMISSION GRID CODE

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CHAPTER 1: GENERAL PROVISIONS

1.1. SUBJECT MATTER OF THE TRANSMISSION GRID CODE

1.1.1. The Transmission Grid Code (hereinafter: the Code) regulates the following:

1) planning the development of the transmission system, including the development plan contents, planning method and investment plan contents;
2) conditions for secure and reliable transmission system operation;
3) obligations of transmission system users required for secure and reliable transmission system operation;
4) obligations of both transmission system users and operator in function testing and commencement of one part of the 110 kV voltage distribution system controlled by the transmission system operator, as well as in the elements of the power system of the facilities of producers and end customers that affect the safe and reliable operation of the transmission system, as well as in testing the operation of protective and control devices after significant operational events or disturbances in the transmission system operation;
5) content of the contract on exploitation of the facility concluded with the buyer, producer, distribution system operator and closed distribution system operator;
6) use and maintenance of facilities;
7) parameters and method of electricity quality control;
8) transmission system operation planning;
9) procedure for registration and confirmation of schedules of the balance responsible parties;
10) types and scope of ancillary and system services;
11) operative procedures and managing the transmission system under normal conditions and in the case of disturbances;
12) access to the transmission system, payment security instrument for system access payment and criteria for determining amount and period requested;
13) metering procedure with defined necessary metering equipment, criteria for choosing the metering device accuracy class and characteristics of accompanying devices and equipment, procedures for testing and controlling the metering equipment, putting the metering equipment into operation, metering data, the use of metering data, depending on the position of the metering point in the system and the type of system user;
14) frequency and method of checking the correctness of the measuring point, measuring and control devices in the function of measurement, content of the control report, method of determining unauthorised consumption;
15) measures that are taken in the event of disruption of the power system, as well as due to works on the maintenance and expansion of the power system;
16) training of operator personnel and transmission system users in the area of operative procedures, with the aim of secure and reliable transmission system operation;
17) other issues necessary for the transmission system operation.

1.2. TRANSMISSION SYSTEM AND THE SCOPE OF THE CODE APPLICATION

1.2.1. Transmission system operator, in addition to transmission system, also manages a part of distributive system, which, as a rule, includes: 110 kV bus coupler bays, 110 kV line bays and 110 kV busbars, as well as 110 kV transformer bays in function of bus coupler bay or line bay, in accordance with the Categorization of the power system elements referred to in points 1.2.2-1.2.4.

1.2.2. Depending on the voltage level of the facility and the element impact on the reliability of the transmission system and interconnection,400 kV, 220 kV and 110 kV power system elements are normally classified according to the following general criteria of categorization into:

- the first group: the power system elements of 400 kV and 220 kV voltage level and 110 kV interconnection lines, with the associated bays;
- the second group: the power system elements of 110 kV that are important for reliable operation of power generation facilities and 110 kV interconnection lines;
- the third group: 110 kV power system elements that do not fall under the criteria for the first and second group, which are managed by JSC EMS;
- the fourth group: the power system elements that are not managed by JSC EMS.

1.2.3. JSC EMS shall create the document Categorization of elements 400 kV, 220 kV and 110 kV (hereinafter referred to as: the Categorization), which shall contain a list of all transmission lines, cables, mixed lines, transformer substations and switchyards, with full title, numbering and categorization of elements of the transmission system facilities and the transmission system users' facilities of 400 kV, 220 kV and 110 kV. More detailed criteria of Categorisation are determined by JSC EMS. JSC EMS shall be responsible for maintaining a single register of facilities and elements of EES 400 kV, 220 kV and 110 kV, with regular updating of the Categorization and delivery to the transmission system users at each change.

1.2.4. Apart from the transmission system itself, the scope of application of the Code also covers the power system elements of 400 kV, 220 kV and 110 kV, classified under Categorization into the first, second or third group of the power system elements, and are not the part of the transmission system.

1.3. UNFORESEEN CIRCUMSTANCES

1.3.1. JSC EMS shall be authorised to take measures in the event of unforeseen circumstances during the application of the Code, i.e. the circumstances the occurrence of which could not be prevented, whereby the effects of these circumstances may result in altered technical requirements for the transmission system use and may cause damage to the transmission system users.

1.3.2. JSC EMS shall take the measures referred to in Section 1.3.1. in agreement with the transmission system users affected by altered technical requirements for the use of the system. Immediately upon determining the possible methods of eliminating the consequences of unforeseen circumstances, JSC EMS shall be obliged to notify the affected transmission system users and to suggest measures that can be taken, as well as the deadline in which said measures should be taken.

1.3.3. If JSC EMS and the user cannot reach an agreement on measures to be taken within the given time interval, JSC EMS shall decide on implementing the measures for the prevention or elimination of consequences of unforeseen circumstances. JSC EMS shall be obliged to implement such measures that reduce the consequences for the transmission system users to a minimum.

1.3.4. The transmission system user shall be obliged to abide by all the instructions issued by JSC EMS in order to implement appropriate measures in the course of unforeseen circumstances.
1.3.5. JSC EMS shall be obliged to prepare a report on the implementation of measures in the event of unforeseen circumstances, following the procedure for drafting special reports on the transmission system operation, which provides, inter alia, the causes of the occurrence of unforeseen circumstances, the measures taken, as well as the consequences these circumstances. In accordance with the Code, the report shall be submitted to the transmission system users and, among other competent bodies, to the Commission for monitoring the implementation of the Transmission Grid Code.
1.3.6. No later than 45 days from the date of occurrence of unforeseen circumstances, JSC EMS shall prepare and submit for review and compliance the initiative for amending the Code, for the purpose of regulating this issue, if this amendment solves the cause of the occurrence of unforeseen circumstances.

1.4. COMMISSION FOR MONITORING THE IMPLEMENTATION OF THE TRANSMISSION GRID CODE

1.4.1. The Commission for monitoring the implementation of the Transmission Grid Code (hereinafter the Commission) is a body that monitors the implementation of the Code and considers initiatives for amending the Code.
1.4.2. JSC EMS shall provide the conditions for the Commission operation.
1.4.3. The members of the Commission are:

- 6 representatives of JSC EMS, one of whom acts as the Chairman of the Commission;
- 2 representatives of electricity producers whose facilities are connected to the transmission system;
- 1 electricity storage representative whose facility is connected to the transmission system;
- 1 representative of privileged electricity producers whose facility is connected to the transmission system;
- 2 representatives of the distribution systems operators;
- 1 representative of a closed distribution system operator connected to the transmission system;
- 1 representative of a public supplier;
- 2 representatives of suppliers;
- 2 representatives of end users whose facilities are connected to the transmission system;
- 1 representative of prosumers whose facility is connected to the transmission system;
- 1 representative of aggregators whose facilities are connected to the transmission system.

1.4.4. The representative of the Energy Agency of the Republic of Serbia (hereinafter: Agency) participates in the Commission work without voting and decision-making rights.
1.4.5. The member of the Commission who represents the group of transmission system users shall be appointed for a period of two years.
1.4.6. Within the group, a member of the Commission shall be determined by the order list, compiled on the basis of:

- number of the permit issued by the Agency's Register of Issued Permits, for the transmission system users;

- registration number in the Register of privileged electricity producers, kept within the Ministry in charge of energy;
- alphabetical order of the transmission system users' facilities, that is, aggregators for which Agency licenses are not issued.

1.4.7. The Commission adopts Rules of procedure, regulating the working method of the Commission, specially:

- organisation and working methods of the Commission;
- organisation and convening the sessions;
- the course of the sessions;
- making and submitting meeting minutes, decisions, conclusions, opinions, proposals, recommendations, etc.;
- keeping the materials created during the work of the Commission and other matters of importance for the work of the Commission.

CHAPTER 2: GLOSSAR

2.1. TERMS

2.1.1. The terms used in the Transmission Grid Code have the meanings defined by energy sector regulations, with the exception of:

GENERATION ADEQUACY – assessment of generating unit capacity within a certain area to secure the required electricity supply and the system balancing. Transmission system operator shall examine the mid-term and short-term generation adequacy for its area according to the interconnection operation rule. As a rule, short-term adequacy covers the period of the next 7 days, while medium-term adequacy represents a period of up to 10 years.

ACTIVE POWER – Mean value of current power value calculated during one period of basic frequency.

BALANCING OF THE TRANSMISSION SYSTEM – The process of activating secondary and tertiary reserves in order to maintain the sum of power exchange with the neighbouring transmission systems and the frequency at the planned value. Deviation from the declared reserve activation merit order list of balancing mechanism is not allowed, except when the operation of the transmission system is compromised.

BALANCE GROUP – Virtual area that can receive electricity, or from which electricity can be delivered, which is used for the purpose of billing and financial settlement from the aspect of balance responsibility. It includes a set of accounting points in the transmission, or distributive system, as well as the receipt and delivery of energy on the basis of power exchange blocks.

BALANCE ENTITY is the entity for system balancing or re-dispatching, which can be:

a) a single generating unit;
b) a group of generating units – within one or more production facilities;
c) controlled consumption – which represents the facility of the end user, that is, prosumer that can regulate consumption upon the request of the transmission system operator;
d) electricity storage facility.

BALANCE RESPONSIBLE PARTY – Participant in the electricity market who is balance responsible for the deviation of one balance group in the market area of Serbia and who has concluded the agreement on balance responsibility with the transmission system operator.

DEAD TIME – Time from the beginning of protection and impulse giving for tripping the breaker, to the impulse for turning the breaker on by the device (function) for automatic reclosing (AR). Dead time does not include the time of tripping, or turning the breaker on.

BLACK START OF A GENERATING UNIT – Capability of a generating unit, when disconnected from the grid, to return to the operational regime and to start delivering the power, in the situation when a part of the transmission system it is connected to is de-energized.

BLOCK OF ELECTRICITY EXCHANGE – Reported exchange of energy between two balancing groups within the same trading zone or between a balancing group and a cross-border partner (block of cross-border exchange), in a given time interval, of defined block value and exchange direction.

ELECTRICITY METER – A device for measuring and recording electricity and power. Electricity meter is a multifunctional device: it measures active and reactive power per Time of Use tariffs, registers load profile of active and reactive power and controls the switching between internal tariff registers in the meter.

VALIDATION – Validity check of measuring data acquired from remote or local communication, carried out according to predefined algorithms and analysis of logbooks of events registered in the meters.

WIND POWER PLANTS – An energy park unit consisted of a unique set of devices (wind turbines, wind generators, block transformers, cable network and power transformers), which uses wind energy to produce electricity.

FORCE MAJEURE – Indicates an event or circumstance, or a series of events or circumstances that cannot be avoided, predicted, or removed, resulting in the impossibility of performing part or all obligations.

LINE – A common term for transmission line, cable line or mixed line.

INTERVENTION SWITCHING ON TIME - The time required to safely switch on the EES element that has been switched off due to works, calculated from the moment when the order for emergency switch-on is issued.

AREA CONTROL ERROR – Current difference (ΔP) between the actual measured exchange power in the real time (P) and planned values of power exchange within the control area (P_0), corrected for the value of a frequency member of that control area (the regulation constant (K factor) of the given control area multiplied by frequency deviation (Δf) from the nominal value).

REMOTE DATA ACQUISITION – Remote collection of metering data from the meters in the authorised metering data accounting centre.

DAILY OPERATING SCHEDULE OF ORGANIZED ELECTRICITY MARKET – electronic document containing results of day-ahead or intra-day trading on organized electricity market in the form of internal power exchange blocks. JSC EMS is provided this document by operator of organized electricity market or legal entity authorised by the operator to deliver the daily schedule on behalf of its balance group.

DAILY DISCONNECTION OF THE EES ELEMENT – Disconnection of the EES element due to the performance of work on it or in its vicinity, whereby every day after the completion of the work the element is turned on again.

ALLOCATED TRANSMISSION CAPACITY – The total transmission capacity properly allocated to electricity market participants by the transmission system operator.

WORK PERMIT – Type of the document issued prior to the commencement of works on the power system elements, or in the vicinity of the power system elements.

ALLOWED DRIVE CURRENT – The maximum current with which the EES element can be permanently loaded, taking into account the characteristics and conditions of the EES elements, as well as the seasonal climatic conditions of operation. The setting of the first level of overload protection shall be adopted in relation to this value. For the purpose of more efficient functioning of the transmission system, the setting of the first stage of protection against overload can be dynamically changed in transmission lines using a system for monitoring the conductor temperature.

EXPLOITING (USE) OF FACILITIES – Activities aimed at ensuring the best use of the existing, already constructed power facilities and the overall energy system through application of technical and economic methods. In other words, it is a set of control actions (manual or automatic) undertaken to meet the needs of the transmission system users, provided that adequate conditions for normal operation of power systems and the lowest operating costs are met.

POWER PLANT - A unique technical-technological unit where electricity is produced.

POWER FACILITY (FACILITY) – Construction-electric installation used for generation, transmission, distribution or consumption and storage of electricity.

POWER SYSTEM – A set of all interconnected electrical facilities that make a single technical and technological unity.

POWER SYSTEM ELEMENT – Transmission line, cable line, mixed line, transmission line bay, cable bay, transformer, transformer bay, busbar system, bus coupler bay, busbar measurement bay, disconnector etc. Such element is categorized into a specific group of Categorization of 400kV, 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 metering voltage. These metering point codes are generated by JSC EMS.
EMISSION – Electromagnetic interference emitted by a device, equipment, system, or installation that causes a deviation from the normal operation of the system.
EMISSION LEVEL OF THE VOLTAGE QUALITY PARAMETER – The observed emission level, assessed and measured appropriately in accordance with the technical standards governing voltage quality.
PROTECTION DEVICE (PROTECTION) – A device used to protect the power system element from abnormal operating conditions. Protection service is carried out by switching off protected element and sending the alarm signal to the command board.
TRADING ZONE – The largest geographical area within which participants in the electricity market can exchange energy without the distribution of transmission capacity.
EMERGENCY WORKS – Works on the power system elements, or in the vicinity of the power system elements, whose performance is not envisaged by the appropriate outage plans (these works are normally carried out due to actual or potential failure of the power system element), i.e. due to the increased risk for the safety and health of people, the increased risk of fire, that is, endangering property.
INTERCONNECTION (SYNCHRONOUS AREA) – A system of two or more individual transmission systems connected by interconnection lines and in synchronized operation. Within the synchronous area, the system frequency is the same in stationary state.
OUTAGE – Unexpected disconnection of one or more of power systems elements due to failure or other causes.
SINGLE-PHASE AR – Operating cycle of protection and device (function) for automatic reconnecting (AR), which turns off single-phase earth faults (only the phase affected by earth fault) and turns that same phase on after the expiry of dead time.
CAPACITY – Rated continuous load of a generating unit, electricity storage, transmission element or other electrical equipment.
TYPICAL DAY – Calendar Day determined by JSC EMS in compliance with the interconnection operation rules.
CATEGORISATION OF POWER SYSTEM ELEMENTS – The process according to which JSC EMS classifies all 400 kV, 220 kV and 110 kV power system elements into one of 4 groups (categories), according to the classification criteria issued by JSC EMS and published in the Document on Categorization of 400 kV, 220 kV and 110 kV power system elements of the Republic of Serbia. The purpose of categorizing the power system elements is to determine control areas of the JSC EMS control centres and the transmission system users, and to regulate the JSC EMS and the transmission system users' responsibilities related to the use of transmission facilities exploitation.
POTENTIAL FAILURE – Accidental event of internal or external origin, which occurs on the equipment and causes the termination of the function and the outage of the affected, as well as the associated equipment. According to its nature, this failure can be temporary or permanent.
ELECTRICITY METER CONFIGURATION – The setting up of metering and tariff parameters in the meters. Configuration of electricity meter can be primary, when the accounting constant of Metering Point is entered as parameter, or secondary, when it is not.
TRANSMISSION SYSTEM USER – Electricity producer, end user whose facility is connected to the system, prosumer, electricity storage, aggregator, supplier, wholesale

electricity supplier and other system operator whose facilities are connected to the transmission system.
SECURITY CRITERION N-1 – The rule according to which the transmission system elements which remain in operation after the failure of an element from the defined list of failures for the control area are capable of adapting to a new operating situation, without exceeding the limit values of operating parameters.
PROSUMER - The end consumer who has connected his own facility for electricity production from renewable energy sources to the internal installations, whereby the electricity produced is used to supply his own consumption, and the excess electricity produced is handed over to the transmission system, distribution system, i.e. closed distribution system.
LIST OF OUTAGES - List of elements of the transmission network whose outages are taken into account when checking the fulfillment of the "N-1" security criteria.
LOCAL ACQUISITION – Acquisition of metering values from the meters and the data registrars at the Metering Point. Local data acquisition can be performed visually (by observing the status of meter and registers), or by local communication via optical or serial port of meter and register.
LOCAL EQUIPMENT FOR SECONDARY CONTROL – Equipment located at the power plant or the energy park unit which passes the control impulse or set point of active power to the turbine regulator of the generating unit.
TRANSMITION RELIABILITY MARGIN – Part of the cross-border transmission capacity required to ensure reliable transmission system operation due to uncertainty regarding the conditions of the planned transmission system operation. These uncertainties arise primarily from the operation of secondary control, need for electricity exchange due to a breakdown and deviation of the plant from the planned operation in real time.
TRANSFER POINTS - The electricity delivery point, that is, the place of receiving the electricity for which information on the actual delivery or receipt of electricity in the billing period can be provided. This information is determined based on the electricity metering in each accounting period (from one or more meters with the application of reduction coefficients if necessary). Transfer points in particular include: electricity transfer point to the end user, electricity transmission point from the transmission to the distribution system, point of taking over electricity from the producer, electricity transmission point from the distribution to the transmission system, collection point of electricity transmission to the transmission system operator for the purpose of the compensation of electricity losses on the transmission system, the collection point of the electricity transmission to the operator of the distribution or closed distribution system to cover the losses of electricity on the distribution system, the point of electricity reception or transmission on the interconnecting line.
METERING DATA – Metering values stored in the memory registers of the meter. These values refer to active and reactive energy, active and reactive power load profiles, and time and date of maximum loaded. Each metering data is associated with time flag of occurrence, which defines the identity of metering data.
METERING POINT – A point (in electrical means) of connection to voltage and current metering transformers which supply the meters and are used for measuring the power flows between the facility of the transmission system user and the transmission grid.
ENERGY PARK UNIT – A unit or set of units for the electricity production that is connected to the grid asynchronously or via power electronics devices, with one connection point to the transmission system.
400 kV, 220 kV and 110 kV GRID – Power system elements classified into the first, second and third Categorization group. It includes the transmission grid and parts of the transmission system user’s facilities through which electricity is physically transmitted.

GRID MODEL - Mathematical model of the power system elements, their interconnections, and the appropriate set of technical characteristics for different types of energy analysis based on iterative power flow calculations.
VOLTAGE COLLAPSE – Occurrence of rapid lowering of voltage in the transmission system due to lack of reactive power.
VOLTAGE REDUCTIONS – Reduction of operating voltage in distribution grids to which the energy is supplied from the transmission grid, to the value of 95% of the distribution grid rated voltage.
UNINTENDED DEVIATION – Deviation between the realization of cross-border electricity exchanges consisting the programs of control area exchanges, from the plan programs of these exchanges.
VOLTAGE (CURRENT) IMBALANCE – The state of multiphase system in which effective values of interphase voltages or currents (basic component), or phase angles between adjacent interphase voltages or currents are not all equal. The level of inequality is usually expressed by the ratio of inverse and zero components to direct component of voltage or current.
NET TRANSFER CAPACITY – Maximum total exchange program between the two adjacent control areas, i.e. between the subareas within a control area. It is calculated according to the interconnection operation rules.
NORMAL TRANSMISSION SYSTEM OPERATION– Transmission system operation in which all requirements for secure operation of the system are met, including stability requirements, and in which there is no interruption of electricity supply from the transmission system due to causes within the transmission system.
WORKS COMPLETION NOTICE – Type of document issued following the completion of works on the power system elements, or in their vicinity.
OBIS CODE – A unique identification code for all quantities registered in the meter as per IEC
TRANSFORMATION RATIO – A number obtained after by multiplying the transmission ratios of voltage and current metering transformers at the metering point, used for the transferring of the secondary values of energy and power measured by electricity meter, into physical values of energy and power.
MAINTENANCE OF FACILITIES – Overall work aimed at aimed at preserving the constant technical correctness of electric power facilities. Maintenance includes: inspections, checks, audits, and overhauls.
OPERATIONAL LIMITATIONS - Temporary reduction of active power at the point of connection in order to ensure the safe operation of the transmission system.
PRIMARY REGULATION RANGE – Range of primary regulation power adjustment within which primary regulators can provide automatic regulation in both directions, in response to frequency deviation.
SECONDARY REGULATION RANGE– Range of power adjustment on the secondary regulator within which the secondary regulation can work automatically for a certain time, in both directions from the operating point of the secondary regulation power.
ISLAND OPERATION – Operation of a facility in a part of the transmission system separated from the rest of transmission system which is in synchronous operation with the interconnection.
ELECTRICITY EXCHANGE PLAN AND PROGRAM – The electricity exchange plan represents the sum of electricity exchange blocks between trading zones in each time interval and direction of exchange. The electricity exchange program represents the scheduled planned exchange of electricity in each time interval for a control area, between two control areas or for control blocks.
PLANNED LEVEL OF VOLTAGE QUALITY PARAMETERS – The level of disturbance in a certain environment, adopted as a reference value for the limitation of emissions from plants

in a certain system, in order to coordinate these limits with all limits adopted for equipment and installations that should be connected to the system.
DEVIATION – An unplanned event (failure of a transmission system element, a part of production or consumption, electromagnetic interference, etc.) that can cause the state of the transmission system to be outside of normal operation, or further deterioration of the system's condition.
DISTURBED OPERATION – A state in the transmission system that meets at least one of the following conditions:

- frequency deviation exceeds ±200 MHz;
- voltages in individual hubs are not within normal operating values;
- the load currents of some elements of the transmission network are higher than the permitted operating values for those elements;
- the system is unbalanced and the entire reserve for primary, secondary, and tertiary regulation is missing;
- the short-circuit currents in individual nodes are higher than the maximum allowed values for the equipment installed in the given node;
- some of the measures foreseen in the Defence Plans have been activated (operation of under-frequency protection, over-frequency protection, limitation of electricity supply, voltage reduction);
- there is an unavailability of key electronic systems for managing the transmission system, in accordance with the rules on interconnection operation, for more than 30 minutes.

DISTURBED ACCESS – Operating condition at the connection point, at which the effective value of at least one-phase voltage is higher or lower than the required range for normal operating voltages, i.e. when the value of frequency is beyond the range 49.5 - 50.5 Hz (transient phenomena in the transmission system are not taken into account). If the transmission system user has several connection points in one facility, it is not considered that there is a disturbed access if the total transmission capacity of connection points, with normal operating conditions, exceeds the approved capacity of this user.
GENERATING UNIT – A synchronous generating unit or the power park unit.
PLANT – Common name for a transformer substation, switchgear, or connection switchgear.
POTENTIAL FAILURE – Accidental event of internal or external origin, which occurs on the equipment and causes a decrease in reliability of equipment (there is a significant probability of the plant equipment outage and associated equipment outage).
CONSUMPTION (NET CONSUMPTION) – Electricity, or power, taken from the transmission grid or from a part of it.
RELIABILITY – Capability of the transmission system elements to deliver electricity to the corresponding transmission system users over a certain period of time within the accepted standards and in the desired amount. Reliability at the transmission level can be measured according to frequency, duration and size (or probability) of negative effects on consumption, transportation, or generation of electricity.
INTERCONNECTION OPERATION RULES – The rules which the transmission system operators as members of ENTSO-E shall be obliged to implement according to European legislation and internal acts of the organisation.
PRE-QUALIFICATION – The process of checking the compliance of facilities of transmission system users to provide auxiliary services according to the requirements of the transmission system operator.
COMPLIANCE CHECK - the procedure of checking the technical characteristics of facilities and operating procedures that the transmission system users use in their work. The compliance

check is carried out in accordance with: the issued connection act, i.e. the designed technical characteristics for the existing facilities of transmission system users for which there is no connection act, the contracted auxiliary services, this Code, the rules governing the connection of facilities to the transmission system, the rules on interconnection operation and network rules related to the connection of facilities.
CONNECTING DISTRIBUTION FACILITY – Electric power facility through which the facility of the transmission system user is connected.
PRIMARY REGULATION – Primary regulation is an automatic decentralized function of the turbine regulator which adjusts the output power of the generating unit as a result of frequency deviation in the synchronous area. Primary regulation should be distributed, as evenly as possible, to the units that are in operation in the synchronous area.
PRIMARY REGULATOR – Subsystem of turbine regulator for the correction of generating unit output power based on the generator rotation speed, that is, the frequency.
TRANSMISSION SYSTEM BREAKDOWN - Operating state in which a significant part of the consumers (at least 50%) in the control area is without power or there is an absence of voltage in the entire control area for longer than 3 minutes, as a result of which the System Establishment Plan is activated.
AVAILABLE TRANSMISSION CAPACITY – The difference in net transmission capacity and transmission capacity allocated to participants in the electricity market.
AVAILABILITY – The state in which the generating unit, electricity storage or another power system element is able to perform the intended function, regardless of whether it is actually used or not.
DISTRIBUTION FACILITY – A facility in which there is only one voltage level (400 kV, 220 kV or 110 kV).
REACTIVE POWER – Imaginary unit of conjugated complex obtained product of voltage and power. Reactive power creates and maintains electromagnetic fields of AC equipment. Reactive power must be delivered to devices whose operation requires electromagnetic field, such as motors and transformers. Reactive power is generated by generating units, synchronous compensators, or electrostatic equipment such as capacitors and it directly affects voltage in the power system. Reactive power is also generated by overhead transmission lines when loaded below the natural power.
VOLTAGE CONTROL – Coordinated controlling action that includes managing the electricity generation, that is absorbing the reactive power generation in generating units, synchronous compensators, static compensation devices, as well as controlling of the reactive power flow in 400 kV, 220 kV and 110 kV grids by changing the transformation ratio and by turning on/switching off the elements of the 400 kV, 220 kV and 110 kV grids. At generating unit level: automatic or manual adjustment of the excitation current in order to achieve adequate voltage on the generator or on the high-voltage side of the step-up transformer
EXCITATION REGULATOR – Decentralized, locally installed control device for regulating the current excitation of synchronous generating unit.
REGIONAL COORDINATION CENTRE - The body in charge of coordinating the activities of transmission system operators in a certain European region in order to improve the safety and coordination of the transmission system operations (RSC/RCC).
RE-DISPATCHING – Activating tertiary (in exceptional cases secondary as well) reserves in order to maintain or restore normal or safe operation of the transmission system, primarily with the aim of maintaining safety criteria “N-1”. In case of re-dispatching, a deviation from the declared sequence of tertiary reserves activation is possible. As a rule, re-dispatching involves active power increase in a balancing entity and an equal decrease in another balancing entity.
PRIMARY CONTROL RESERVE (PRIMARY RESERVE) – Part of the primary control band measured from the operation point of a generating unit before the disturbance, to the maximum

value of active power of primary control. It can be positive (increase in the production of active power) or negative (decreased in the production of active power). Primary reserve corresponds to the frequency containment reserve (FCR) from the interconnection operation rules which is automatically activated though primary control (FCR).
SECONDARY CONTROL RESERVE (SECONDARY RESERVE) – Part of the secondary control band between the operation point of a generating unit and maximum/minimum value (positive or negative reserve) of active power of secondary control. Secondary control complies with the frequency restoration reserve from the interconnection operation rules which is automatically activated by secondary control (aFRR).
TERTIARY CONTROL RESERVE (TERTIARY RESERVE) – Tertiary reserve is the one activated at any time by the dispatcher's order in less than 15 minutes. Tertiary reserve corresponds to the frequency restoration reserve from the interconnection operation rules, which is manually (upon verbal order) activated through tertiary control, i.e. fast tertiary reserve from the Market Code (mFRR). It should be distinguished from the planned (program) tertiary reserve. Program tertiary reserve is a reserve activated in a period longer than 15 minutes. Program tertiary reserve corresponds to the replacement reserve from the interconnection operation rules which is activated as part of a plan (as a rule, through Transmission System Daily Schedule) by tertiary control, i.e. slow tertiary reserve from the Market Code (RR). According to the direction, tertiary reserve is divided into positive and negative reserve. Positive reserve is considered to be: production increase, cross-border receipt of electricity and reduction of consumption. Negative reserve is considered to be: production decrease, cross-border delivery of electricity and consumption increase.
OPERATOR – A person in the facility responsible for supervising the operation of the facility and execution of orders placed by the responsible dispatch centre related to the facility.
WORKS SUPERVISOR – A person with whom the authorised person of the responsible dispatch centre opens the work permit, after which this person checks the basic measures implemented to secure the work place and applies further measures for safe operation; the person also informs the authorised dispatch centre about the completion of works.
SECONDARY CONTROL (FREQUENCY AND EXCHANGE POWER) – Centralized automatic function that regulates the generation in the control area within the reserve for secondary control, for the purpose of:

- maintaining the cross-border active power flows in accordance with the exchange program with other control areas and simultaneously;
- resetting the pre-set value of frequency in case of frequency deviation caused by the control area (especially in the case of larger frequency deviation caused by the control area, after the outage of big generation unit) in order to release the active power capacity engaged by the primary control (to restore the reserve for primary control).

Secondary control is realized by engaging selected generating units in power plants equipped and included in this type of control.
SECONDARY REGULATOR – A unique centralized equipment of the transmission system operator in each control area that supports the operation of secondary control.
SECURE POWER SYSTEM OPERATION – Power system operation in which the following conditions are met:

1. voltages in all nodes are within normal operating values;
2. frequency deviation does not exceed the following values:
   - ±200 MHz;
   - ±100 MHz for more than 5 minutes;
   - ±50 MHz for more than 15 minutes;

3. load currents of all elements of the transmission grid do not exceed the allowed values for these elements;
4. short circuit currents at all nodes do not exceed the maximum allowed values for equipment installed in the given node;
5. an appropriate band is provided for primary, secondary and tertiary control;
6. safety criterion "N-1" is met, and in case of its disturbance there is a possibility for restoring it in the shortest possible time;
7. all synchronous generators operate in regimes according to their operating diagrams.

SYNCHRONOUS TIME – A fictitious time based on the system frequency in synchronous area that is set with regard to the astronomic time. If synchronized time is ahead of astronomic time, this means that the system frequency is higher than 50 Hz on average, and vice versa.

SYNCHRONOUS GENERATING UNIT – an indivisible set of devices (turbines, generators, and necessary accompanying devices) which can generate electricity so that the frequency of the produced voltage, generator speed and frequency of the network voltage are in constant relation and are thus synchronized.

SCADA SYSTEM – The system for collecting and processing data submitted in real time from transmission facilities and from the transmission system users' facilities. This system is used for operation monitoring, the remote command, and other aspects of the transmission system control.

SYSTEM PROTECTION – Underfrequency and overfrequency protection, overload protection, protection against permanent asymmetry of currents, protection against power oscillations and voltage protection. These types of protections are primarily used to preserve secure operation of the power system.

ELECTRICITY STORAGE - Facilities for delaying the use of electricity in relation to the moment in which it was produced, i.e. facilities for converting electrical energy into other forms of energy and storing such energy for subsequent re-conversion into electrical energy.

SOLAR POWER PLANT – An energy park unit that consists of an indivisible set of devices (solar panels (strings), inverters, block-transformers, cable network and power transformers), which uses the solar energy as a source for the electricity generation (this definition does not refer to the so-called concentration solar power plants that use the solar energy to heat water vapor, which is then used to obtain electricity - this type of generator unit is treated as a turbogenerator unit).

SELF-CONSUMPTION – Energy consumed by the facility for its regular operation. Usually, this consumption is separated from the rest of consumption and is supplied from the separated busbars within the facility. It is also common to provide special connection with the transmission or distribution grid for this consumption, as well as independent power sources.

STABILITY – The transmission system stability is the ability of the system to restore the state of operating balance for the given initial operating state after being exposed to physical disturbance, whereby the most of the system variables are limited, thus the entire system practically remains complete.

TRANSMISSION SYSTEM STATES– In accordance with the rules on interconnection operation, the transmission system can be in one of the following states:

- normal operation;
- normal operation is threatened;
- disturbed operation;
- transmission system breakdown;
- transmission system restoration:

TECHNICAL LOSSES IN THE TRANSMISSION GRID – Power losses, that is, electricity losses that are the consequence of power or energy consumption generated by the heating of elements of the transmission grid, due to the active resistance in these elements (Joule's losses), losses due to hysteresis, losses due to eddy currents, losses due to discharge current in isolation, losses due to corona or dielectric losses.
TECHNICAL CONTROL SYSTEM – System for the exchange and processing of data transferred between facilities and control centres, as well as among control centres, in order to provide conditions for the transmission system control.
TERTIARY CONTROL – Activation of tertiary reserve in order to restore the reserve for secondary control or for the purposes of re-dispatching.
THREE-PHASE AR – Operating cycle of protection and devices (functions) for automatic reclosing (AR) which trips multiphase faults (short circuits and ground faults) at three-phase and activates all three phases after the expiry of dead time.
PERMANENT DISCONNECTION OF THE EES ELEMENT – Disconnection of the power system element due to the performance of works on it or in its vicinity, whereby the element is not switched on every day after the completion of the works, but only after the completion of all works.
TRANSFORMER SUBSTATION (TS) – Electric power facility that contains transformers and enables the transmission of electricity between networks of different voltage levels. TS contains several plants of different voltage levels.
MARKET MODEL – Mathematical model of the electric power system composed of technical and economic characteristics of the elements of the electric power system that are used to calculate the economically optimal engagement of generating units.
TURBINE GOVERNOR – Decentralized, locally installed control device for regulating the position of turbine valves of generating units, that is, the position of the hydraulic unit's control device.
THREATENED NORMAL OPERATION OF THE TRANSMISSION SYSTEM – A state of the transmission system in which all conditions for the safe operation of this system are met, except that:

- the safety criterion "N-1" is not met and there is no possibility of meeting it again in the shortest possible time;
- frequency deviation exceeds ±100 MHz for a duration longer than 5 minutes or ±50 MHz for a duration longer than 15 minutes, but does not exceed ±200 MHz;
- more than 20% of the total required reserve for primary, secondary, or tertiary regulation is missing for more than 30 minutes.

TOTAL TRANSMISSION CAPACITY – Cross-border transmission capacity calculated according to the interconnection operation rules, and represents a sum of net transmission capacity and transmission reliability margin.
TRANSMISSION SYSTEM CONTROL – A set of actions ensuring the transmission system functioning under normal operating conditions, and bringing the system back to normal and safe operation after disturbances. Transmission system control is carried out from the transmission system operator's dispatch centres. Transmission system control includes the regulation of frequency and power exchange, voltage control, supervision of the transmission system operation, rehabilitation of disorders, data collection and more.
CONTROLLED CONSUMPTION – Consumption which can be turned on/off upon operator's request, or whose power can be changed.
TRANSMISSION SYSTEM ESTABLISHMENT - The state of the transmission system, which is in the regime of disrupted operation or transmission system breakdown in which the Plan for the establishment of the transmission system is activated.

POWER FACTOR – Cosine of the phase difference between voltage and current.
FLICKER – Distortion of voltage wave causing discomfort to the sense of sight exposed to the effect of lightening devices that are powered by fluctuating voltage.
FUNCTIONAL TESTS – Tests carried out by the transmission system operator, or the transmission system user under the operator's supervision, within the maintenance and development system, including also the connection of facilities to the transmission system.
BREAKDOWN – Outage of larger scale, significant dysfunction or substantial damage to the facility, part of the facility or to the transmission system element. Breakdowns occur as a consequence of failures or damages to the installed high-voltage or other equipment, or natural disasters and other unforeseen and unexpected events. As a rule, breakdowns cause reduced reliability and safety of the equipment or transmission system operation, which could endanger safety and health of people and property, thus requiring urgent removal of causes and consequences of a breakdown.
HARMONICS COMPONENT (HARMONIC - HIGHER HARMONICS) – any component which has harmonic frequency.
TRANSMISSION SYSTEM USER'S DISPATCHING CENTRE – Dispatching centre, control room or some other facility with local staff authorised to control the facility or part of the power system under the authority of the transmission system user. The authority of this centre is governed by the law, bylaws, and relevant agreements.
CENTRALIZED AUTOMATIC VOLTAGE CONTROL – Voltage control in the transmission system from the control centre of the transmission system operator by sending reference values to local voltage regulators.

2.2. ABBREVIATIONS

2.2.1. Cyrillic abbreviations used in the Grid Code have the following meaning:
AR – Automatic Re-closure;
EPS – Electric Power System;
JSC EMS – Joint Stock Company Elektromreža Srbije
SRPS – denotation for standard and related documents issued by the Standardization Institute of Serbia.;
2.2.2. Latin abbreviations used in the Grid Code have the following meaning:
CIGRE – Conseil International des Grands Reseaux Electriques (International Association for Large Electricity Systems);
ENTSO-E – European Network Transmission System Operators for 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;
aFRR – Automatic Frequency Restoration (secondary reserve);
mFRR – Manual Frequency Restoration (direct tertiary reserve);
RR – Replacement Reserve (planned tertiary reserve);
TYNDP – Ten-Year Network Development Plan;
*RegIP – Regional Investment Plan (*there are six of them for Europe);
ERAA – European Resource Adequacy Assessment (for ten-year period).
RSC/RCC – Regional Security Coordination/ Regional Coordination Centre

ENS – Energy not supplied (Total unsupplied electricity due to interruptions in the reporting period)
AIT – Average Interruption Time (Average supply interruption time in the reporting period)

CHAPTER 3: CONDITIONS FOR SECURITY AND RELIABILITY OF THE TRANSMISSION SYSTEM

3.1. INTRODUCTION

3.1.1. This chapter of the Codes regulates in detail the technical conditions for secure and reliable operation of the transmission system, network transmission capacity, voltage, frequency, safety criterion "N-1", as well as the types of stability analised by JSC EMS.

3.1.2. The conditions for secure and reliable operation of the transmission system are general criteria that JSC EMS applies when performing all technical functions based on the law and other general acts.

3.1.3. The conditions for secure and reliable operation of the transmission system are applied in the process of planning the transmission system development, connecting facilities to the transmission system, planning the transmission system operation, and managing the transmission system. Depending on the specifics, the conditions for each of the mentioned processes can be defined more precisely.

3.2. TRANSFER CAPACITY

3.2.1. Allowed drive current, that is thermal load of all overhead transmission lines and transformers in the 400 kV, 220 kV and 110 kV grid shall be calculated based on the:

- technical specifications;
- expected conditions of operation;
- technical and economic conditions of exploitation;
- current state of overhead transmission lines, i.e. transformers.

3.2.2. JSC EMS does the calculation of the transmission capacity of elements of the grid 400 kV, 220 kV and 110 kV according to:

- allowed values of drive current for transmission lines;
- values of rated power, that is, current for transformers.

3.2.3. It is necessary to dimensionate the entire additional equipment in line and transformer bays in the grid 400 kV, 220 kV and 110 kV (like current instrument transformers, disconnectors, circuit breakers and other equipment) so that it does not pose limitation to transmission capacity in the planned switching state, determined in accordance with the provision 3.2.2.

3.2.4. In the event that it is determined that there is the equipment in transmission lines, i.e. cable or transformer bays in the 400 kV, 220 kV and 110 kV grid, which is a limitation for the transmission capacity, i.e. for the establishment of optimal operating regimes, and which is the property of the transmission system user, it must be adapted or replaced by the transmission system user, in accordance with the harmonized development and investment plans, and within the period agreed between JSC EMS and the transmission system user.

3.2.5. JSC EMS also determines the short-term allowed loads of individual elements of the transmission grid based on the structural characteristics of the elements and the expected operating conditions, including atmospheric conditions.

3.3. VOLTAGE

3.3.1. Nominal values of voltage in the transmission grid of the Republic of Serbia are: 400 kV, 220 kV and 110 kV.

3.3.2. The value of voltage in normal operating conditions in any point of the grids 400 kV, 220 kV and 110 kV are within the following range:

- 400 kV grid: between 360 kV and 420 kV;
- 220 kV grid: between 198 kV and 245 kV;

– 110 kV grid: between 99 kV and 123 kV.

3.3.3. Voltage quality parameters are divided into planned and emission values. The planned values of voltage quality parameters are defined in point 5.3.2.3 of these Codes. The emission levels of voltage quality parameters are defined in the rules governing the connection of facilities to the transmission system.

3.4. FREQUENCY

3.4.1. Nominal value of frequency is 50 Hz. When the transmission system of the Republic of Serbia operates within the interconnection, values from the interconnection operation rules are applied to allowed deviations from the nominal value of frequency in the transmission grid.

3.2.4. In cases when the transmission system of the Republic of Serbia operates in isolation from the neighbouring transmission systems, the allowed frequency in the transmission grid in quasi-stationary state is 50 Hz ± 0.5 Hz.

3.5. SECURITY CRITERION "N-1"

3.5.1. Security criterion "N-1" checks whether the operating parameters (current, voltage) of grid elements after an outage are within the permitted limits, which are included in the outage lists.

3.5.2. Security criterion "N-1" is tested on models, which apart from the JSC EMS transmission system, include models of other transmission system, in accordance with the interconnection operation rules.

3.5.4. Security criterion "N-1" is not applied to "radially fed" consumption or the transmission system elements that radially connect power plant with the transmission system facility.

3.5.5. Outage lists include grid elements in the control area of JSC EMS, as well as grid elements in neighbouring transmission systems located in the external observability zone. Outage lists are divided into: standard outage list, additional outage list and emergency outage list. JSC EMS compiles outage lists in accordance with the rules on interconnection work and according to its own risk assessment.

3.5.6. The standard outage list must be applied when checking the fulfillment of the "N-1" security criteria, in such a way that the individual outage of each of the listed elements is examined:

- 400 kV, 220 kV and 110 kV transmission lines, taking into consideration point 3.5.4;
- transformers 400/220 kV/kV, 400/110 kV/kV, 220/110 kV/kV;
- phase shifting transformers;
- synchronous generating unit connected to the transmission system;
- an element via which a set of generating units is connected to the transmission system;
- facilities for reactive power compensation and voltage regulation;
- electricity storage facility;
- transfer points of electricity from the transmission system.

3.5.7. In cases of exceptional operating conditions (unfavorable meteorological conditions, occurrence of landslides, floods, complex maintenance work etc.), when there is a significant increase in the probability of outages in the transmission system, an additional outage list is applied while checking the fulfillment of the "N-1" security criterion, which includes simultaneous outages:

- elements that fall out of operation simultaneously in case of certain failures in the grid (busbars, bus coupler bay, switch, metering transformer, etc.);
- 400 kV, 220 kV and 110 kV transmission lines built on the same poles;

- 400 kV, 220 kV and 110 kV cables installed in the same trench;
- a facility connected to a transmission system that is technologically connected to another facility, so that the outage in one facility can lead to the outage in another;
- grid elements or elements in facilities connected to the transmission system that simultaneously fall out of operation as a result of the operation of a special protection scheme;
- more generating units connected to 110kV and higher voltage level (including solar and wind power plants) due to voltage drop in the network or frequency deviation.

3.5.8. The emergency outage list is used, where applicable, for transmission system users where a longer supply interruption may endanger the environment and human health (chemical industry, radiation, underground mining, and similar production processes). The emergency outage list includes simultaneous outages of two or more of the following elements:

- 400 kV, 220 kV and 110 kV transmission 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;
- facilities for reactive power compensation and voltage regulation;
- transfer and distribution points in the transmission system users' facilities.

3.6. SHORT-CIRCUIT CURRENTS

3.6.1. The equipment in transmission system operator's and the transmission system users' facilities has to meet calculated values of short circuit currents.

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

3.6.3. The transmission system operator shall be obliged to check the level of short-circuit currents and to take appropriate measures and procedures in a timely manner to limit excessive levels of short-circuit currents, in order to prevent damage or destruction of power system elements, as well as to avoid events dangerous for people and the environment.

3.7. STABILITY

3.7.1. In order to ensure that the transmission system operates in conditions of satisfied stability, JSC EMS shall analise the following types of stability:

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

in accordance with definitions and classification IEEE/CIGRE. Short time interval is considered to be the first 3-5 seconds after disturbance has occurred, i.e. 10-20 seconds for very large systems with dominant oscillations between the areas. Long time interval is considered to be the first 30 seconds for oscillations of synchronisation power between machines, i.e. 15 minutes after disturbance has occurred for transient processes of secondary control.

CHAPTER 4: TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.1. INTRODUCTION

4.1.1. This chapter of the Codes regulates in detail he planning of the transmission system development, the content of the development plan, the method of planning and the content of the investment plan, the bases and data used when planning the transmission system development, i.e. the medium-term generating adequacy, the calculation of secondary and tertiary reserves, the calculation of stability and the calculation of the minimum and maximum short-circuit currents.

4.1.2. Transmission system development planning includes the necessary development of the transmission system and the list of scenarios according to which the operation of this system will take place in the forthcoming period, in order to determine the measures necessary for ensure the normal operation of the transmission system.

4.1.3. The planned construction, reconstruction and extension of transmission system elements provides prerequisites for the connection of the planned generating and distribution capacities, the development of the electricity market and the reliable delivery of electricity for the forecasted level of consumption.

4.1.4. In addition to the technical criteria for the transmission system development planning, JSC MS takes into account the costs of the optimal development of the transmission system in order to reduce them to a minimum.

4.2 TECHNICAL CRITERIA IN THE TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.2.1. This section specifies the method of applying the technical conditions for the secure and reliable operation of the transmission system from chapter 3, which JSC EMS is guided by when preparing the Transmission System Development Plan.

4.2.2. The security criterion "N-1" is used in planning the transmission system development to check outages from the pre-defined outage list, which include outages from point 3.5.6., including the transmission lines that radially supply the facilities of the distribution system operator.

4.2.3. The security criterion "N-1" can be considered fulfilled in development planning if the identified illegal voltage deviations and illegal operating currents, including re-dispatching, can be removed with the available operational measures, provided that its application is economically more profitable than the construction of a new transmission infrastructure system.

4.2.4. The security criterion "N-1" in development planning is considered to be fulfilled in the 110 kV transmission network if there is a possibility of changing the switching scheme in the double-sided power supply of the end user's facility, when one transmission line in the facility is in operation and the other one is disconnected and under voltage on the other side of the power supply.

4.2.5. For new 400 kV voltage level transmission line, if necessary, it can be checked whether there are operating regimes that enable the works on their maintenance for a defined duration, without jeopardizing access to the grid for transmission system users and without violating the technical conditions for secure and reliable operation, in accordance with these Codes.

4.2.6. The equipment that is installed in the transmission system operator’s facilities and in the transmission system users’ facilities is dimensioned to meet the calculated maximum and minimum values of short-circuit currents.

4.3. METHOD OF TRANSMISSION SYSTEM DEVELOPMENT PLANNING

4.3.1. JSC EMS develops and publishes the Transmission System Development Plan every year. The Transmission System Development Plan is prepared for the upcoming ten-year period.

4.3.2. Transmission system development is planned in a way that allows flexible operation of generation capacities in all foreseeable modes of the transmission system operation.

4.3.3. Transmission system planning takes into consideration the need to meet the foreseen consumption of all transmission system users, as well as the foreseen generation to be transferred to the transmission system.

4.3.4. Transmission system planning meets the needs of electricity exchange on the electricity market.

4.3.5. Transmission System Development Plan contains data on total consumption and generation trends with special emphasis on the significant changes, the commissioning of new facilities or de-commissioning of the existing facilities of transmission system users.

4.3.6. The main objective of the Transmission System Development Plan is to provide to all existing and potential users of the transmission system, participants in the electricity market and the competent authorities, the following:

- Comprehensive overview of the transmission system development at a given time interval;
- Overview of major changes in the transmission system (list, locations and basic characteristics of the transmission system facilities which will be reconstructed, expanded, built, or shut down, including the tie-lines).

4.3.7. JSC EMS cooperates with distribution system operators in preparation of the Transmission System Development Plan. In addition to meeting the technical criteria of the transmission system, the following is also taken into consideration:

- Quality of electricity supply to distribution facilities that are radially inter-connected to the transmission system;
- Provision of reserve direction within the distribution system for feeding distribution facilities that are radially connected;

4.3.8. JSC EMS cooperates with European transmission system operators when producing Pan-European ten-year transmission grid development plan (*TYNDP*), regional investment plan(*RegIP*), as well as the report on resource adequacy assessment in Europe (*ERAA*).

4.3.9. Based on recorded historical data, data submitted by transmission system users and submitted requests for connection to the transmission system, JSC EMS creates a consumption and generation forecast for all connection points. As a rule, when forecasting consumption and generation, JSC EMS produces several different scenarios related to future consumption, which cover different economic development routes of the Republic of Serbia.

4.3.10. JSC EMS models the transmission system based on the transmission system parameters. This model shall take into account the real current limitations of all transmission system elements and system protection settings. Grid models are later used for calculation of power flows, calculation of voltage conditions in the grid, verification of N-1 security criterion, calculation of short-circuit parameters and stability analysis. Market models are used to calculate the parameters of generation adequacy and optimal engagement of power plants, as well as the system balance.

4.3.11. Analyses are performed on network models, which, in addition to the JSC EMS transmission system, also include models of other transmission systems, at all hours of the

intervening plan years, or alternatively on models that represent the characteristic regimes of the winter and summer periods.

4.3.12. In the typical regimes of the summer period, the engagement of wind power plants in grid models is 85%, and in the winter regime it is 100% of the installed power (maximum active power), whereby the engagement must not exceed the approved power. In case of solar power plants, in the typical regimes of winter maximum, summer maximum and summer minimum, engagements in network models amount to 70%, 100% and 70%, of the installed power (maximum active power), respectively, whereby the engagement must not exceed the approved power.

4.3.13. When modeling generation, JSC EMS takes into account connected generation facilities, as well as those that have been issued a transmission system operator's act on the conditions and possibilities of connection to the transmission system at 400 kV, 220 kV and 110 kV. When preparing the adequacy analysis, as well as the market and grid calculations from point 4.3.10., in addition to the mentioned generation facilities, in summary by type of generation, generation facilities connected to the distribution power grid, those to which conditions for connection have been issued, as well as the distribution system operator's assessment of the installed power by type of generation that will be connected to the distribution power grid, are taken into account for target plan years. Also, for the purposes of grid calculations, JSC EMS takes into account noted limitations in the operation of generating units that deviate from the indicated parameters, as well as their unavailability.

4.3.14. Based on the results of market simulations, JSC EMS determines the engagement of generating units, cross-border exchanges and electricity consumption, which is included in the analyses carried out in order to plan the transmission system development.

4.3.15. When creating market simulations, information on planned unavailability and outages of generating units is taken into account.

4.3.16. During the preparation of the transmission system development plan, the conclusions of the study on the connection of facilities to the transmission system are taken into account.

4.3.17. By January 15 in the year preceding the first year to which the Transmission System Development Plan applies, JSC EMS informs all transmission system users (including future transmission system users who have been issued an act of the transmission system operator on the conditions and possibilities of connection to the transmission system) about the data which are to be submitted to JSC EMS AD in order to create a Transmission System Development Plan. Information on the set of standard necessary data for development planning can be found on the JSC EMS website. Data shall be submitted in the format determined by JSC EMS. In order to create a transmission system development plan, it is necessary to obtain an agreed set of input data.

4.3.18. At the special request of JSC EMS, the transmission system users submit other necessary data in order to model the facilities of the transmission system users, that is, parts of the distribution grid.

4.3.19. Transmission system users for which JSC EMS determines the need, in accordance with the grid connection rules and interconnection operation rules, submit to JSC EMS updated and validated simulation models of their facilities, which faithfully simulate the behaviour of these facilities in stationary and dynamic situations, in the format and deadline defined by JSC EMS. Validation of simulation models shall be confirmed during functional tests in accordance with point 7.6. of these Codes.

4.3.20. Transmission system users shall submit all requested data to JSC EMS no later than March 31 in the year preceding the first year to which the Transmission System Development Plan applies.

4.3.20. In cooperation with the distribution system operator, JSC EMS shall harmonize the Transmission System Development Plan and the Distribution System Development Plan by

September 30 in the year preceding the first year to which the Transmission System Development Plan refers.

4.3.21. JSC EMS shall submit the Transmission System Development Plan to the Agency by November 30 in the year preceding the first year to which the ten-year plan refers in order to obtain approval. Upon approval, the Transmission System Development Plan shall be published on the JSC EMS website.

4.4. CONTENT OF THE TRANSMISSION SYSTEM DEVELOPMENT PLAN

4.4.1. INTRODUCTION

4.4.1.1. Transmission System Development Plan specifically contains:

- description of the current condition and the results of the analyses of the condition of the transmission system facilities and equipment;
- description of the strategic determinations of the development of the transmission system, as well as the power system development scenarios;
- forecast of consumption and peak consumption power by year for the planning period
- Inventory of transmission system facilities that need to be constructed, reconstructed or upgraded by year for the planning period;
- planned years of commencement and completion of projects, that is, investments;
- list of connection projects of facilities for which requests for connection have been submitted, by years for the planning period;
- a list of projects for connecting the facilities of the distribution system operator to the transmission system, by year for the planning period, harmonized with the distribution system operator;
- development plan of supporting infrastructure for the transmission system (telecommunications system, data management system, power metering system, etc.);
- analyses of generation and the transmission system adequacy;
- voltage control analyses;
- stability analyses;
- analyses of maximum and minimum short circuit currents;
- changes in relation to the previous Transmission System Development Plan (new projects, i.e. investments, activated projects, i.e. investments, changes in the planned commencement and completion years of projects, i.e. investments and other).

4.4.2. THE METHOD OF DRAWING UP THE TRANSMISSION SYSTEM DEVELOPMENT PLAN

4.4.2.1. The first step in developing Transmission System Development Plan is the analysis of the current state of the transmission grid (age of facilities, reliability of certain transmission grid elements, observed congestion and recorded transmission events) as well as N-1 security analyses for the present state of the transmission grid. The second step is the analysis of transmission grid on simulation models of the perspective condition, created with consideration of the observed development of the transmission system and forecasted changes in consumption. Based on these analyses, projects for the construction of new facilities of the transmission system are determined, as well as projects for the reconstruction and increase of the transmission capacity of the existing elements of the transmission grid.

4.4.2.2. New interconnecting transmission lines are planned based on the results of the system needs identification process, contained in the TYNDP package, as well as system studies and

justification studies, which look at the wider impact of the planned transmission lines. The decision on the construction of these elements of the transmission network is based on the results of studies and with the consent of neighbouring transmission system operators. System and justification studies are made after the TYNDP is created.

4.4.2.3. Defining the final transmission system development plan by year includes a plan for the construction of new transmission system facilities, reconstruction of existing transmission system facilities and construction of new interconnecting transmission lines, as well as descriptions of all other necessary investment activities in the transmission system.

4.4.2.4. The Transmission System Development Plan includes data on places of potential congestion in the transmission network (list of transmission system elements that are assumed to be exposed to frequent overloads), as information of special importance. This information is one of the main criteria for planning the transmission system development.

4.4.2.5. If it is assessed that the accompanying equipment connected to a transmission line or transformer in the transmission grid creates the limitation of power flows in the basic condition (all elements of the transmission network in operation) or after an outage of an element of the transmission grid from a predefined list of outages, JSC EMS shall enter data on the equipment in the transmission system users' facilities that limits power flows through the transmission grid into the Transmission System Development Plan. JSC EMS agrees with the transmission system user on the measures for removing the restrictions.

4.4.3. VOLTAGE CONTROL

4.4.3.1. If potential problems related to voltage control are identified during the operation or in the process of analysing voltage circumstances, JSC EMS shall include development measures within its competence in the Transmission System Development Plan, which can be applied in order to eliminate or mitigate the observed problems.

4.4.3.2. If JSC EMS concludes that voltage control problems stem from the influence of neighbouring transmission systems, JSC EMS shall try to find a common solution with the operators of these transmission systems.

4.4.4. STABILITY

4.4.4.1. JSC EMS shall, if necessary, and at least once every five years, include the stability study of the transmission system in its Transmission System Development Plan.

4.4.4.2. If the results of stability analysis indicate the possible shortcomings of the excitation regulator, primary frequency regulators, local equipment for secondary frequency control and power exchange, as well as protection settings, JSC EMS shall take necessary measures within the transmission grid (installation, pre-protection settings, etc.), or agree upon the necessary measures with the transmission grid users (installation of stabilization devices on generating units, pre-setting and installation of primary frequency and voltage control, secondary frequency and power exchange control setting, 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 grids are calculated during the preparation of the Transmission System Development Plan.

4.4.5.2. If JSC EMS assesses that the calculated maximum values of short-circuit currents (due to the development of the transmission system) may endanger the existing installed equipment in the transmission system facilities and the facilities of the transmission system users, JSC EMS shall undertake measures in the transmission system facilities and shall agree on the necessary measures with the transmission system users undertaken in the users' facilities. The aforementioned measures primarily include the preparation of plans for the replacement of

endangered equipment, the determination of new switching conditions in the transmission grid and users' facilities, and the establishment of real-time monitoring of short-circuit currents.
4.4.5.3 If JSC EMS assesses that the calculated minimum values of short-circuit currents may lead to improper operation or non-selective functioning of the protection, JSC EMS shall take measures in the transmission system facilities and shall agree with the transmission system users on the measures that need to be taken in their facilities

4.4.6. ASSESMENT OF THE ADEQUACY OF THE GENERATION AND THE TRANSMISSION SYSTEM

4.4.6.1. Adequacy of the generation and the transmission system is the analysis that the transmission system operator shall carry out in compliance with the law governing the energy sector, as well as with the law governing the use of renewable energy sources.
4.4.6.2. The objectives of the analysis of the adequacy of the generation and transmission system over a ten-year period are:

- assessment of the amount of unsupplied electricity to transmission system users;
- estimation of the number of hours during which this supply interruption occurs;
- pointing out the potential risks to the security of supply that arise due to the high share of generation from variable renewable energy sources;
- calculation of the available reserve on the territory of the Republic of Serbia and assessment of the amount of the necessary reserve for balancing in accordance with the chapter 6.2. of these Codes.

4.4.6.3. The assessment of the necessary balancing reserve within the framework of the analysis of the adequacy of generation and the transmission system is made taking into account all facilities for which the requests for conclusion of contracts on preparation of the connection study have been submitted to the transmission system operator, as well as all facilities for which the requests for the issuance of conditions for design and connection to the distribution system have been submitted to the operator distribution system operator.
4.4.6.4. The analysis of the adequacy of the generation and transmission system shows the following:

- a list of connection projects for which a contract on the preparation of the facility connection study has been concluded with the transmission system operator, i.e. for which conditions for the design and connection of the power plant have been issued by the distribution system operator or a closed distribution system, and whose connection cannot be postponed;
- review of historical data on the contracted and realistically secured reserve for balancing the system in the relevant period;
- methodology for estimating the available and necessary reserves for balancing the system;
- assessment of the necessary reserve for balancing the system in the control area;
- assessment of the currently available reserve for balancing the system in the control area;
- assessment of whether and how much reserves are missing for balancing the system in case of connection of all power plants that are in the process of being connected, and which use variable renewable energy sources;
- indicators of the adequacy of the production system to meet consumption obtained on the basis of the calculations (estimation of the amount of unsupplied electricity and the number of hours during the year when electricity supply is interrupted);
- conclusion on the risks to the safe operation of the electric power system and the need to postpone the connection of power plants that use variable renewable

energy sources, with the exception of the power plants from the first point of this paragraph.

4.4.6.5. If, during the assessment of the amount of unsupplied electricity, it is established that there is a lack or a significant excess of electricity generation in relation to the consumption, this information is particularly emphasized.

4.4.6.6. The lack of balance reserve is noted when the calculated available reserve is less than the estimated required reserve.

4.4.6.7. In the case of a lack of balance reserve that leads to problems in balancing the system due to a high share of generation from variable renewable energy sources, the transmission system operator shall implement the measures defined by the law regulating the use of renewable energy sources

4.5. CONTENT OF TRANSMISSION SYSTEM INVESTMENT PLAN

4.5.1. Every year, JSC EMS develops Transmission System Investment Plan, for three year period, harmonized with Distribution Systems Investment Plan and initiated connection procedures.

4.5.2. JSC EMS submits the Transmission System Investment Plan to the Agency for approval by 30 November.

4.5.3. Transmission System Investment Plan particularly includes the following:

- titles of projects and investment codes;
- short description of projects and investments;
- total estimated budget value for each project, that is, for each investment with adequate basis for determining the estimated value;
- dynamics of the investment for each investment in the next three years by funding sources;
- realized investments in ongoing investments;
- technical data about each project, i.e. investment (project category, voltage level, type of facility, etc.)
- a list of all transmission system connection projects, by year, for the planning period, harmonized with the distribution system operator;
- changes in relation to the previous Investment Plan in the transmission system (new projects, i.e. investments, activated projects, i.e. investments and other changes).

4.5.4. For all connection projects, a necessary condition for the entry of the project into the Transmission System Investment Plan is the conclusion of the Connection Agreement.

CHAPTER 5: ACCESS TO THE TRANSMISSION SYSTEM

5.1. INTRODUCTION

5.1.1. This chapter of the Codes regulates access to the transmission system, the payment security instrument and the criteria for determining the amount and period for which it is requested, the obligations of transmission system users necessary for the secure and reliable system operation, access to transmission capacities between trading zones, access through facilities, parameters and the method of controlling the quality of electricity, the content of the Agreement on access to the transmission system, as well as the determination of facts about disrupted access.

5.1.2. The access, or the use of the transmission system, includes:

- access to transmission capacities between trading zones;

- access through facilities connected to the transmission system.

5.2. ACCESS TO TRANSMISSION CAPACITIES BETWEEN TRADING ZONES

5.2.1. INTRODUCTION

5.2.1.1. Access to the transmission capacities between trading zones is realized through the following procedures:

- determination of transmission capacities between trading zones in cooperation with neighbouring transmission system operators, that is, the regional coordination centre;
- assigning the right to use transmission capacities between trading zones to participants in the electricity market, in the manner regulated by the rules for the distribution of the right to use transmission capacities between trading zones;
- enabling participants in the electricity market to exercise the assigned right to use transmission capacities between trading zones, in the manner regulated by the rules for the distribution of the right to use transmission capacities between trading zone.

5.2.1.2. The conditions for denying access to transmission capacities between trading zones are governed by the regulations governing the energy area, the rules for the distribution of the right to use transmission capacities between trading zones and these Codes in the part related to the transmission system operation.

5.2.2. DETERMINATION OF THE TRANSMISSION CAPACITY BETWEEN TRADING ZONES

5.2.2.1. Along with the harmonization with neighbouring transmission system operators, JSC EMC determines the following:

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

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

5.2.2.2. When determining the net transmission capacity and transmission reliability margin, the predicted operating conditions in the transmission systems in the region for the corresponding time period, the technical criteria referred to in section 3.2 of the Codes and corresponding procedures regulated by the interconnection operation rules, are taken into account.

5.2.2.3. JSC EMS shall inform the balance-responsible parties about the necessary data and data format that must be submitted in accordance with the interconnection operation rules, needed for the calculation of transmission capacities between trading zones for month M, by the first day of month M-2. The balance-responsible parties submit the above data to JSC EMS by the 15th day of the month M-2. For calculations of transmission capacities between trading zones on a daily basis, for day D, the balance-responsible parties submit the data of day D-2 by 10:00, in the format prescribed by JSC EMS.

5.2.2.4. JSC EMS cooperates with the Regional Coordination Centre in calculations of transmission capacities between trading zones on the daily and intraday time horizon. The regional coordination centre and JSC EMS participate in the regional calculation of transmission capacities between trading zones in accordance with the interconnection operation rules, and the final validation and harmonization of these values is carried out by JSC EMS.

5.2.3. EXERCISING THE ALLOCATED RIGHT TO THE TRANSMISSION CAPACITY BETWEEN TRADING ZONES

5.2.3.1. After JSC EMS performs the allocation of the right to use transmission capacities between trading zones to electricity market participants, these participants acquire the right to nominate cross-border exchange of electrical energy within the development of the Daily Plan of the transmission system operation, i.e. within the intra-day plan changes.
5.2.3.2. All the procedures relating to the exchange of electrical energy between trading zones are regulated by the Code in the part referring to the transmission system operations.

5.3. ACCESS THROUGH THE FACILITIES

5.3.1. INTRODUCTION

5.3.1.1. Transmission system users connected to the transmission system through the facilities have uninterrupted right of access to the transmission system under the conditions regulated by the Connection act and regulations governing the energy area.
5.3.1.2. Refusal of access to the transmission system to transmission system users connected to the transmission system through the facilities is carried out in the manner determined by the regulations governing the energy area.
5.3.1.3. In order to regulate the conditions of access to the transmission system of transmission system users connected to the transmission system through facilities, it is necessary to determine:

- measures of the supply quality and the supplied electricity;
- the method of determining the facts about disrupted access.

5.3.1.4. JSC EMS shall be obliged to monitor the conditions of access to the transmission system through facilities. In case it is determined that the values from points 5.3.2.2, 5.3.2.3, and 5.3.2.4 have been exceeded, JSC EMS shall examine the causes of the disrupted access and shall decide on the measures that need to be taken, in order to bring the supply quality and supplied electricity in line with the prescribed values. These measures include regulating the conditions of exploitation of transmission system facilities, facilities of the transmission system users, i.e. transmission system development.

5.3.2. PARAMETERS AND METHOD OF ELECTRICITY QUALITY CONTROL

5.3.2.1. Introduction

5.3.2.1.1. Quality of electricity supply shall be estimated on the basis of the value of electricity supply reliability parameters.
5.3.2.1.2. Quality of supplied electricity shall be estimated based on:

- voltage quality;
- frequency quality.

5.3.2.2. Quality of supplied electricity

5.3.2.2.1. The interruption of the electricity supply from the transmission system may be classified as:

- a planned interruption that has been previously agreed upon, when the transmission system users have been informed 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 via following parameters:

- ENS - total unsupplied electricity due to interruptions in the reporting period.

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

It is calculated as the sum of unsupplied electricity (ENSp) of all interruptions (p) of the corresponding category (depending on the type and cause of interruption).

- AIT - Average duration of power outages in the reporting period.

$$AIT = \frac{ENS}{\frac{E_i}{T_p}} = \frac{ENS}{\frac{E_i}{b_d \times 24 \times 60}}$$

It is calculated as the quotient of unsupplied electricity due to interruptions in the reporting period and average power. Average power is calculated as the quotient of supplied electricity in the reporting period (Ei) and the duration of the reporting period (Tp) expressed in minutes (if the reporting period is one calendar month, the duration of the reporting period will be the number of days in the month (bd) multiplied by the number of minutes in day).

5.3.2.2.3. JSC EMS prepares monthly and annual reports on the reliability of electricity supply from the transmission system.

5.3.2.2.4. JSC EMS may temporarily limit or interrupt the supply of electricity to the transmission system users without prior notice due to a fault in the transmission system, or overload and other unforeseen events, for up to two hours.

5.3.2.2.5. Exceptionally, JSC EMS may, without prior notice, limit or interrupt supply to the transmission system users for more than two hours, in cases of force majeure and in other unforeseen circumstances that JSC EMS could not foresee or the consequences of which it cannot remedy.

5.3.2.2.6. In the event of a temporary restriction or interruption of electricity supply due to the reasons specified in point 5.3.2.2.5, transmission system users may be temporarily restricted or interrupted for a maximum of 12 hours within a 24-hour period.

5.3.2.2.7. At the connection point, there may be an interruption in the supply of electricity due to causes within the transmission system, for a total duration during one calendar year that amounts to:

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

The duration of planned outages in the transmission system is not counted in the specified times.

5.3.2.2.8. In the case of planned works on the maintenance of energy facilities or planned works on the expansion and development of the transmission system, JSC EMS can apply a measure of limitation or interruption of the electricity supply for up to 72 hours during one calendar year, provided that the limitation or interruption of the supply is announced 15 days in advance.

5.3.2.3. Voltage quality

5.3.2.3.1. Voltage quality in the connection point of the transmission user's facility is determined by measuring and monitoring the higher harmonics parameters, asymmetry of voltage and flicker, in compliance with technical standards governing the voltage quality (SRPS IEC).

5.3.2.3.2. The planned level of effective values of individual higher voltage harmonics must not exceed the values defined in Table 5.1 in 95% of the measurements of 10-minute intervals.

Table 5.1.

Odd harmonics, non divisible by 3		Odd harmonics, divisible by 3		Even harmonics	
Higher harmonics h	Higher voltage harmonics [%]	Higher harmonics h	Higher voltage harmonics [%]	Higher harmonics h	Higher voltage harmonics [%]
5	2	3	2	2	1.4

Odd harmonics, non divisible by 3		Odd harmonics, divisible by 3		Even harmonics	
Higher harmonics h	Higher voltage harmonics [%]	Higher harmonics h	Higher voltage harmonics [%]	Higher harmonics h	Higher voltage harmonics [%]
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 planned level of total harmonic voltage distortion (THD) in the 110 kV, 220 kV and 400 kV transmission grid must not exceed a value of 3%.

5.3.2.3.4. The planned level of voltage asymmetry in 95% of the measurements of 10-minute intervals must not exceed the values defined in Table 5.2.

Table 5.2.

Voltage level	Planned asymmetry level
110 kV, 220 kV	1.4
400 kV	0.8

5.3.2.3.5. The planned intensity level of short-term flickers must not exceed Pst=0.8. The stated value of the intensity of short-term flickers refers to 95% of the measurements of 10-minute intervals in normal operation.

5.3.2.3.6. The planned intensity level of long-term flickers must not exceed Plt=0.6. The stated value of the intensity of long-term flickers refers to 95% of measurements of 120-minute intervals in normal operation.

5.3.2.4. Frequency quality

5.3.2.4.1. Frequency quality in the connection point is defined by the Chapter 3.4. of these Codes.

5.3.2.5. Measuring the quality of supplied electricity

5.3.2.5.1. Measuring the quality of supplied electricity at the connection points shall be carried out in accordance with the technical standards for determining the voltage quality (SRPS IEC).

5.3.2.3.2. Measuring the quality of supplied electricity shall be carried out continuously under normal operating conditions during a minimum of 7 days in any period of the year. The measuring period also includes the period in which the maximum distortion of the voltage wave is expected.

5.3.2.3.3. If, during the measuring of the quality of the supplied electricity it is established that the facility of the transmission system user exceeds the maximum emission values defined by the act on the connection of the facility to the transmission system, JSC EMS and the transmission system user shall define the measures that need to be taken in order to eliminate the causes that led to the non-compliance, as well as the deadline for implementing these measures. The transmission system user shall be obliged to inform JSC EMS about the results of the implementation of the mentioned measures within the agreed time period.

5.3.2.3.4. If, during the measuring of the quality of the supplied electricity it is established that the prescribed parameters of the quality of the supplied electricity are not met at the connection point of the distribution system operator facility, as a consequence of the impact on the quality of the electricity of the transmission system user w connected to the part of the distribution system managed by the transmission system operator, the procedure from point 5.3.2.3.3. shall

apply to the transmission system user who is connected to the part of the distribution system managed by the transmission system operator.

5.3.3. DETERMINATION OF FACTS ON DISRUPTED ACCESS

5.3.3.1. The beginning of the disrupted access in cases of effective voltage value deviation shall be the moment the moment of registering deviations in the software tools that make up the technical management system. Exceptionally, the beginning of the disrupted access in cases of effective voltage value deviation when the transmission system user's facility is not integrated into a technical system of transmission system control shall be the moment when the transmission system user control centre notifies (by phone or in writing) the relevant control centre of JSC EMS.

5.3.3.2. Data to be considered when establishing the facts on the transmission system user's disrupted access through the facilities are as follows:

- data from the facilities (data on protection activities, chronological registry of events, log file, audio recordings of conversation with the control centres and other data);
- data from the control centres (SCADA system data, log files, audio recordings of conversation with the control centres and facilities and other data).

5.3.3.3. The data listed in the position 5.3.3.2. below shall be ranked, in terms of credibility, in the following order:

1. data exchanged in real-time between JSC EMS and the transmission system user whose facility has experienced a disrupted access, i.e. other data equally accessed by JSC EMS and the transmission system user;
2. data from *SCADA* system, facilities and control centres of JSC EMS;
3. data from the facilities and control centres of the transmission system user whose facility has experienced a disrupted access;
4. data from the facilities and control centres of other transmission system users.

5.3.3.4. JSC EMS and the transmission system user may require, by an official letter within 15 working days after disrupted access, the other party to deliver the data referred to in point 5.3.3.1. Term for submission of mentioned data shall be 15 days.

5.4. TRANSMISSION SYSTEM ACCESS AGREEMENT

5.4.1. Transmission system user shall be obliged to arrange the access to the transmission system for each transfer point.

5.4.2. The access to the transmission system is governed by the Agreement on Access to the Transmission System concluded by JSC EMS and the transmission system user.

5.4.3. JSC EMS shall conclude the contract on the access to the transmission system with the supplier for the transmission system users' transfer points for which the full supply contract has been concluded.

5.4.4. The transmission system access agreement regulates in particular:

- accounting period;
- type, amount, features and validity period of the payment security instrument;
- method of measuring electricity;
- reading and acquisition of data from electricity meters;
- calculation of transmission system access service;
- the procedure for issuing invoices and the payment method for the transmission system access;
- agreement duration;
- conditions for amending the agreement;

- method of agreement termination
- method of resolving disputes.

In case the transmission system user is not obliged to pay for the transmission system access service, the Transmission System Access Agreement shall not contain elements related to the type, amount, characteristics and validity period of the payment security instrument and the procedure for issuing invoices and the method of payment for the transmission system access service.

5.4.5. JSC EMS shall publish the model of the Transmission System Access Agreement on their website.

5.4.6. EMS AD can unilaterally terminate the Transmission System Access Agreement when:

- the transmission system user of the does not submit the appropriate collateral instrument, that is, does not extend the collateral instrument in accordance with the deadlines specified in chapter 5.5;
- the transmission system users do not fulfil the obligations in accordance with regulations in the field of energy.

5.4.7. The transmission system access agreement shall be considered terminated on the day following the day on which the transmission system user, or his supplier in the case referred to in point 5.4.3, was notified by JSC EMS of the unilateral termination of the contract.

5.5. COLLATERAL INSTRUMENT FOR THE TRANSMISSION SYSTEM ACCESS

5.5.1. Transmission system user – transmission system access fee payer (hereinafter: the payer) shall secure its obligations undertaken by the Agreement on Transmission System Access by collateral instruments.

5.5.2. Provision of the agreed financial collateral shall constitute an important element in the Transmission System Access Agreement and a deferring condition for legal enforcement of the respective Agreement.

5.5.3. Financial collateral amount shall be equal to the calculated risk value.

5.5.4 JSC EMS shall calculate the risk value and the period for which that value is calculated. The risk value shall equal:

- twice the multiplied value of the calculated quantities from the highest monthly bill for access to the transmission system in the previous 12 months (for transfer points for which the end customer or an energy entity engaged in market energy activity is liable) and currently valid prices for access to the transmission system
- 10% of the double value of the multiplied calculated quantities from the highest monthly bill for access to the transmission system in the previous 12 months (for transfer points where the payer is an energy entity engaged in regulated energy activity only) and currently valid prices for access to the transmission system.

5.5.5. The risk value for the new transfer point shall be determined on the basis of the double value of the multiplied planned energy quantities according to the tariffs for access to the transmission system calculated on the basis of the planned average monthly quantities of active and reactive energy and approved power delivered by the payer when concluding the Transmission System Access Agreement and the currently valid price to access the transmission system.

5.5.6. JSC EMS shall determine the risk value in the forthcoming period for each payer no later than 30 days before the end of the current period for which the risk value was calculated.

5.5.7. JSC EMS shall calculate the risk value for the payer every three months, as a double value of the multiplied value of the calculated quantities from the highest monthly bill for

transmission system access in the previous 12 months and the currently valid prices for access to the transmission system.

5.5.8. If the change in the risk value is greater than 10%, JSC EMS shall define the new risk value and shall ask the payer to submit a new collateral instrument that is equal to the newly determined risk value. Exceptionally, in the event of a reduction in the risk value, the payer may retain the right not to have the reduced risk value applied.

5.5.9. In case of payer's default regarding the payment of the transmission system access, collection of receivables shall be provided by one the following collateral instruments:

- Bank guarantee of a bank headquartered in the Republic of Serbia and with license issued by the NBS;
- Special purpose (guarantee) deposit with a revolving clause of the bank headquartered in the Republic of Serbia with license issued by the NBS.

5.5.10. The payer shall select one of the three stated collateral instruments, as regulated by the Agreement on Transmission System Access concluded between EMS JSC and the payer.

5.5.11. The payer has the right to change the type of collateral instrument. The previous collateral instrument must be valid until the newly selected collateral instrument is active. The payer shall submit a new or extend the existing collateral instrument 65 days before the expiration date of the existing collateral instrument.

5.5.12. The payer shall provide the appropriate collateral instrument in the event of a change in the risk value from points 5.5.4, 5.5.5, 5.5.6, 5.5.7. and 5.5.8. within 30 days from the conclusion of the Transmission System Access Agreement, i.e. the Annex to the Transmission System Access Agreement, which must be signed no later than 30 days from the date of receipt of the request for submitting new collateral instrument. Exceptionally, in the event of a reduction in the risk value, the user may retain the right to keep the instrument with the existing risk value.

5.5.13. Bank guarantee shall be irrevocable, unconditional, payable on first demand, waiving all objection rights and without protest, with a validity period that is 60 days longer than the expiration date of the established period for which the risk value was calculated.

5.5.14. In the case of payer`s default regarding the payment of the transmission system access, JSC EMS shall enforce the bank guarantee, in order to collect the total unpaid amount of receivables increased by the official default interest rate, informing the payer about such a deed in writing at least 2 business days before enforcing the guarantee.

5.5.15. Validity period of the bank guarantee must be extended 60 days from the date of termination of the Transmission System Access Agreement or the calculation of the new risk value.

5.5.16. Special-purpose (guarantee) deposit with a revolving clause is a collateral instrument in which payer deposits funds in a special-purpose account with the bank headquartered in the Republic of Serbia with the license issued by the NBS. The payer deposits the funds in the special-purpose account in favour of JSC EMS for the period that cannot be shorter than the period for which the risk value was calculated, extended by 60 days.

5.5.17. The payer, the bank and EMS JSC shall conclude the agreement on opening and administration of a special-purpose (guarantee) deposit.

5.5.18. In the case of payer`s default, EMS JSC is entitled, after the first written demand to the Bank, to collect the receivables from the special-purpose (guarantee) revolving principle deposit. The payer shall refill the special-purpose revolving principle (guarantee) deposit according to the deadline defined by the agreement on opening and administration of the special-purpose deposit.

5.5.19. Validity of special-purpose revolving principle (guarantee) deposit shall be 60 days after the date of termination of the Transmission System Access Agreement.

CHAPTER 6: TRANSMISSION SYSTEM OPERATION

6.1. INTRODUCTION

6.1.1. This chapter of the Codes regulates in more detail the conditions for secure and reliable operation of the transmission system, the types and scope of auxiliary and system services, the planning of the transmission system operation, operational procedures for managing the transmission system under normal conditions and in the event of a disruption, and the measures taken in the event of a disruption of the electric power system, as well as procedures due to works on the maintenance and expansion of the electric power system, procedures for reporting and confirming the work program of the balance-responsible parties, protection system operation, communication system operation and reporting on the transmission system operation.

6.1.2. Through procurement of ancillary, i.e. system services within the stipulated amount, JSC EMS provides the mechanisms for transmission system planning and managing.

6.1.3. The Transmission System Defence Plan and the Transmission System Establishment Plan are the basis for acting under the most severe disturbances and during the restoration of the transmission system after the partial or full blackout.

6.1.4. Planning of transmission system operations implies harmonization of the needs for generation, consumption and exchange of electricity, as well as operation performance on the transmission system elements while observing the criteria of normal operation.

6.1.5. Transmission system has to be managed in real time in such a way to make the operations of the system run within the planned mode as much as possible. However, the electricity market participants have to be provided with possibility to change the initial plans of generation, consumption and exchange of electricity.

6.1.6. Transmission system control also implies special attention to make the operations of the transmission system run in normal conditions, and in the case of disturbances all available measures shall be undertaken to lead to the fastest elimination of disturbances and restoration of the system into normal operating conditions.

6.1.7. Reporting on the transmission system operations based on conducted analyses on operations, shall provide necessary feedback, which, inter alia, may impact the following:

- transmission system development planning;
- technical requirements for connection of the facilities;
- method planning of the transmission system operation;
- control of the 400 kV, 220 kV and 110 kV transmission grid.
- concept and contents of the technical standards and procedures.

6.2. TYPES AND SCOPE OF ANCILLARY AND SYSTEM SERVICES

6.2.1. INTRODUCTION

6.2.1.1. For the purpose of providing system services, the transmission system operator shall procure the following auxiliary services:

а) primary reserve for ensuring the system service of primary control;
б) secondary reserve for ensuring the system service of secondary regulation;
в) tertiary reserve for ensuring the system service of tertiary regulation;
г) provision of capacity for the generation and absorption of reactive power on the generation units to ensure the system service of voltage regulation;
д) provision of capacity for the re-establishment of the transmission system after breakdown to ensure the system service of voltage-free start-up of the production module and island operation of the production module.

6.2.1.2. JSC EMS shall conclude a contract with transmission system users on the provision of auxiliary services, in accordance with the rules governing the operation of the electricity

market. This contract can cover only facilities that have met the test conditions for pre-qualification, in accordance with the section 7.6 of these Codes.

6.2.1.3. The transmission system user who has concluded a contract with JSC EMS referred to in point 6.2.1.2 of these Codes, shall be obliged to maintain in proper condition all the equipment necessary for the provision of auxiliary services that are his means, and to notify JSC EMS, without delay, on changes in the capacities affecting the possibility and quality of providing these services.

6.2.1.4. Transmission system user may, during the given period, agree the primary, i.e. secondary and tertiary reserve per a generating unit, i.e. the electricity storage, only with one transmission system operator.

6.2.1.5. The transmission system user shall be obliged to offer auxiliary services to the transmission system operator in accordance with the law governing the field of energy and the rules governing the connection of facilities to the transmission system. A transmission system user of the who is not obliged to offer a specific auxiliary service can offer it to JSC EMS, provided that his facility meets the requirements of these Codes, i.e. the rules governing the connection of facilities to the transmission system.

6.2.1.6. EMS JSC may agree with other transmission system operators mechanisms for the exchange of primary, secondary and tertiary control energy and joint use of primary, secondary and tertiary reserve in accordance with the regulations and rules on inter-connection operation.

6.2.2. PRIMARY RESERVE

6.2.2.1. Based on the rules on interconnection operations, competent authority of *ENTSO-E* shall prescribe the amount of mandatory primary reserve on annual bases for the control area of JSC EMS, which is provided from generation units in the control area of JSC EMS.

6.2.3. SECONDARY AND TERTIARY RESERVE

6.2.3.1. The minimum volume of secondary and tertiary reserves is provided from generating units, controllable consumption and electricity storage in the control area of JSC EMS.

6.2.3.2. The total required reserve in secondary and tertiary regulation is calculated in accordance with the methodology for calculating the required reserve prescribed in the interconnection operation rules.

6.2.3.3. The total required reserve in secondary and tertiary regulation is calculated in two methods:

- probabilistic method;
- the maximum possible imbalance method.

6.2.3.4. According to the probabilistic method, for the previous period of at least 12 months, 15-minute mean values of regulatory deviations (ACEol) are calculated, according to the following equation:

$$ACEol = ACE + aFRRact + mFRRact+RRact+IGCC+aFRRxb+mFRRxb+RRxb$$

where:

- ACEol – is the mean value of the regulatory deviation during the 15-minute time interval;
- ACE – is the mean value of the regulation error during a fifteen-minute time interval;
- aFRRact – is the mean value of activated power in secondary regulation during a fifteen-minute time interval;
- mFRRact – is the mean value of activated power in tertiary regulation during a fifteen-minute time interval;

- RRact – is the mean value of the activated power from the replacement reserve within the regulation area during a fifteen-minute time interval;
- IGCC – is the mean value of the power exchanged across the platforms for netting deviations during a fifteen-minute time interval;
- aFRRxb – is the mean value of cross-border activated power in secondary regulation during a fifteen-minute time interval;
- mFRRxb – is the mean value of cross-border activated power in tertiary regulation during a fifteen-minute time interval;
- RRxb – is the mean value of the activated power from the replacement reserve that was exchanged with another regulation block during a fifteen-minute time interval.

The required total secondary and tertiary reserve is obtained by discarding 1% of the highest values from the series of ACEol values and adopting the highest remaining value. The total secondary and tertiary reserve must cover 99% of regulatory deviations during the year. In this way, the necessary reserve for increasing the power is calculated first, and then, according to the same methodology, the required reserve for lowering the power.

6.2.3.5. The maximum possible imbalance method represents the determination of the highest expected current imbalance that can occur in the control area. The maximum possible positive and the maximum possible negative imbalance are determined separately.

6.2.3.6. When the required total secondary and tertiary reserve is calculated in the two ways mentioned above, the higher obtained value is adopted. The calculation is made separately for increasing and decreasing of power.

6.2.3.7. The obtained amount of the total secondary and tertiary reserve can be reduced in case JSC EMS operates in a control block where there is an agreement on a joint reserve.

6.2.3.8. If the maximum possible disturbance is above the value obtained by the probabilistic method, the reserve corresponding to the difference between these two values can be provided by reserve sharing contracts with neighbouring control blocks.

6.2.3.9. The minimum regulation scope in secondary regulation is calculated according to the empirical formula:

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

where L_{max} is the maximum consume (MW) in the last 12 months.

6.2.3.10. The required tertiary reserve is calculated separately in two directions, upwards and downwards:

- tertiary reserve upwards is equal to the difference of total secondary and tertiary reserves upwards according to point 6.2.3.6 or 6.2.3.7 and a half of the regulatory scope of secondary regulation according to point 6.2.3.9;
- tertiary downwards reserve is equal to the difference between the total secondary and tertiary downside reserves according to point 6.2.3.6 or 6.2.3.7 and a half of the regulatory scope of secondary regulation according to point 6.2.3.9

6.2.3.11. Reserve values in secondary and tertiary regulation for the year G+1 are defined no later than October of the year G.

6.2.3.12. Defined reserve values in secondary and tertiary regulation are submitted to the Agency by JSC EMS by November 30 of year G for year G+1. These values are published on the JSC EMS website.

6.2.4. REGULATORY SCOPE OF PRIMARY, SECONDARY AND TERTIARY REGULATION SERVICE PROVIDERS

6.2.4.1. The production module that provides the primary reserve service must provide this service without interruption and limitation, in a defined amount in accordance with the contract on the provision of auxiliary services.

6.2.4.2. If the primary reserve service is provided by the electricity storage, it must be capable of continuous operation in primary regulation as long as the frequency deviation does not exceed ±50 MHz For frequency deviations greater than ±50 MHz, electricity storages must be able to be continuously engaged in primary regulation and activated with the full amount of their primary reserve for at least 30 minutes.

6.2.4.3. The secondary reserve service provider is obliged to report its regulation scope to JSC EMS, by submitting the minimum (Pmin) and maximum (Pmax) active power available for operation in secondary regulation.

6.2.4.4. The regulation scope of the generating unit, that is, the electricity storage in the secondary regulation (Pmax - Pmin) must not exceed the value of 15min*ΔP/Δt, where ΔP/Δt is the value of the rate of increase in the generation of active power of the generating unit or electricity storage expressed in MW/ min (power change speed), determined in the contract on the provision of auxiliary services.

6.2.4.5. Positive tertiary reserve of a generating unit, that is, the electricity storage, is calculated as a lower of the following two values:

1) 15min*ΔP/Δt, where ΔP/Δt is the value of the speed increase of active power generation for a generating unit, that is, electricity storage, expressed in MW/min (power change speed), determined in the contract on the provision of auxiliary services;
2) P_{nom} – P, where P_{nom} is a nominal active power of a generating unit, that is, electricity storage, and P is a generated active power of a generating unit, that is, electricity storage.

6.2.4.6. Negative tertiary reserve of a generating unit, that is, electricity storage, is calculated as a lower of the following two values:

1) 15min*ΔP/Δt, where ΔP/Δt is an absolute value of the speed of decrease of generated active power of a generating unit, that is, electricity storage, expressed in MW/min, determined in the contract on the provision of auxiliary services;
2) P – P_{tm}, where P is a generating active power of a generating unit, that is, electricity storage, and Ptm is the power of a technical minimum of a generating unit, that is, electricity storage, determined in the contract on provision of ancillary services.

6.2.4.7. Positive tertiary reserve of controllable consumption is calculated as a lower of the following two values:

1) 15min*ΔP/Δt, where ΔP/Δt is an absolute value of the speed of the decrease of active power of controllable consumption in MW/min, determined in the contract on provision of ancillary services;
2) P – P_{tm}, where P is the active power of the controllable consumption, and P_{tm} is the power of a technical minimum of a controllable consumption, determined in the contract on provision of ancillary services.

6.2.4.8. Negative tertiary reserve of controllable consumption is calculated as a lower of the following two values:

1) 15min*ΔP/Δt, where ΔP/Δt is an absolute value of the speed of increase of active power of controllable consumption in MW/min, determined in the contract on provision of ancillary services;

2) P_{od} – P, where P_{od} is an approved active power of a controllable consumption defined by the act on connection to the transmission system, and P is an active power of controllable consumption.

6.2.4.9. Total available positive, i.e. negative direct tertiary reserve shall be calculated as the sum of all the stated reserves at all available generating units, controllable consumption and all electricity storage units in operation.

6.2.5. VOLTAGE CONTROL

6.2.5.1. Ancillary service of voltage control shall be provided by all generation units and electricity storages connected to the transmission system in accordance with their technical characteristics determined in the contract on provision of ancillary services.

6.2.5.2. For the purposes of voltage regulation in the transmission system, the transmission system user can increase the takeover, i.e. the transfer of reactive power from his facility beyond the established limits by the act on the connection of this facility to the transmission system, if there are technical possibilities for this in the required period, and in accordance with the needs of the transmission system and concluded exploitation contracts.

6.2.5.3. Voltage control can be individual, per synchronous production module, the group control, at the level of the power plant, or the group one at the level of the energy park unit, i.e. electricity storage.

6.2.5.4. Voltage control can be done centrally, automatically from the JSC EMS control centre. The transmission system user must have the technical capabilities to participate in such voltage regulation, in accordance with the rules governing the connection of facilities to the transmission system.

6.2.6. PARTICIPATION IN TRANSMISSION SYSTEM RESTORATION

6.2.6.1. Ancillary services provided by the transmission system users in terms of the transmission system restoring after the blackout refer to:

- black start of synchronous generating units;
- island operation mode of synchronous generating units.

6.2.6.2. The generating unit that provides the service of black start and island operation must be ready to provide this service at any time in accordance with the characteristics defined by the rules governing the connection of the facility to the transmission system, i.e. in accordance with the contract on the provision of auciliary services.

6.3. TRANSMISSION SYSTEM DEFENCE AND RESTORATION PLANS

6.3.1. INTRODUCTION

6.3.1.1. The Transmission System Defence Plan and the Transmission System Restoration Plan are intended to create technical and organisational prerequisites in order to preserve the security of the system operation in the event of serious disturbances, i.e. to enable the normalization of the situation.

6.3.1.2. In the worst case scenario, in case of a partial or complete breakdown of the transmission system, the Transmission System Restoration Plan prescribes the procedures that will lead to the fastest possible transmission system restoration.

6.3.1.3. Transmission System Defence Plans include:

- Underfrequency protection plan;
- Overfrequency protection plan;
- Electricity supply limitation plans;
- Transmission system protection plan against voltage breakdown.

6.3.1.4. When approving the connection of facilities, JSC EMS shall regulate participation of the facilities in the Transmission System Defence Plans and in Transmission System Restoration Plan.
6.3.1.5. JSC EMS shall prepare the Transmission System Defence Plans and the Transmission System Restoration Plan in cooperation with the transmission system users.
6.3.1.6. Transmission system users shall provide all required data for the development of the plans within the deadlines and in forms prescribed by JSC EMS.
6.3.1.7. All participants in implementation of the Transmission System Defence Plans and the Transmission System Restoration Plan shall get familiar with the contents of the plans and train their staff for their efficient use.
6.3.1.8. The Transmission System Defence Plans and the Transmission System Establishment Plan are harmonized with the requirements of the interconnection operation rules.

6.3.2. UNDERFREQUENCY PROTECTION PLAN

6.3.2.1. JSC EMS shall prepare the Underfrequency protection plan as the transmission system protection against major blackouts and outage of a major portion of generating units and electricity storages. It shall be implemented in several phases, when the frequency reaches the following value:

1. 49.8 Hz – alarming of the operational staff in the control centres, in major transmission system facilities and in the transmission system users' facilities;
2. 49.0 Hz – activation of the first degree of underfrequency protection (5% of consumption turned off);
3. 48.8 Hz – activation of the second degree of underfrequency protection (additional 5% of consumption turned off);
4. 48.6 Hz – activation of the third degree of underfrequency protection (additional 10% of consumption turned off);
5. 48.4 Hz – activation of the fourth degree of underfrequency protection (additional 10% of consumption turned off);
6. 48.2 Hz – activation of the fifth degree of underfrequency protection (additional 10% of consumption turned off);
7. 48.0 Hz – activation of the sixth degree of underfrequency protection (additional 10% of consumption turned off);
8. 47.5 Hz – outage of the generators is allowed for the purpose of protection thereof against permanent damage.

6.3.2.2. Upon drop of frequency in range 49.2 – 49.8 Hz, additional level of underfrequency protection shall be provided by disconnecting generators in the reversible hydropower plants from the grid when in pumping mode of operation, i.e. pumps in pumping facilities. In that sense, JSC EMS shall regulate settings of underfrequency protection in this type of facilities.
6.3.2.3. In the event of the frequency drop in the range of 49.2 Hz - 49.8 Hz, the electricity storages, connected to the transmission or distribution system, which at the moment of the frequency drop are working in the electricity storage mode, shall be automatically switched to the electricity generation mode in the system. Electricity storage facilities change their operating regime within the set time defined by the Underfrequency Protection Plan. In case the electricity storage, which operates in the storage mode, is not able to switch to the electricity generation mode within the given time, such electricity storage is automatically disconnected from the grid. JSC EMS shall define the value of the frequency at which the operating mode is automatically changed, i.e. the disconnection of the electricity storage from the grid, as well as the set time for this operation in cooperation with the electricity storage, in accordance with the interconnection operation rules.

6.3.2.4. Distribution system operator shall participate in the Underfrequency Protection Plan, including prescribed levels of consumption within their distribution systems.
6.3.2.5. JSC EMS shall include in underfrequency protection plan the end users whose facilities are connected to the transmission system, in accordance with the possibility to separate directions of the consumption supply that can be included in this plan.
6.3.2.6. Underfrequency protection plan shall be subject to regular annual revision. In order to achieve that, the following procedure must be implemented:

- By May 31st , JSC EMS shall submit the request to the transmission system users to submit the data (the request for drafting the list of distribution supply routes for inclusion into underfrequency protection plan shall be delivered to distribution system operator);
- By June 30th , transmission system users shall submit requested data to JSC EMS;
- By July 31st , JSC EMS shall check whether the data supplied by the transmission system user meet the criteria referred to in item 6.3.2.1.
- if users fail to meet the criteria for plan preparation, JSC EMS shall contact these users in order to jointly eliminate the deficiencies – this harmonization shall be completed by August 31;
- By October 5, JSC EMS shall deliver the underfrequency protection plan to the transmission system users, in part related to these users.

6.3.2.7. Revised underfrequency protection plan shall enter into force by October 15.
6.3.2.8. The accuracy of frequency measurement for unloading and maximum response time of underfrequency protection shall be regulated by the interconnection operation rules.
6.3.2.9. The owner, i.e. holder of the right to use frequency protection devices shall be responsible for maintaining the devices in operational order.
6.3.2.10. JSC EMS and transmission system users, in accordance with their authorities, shall ensure that underfrequency protection is implemented in accordance with underfrequency protection plan.

6.3.3. OVERFREQUENCY PROTECTION PLAN

6.3.3.1. JSC EMS shall create the Overfrequency protection plan that shall serve as the transmission system protection in case of increased frequency.
6.3.3.2. JSC EMS can only include generating units or electricity storages in the Overfrequency Protection Plan that are not equipped for regulation at high frequency, or an equivalent local system that can quickly reduce active power in a controllable manner in accordance with JSC EMS, according to the rules governing the connection of facilities to the transmission system.
6.3.3.3. The overfrequency protection plan is drawn up in accordance with the requirements of the interconnection operation rules, according to the following general rules:

- the generating units with the highest number of operating hours on the grid in the previous calendar year, whose downtime shall not be longer than the usual in the following year, are included in the plan as a matter of priority;
- one hydroelectric power plant, or thermal power plant, can only have one generator in one level of overfrequency protection, unless otherwise agreed between JSC EMS and the producer;
- turbo generating units are not included in lower levels of overfrequency protection, unless otherwise agreed between JSC EMS and the producer.

6.3.3.4 Electricity storages, connected to the transmission or distribution system, which at the moment of frequency increase operate in the electricity generation mode, are automatically switched to the electricity storage mode in the system. Electricity storages change their operating regime within the set time defined by the Overfrequency Protection Plan. In case the

electricity storage, which operates in the generation mode, is not able to switch to the electric energy storage mode within the given time, such electric energy storage is automatically disconnected from the grid. JSC EMS shall define the frequency value at which the operating mode is automatically changed, i.e. disconnect the electricity storage from the grid, as well as the set time for this operation in cooperation with the electricity storage, in accordance with the rules governing the interconnection operation.

6.3.3.5. The overfrequency protection plan is subject to regular annual changes. In order to achieve this, it is necessary to carry out the following procedure:

- by July 31, JSC EMS shall prepare the draft of the Overfrequency Protection Plan and shall submit it to review to the transmission system users participating in the plan;
- by August 31, JSC EMS and transmission system users participating in the plan shall agree on the Overfrequency Protection Plan;
- by October 5, JSC EMS shall submit the Overfrequency Protection Plan to the transmission system users who participate in the plan in the part that refers to these users.

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

6.3.3.7. JSC AD and the transmission system users, in accordance with their authorizations, shall ensure that the overfrequency protection works in accordance with the Overfrequency Protection Plan.

6.3.4. ELECTRICITY SUPPLY RESTRICTION PLANS (LOAD SHEDDING PLANS)

6.3.4.1. Load shedding plans shall define:

- measures to be undertaken before load-shedding implementation;
- implementation of load-shedding.

6.3.4.2. Load-shedding Plans shall include:

- Immediate Load-shedding Plan;
- Urgent Load-shedding Plan;
- Long-term Load-shedding Plan.

6.3.4.3. JSC EMS shall develop Load-shedding Plans in consultation with the transmission system users.

6.3.4.4. Immediate Load Shedding Plans are measures that are applied in case of disturbances of high intensity when, due to the speed of reaction, it is not possible to apply urgent or long-term load-shedding plan. These load-shedding plans do not take selectivity into account. Immediate Load-Shedding Plans are implemented by remote disconnection of the following elements in the facilities of JSC EMS: transformers 400/110 kV/kV, 220/110 kV/kV and 110/x kV/kV($x < 110$), as well as lines that supply transmission system users' facilities. When applying the Immediate Load-Shedding Plans, after the situation stabilizes, it is important to, move to the implementation of Urgent and Long-term Load Shedding Plans as soon as possible.

6.3.4.5. Urgent Load-shedding Plan is intended for the disturbances of minor intensity when load-shedding can be postponed for a while. This plan is selective to some extent and includes the list and schedule of disconnection of transformers 110/x kV/kV ($x <110$),that is, high-voltage and medium-voltage outlets with the possibility of remote control and monitoring. When implementing the Urgent Load-shedding Plan after the stabilization of the situation in the EES, it is necessary to implement the Long-term Load-shedding Plan as soon as possible

6.3.4.6. Distribution system operator shall include at least 35% of consumption within their distribution system into the urgent load-shedding plan.

6.3.3.7. The Long-term Load-shedding Plan shall be drafted for disturbances lasting longer than two hours. Therefore, this plan does take into account selectivity of disconnection of end users at the medium voltage (35 kV, 20 kV, 10 kV).
6.3.4.8. Long-term Load-shedding Plan also serves as a basis for load-shedding in case of a general electricity shortage, if the measures for saving and rational consumption of electricity, adopted on the basis of the law governing the energy sector, do not produce results related to the preservation of transmission system secure operation.
6.3.4.9. The distribution system operator shall include at least 60% of the consumption of the distribution system in the Long-term Load-shedding Plan, taking into account the degree of priority of end customers, causing of general danger and causing of large-scale material damage.
6.3.4.10. Load-shedding Plans include closed distribution system operators and other transmission system users (end customers) connected to the transmission system or to a part of the distribution system managed by the transmission system operator, taking into account the degree of priority of end customers, causing of general danger and large-scale material damages, in accordance with legal and by-law regulations.
6.3.4.11. At the request of JSC EMS, the transmission system users referred to in point 6.3.4.10 shall propose the amount of their consumption that can be included in a certain way in the Long-term Load-shedding Plan.
6.3.4.12. The duration of the load-shedding is time-limited by the regulations governing the field of energy.
6.3.4.13. Load-shedding Plans shall be subject to regular annual revision. In order to achieve that, the following procedure must be implemented:

- By May 31st , JSC EMS shall submit the request to the transmission system users submits to users of the transmission system a request for submission of a list of extracts, i.e. parts of consumption or amounts of power by groups and subgroups that are switched off at the points of electricity transfer, which the user proposes for inclusion in the plans (depending on the type of plan)
- By June 30th , transmission system users shall submit requested data to JSC EMS;
- By July 31st , JSC EMS shall check whether the data supplied by the transmission system user meet the criteria referred to in items 6.3.3.7. and 6.3.3.9;
- if user fails to meet the criteria for the plan development, JSC EMS shall contact the user in order to jointly eliminate the deficiencies – this harmonization shall be completed by August 31;
- By October 5th, JSC EMS shall submit the Load-shedding Plans to the transmission system users, in part related to these users.

6.3.4.14. Revised Load-Shedding Plans shall enter into force by October 15.

6.3.5. PLAN FOR TRANSMISSION SYSTEM PROTECTION AGAINST VOLTAGE COLLAPSE

6.3.5.1. The transmission system protection plan against voltage collapse is based on the application of voltage reductions carried out on the transformers of the transmission system users and JSC EMS transformers with a voltage ratio of 220/x kV/kV and 110/x kV/kV (x < 110) and contains:

- a list of transformers on which voltage reductions are carried out;
- a method of blocking automatic voltage regulation (local or remote);
- the competent management centre of transmission system users to whom an order for voltage reduction is issued;
- if necessary, notes on consumption characteristics, especially on sensitive consumers from the point of view of voltage deviations.

6.3.5.2. Voltage reductions are carried out by blocking automatic voltage regulation on transformers from point 6.3.5.1, either remotely from the competent control centre, or locally in the facility where the said transformers are located.
6.3.5.3. After the blocking of the automatic voltage regulation, the competent control centre, that is, the operator in the facility, maintains the voltage at the amount of 95% of the nominal voltage of the grid on the lower voltage side of the transformer from point 6.3.5.1.
6.3.5.4. The order for the implementation of voltage reductions is executed within 15 minutes of its issuance by the competent control centre of JSC EMS for facilities that are in the remote control system or possessed, i.e. within a maximum of 30 minutes for other facilities.
6.3.5.5. During the voltage reductions, JSC EMS and transmission system users take all measures to ensure that the takeover of reactive power from the transmission system is maintained within the limits of the rules governing the connection of facilities to the transmission system.
6.3.5.6. The transmission system protection plan against voltage collapse is subject to regular annual changes. In order to achieve this, it is necessary to carry out the following procedure:

- by July 31, JSC EMS shall submit to the transmission system users a request for the submission of a list of transformers from point 6.3.5.1 that meet the necessary technical requirements for the application of voltage reductions, possible ways of blocking automatic voltage regulation, as well as notes on consumption characteristics;
- by August 31, the transmission system users shall submit the required data to JSC EMS;
- by October 5, JSC EMS shall submit the transmission system protection plan against voltage collapse to transmission system users participating in the plan.

6.3.5.7. The revised Plan for the protection of the transmission system against voltage collapse shall enter into force by October 15.

6.3.6. TRANSMISSION SYSTEM RESTORATION PLAN

6.3.6.1. Transmission system restoration plan shall include several basic scenarios, in order to make it usable in any blackout.
6.3.6.2. In drafting said Plan, JSC EMS shall envisage sufficient number of generation units within its control area which shall provide system service of black start and island mode of operation, in order to ensure swift restoration of the transmission system in all foreseeable situations.
6.3.6.3. The plan for the transmission system restoration shall encompass all transmission system users in accordance with technical characteristics of the facility.
6.3.6.4. Parts of the Plan for the transmission system restoration shall be harmonized with the neighbouring transmission system operators in order to achieve compatibility thereof, based on the interconnection operation rules.
6.3.6.5. JSC EMS shall test the plan for restoration of the transmission system by the computer simulation of blackout.
6.3.6.6. JSC EMS shall perform regular revision of the Plan for restoration of the transmission system, at least once in two years' period.
6.3.6.7. In case of changes in the Plan for restoration of the transmission system, JSC EMS shall deliver this plan to all transmission system users, in part referring to their facilities, at least 15 days prior to entering into force of the said plan.

6.4. TRANSMISSION SYSTEM OPERATION PLANNING

6.4.1. INTRODUCTION

6.4.1.1. Planning of the electric transmission operations shall encompass activities on planning the time horizon of one year ahead, to the intra-day.

6.4.1.2. The most significant activities to be implemented in the scope of planning of the electric transmission operations shall imply the following:

- development of the annual plan related to the transmission system operations; -
- development of the daily plan related to the transmission system operations; -
- development of disconnection plans within the 400 kV, 220 kV and 110 kV grid;
- determining of cross-border transmission capacitates (in accordance with paragraph 5.2.1. of the Codes);
- assessment of the short-term generating adequacy.

6.4.2. ANNUAL PLAN OF THE TRANSMISSION SYSTEM OPERATION

6.4.2.1. Annual plan of the transmission system operations aims to examine whether all basic preconditions for transmission system normal operations have been met, including the evaluation related to potential problems in the provision of system services, i.e. problems in achieving power system balance in the Republic of Serbia, in the part related to electricity.

6.4.2.2. JSC EMS shall draw up the Annual plan related to the transmission system operations until November 30 in the year preceding the year for which the plan is developed.

6.4.2.3. The annual plan of transmission system operations at a monthly level comprises:

- the plan for consumption, production and exchange of electricity;
- the plan for providing primary, secondary and tertiary reserve;
- the planned quantity of electricity for compensation of technical losses in transmission network;
- the planned value of net transmission capacity;
- the capacity of transmission system elements, the conditions in the transmission system and the list of facilities planned for commencement;
- consumption, production and exchange of electricity in the hour of monthly peak demand;
- planned unavailability of generating units or electricity storages on a daily basis, as well as the reasons for unavailability;
- the plans for transmission system operations for specific days.

6.4.2.4. JSC EMS shall plan transmission system losses based on mathematical models, using historical data in calculated technical losses in the previous period and taking into account the planned consumption, generation and cross-border exchange, as well as the expected changes in the transmission system topology in the forthcoming period.

6.4.2.5. The plan of operations for the specific day referred to in point 6.4.2.3. shall comprise the data in accordance with the rules on interconnection operations. JSC EMS shall inform balance responsible parties about the dates to be considered as specific, at least 30 days prior to the deadline for submission of the data related to those specific dates.

6.4.2.6. Not later than September 20 of the year preceding the year for which the annual plan of transmission system operations is developed, balance responsible parties shall deliver to JSC EMS the annual plan of their balance groups' operations, which shall comprise at a monthly level:

- planned summarized active power consumption;
- planned consumption of active power by certain facilities, at the JSC EMS special request (e.g. distribution area consumption in the other control area);
- planned consumption of active power required for pumping;

- planned generation of active power(at connection point) in the facilities connected to the transmission system;
- planned summarized generation in the facilities connected to the distribution system according to the type of primary energy source;
- planned active power exchange both in the control area of JSC EMS and on its borders (import and export are disclosed separately);
- the plans of available capacities for the provision of contracted ancillary services;
- planned unavailability of generating units connected to the transmission system on a daily basis, with reasons for unavailability;
- all plans referred to in indents 1-7 herein related to the hour of maximum load on a specific date.

JSC EMS shall define the form in which listed plans are to be delivered to it, and shall be obliged to publish the form on its official web site at least thirty days prior to the deadline for data submission.

6.4.2.7. If, based on the security analyses for specific days, JSC EMS estimates that the requirements for normal operations, i.e. the requirements for realization of primary, secondary and tertiary reserve and for voltage control have not been met, JSC EMS shall contact balance responsible parties demanding certain changes to be made in the submitted schedules.

6.4.2.8. JSC EMS shall conduct regular verification, i.e. correction of the annual plan of transmission system operations by 25th in the month M-1, whereby the verification, i.e. correction of the said plan shall refer to all months starting with the month M until the end of the year.

6.4.2.9. In case of unforeseen changes in operations of the balance responsible group, which could not have been anticipated prior to the deadline, referred to in point 6.4.2.8. the balance responsible party shall promptly notify JSC EMS of these changes. This correction shall not refer to the previous period.

6.4.3. DAILY SCHEDULES

6.4.3.1 Introduction

6.4.3.1.1. Daily schedules shall include:

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

6.4.3.1.2. For submission, validation and confirmation of daily schedules of balance groups, a *MMS* shall be used. JSC EMS shall provide redundancy in this system.

6.4.3.1.3. JSC EMS shall publish on its website the User's manual for MMS system.

6.4.3.1.4. JSC EMS and balance responsible parties shall provide redundant communication channels for the purpose of submitting daily schedules of balance groups.

6.4.3.1.5. JSC EMS is obliged to establish data formats and the procedure for submission, validation and confirmation of balance groups' daily schedules under normal circumstances, as well as in situations where the JSC EMS information system is not available, and to publish them on its official website.

6.4.3.1.6. JSC EMS is obliged to inform as soon as possible the balance responsible parties in case of sudden unavailability of information system and/or when the normal functioning of information system is restored.

6.4.3.1.7. Each balance responsible party shall nominate at least one person to be permanently available for contacts with JSC EMS in matters relating to creating daily schedules.

6.4.3.1.8. Submission of balance group daily schedule shall be done only by its balance responsible party.

6.4.3.1.9. The basic time interval within the daily schedules shall be defined by the rules that

govern the electricity market operation.

6.4.3.1.10. By introducing common rules on cross-border transmission capacities allocation with the neighbouring transmission system operator, different rules for certain borders may apply concerning submission of cross-border power exchange, which shall be determined in the contract concluded with the neighbouring transmission system operator and these rules shall be available on the JSC EMS website.

6.4.3.1.11. Submission, processing and acceptance of daily schedules of balance groups, as well as intraday changes to these daily schedules, while the suspension and resumption of market activities are in effect, shall be carried out in accordance with the rules governing the suspension and resumption of market activities.

6.4.3.2. Procedure for application and confirmation of the balance group daily schedule

6.4.3.2.1. Balance responsible party shall report to JSC EMS the daily schedule of its balance group for day D in accordance with the User's manual for MMS system not later than 10:00 for day D in day D-2. for the purpose of calculations in accordance with the interconnection rules, and the form and manner requested by JSC EMS.

6.4.3.2.2. Balance responsible party shall nominate to JSC EMS the daily schedule of its balance group for day D in accordance with the User's manual for *MMS* system no later than 14:30 for day D in day D-1. *MMS* system is not available between 23:50 and 00:10.

6.4.3.2.3. Balance responsible party can modify the nominated daily schedule for day D of its balance group that does not include balance entities for paragraphs 1-3 from Article 6.4.3.2.5, i.e. of its balance group that includes balance entities for paragraphs 1-7 and 9-10 from Article 6.4.3.2.6, no later than 15:30 for day D in day D-1.

6.4.3.2.4. Balance responsible party can modify nominated blocks of cross-border exchange from Articles 6.4.3.2.5 and 6.4.3.2.6 in daily schedule of its balance group for day D until 14:30 in day D-1, and from 14:30 until 15:30 in day D-1 only if there is a mismatch with nomination of its cross-border partner which is available to JSC EMS by the neighbouring transmission system operator.

6.4.3.2.5. Daily schedule of balance group that does not include balance entities, depending on the role assigned to the balance responsible party as regards the nomination of daily schedules, defined in the agreement on balance responsibility, contains:

- a plan for total electricity generation in each time interval that is not greater than the sum of the approved power of individual generating units and electricity storages belonging to the balance group;
- a plan for the total electricity consumption in each time interval that is not greater than the sum of the approved powers of controllable consumption and the consumption of facilities of this balance group, i.e. a consumption plan for specific facilities at the special request issued by JSC EMS (e.g. consumption of a distribution area in another control area);
- plan of electricity exchange blocks in each time interval.

6.4.3.2.6. Daily schedule of balance group that includes balance entities, depending on the role assigned to the balance responsible party as regards the nomination of daily schedules, defined in the agreement on balance responsibility, contains:

- daily schedule for generation separately for each balance entity that cannot exceed the value of approved powers for such entity in each time interval;
- maximum and minimum power value for each balance entity;
- maximum power value for each generation unit, electricity storage and pump-accumulation unit in each time interval that cannot exceed the value of approved powers;
- availability of generating and pumped storage units in each time interval;
- daily schedule of controlled load separately for each balance entity in each time

interval that cannot exceed the approved power of such entity;
- daily schedule of balance group facilities i.e. load schedule for certain facilities upon special request by JSC EMS (e.g. consumption of distribution area in other control area) in each time interval;
- blocks of internal schedule in each time interval;
- blocks of cross-border schedule in each time interval;
- entities that shall provide contracted primary reserve and their order of engagement for the purposes of primary regulation
- balance entities which will provide the contracted secondary reserve which work is planned within the regulation scope, the order of the engagement, the number of synchronous generating units per balance entity and the amount of provided secondary reserve, i.e. for balance entities in which all generating units that are in operation do not participate in the reserve provision, a further defined reserve amount shall be submitted;
- balance entities which will provide the contracted secondary reserve and the order of their engagement for the purpose of tertiary regulation in accordance with the market operation rules.

6.4.3.2.7. Daily schedule of balance group that does not include balance entities must be balanced in each time interval, i.e. algebraic sum of the power referred to in the all indents of 6.4.3.2.5 must be equal to zero in each time interval.
6.4.3.2.8. Daily schedule of the balance group which contains balancing entities, must be balanced in each time interval, i.e. algebraic sum of the power referred to first, fifth, sixth, seventh and eighth indents of point 6.4.3.2.6 must be equal to zero in each time interval.
6.4.3.2.9. If daily schedule of the balance group, except for organized electricity market, becomes unbalanced as a result of activities set out in point 6.4.3.2.13-16. and 6.4.3.2.19. the JSC EMS leaves the possibility for this balance group to balance its daily schedule by modifying it in intraday process in accordance with point 6.4.3.3. Balance responsible party whose daily schedule remained unbalanced even after the intraday process shall be held liable as defined in the contract on balance responsibility.
6.4.3.2.10. For each time interval and for each direction, submission of only one block of internal exchange between two balance groups shall be permitted.
6.4.3.2.11. Power exchange between electricity market participants belonging to the same balance group shall not be reported to JSC EMS.
6.4.3.2.12. Block of internal exchange shall be submitted by both balance responsible parties which are counterparties in this block of exchange. If the balance responsible party did not report the power exchange within the trading zone, JSC EMS shall inform the balance responsible party whose daily schedule includes that exchange about that irregularity.
6.4.3.2.13. If a balance responsible party which is not a balance responsible party of the organized electricity market does not eliminate the irregularity referred to in point 6.4.3.2.12. within the deadline envisaged for daily schedule modification (in accordance with point 6.4.3.2.2.), JSC EMS determines that the value of the submitted block of internal exchange of electricity is zero at each time interval.
6.4.3.2.14. If the balance responsible party, referred to in point 6.4.3.2.12, is a balance responsible party of the organized electricity market, then after the expiration of the deadline envisaged for the daily schedule modification (in accordance with point 6.4.3.2.2), JSC EMS determines that the values of the submitted block of internal exchange are accepted at each time interval and imposes the same block of internal exchange to the another balance responsible party.
6.4.3.2.15. The block of internal exchange between two balance groups, none of which is an organized electricity market, must be identical. If that is not the case, i.e. if there is different

power exchange in a time interval, which may be registered only after submission of both daily schedules, JSC EMS shall immediately notify both balance responsible parties in accordance with the User's manual for *MMS* system. If the balance responsible party does not correct the irregularity within the deadline envisaged for modification the daily schedule (in accordance with point 6.4.3.2.2.), JSC EMS determines that the lower value of internal exchange from mentioned daily schedules in the disputable time intervals, is binding.

6.4.3.2.16. The blocks of internal exchange between two balance groups, none of which is an organized electricity market, must be identical. If that is not the case, i.e. if there is different power exchange in a time interval, JSC EMS shall immediately notify both balance responsible parties in accordance with the User's manual for *MMS* system. If the balance responsible party which is not a balance responsible party of the organized electricity market does not correct the irregularity within the deadline envisaged for modification the daily schedule (in accordance with point 6.4.3.2.2.), JSC EMS determines to accept as binding value from daily schedule of organized electricity market in these time intervals.

6.4.3.2.17. In daily schedule of balance group nominated quantity of block of cross-border exchange, in each time interval, should be lower or equal to the allocated cross-border transmission capacity and must be an integer value. If this value is higher than allocated cross-border transmission capacity, JSC EMS shall give information about irregularities and reject the submitted block of cross-border exchange, immediately upon submission of such plan. If the information about the allocated cross-border transmission capacity is not available in the MMS system at the very moment of submission of the daily business plans of balance groups, JSC EMS informs the balance responsible party about that and waits for the deadline envisaged for modification the daily schedule to expire (in accordance with point 6.4.3.2.3.). If within the deadline envisaged for the modification the daily schedule (in accordance with point 6.4.3.2.3.), JSC EMS concludes that the value of the submitted power exchange is greater than the allocated cross-border transmission capacity, or that cross-border transmission capacity was not allocated, JSC EMS determines that the value of block of cross-border electricity exchange is zero in every time interval.

6.4.3.2.18. Information concerning allocated cross-border capacity, as well as their capacity agreement identification shall be made available to each balance responsible party via the *MMS* system, in accordance with time intervals defined in the rules for allocation of available cross-border transmission capacities.

6.4.3.2.19. The nominated block of cross-border exchange reported by the balance responsible party, using the allocated cross-border transmission capacity available in the MMS system, in its daily schedule shall be identical to the nomination of block of cross-border exchange of its cross-border partner which is available to JSC EMS by the neighbouring transmission system operator. In case of mismatch in one of time intervals, JSC EMS shall report the irregularity to the balance responsible party and allow it to correct the irregularity. If the balance responsible party does not correct irregularity within the deadline envisaged for the modification the daily schedule (in accordance with point 6.4.3.2.3.) or if JSC EMS does not receive information from the neighbouring transmission system operator about modification of submission of cross-border partner, JSC EMS in co-operation with the neighbouring transmission system operator, based on interconnection rules and mutual agreements, shall consider lower value for these block of cross-border exchange as binding.

6.4.3.2.20. The nominated block of cross-border exchange reported by the balance responsible party in daily schedule until 14:30 in day D-1 for day D, using the allocated cross-border transmission capacity available in the MMS system and which is matched with the neighbouring transmission system operator cannot be changed in a period of time from 14:30 until 15:30 in day D-1 for day D

6.4.3.2.21. Each balance responsible party which do not contain balance entities and has the

role of production responsible party is obliged to submit the balance responsible party operation schedule, which contains the first indent from point 6.4.3.2.5.

6.4.3.2.22. Each balance responsible party which contains balance entities and has the role of production responsible party is obliged to submit the balance responsible party generation schedule, which contains the first indent from point 6.4.3.2.6.

6.4.3.2.23. Each balance responsible party which do not contain balance entities and has the role for consumption responsible party is obliged to submit the balance responsible party generation schedule, which contains the second indent from point 6.4.3.2.5.

6.4.3.2.24. Each balance responsible party which contains balance entities and has the role for consumption responsible party is obliged to submit the balance responsible party generation schedule, which contains the fifth and sixth indents from point 6.4.3.2.6.

6.4.3.2.25. If balance responsible party with role of production responsible party i.e. consumption responsible party does not nominate daily schedule as referred in points 6.4.3.2.21-24. until the deadline for submitting and corrections of daily schedules of balance group for day D (set out in 6.4.3.2.3.), JSC EMS considers these values set out in points 6.4.3.2.21-24. are zeros in all time intervals

6.4.3.2.26. In case of irregularities in submitted daily schedules set out in 6.4.3.2.5-6, particularly in relation to typical situations as referred to in 6.4.3.2.13-16 and 6.4.3.2.19, the balance responsible party may modify its daily schedule in deadlines set out in 6.4.3.3-4.

6.4.3.2.27. Balance responsible party may not cancel in part or in whole the block of crossborder exchange in already confirmed daily schedule.

6.4.3.2.28. JSC EMS shall send to the balance responsible party which does not contain balance entity confirmed daily schedule for the blocks of internal and cross-border schedules, confirmed production responsible schedule and confirmed consumption responsible schedules for day D, on the day of submission D-1 until 15:45 CET. Exceptionally, JSC EMS may extend that period in case of unavailability of information systems or delay in receiving the required data from neighbouring transmission system operators, which JSC EMS shall timely report to the balance responsible party

6.4.3.2.29. JSC EMS shall send to the balance responsible party which consists of balance entity confirmed daily schedule for the blocks of internal and cross-border schedules, confirmed electricity production schedule referred to the first indent from point 6.4.3.2.6 and confirmed electricity consumption schedules referred to the fifth and sixth indent from point 6.4.3.2.6 for day D, on the day of submission D-1 until 15:45. Exceptionally, JSC EMS may extend that period in case of unavailability of information systems or delay in receiving the required data from neighbouring transmission system operators, which JSC EMS shall timely report to the balance responsible party.

6.4.3.2.30. The balance-responsible party has the right to change its daily work schedule in the cases from points 6.4.3.2.13 to 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 changes to balance group daily schedule

6.4.3.3.1. Balance responsible party may modify balance group daily schedule for day D on the day of submission D-1 from 18:00, and on day D to which the daily schedule relates, but no later than 45 minutes prior to the beginning of the time interval covered by the change.

6.4.3.3.2. In case of unavailability of information systems or delayed receiving of information from neighbouring transmission system operator, JSC EMS shall cancel the report of intraday changes stated in point 6.4.3.3.1. until the problem is solved.

6.4.3.3.2. The balance responsible party's intraday change of daily schedule will be accepted if:

- submitted blocks of cross-border exchange are identical to exchanges submitted by the neighbouring transmission system operator;

- submitted blocks of internal exchange are identical to submissions of related balance responsible parties;
- scheduled value for generation separately for each balance entity for available units is between minimum and maximum power value for each balance entity;
- if the value of planned balance group generation is lower than the sum of values of its individual approved powers for each balance entity;
- scheduled value for controlled electricity generation separately for each balance entity, for available pump-accumulation units is between minimum and maximum power value for each balance entity;
- scheduled value for the consumption of the balance group facilities i.e. load schedule for certain facilities upon special request by JSC EMS (e.g. load of distribution area in other control area) cannot exceed the value of approved power for such.

6.4.3.3.4. In case of intraday submission of block of cross-border exchange, the submitted value shall be identical to intraday allocated capacity. At the end of each month JSC EMS shall check whether the submitted value of cross-border exchange is identical to the intraday allocated capacity. In case of detected irregularity, action should be taken by JSC EMS in accordance with the Allocation rules valid between trading zones**.**

6.4.3.3.5. EMS AD confirms the intraday change of the daily schedule of the balance group for electricity exchange blocks, the plan of total electricity generation and the plan of total electricity consumption no later than 15 minutes before the start of the time period to which the change applies.

6.4.3.3.6. During the intraday change of the daily schedule of the balance group, the electricity exchange blocks between two balancing groups, none of which is organized as an electricity market, must be identical. If this is not the case, i.e. if there are different power values in the electricity exchange blocks in some time intervals, which can only be registered after the intraday change of the daily schedule of both balancing groups, JSC EMS urgently informs both balance responsible parties responsible about this in accordance with the instructions for using the MMS system. If the balance-responsible parties do not eliminate the irregularity within the period provided for the intraday change of the schedule (in accordance with point 6.4.3.3.1.), JSC EMS determines that the lower power value in the electricity exchange blocks from the specified daily plans is to be accepted as binding in disputed time intervals.

6.4.3.3.7. During the intraday change of the daily schedules of the balance groups, the block of electricity exchange between two balance groups is reported by the balance parties of those balance groups. If one balance responsible party has not reported a block of electricity exchange within the trading zone, JSC EMS informs the balance responsible party, which entered such block of electricity exchange in the intraday change of the daily schedule of the balance group, about the irregularity.

6.4.3.3.8. If the balance-responsible party that is not the balance-responsible party of the organized electricity market does not remove the irregularity referred to in point 6.4.3.3.7. within the period provided for the intraday change of the daily schedule (in accordance with point 6.4.3.3.1.), JSC EMS determines that the value of the reported electricity exchange block is zero in each time interval.

6.4.3.3.9. During the intraday change of the daily schedule of the balance group, the electricity exchange blocks between two balance groups, one of which is the organized electricity market, must be identical. If there are different power values in the electricity exchange blocks in some time intervals, JSC EMS informs both balance responsible parties about this in accordance with the instructions for using the *MMS* system. If the balance-responsible party that is not the balance-responsible party of the organized electricity market does not eliminate the irregularity within the period provided for the intraday change of the daily schedule (in accordance with

point 6.4.3.3.1.), JSC EMS accepts as binding the value from the changed intraday schedule of the organized electricity markets in those time intervals.

6.4.3.4. Transmission system daily schedule

6.4.3.4.1. E JSC EMS shall produce daily plan of transmission system.

6.4.3.4.2. Daily plan of transmission system shall be prepared based on:

- available cross-border transmission capacities per each border and direction;
- confirmed daily schedules of balance groups;
- electricity consumption forecast;
- transmission system technical losses forecast;
- planned amount of primary, secondary and tertiary reserve;
- availability of generating units and electricity storages, i.e. of balance entities.

6.4.3.4.3. Daily schedule of transmission system shall include the following hourly data:

- electricity consumption schedules of balance groups;
- electricity consumption schedules of transmission system prepared by JSC EMS based on internal methodologies;
- schedule of controlled electricity consumption (pump storages);
- scheduled blocks of cross-border exchange of balance groups and cross-border exchange of JSC EMS;
- balance entities scheduled generation of active electricity;
- the production plan of renewable sources of electricity from wind and solar power plants prepared by JSC EMS based on internal methodologies
- calculated values of primary reserve of balance entities planned for operation i.e. which are available on the merit order list of balance reserve engagement in secondary and tertiary control;
- calculated values of the secondary control range of balance entities which are planned for the operation i.e. which are available on the list of balance reserve engagement in secondary control;
- calculated values of tertiary reserve of balance entities which are planned for the operation i.e. which are available on the merit order list of balance reserve engagement in tertiary control;
- availability plan of balance entities and the list of balance reserve engagement in tertiary control;
- recoupment plan of transmission system losses;
- compensation plan for technical losses in the transmission grid;
- set-point frequency delivered by the responsible coordination centre in interconnection;
- data on net and available cross-border transmission capacity, as well as the transmission reliability margin for each border.

6.4.3.4.4. Daily schedule of transmission system shall provide conditions for normal operation and, if it is not possible, conditions for secure operation.

6.4.3.3.5. JSC EMS shall conduct security analyses based on the daily schedule of transmission system.

6.4.3.4.6. If the security analyses show that the submitted daily schedules of balance groups do not provide conditions for normal operation, JSC EMS shall take appropriate measures listed below:

- evaluates which schedules are exerting major impact on disturbance of normal operations;
- communicates and consults with the responsible for schedules in order to modify them;

- plans the configuration and parameters of 400 kV, 220 kV and 110 kV grids;
- cancels planned disconnections in the 400 kV, 220 kV and 110 kV grids;
- plans re-dispatching;
- analyses the impact of cross-border exchanges of electricity;
- manages appropriate blocks of cross-border exchanges in accordance with the contract concluded with other transmission system operators.

6.4.3.4.7. If there is a need to apply re-dispatching to a balance entity within a balance group, the first on the list of application of production restrictions will be that balance group that has balance entities for which the connection method containing operational restrictions is defined by the act of connection. JSC EMS is obliged to notify such a balance group in a timely manner (by 18:00 at the latest), on day D-1 for day D, about the need to change the daily schedule.

6.4.3.4.8.In case the measures from point 6.4.3.4.6 are not sufficient to ensure normal operation, JSC EMS decides to limit or reject the exchange of electricity between trading zones in accordance with the rules on interconnection operation and agreements with neighbouring transmission system operators.

6.4.4. 400 KV, 220 KV AND 110 KV GRIDS OUTAGE PLANS

6.4.4.1. General Rules for Outage Plans

6.4.4.1.1. JSC EMS shall prepare Outage Plans for electricity transmission grid (ETG) elements in coordination with the transmission system users and neighbouring grid operators and regional security centres in accordance with the rules on interconnection operation.

6.4.4.1.2. JSC EMS shall prepare annual, quarterly and weekly ETG elements Outage Plans for the first, second and third group. If necessary, ETG users shall prepare ETG Outage Plans for the fourth group according to Classification.

6.4.4.1.3. Outage plans include the disconnection of ETG elements for the purpose of performing works in a de-energized state that are carried out in the third safety zone, in terms of the regulations governing general safety and health measures at work, on ETG elements of voltage levels 400 kV, 220 kV and 110 kV, as well as those elements of a lower voltage level that are an integral part of those elements (transformer tertiary, transformer centre and the like) and other works that require disconnection of the ETG elements.

6.4.4.1.4. When creating outage plans, JSC EMS is obliged to coordinate outages in the 400 kV, 220 kV and 110 kV grid with the work plans of the generating units and electricity storage in order to preserve the conditions of normal, and if this is not possible, safe operation during the outage.

6.4.4.1.5. In order to provide normal conditions for transmission grid operation during planned outage of transmission grid elements JSC EMS may establish (impose) schedule for generating units maximum:

- 100 hours for turbo generator coal-fuelled units;
- 250 hours for hydroelectric power plants
- 100 hours for each of the other types of generating unit;
- 100 hours per electricity storage.

during one calendar year per unit and in accordance with technical specifications of these units. JSC EMS shall submit so defined schedules for D day to producer within the periods of time when it planned availability of generator unit:

- until 12:00 on D-3 day for turbo generator units
- until 08:30 on D-1 day for hydroelectric plants, other generating units and electricity storages.

6.4.4.1.6. Outage plans, for the purposes works due to JSC EMS investments and transmission system users shall be included in Outage Plans.

6.4.4.1.7. Transmission system user shall plan outage of ETG elements which are their property (OHL bays, bus coupler bays, busbars, transformer bays etc.) and which require switching off transmission line, in time intervals when JSC EMS has planned outage of transmission lines.
6.4.4.1.8. Transmission system operators, based on the methodology arising out of the rules on the interconnection operation, shall prepare a ETG elements which are the subject of coordinated regional planning and outages between transmission system operators. JSC EMS shall timely inform the transmission system users on the ETG elements of the user which are the subject of the coordinated regional outages plans.
6.4.4.1.9. JSC EMS and the transmission system users shall be informed on the persons responsible for planning outage in compliance with the exploitation agreements.
6.4.4.1.10. Power system elements in the process of planning outages may have the status: available, unavailable and daily outage.
6.4.4.1.11. As a rule, JSC EMS and transmission system users plan to carry out work on ETG elements that require a permanent outage in the period from March 1 to November 30.
6.4.4.1.12. For the purpose of mid-term outage planning, JSC EMS may ask for indicative data on the planned outages of generating units and outages of power system elements from the position 6.4.4.1.8 up to two years in advance.
6.4.4.1.13. Detailed procedures for preparing Outage Plans, informing on the responsible persons for outages planning, issuing approvals for switching off ETG elements and implementation of basic safety measures at the location where work is done on ETG facility elements, as well as form and contents of the documents (requests, approvals etc.) based on which outage is approved, shall be defined by JSC EMS in cooperation with transmission system users, which shall be inserted in the agreements on exploitation.

6.4.4.2. Regular Outage Duration
6.4.4.2.1. For the duration of outage due to regular annual maintenance, the values from table 6.1 are adopted for transmission lines and from table 6.2 for other elements.

Table 6.1.

Transmission Line Description	maximum turn-off duration
Single-system transmission lines of 110 kV, for each 10 km	1 day
Single-system transmission lines of 220 kV, for each 10 km	1.1 day
Single-system transmission lines of 400 kV, for each 10 km	1.25 day
Two-system transmission lines *	Time for single-wire × 1,2
For each river cross-over of transmission line	One additional day

*duration refers to the whole transmission line (both systems synchronously), when turned-off

6.4.4.2.2. Works on regular maintenance of block transformers and other elements whose disconnection is necessary during outage of the associated generating unit and electricity storage are carried out during the outage of that generating unit, i.e. electricity storage.

Table 6.2.

Description of ETG elements	maximum turn-off duration
Busbar system	1 day
Transformer of110/x kV/kV	3 days
Transformer of 220/x kV/kV	5 days

Transformer of 400/x kV/kV	6 days
All bay types	3 days

6.4.4.3. Annual Outage Plan and Annual Regional Interconnection Outage Plan

6.4.4.3.1. Annual Outage Plan shall be prepared as an outage plan on daily bases, and if this is not possible, than per quarters and months. Annual outage plan includes power system elements of the first, second and third group of Categorisation.

6.4.4.3.2. Annual Outage Plan shall be harmonised with the Annual regional interconnection outage plan, developed in accordance with the rules on interconnection operation, and it includes the elements of power system determined in the manner as stated in the position 6.4.4.1.8.

6.4.4.3.3. Draft plans for outages of power system elements in the facilities of the transmission system users shall be used as basis for the development of the Annual Outage Plans and Annual Regional Interconnection Outage Plans, which the users shall supply to EMS JSC:

- By the deadline stated in the rules on interconnection operation for the power system elements included in the Annual Regional Outage Interconnection Plan, i.e.
- By September 20th of the current year for the next year for the power system elements included only in the Annual Outages Plan.

6.4.4.3.4. JSC EMS and transmission system users shall harmonise the outage plan for power system elements in the facilities of the transmission system users for the purpose of development of the regional plan of interconnection outages.

6.4.4.3.5. JSC EMS submits the draft of the Annual Outages Plan to the transmission system users by December 5th of the current year for the following year, after which JSC EMS and the transmission system users harmonise this plan by December 20th of the current year for the following year, when it is finalised. JSC EMS shall supply the Annual Outages Plan to transmission system users no later than 5 days from the date it is completed.

6.4.4.3.6. Changes in the Outage Plan of the power system elements which are not included in the Annual Regional Interconnection Outages Plan shall be performed in accordance with the rules on interconnection operation.

6.4.4.3.7. Annual outage plans may be changed by JSC EMS on its own initiative or as requested by transmission system user, if there are justified reasons and with consent of the affected transmission system users. Changes shall pertain to the period starting from occurrence of circumstances for change until the end of the year for which Outage Plan was adopted. Changes may be done only in the part of annual plan for which no quarterly Outage Plan was adopted, except if JSC EMS and transmission system users, affected by the change, agree with the change. Transmission system users may file a request to JSC EMS for change of plan, not later than 25th day in the month M-2 for the month M. If switching off elements of one Classification group requires additional switching off of elements in another group, the elements additionally switched off shall be reported in the other Classification group's outage plans.

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 changes to the Annual Outage Plan, except for the first quarter of the year which shall be prepared along with the Annual Outage Plan. Quarterly Outage Plans shall be prepared by days.

6.4.4.4.2. Quarterly plan drafts for halting operation in generation facilities and electricity storages, quarterly proposals for outage plans of electricity distribution facilities and quarterly Outage Plan proposals for power facility elements of other transmission system users, shall be

submitted to JSC EMS no later than 30 days prior to deadline for the preparation of the quarterly plan, except for the first quarter which shall be submitted in terms for Annual Outage Plan.

6.4.4.4.3. Quarterly Outage Plan for the first, second and third group of Classification of ETG elements shall be prepared no later than 15 days prior to the commencement of the period which the plan pertains to, except for the first quarter which is developed at the same time as the Annual Outage plan. JSC EMS shall submit quarterly outage plans to transmission system users no later than 5 days following the day of their completion.

6.4.4.4.4. Quarterly outage plans may be changed by JSC EMS on its own initiative or as requested by transmission system user, if there are justified reasons and with consent of all affected transmission system users. Changes shall pertain to the period starting from occurrence of the circumstances for change until the end of the quarter for which Outage Plan was adopted. Changes may be done only in part of quarterly plan for which no weekly Outage Plan was adopted, unless JSC EMS and transmission system users, affected by the change, agree with the change. Transmission system users may file a request for change of plan to JSC EMS, no later than Wednesday at 10:00 o'clock in the week W-2 for the week W. If the outage of elements of one Classification group requires additional outage of elements regarding the other group, the elements that are to be switched off additionally shall be included into the other Classification group outage plans.

6.4.4.5. Weekly Outage Plan

6.4.4.5.1. Weekly Outage Plans shall be prepared by days and hours.

6.4.4.5.2. Weekly Outage Plans, previously set by the quarterly Outage Plan for the week for which weekly plan is adopted, shall be revised in compliance with the approved requests for extension of deadline for work that has already begun, requests for work that was postponed based on the orders received from JSC EMS dispatch centres and outage requests due to occurred or determined potential failure or request for emergency work, as well as the determined new time intervals for implementing outage for delayed or extended work.

6.4.4.5.3. If, for justified reasons, the planned work on certain ETG element is not done or not completed within the time interval determined in weekly outage plan, the transmission system user shall propose to JSC EMS a new outage time interval. New outage time interval shall be proposed so that it does not violate the adopted quarterly outage plan. If the additional outage time interval cannot be obtained in the existing quarter, such outage needs to be planned in some of the following quarters. JSC EMS shall be responsible for determining new outage time interval for delayed or extended work in coordination with the transmission system user.

6.4.4.6. Submitting and Approving Outage Requests

6.4.4.6.1. For the purposes of prescribing procedure of submitting and approving outage requests, JSC EMS shall define the form for the elements of the first, second and third Classification group in cooperation with transmission system users, which shall be binding for all transmission system users.

6.4.4.6.2 If, due to the performance of works on ETG elements of the fourth group of the Categorization, it is necessary to disconnect the elements of the first, second or third group of the Categorization, JSC EMS, in cooperation with the transmission system users, defines the procedure for such cases.

6.4.4.6.3. Regular interchange of lists of authorised persons, which may fill in the form referred to in 6.4.4.6.1 between JSC EMS and transmission system user, shall be performed each year no later than March 1.

6.4.4.6.4. Outage request shall be submitted on three bases:

- for work performed on ETG elements;

- for work performed in the vicinity of ETG elements;
- for work that do not require basic safety measures at work location. 6.4.4.6.4.

6.4.4.6.5. Transmission system users shall submit to JSC EMS the outage request due to planned works not later than Wednesday at 10:00 o'clock of the current week for the following week. Outage requests submitted due to existing outage may be submitted immediately upon the occurrence of the outage (emergency works).

6.4.4.6.6. When submitting the outage request due to planned works, the applicant declares whether a permanent or daily disconnection is requested, with the necessary information whether the elements are disconnected on weekends or not. In addition, the applicant provides information on the time of intervention connection in case of need.

6.4.4.6.7. Outage approval for planned works shall be submitted by JSC EMS to the applicant no later than Thursday 15:00 o'clock of the current week for outages planned for the next week, and for emergency works up to 60 minutes following the receipt of the outage request.

6.4.4.6.8 Outage approval, based on which transmission system user remains without electricity supply, may be issued by JSC EMS issues after having previously received consent from the users of the transmission system to remain without power or after informing the affected users of the transmission system, i.e. the public, in accordance with the decree governing the conditions of delivery and supply of electricity, and the distribution system operator at least 20 days in advance.

6.4.5. ADDITIONAL DATA FOR PLANNING THE INTERCONNECTION OPERATION

6.4.5.1. Balance-responsible party shall submit to JSC EMS, upon its request, data for two days ahead and a week ahead according to the rules on interconnection operation.

6.4.5.2. JSC EMS shall timely inform balance responsible parties on the form and type of data as referred to in point 6.4.5.1. and the deadlines for their submission, along with explanation on the purpose and the basis the data are asked for.

6.4.5.3. Energy parks generating units and electricity storages submit planned and realized data to EMS AD according to the rules on interconnection operation in defined time intervals in the format, type and method of data delivery defined by JSC EMS.

6.4.5.4. The distribution system operator submits the following data to JSC EMS in order to create more precise network models:

- monthly updated data on all generation facilities, including prosumer facilities, related to the type of production facility, installed power, geographic location and connected generating facility to the transmission system to which the generating facility belongs;
- seasonal, weekly and daily production plans of generating facilities, previously submitted to it by the producer connected to the distribution system in accordance with the regulations;
- forecast of generation and consumption of facilities connected to the distribution system, if the distribution system operator makes these estimations.
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6.4.6. ESTIMATION OF SHORT-TERM GENERATION ADEQUACY

6.4.6.1. JSC EMS estimates short-term adequacy of electricity generation under the rules on interconnection operation, as a rule for the next 7 days, according to the data on availability of generating units, the amount of primary, secondary and tertiary reserve, consumption forecast and values of cross-border transmission capacities.

6.4.6.2. In case of identifying inadequacy in electricity generation, JSC EMS shall estimate the probability, expected duration and the unsupplied electricity due to this occurrence.

6.4.7. UNWANTED CONTROL AREA DEVIATIONS

6.4.7.1. JSC EMS shall be responsible for the financial settlement of unwanted deviations of its control area, which is calculated in accordance with the interconnection operation rules.

6.4.8. REGIONAL SECURITY COORDINATION CENTRE

6.4.8.1. JSC EMS cooperates with regional coordination centres in accordance with the rules on interconnection operation.

6.5. MANAGING THE TRANSMISSION SYSTEM UNDER NORMAL CONDITIONS AND IN CASE OF DISTURBANCE

6.5.1. INTRODUCTION

6.5.1.1. JSC EMS shall manage the transmission system in the manner that provides:

- preservation of the transmission system operation;
- reliable delivery of electricity to transmission system users; -
- optimal usage of available transmission capacities;
- achieving maximum cost-effectiveness in operation of transmission system as a whole in given circumstances.

6.5.1.2. Transmission system control shall be implemented by JSC EMS dispatch centres, established on two levels:

- on the level of the National Dispatch Centre that manages 400 kV and 220 kV transmission grid, along with 110 kV tie-lines;
- on the level of the regional dispatch centres that manage 110 kV transmission grid, with exception of 110 kV tie-lines.

6.5.1.3. Transmission system facilities shall be used in compliance with technical characteristics of such facilities issued by the equipment vendor, which were verified during the technical inspection and potential test operation, in compliance with operating condition of the facility and agreement regulating facility exploitation.

6.5.2. CONTROL AT NORMAL OPERATION

6.5.2.1. Order issuance

6.5.2.1.1. Orders are issued via telephone or in another way, in compliance with the agreement on exploitation of the facility, concluded between the JSC EMS and transmission system user.
6.5.2.1.2. Orders shall be issued by dispatchers in the JSC EMS dispatch centres. Such orders shall be executed promptly.
6.5.2.1.3. All transmission system users shall implement orders issued by authorised JSC EMS dispatch centres pertaining to electricity generation, electricity consumption, connection status in the 400 kV, 220 kV, 110 kV transmission grid, equipment and devices settings which are under the competence of JSC EMS, in compliance with the Code and relevant contracts. Transmission system users shall not, of their own motion, change connection status in the part of their facilities managed by JSC EMS, pursuant 1.2.2, but only at the request or with the prior consent of the authorised JSC EMS dispatch centre.
6.5.2.1.4. Balance entities shall execute independently (without an order from JSC EMS) the last approved daily schedule of the balance group in the part referring to such an entity. In this process, reverse hydro electric power plant reports the synchronisation and untying generators i.e. controlled consumption from the grid to the competent JSC EMS dispatch centre at least 15 minutes ahead. In case it fails to implement the daily plan of its balance group, a balance entity shall immediately inform the competent JSC EMS dispatch centre.
6.5.2.1.5. JSC EMS dispatch centres shall issue orders for balancing and re-dispatching balance entities. These orders shall be issued in a timely manner in advance (considering the time required for the implementation of the order in accordance with the technical specifications of

the generator i.e. controlled consumption), and shall include the beginning and end of order validity period, the amount of change of capacity balancing entity n relation to the last adopted daily plan of that entity and the value of new balance entity daily schedule.

6.5.2.1.6. In case JSC EMS issues an order which can endanger safety of people or facility, subordinate personnel in the transmission system control (operators in transmission facilities, and/or staff in transmission system user control centres) shall not be obliged to execute the order but shall provide explanation for such action. On the other hand, the staff is free to propose control actions to the superior JSC EMS dispatch centre based on available information, whereby the staff has full responsibility for accuracy of such information.

6.5.2.1.7. In case of oral issuance of order, the order recipient shall repeat the order to the order issuer, and the order issuer shall confirm the accuracy, or the order procedure shall be repeated

6.5.2.1.8. JSC EMS dispatch centres shall keep activity logs. Activity log shall be kept chronologically. Activity logs shall include all relevant data for transmission grid control, and particularly the following:

- Issued and received orders;
- Trippings and failures of 400 kV, 220 kV and 110 kV transmission grid elements;
- Switch-on or switch-off in the 400 kV, 220 kV and 110 kV transmission grid;
- Generation issues;
- 400 kV, 220 kV and 110 kV transmission grid security issues;
- Implementation of load-shedding;
- Issues with regard to the control equipment; -
- Issues regarding protection in the 400 kV, 220 kV and 110 kV transmission grid;
- Issued i.e. repealed documents on work;
- Received telegrams;
- other information relevant for transmission system operation.

6.5.2.2. Load-frequency control

6.5.2.2.1. Load-frequency control shall be done through following activities:

- Application of primary control;
- Application of secondary control;
- Application of tertiary control;
- Provision of additional electricity interchange by engaging balance reserves from suppliers, i.e. transmission system operator.

6.5.2.2.2. At any given moment JSC EMS shall provide the primary control band, defined by this Code.

6.5.2.2.3. In order to provide safe operation of the transmission system, JSC EMS has the right to connect or disconnect a generating unit from operation in primary control, in cooperation with the transmission system user, which is governed by the Contract on Ancilliary Services Such connection, i.e. disconnection, shall be based on technical reasons.

6.5.2.2.4. Each transmission system user providing ancillary service of primary control shall activate or deactivate primary regulators as requested by JSC EMS. If a generating unit providing system service of primary control disposes of an energy source which does not reflect its possibility of providing services of primary control, it shall activate its reserve in primary control until the frequency deviation ends.

6.5.2.2.5. JSC EMS shall provide uninterrupted implementation of secondary control, as well as the control band at any given moment, as defined by the Code. JSC EMS may exchange secondary control energy with neighbouring transmission system operators, in accordance with the rules on operation of interconnection and concluded agreements.

6.5.2.2.6. Each transmission system user providing system service of secondary control shall, as requested by JSC EMS, include its generator units, declared for secondary control operation, in this type of control.

6.5.2.2.7. If the area control error is such that it may not be removed through full activation of the secondary control band, JSC EMS shall timely issue an order for activation of available tertiary reserves through balancing mechanism in compliance with the rules governing electricity market

6.5.2.2.8. Orders for engaging balance entities shall be issued by JSC EMS taking into account that the start time of the engagement of balance entities is feasible in accordance with the technical specifications and the currently available capacity of the entity for engagement in the balancing mechanism.

6.5.2.2.9. All orders for engagement of balance entities shall be recorded by JSC EMS. These orders shall include the following data:

- time of issuing the order;
- reason for engaging balance entities (balancing system, endangered system security, other.);
- EIC identification code of engaged balance entity;
- interval of engagement;
- direction of tertiary control (upward or downward);
- ordered change in MW compared to the applicable daily schedule of balance entity

6.5.2.2.10. JSC EMS shall keep a record of activated balancing reserves. Data to be recorded are as follows:

- amount of activated balancing reserves in MW;
- interval of engagement;
- balance reserve supplier.

6.5.2.2.11. In case the tertiary reserve is less than the minimum amount defined by the Code, JSC EMS shall take measures in order to ensure the lacking reserve. These measures shall include:

- issuing orders to activate or shut down generating units and/or electricity storage;
- agreements on cross-border electricity exchange.

6.5.2.2.12. In case the neighbouring transmission system operator requests a cross-border electricity exchange for balancing its system, JSC EMS may agree with such exchange if the reserve is greater than the minimum set out in the Code, and in exceptional cases when this condition is not fulfilled if significant regulatory deviation of neighbouring system is registered or planned.

6.5.2.3. Voltage control

6.5.2.3.1. Voltage control shall be implemented based on the daily schedule of transmission system operation and real operating conditions of the transmission system, for the purposes of maintaining voltage within prescribed limits.

6.5.2.3.2. Voltage shall be primarily controlled, through issuing appropriate orders for generating or absorption of reactive energy in all operational generating units and operational electricity storages capable of voltage control, synchronous compensators and static compensation facilities that have contractual obligation to provide ancillary services in the area of voltage control.

6.5.2.3.3. In addition to generating i.e. absorption of reactive energy, voltage control shall be regulated with reactive power flow control in the 400 kV, 220 kV and 110 kV transmission grid, by changing positions on voltage control transformers, as well as by changing the switching condition in the transmission grid.

6.5.2.3.4. If, due to voltage control it is necessary to decrease active energy generation on certain generators due to reactive energy production, JSC EMS shall apply re-dispatching.

6.5.2.3.5. JSC EMS shall issue orders for change of positions on block transformers of all generating for the purpose of keeping the voltage in prescribed limits.

6.5.2.3.6. In the facilities where tie-lines are starting from, the voltage shall be maintained within the range defined with the neighbouring transmission grid operator.

6.5.2.3.7. If, in the operational work or in the process of analysing the voltage conditions, problems are identified in the matter of voltage regulation, which are caused by the operation of facilities of the transmission system users that deviate from the parameters prescribed by the rules governing the connection of facilities to the transmission system (illegal consumption power factor, deviations from defined technical characteristics, permanent limitations of generating units in relation to designed parameters etc.) JSC EMS requires such users of the transmission system to reduce their work to technically defined limits.

6.5.2.4. Transmission system operation monitoring

6.5.2.4.1. JSC EMS dispatch centres shall monitor the operation of power system in real time. Monitoring shall be done via SCADA system and telephone contacts with transmission system facilities personnel, as well as control centres and transmission system users' facilities.

6.5.2.4.2. JSC EMS shall provide the following real time information in its dispatch centres:

- System frequency; -
- Area control error (only for National Dispatch Centre); -
- Indication and alarm signals in transmission system facilities and the users' facilities;
- Active and reactive power flows, as well as values of electricity in the 400 kV, 220 kV and 110 kV transmission grid and transmission system user facilities (that are of interest for 400 kV, 220 kV and 110 kV grid operation);
- Active and reactive power of generating units;
- Connection equipment status;
- Control transformer tap positions;
- Voltage values at busbars of 400 kV, 220 kV and 110 kV grids facilities and transmission lines;
- Alarms and signals regarding accuracy of measured values, protection devices operation, communication status, etc.

6.5.2.4.3. JSC EMS shall define the necessary information in cooperation with the neighbouring transmission system operator, that is subject to real time exchange, in accordance with the interconnection rules.

6.5.2.4.4. JSC EMS dispatch centres shall be equipped with required telecommunication and computer equipment for collection and processing data, necessary for analysis of security of transmission system operation

6.5.2.4.5. The transmission system users continuously monitor the operation of their facilities and promptly inform the competent JSC EMS dispatch centres about all changes made to the elements of the first, second and third group of elements from the Classification.

6.5.2.4.6. JSC EMS promptly informs the transmission system user about the changes made to the elements of the first, second and third groups from the Classification that have an impact on the facility of this user.

6.5.2.5. Performance of Works in the 400 kV, 220 kV and 110 kV Transmission Grid

6.5.2.5.1. JSC EMS and transmission system users shall adhere to the planned state of power system elements they own, i.e. they are entitled to use, as well as the urgent switching-on.

6.5.2.5.2. Switching off ETG elements shall be done based on outage approval issued by JSC EMS, pursuant to submitted outage requests from point 6.4.4.6 in compliance with weekly outage plans or emergency outages.

6.5.2.5.3. Operating approval and notification on completion of work, for performance of works on elements of the first, second and third group of Classification are consolidated in the form, defined by JSC EMS jointly with transmission system users.
6.5.2.5.4. Columns in the Form referred to in Point 6.5.2.5.3 may be filled in by persons authorised by JSC and the transmission system user. Regular exchange of lists of authorised personnel, which may fill in the form, between JSC EMS and transmission system user, shall be done each year no later than March 1 of the current year.
6.5.2.5.5. For works on ETG elements, whose holder of usage rights is JSC EMS, a person managing the works whose name is in the turn-off request, shall announce the work to the authorised JSC EMS dispatch centre no later than 30 minutes prior to the time indicated in the turn-off request, and shall request switch-on or turn-off
6.5.2.5.6. If the work is performed on power system elements that are the property of, and/or whose holder of usage rights is the transmission system user, the authorised dispatch centre of transmission system user shall announce the works to the authorised JSC EMS dispatch centre no later than 30 minutes prior to the time indicated in the outage request, and shall request switch-on or switch-off.
6.5.2.5.7. If for any justified reason, the works cannot be performed, the person managing the work shall be obliged to inform the authorised dispatch centre accordingly not later than 30 minutes prior to the time for commencement of works (indicated in the outage request form) and to state the reasons why the works cannot be performed. In case of works on transmission system user facilities, transmission system user's dispatch centre shall forward this information to the authorised JSC EMS dispatch centre.
6.5.2.5.8. Authorised dispatch centre and person managing the work shall fill in operating approval for works on power system elements and works in the vicinity of these elements, that are the property, i.e. whose holder of usage rights is JSC EMS, after implementing basic protection measures at the works location, which marks the start of the operating approval. Filling in operating approval shall mean issuing appropriate statement by the dispatcher of the authorised dispatch centre and receipt of such statement by the person managing the works. Upon completion of the work, the person managing the work and authorised dispatch centre shall fill in notification on completion of work, which marks the completion of the operating approval. Filling in notification on completion of work shall mean issuing appropriate statement by the person managing the works and receipt of such statement by the dispatcher of the authorised dispatch centre.
6.5.2.5.9. For the works on power system elements that are the property of, and/or whose holder of usage rights is the transmission system user, authorised person of the authorised user dispatch centre of the transmission grid and person managing the work shall fill in operating approval and notification on completion of works. After filling in the operating approval, and/or notification on completion of works, the authorised user dispatch centre of the transmission grid shall promptly notify the authorised JSC EMS dispatch centre on time interval of unavailability, and/or availability of ETG elements.
6.5.2.5.10. In case of works that do not require basic safety measures at the work location on ETG elements, upon implementation of necessary switch-on or switch-off, the authorised dispatch centre shall inform the responsible person on topology status of ETG elements important for the performance of works, and shall allow performance of works. Upon the completion of works, the responsible person shall inform the authorised dispatch centre on the completion of works. In this case, operating approval and notification on completion of works shall not be filled in.
6.5.2.5.11. The authorised user dispatch centre of transmission grid shall promptly inform the authorised JSC EMS dispatch centre on time interval of unavailability, and/or availability regarding ETG elements that are the property of, and/or whose holder of usage rights is the

transmission system user, regarding works that do not require basic safety measures at work location, after such centre allows the responsible person to perform work, and/or receives information that the work has been completed.

6.5.2.5.12. Work stipulated in the outage request must be completed within the time interval stipulated in the form. However, if the works cannot be completed within such time interval, the person managing works, in coordination with the owner, and/or holder of usage rights of power facility, shall timely notify the authorised dispatch centre with which he/she filled in the operating approval of that fact, shall notify the centre on work status and request extension of deadline for work. In case it was done with user dispatch centre of the transmission grid, such dispatch centre shall forward that information to the authorised JSC EMS dispatch centre. Authorised JSC EMS dispatch centre shall make a decision on extension of deadline for works.

6.5.2.5.13. Authorised JSC EMS dispatch centre shall have the right to issue an order to terminate or delay planned outages, if normal and/or secure operation of transmission system is impaired.

6.5.2.6. Data collection

6.5.2.6.1. JSC EMS shall collect all data necessary for planning and analysing transmission system operations in the basic time unit used for planning the transmission system operation, which is:

- generating active and reactive electricity of all power plants connected to distribution grid;
- plans and estimates of generation and consumption of facilities connected to the distruibution system, at disposal to the distribution system operator;
- generating reactive power at compensation facilities connected to the transmission grid
- availability of generating units and electricity storages
- voltage values in relevant 400 kV, 220 kV and 110 kV grids facilities;
- deviation of frequency and synchronous time;
- current active and reactive power flows for certain time periods;
- hourly interchange of electricity on inter-connectible transmission lines;
- 400 kV, 220 kV and 110 kV grid configuration;
- condition of high-voltage equipment in transmission system facilities and transmission grid user facilities;
- volume and duration of secured and activated system services;
- recording excesses of permissible limits for transmission lines, transformers, and/or deviations of voltage or frequency from the prescribed limits;
- meteorological data (inflows, levels, accumulation state, speed and direction of the wind, temperature, air pressure, solar radiation);
- other data necessary for planning and analysis of operation of electricity transmission system.

Transmission system users shall submit to JSC EMS the stated data regarding their facilities, in a way and in form defined by JSC EMS.

6.5.3. CONTROL DURING DISTURBANCES

6.5.3.1. Introduction

6.5.3.1.1. JSC EMS shall take all available measures in order to avoid disturbances.

6.5.3.1.2. It is necessary for JSC EMS dispatch centres to be able to record disturbances and their characteristics based on the received information, in order to formulate control actions for removing or limiting disturbances based on this information.

6.5.3.1.3. In case of disturbance, JSC EMS shall promptly take all necessary technical measures in order to prevent spreading of disturbances and provide the return of all parameters in the 400 kV, 220 kV and 110 kV grid to the prescribed limits and to restore electricity supply to the transmission system users that lost the electricity supply. These measures shall include:

- attempt to switch on the elements that tripped-out in the 400 kV, 220 kV and 110 kV grid;
- other switch-on or switch-off in the 400 kV, 220 kV and 110 kV grid;
- re-dispatching;
- change of position on regulatory transformers;
- cancelling planned outages in the 400 kV, 220 kV, 110 kV grid and termination of works in progress;
- making appropriate arrangements for electricity exchange;
- cancelling or reducing existing electricity interchange (if changes in generating and making new agreements in electricity interchange are not possible, and/or if the results of these control actions are insufficient to resolve disturbances);
- implementation of the Transmission System Defence and restoration Plans
- other measures prescribed by laws and by-laws

When selecting the above-mentioned measures, JSC EMS shall apply the principles of minimum costs and non-disturbance in the electricity market.

6.5.3.1.4. If there is a disruption and the need to apply re-dispatching measures in order to establish the normal operation of the transmission system, as a rule, generation and consumption capacities from the priority list and bids for threatened safety of the transmission system are engaged in accordance with the rules governing the electricity market.

6.5.3.1.5. JSC EMS does not have to follow the order of engagement of balance entities from the priority list from point 6.5.3.1.4. in cases where the safe operation of the transmission system is threatened, including cases of local disruptions, or in cases where the transmission system user, whose connection method is defined by the act of connection and which contains operational restrictions, endangers the transmission system operation.

6.5.3.1.6. In cases of need for re-dispatching from point 6.5.3.1.5, as a rule, JSC EMS adheres to the order of application of re-dispatching according to the following priority:

1. transmission system users who directly threaten the safe operation of the transmission system and have defined operational restrictions in the connection method, regardless of their status in accordance with the law governing the use of renewable sources;
2. transmission system users who have defined operational restrictions in the connection method and do not have a privileged status in accordance with the law regulating the use of renewable energy sources
3. transmission system users who have defined operational restrictions in the connection method and have a privileged status in accordance with the law regulating the use of renewable sources;
4. transmission system users who do not have defined operational restrictions in the way of connection and do not have a privileged status in accordance with the law regulating the use of renewable sources;
5. transmission system users who do not have defined operational restrictions in the connection method and have a privileged status in accordance with the law regulating the use of renewable sources.

6.5.3.1.7. Re-dispatching of multiple transmission system users from point 6.5.3.1.6 shall be carried out in proportion to the engaged power that affects the safe operation of the transmission system.

6.5.3.1.8. JSC EMS shall keep records of transmission system users who have defined operational restrictions in the method of connection and applied re-dispatching.

6.5.3.2. Removal of disturbances

6.5.3.2.1. In case of overload of power line, transformer or any other 400 kV, 220 kV or 110 kV transmission grid element, authorised JSC EMS dispatch centre shall undertake measures for removal of overload on that element.

6.5.3.2.2. It is permitted to temporary block the overload protection during removal of disturbances, but loads on such elements must not exceed values which can cause damages to the 400 kV, 220 kV and 110 kV transmission grid elements or neighbouring facilities.

6.5.3.2.3. In case of tripping of elements in the 400 kV, 220 kV and 110 kV transmission grid, the operational staff within the JSC EMS dispatch centres shall collect data on effects of security measures based on which they shall decide on control actions that need to be carried out.

6.5.3.2.4. Transmission system users dispatch centres shall deliver to the authorised JSC EMS dispatch centre data on the performance of the protection from all elements in their facility which are categorized in first, second or third group of the Classification, as well as of those elements which are in galvanic connection to such elements. In case of power line tripping, these data shall include:

- name of the facility;
- name of the power line (voltage level, number and route);
- type of the protection which reacted;
- type of failure (single-phase, two-phase etc.);
- phases struck by failure;
- degree to which the protection was effective;
- information on activation of AR and whether the AR attempt was successful or not;
- distance of the failure location 8data from the failure locator)

and in case of transformer tripping:

- name of the facility;
- transformer designation;
- all types of protection devices which reacted;
- transformer load immediately before the tripping;
- ambient, oil and windings temperatures immediately prior to the tripping;
- activation of fixed fire protection (in facilities where such protection exists).

Transmission system user dispatch centre shall also inform the authorised JSC EMS dispatch centre about other circumstances that accompanied the tripping, such as:

- manipulations in the facility;
- works carried out in the facility;
- visible traces of failure in the facility (electric arc, smoke, fire, unusual odour etc.);
- atmospheric discharges in the vicinity of the facility and other weather conditions.

6.5.3.2.5. In case of permanent tripping of power line circuit breakers due to the action of power line protection on both sides of the power line, JSC EMS dispatch centre may issue one order for the reconnection of the power line at least 3 minutes after the tripping if during tripping an unsuccessful AR was recorded, or if there was no AR. The power line reconnection shall be done from the side of the power line where lower tripping currents are expected, except in case of a power line which connects a power plant facility, in which case the trial for the connection of the power line to the voltage shall be done towards the power plant facility. In case of the repeated tripping of the power line due to the action of the protection which indicates to a permanent outage on the power line, the power line shall not be reconnected until the outage is removed. Exceptionally, JSC EMS dispatch centre may repeat the order to reconnect the power

line in the following cases:

- tripping of power lines in star connection;
- tripping of power lines without circuit breaker;
- non selective tripping;
- other trippings when, by sectioning the transmission grid, the element of the grid with outage can be established by repeated energizing,
- Icing of power lines or other situations when there is an influence of weather conditions, vegetation and civil engineering objects on the power line, after the information from the field have been received from the authorised person.

6.5.3.2.6. In case of failure of the cable or mixed line due to the effect of protection, no attempt to switch on is allowed until the cable is tested or repaired. If, in case of a mixed line, it is determined that there is a fault in the above-ground section of the line, it is possible to connect the cable without testing.

6.5.3.2.7 Upon the order of JSC EMS transmission system users shall, in the shortest period of time switch on tripped elements of the transmission grid in their facilities, unless the protection signals indicate that a damage exists in that facility, when the transmission system user is allowed to make a visual inspection of the installation in the shortest possible time, based on what the decision is made regarding the further failure fixing.

6.5.3.2.8. The authorised JSC EMS dispatch centre may request changes to the protection settings with the aim to form a connection scheme which shall ensure the most reliable power supply to the transmission system user's facility during the tripping of an element of 400 kV, 220 kV and 110 kV transmission grids

6.5.3.2.9. Transmission system users shall inform the authorised JSC EMS dispatch centre about the condition of their facility and potential damages that may cause tripping of the facility or its part.

6.5.3.2.10. In the case when the operational staff of JSC EMS dispatch centre receives information on potential failure from an authorised person (from JSC EMS or transmission system user) the staff shall undertake the following activities:

- consider consequences of disconnection, or tripping of that element;
- consider control activities in order to maintain normal, that is secure operation of the transmission system in case of disconnection, or tripping of that element;
- if deemed necessary, disconnect the element whose potential failure was identified;
- if assesses that the necessary disconnection shall jeopardize normal operation of the transmission system, issues an order to persons authorised by JSC EMS, to urgently dispatch teams which shall remedy the failure.

6.5.3.2.11. In case of permanent or potential malfunction of a power system element of a transmission system user, the responsible EMS JSC control centre shall contact the respective user and arrange for the removal of failure.

6.5.3.2.12. In case of permanent or potential failure of a power system element or a transmission system user, such transmission system user shall urgently inform the competent JSC EMS dispatch centre about the following:

- cause of failure;
- expected time for its removal;
- effect of failure to the availability of other power system elements of that transmission system user.

6.5.3.2.13. When JSC EMS determines that a permanent or potential failure of a power element of the transmission system user may jeopardize normal operation of the transmission system, it shall promptly inform such user of the period after which the normal operation of the transmission system cannot be ensured without the return of the stated element into operation. The transmission system user shall notify JSC EMS of its ability to fulfil the stated requirement

regarding such period for the elimination of failure or shall provide JSC EMS with appropriate explanation otherwise.

6.5.3.2.14. JSC EMS shall cooperate with neighbouring interconnecting transmission system operators in order to coordinate exploitation and avoid incidents on tie-lines, as well as when the assistance of neighbouring operator is necessary to solve the problem in our transmission system and vice versa, including agreement for cross-border exchange of electricity in accordance with concluded agreements and for interconnection operation rules.

6.5.3.3. Limitation of electricity supply and voltage reductions

6.5.3.3.1. In the case of a lack of active power in the transmission system, a lack of reactive power in the system or a voltage breakdown, overloading of the 400 kV, 220 kV and 110 kV transmission line elements or some other disturbance, in which there is a danger of disrupting the normal operation of the transmission system, voltage reductions can be done by applying Plan for the protection of the transmission system against voltage collapse, i.e. the limitation of electricity supply in the whole or certain parts of the system by applying the Plans for the limitation of electricity supply, after all possible measures have been taken in order to avoid the implementation of the mentioned plans. On that occasion, the competent management centre of JSC EMS decides which type of plan to implement.

6.5.3.3.2. If the transmission system user refuses to implement the Plans for the limitation of electricity supply in the amount set by JSC EMS, JSC EMS is authorised to disconnect parts or the entire facilities of this transmission system user, up to the value of the set amount, provided that the non-action of the transmission system user is unjustifiable.

6.5.3.3.3. JSC EMS promptly informs users of the transmission system and competent authorities about planned and expected disruptions and interruptions in the supply of electricity, except when this is impossible due to the speed of reaction in order to prevent the breakdown of part or the entire transmission system.

6.5.3.4. Transmission system restoration

6.5.3.4.1. If there is a partial or complete breakdown of the transmission system, the competent control centres of JSC EMS and users of the transmission system establish a transmission system guided by the Transmission System Establishment Plan.

6.6. PROTECTION SYSTEM OPERATION

6.6.1. INTRODUCTION

6.6.1.1. Protection system, technical conditions, selection of types of protection, functional testing of the protection system and setting of protection for the 400 kV, 220 kV and 110 kV networks, as well as the obligations of JSC EMS and users of the transmission system during the process of planning the development, reconstruction, operation and exploitation of the transmission system they are carried out according to the Rules and regulations governing the connection of facilities to the transmission system.

6.6.2 . DOCUMENTATION AND TECHNICAL INSTRUCTIONS

6.6.2.1. JSC EMS has up-to-date documentation related to the types and settings of protection in facilities of the transmission system and adjustment plans in the facilities of transmission system users for the 400 kV, 220 kV and 110 kV networks.

6.6.2.2. The transmission system user submits to JSC EMS up-to-date documentation on

functional changes or reconstructions of the protection system in its facilities, which affect the transmission of electricity.

6.6.2.3. JSC EMS determines the basic technical requirements and conditions for the protection system and setting the protection of lines and power transformers in the network of the transmission system 400 kV, 220 kV and 110 kV.

6.6.3 . PRE- SETTINGS, REPLACEMENT AND MAINTENANCE OF PROTECTION

6.6.3.1. Pre-settings and replacements of protection in facilities of users of the transmission system that affect the operation of the 400 kV, 220 kV and 110 kV networks are carried out with the prior consent of JSC EMS through the modification of the protection setting plan according to the rules governing the connection of facilities to the transmission system.

6.6.3.2. The transmission system user reports to JSC EMS, after the changes made in the settings of the existing protection or the replacement of protection, no later than three working days after the introduced changes in the protection systems in their facility.

6.6.3.3. JSC EMS, i.e. the transmission system user, performs periodic inspection and maintenance of the protection system in its facilities, in accordance with the rules establishing technical standards for the maintenance of power facilities.

6.6.3.4. Protections on interconnecting lines are recommended in accordance with the agreements with the neighbouring transmission system operator.

6.6.4. PROTECTION SELECTIVITY

6.6.4.1. Protection systems operate selectively, in order to shut down the limited part of the transmission system affected by the fault. The principle of overlapping protection zones must be implemented, due to the reliability of the protection operation and so that each part of the transmission system has its own back-up protection.

6.6.4.2. The protection selectivity takes into account:

- topology and operating conditions of the facility of the transmission system user;
- technical conditions in the location of connection;
- switching states for failure of one element of the transmission system.

6.6.5. FAILURE DISCONNECTION TIME

6.6.5.1. Disconnection times for failures in the 400 kV, 220 kV and 110 kV networks are determined by JSC EMS. In order to selectively switch off only the element of the transmission system affected by the failure, the protection action is time-graded.

6.6.5.2. The disconnection times of electrically close failures (except for those with a high proportion of transient resistance of the failure or developing failure) on the lines, which are disconnected in the first stage of protection action, are the maximum:

- 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 failures on lines, as well as failures on adjacent busbars (except for those with a high share of transient resistance of the failure or developing failure), are switched off as a rule in the second stage of remote protection, and the maximum switching times are:

- 350 ms in the 400 kV transmission network, if the system for simultaneous disconnection of protection is not used, i.e. 150 ms if this system is used;
- 500 ms in the 220 kV transmission network if the system for simultaneous disconnection of protection is not used, i.e. 150 ms if this system is used;
- 500 ms in the 110 kV transmission network if the system for simultaneous disconnection of protection is not used, i.e. 150 ms if this system is used.

6.6.5.4. Failures on power transformers are excluded for a maximum of 100 ms from the basic protection of the transformer, which includes electrical protection of the transformer against internal failures (differential protection and limited earth failure protection, i.e. alternative "house" protection) and personal protection of the transformer (Buchholz transformer, Buchholz control switch, rapid pressure rise relays).

After the operation of the mentioned transformer protections, it is necessary to carry out the necessary checks and tests before putting the transformer into operation again.

6.6.5.5. Failures on the busbars are excluded for a maximum of:

- 100 ms if bus differential protection is active (local protection);
- a time equal to the time of disconnection in the second stage of remote protection of the lines, because failures on them are eliminated by disconnecting the supply lines in neighbouring plants (remote protection), i.e. a time equal to the time of disconnection of the multi-stage two-way remote protection of transformers whose low-voltage side is galvanically connected to these busbars.

6.6.6. AUTOMATIC RECONNECTION

6.6.6.1. Automatic reconnection (AR) functions are implemented on overhead lines in the transmission network, which have the following duty cycles:

- single-phase AR in the 400 kV, 220 kV and 110 kV transmission networks with a voltage-free pause, which as a rule is 1 s;
- three-phase AR in the 220 kV and 110 kV transmission networks, and only in exceptional cases in the 400 kV transmission network, with a voltage-free pause which as a rule is 1 s;
- On certain lines, depending on the proximity of the production facility, on interconnecting lines or on lines where the age and operating condition of the primary equipment can affect the operation of the AR, a voltage-free pause of less or more than 1 s can be used, in order to ensure more reliable operation of the system or agreed with the operation of neighbouring systems.

6.6.6.2. Three-phase AR and manual switch-on in 400 kV, 220 kV and 110 kV transmission lines is applied with checking of synchronisation conditions. Checking the synchronisation conditions in the case of a three-phase AR, as well as the manual switching on of the switch in the 220 kV and 110 kV transmission networks is applied in the event that, after analysing the operation of the system or conducted studies, it is found that with a three-phase AR, or manual switching on of the switch, on certain lines can lead to problems with the stability of the transmission system or excessive start-up currents (which can cause an outage immediately

after start-up) occur. JSC EMS issues an order to activate the function of checking the conditions for synchronisation on these lines.

6.6.7. REAL-TIME FUNCTIONING

6.6.7.1. JSC EMS coordinates the work of protection for all users of the transmission system in order to ensure the maximum allowed times of disconnection of failures, which are specified in the rules governing the connection of facilities to the transmission system. Deviations from the maximum allowed disconnection times are allowed only due to the technological obsolescence of the built-in switches, i.e. protection devices, provided that these deviations do not exceed 10%.

6.6.7.2. In the event that the analysis of disturbances in the 400 kV, 220 kV and 110 kV networks showed indiscriminate operation of the protection system in the facilities of the users of the transmission system, JSC EMS undertakes measures within its competences in order to eliminate the irregularities as soon as possible.

6.6.7.3. In the case of the unavailability of the main protection device of the lines or one of several basic protections of the energy transformer, it is possible to operate the protected element for a limited time only with a spare protective device, i.e. the remaining basic protections, and in accordance with the measures and procedures for the effect of protective and automatic devices in the network 400 kV, 220 kV and 110 kV determined by JSC EMS.

6.6.8. PLAN FOR OVERLOAD PROTECTION SETTINGS

6.6.8.1. JSC EMS creates and implements the Plan of settings for protection against overloading of lines for the winter and summer seasons.

6.6.8.2. The plan for overload protection setup on the line takes into account the technical characteristics of the lines and the associated high-voltage equipment in transmission line or cable fields, and according to the expected seasonal meteorological conditions, with the aim of ensuring effective protection of the lines and the associated high-voltage equipment against permanent deformation that can be caused by thermal stress due to excessive current load.

6.6.8.3. The plan for overload protection settings includes all 400 kV and 220 kV lines, as well as 110 kV lines on which overloads can be expected.

6.6.9. UNDERFREQUENCY AND OVERFREQUENCY PROTECTION

6.6.9.1. In order to fulfill the requirements regarding the under-frequency protection plan as part of the Transmission System Defence Plan, underfrequency protection with the following characteristics is installed in the facilities of the end customer, electricity storage, distribution system and closed distribution system:

- frequency adjustment range: 47-50 Hz, in steps of 0.005 Hz;
- response time setting: 0-150 ms;
- the possibility of voltage blocking for a voltage in the range of 30-90% of the nominal voltage;
- the possibility of detecting the direction of the flow of active power, except for outlets, where active energy is either injected or taken over throughout the year and

- to have the number of degrees of response defined by the Underfrequency Protection Plan.

6.6.9.2. In order to fulfill the requirements related to the Overfrequency Protection Plan as part of the Transmission System Defence Plan, overfrequency protections are installed in the facilities of the production modules and electricity storage facilities in accordance with the rules governing the operation of the interconnection and the Overfrequency Protection Plan.

6.7. COMMUNICATION AND TECHNICAL CONTROL SYSTEM OPERATION

6.7.1. COMMUNICATION SYSTEM

6.7.1.1. With its communication system, JSC EMS enables continuous communication with users of the transmission system, participants in the electricity market and other operators of the transmission system in accordance with the rules on the operation of the interconnection.

6.7.1.2. In the event of interruption of the operation of devices and lines for communication with users of the transmission system, the contract on the exploitation of the facility of the users of the transmission system foresees a procedure for communication via public connections.

6.7.1.3. In the event of interruption of the operation of devices and directions for communication with participants in the electricity market, the procedure defined in points 6.4.3.1.4 to 6.4.3.1.7 is foreseen in this Code.

6.7.1.4. In the event of interruption of the operation of the device and directions for communication with other operators of the transmission system, communication is used in accordance with the bilateral agreements signed between neighbouring transmission system operators and the rules on the operation of the interconnection .

6.7.1.5. Communication is provided for telephone conversations, normal functioning of the technical control system and protective devices.

6.7.1.6. The users of the transmission system and JSC EMS, in accordance with their competences, ensure the continuous exchange of data in real time with the competent control centres of JSC EMS.

6.7.1.7. All communication systems, routes and devices should have adequate backup in the event of an outage.

6.7.1.8. All telephone conversations conducted from JSC EMS control centres are recorded and stored for at least 30 days.

6.7.2. TECHNICAL CONTROL SYSTEM

6.7.2.1. The technical control system is designed and used so that the JSC EMS can fulfill all obligations related to the control of the 400 kV, 220 kV and 110 kV networks in the manner prescribed by this Code.

6.7.2.2. The competent control centres of JSC EMS have clearly and comprehensibly displayed real-time data of importance for the management of the 400 kV, 220 kV and 110 kV transmission networks.

6.7.2.3. In the competent control centres of JSC EMS, as well as in other critical facilities, an adequate and reliable uninterrupted backup power supply of the technical control system is

provided. Checking the correctness of the data necessary for calculating the error of the control area, within the technical management system, is performed periodically at least once a year.

6.7.2.4. All interconnecting lines are 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 are transferred to the competent control centres of JSC EMS.

6.7.2.5. JSC EMS archives the measured values of the quantities that are needed to analyse the operation of the transmission system, the operation of production modules and the preparation of reports on the operation of the transmission system.

6.7.2.6. As a rule, a redundant configuration of the control system is used in transmission system facilities.

6.7.3. TEMPORARY UNAVAILABILITY OF JSC EMS CONTROL CENTRES

6.7.3.1. In case of temporary unavailability of one of the regional dispatch centres, its responsibilities are taken over by the National Dispatch Centre. The National Dispatch Centre has appropriate documentation, real-time data and necessary applications of the technical control system.

6.7.3.2. In case of temporary unavailability of the National Dispatch Centre, its functions are taken over by the backup National Dispatch Centre.

6.7.4. MAINTENANCE OF COMMUNICATION AND CONTROL EQUIPMENT

6.7.4.1. JSC EMS and users of the transmission system maintain their equipment, which is used for communication and control of the 400 kV, 220 kV and 110 kV networks, in proper condition.

6.7.4.2. Maintenance work on equipment for communication and control of the 400 kV, 220 kV and 110 kV networks is planned so as not to jeopardize the normal operation of the transmission system. When planning these works, JSC EMS cooperates with transmission system users and neighbouring transmission system operators.

6.7.5. REQUIREMENTS FOR THE TRANSMISSION SYSTEM USERS

6.7.5.1. Communication equipment in facilities of users of the transmission system in accordance with the Code is the equipment that is necessary for the communication of the control centres of JSC EMS with this facility.

6.7.5.2. Users of the transmission system with the technical control system of JSC EMS exchange information in real time necessary for the control of the transmission system in accordance with the technical conditions from the rules governing the connection of facilities to the transmission system, i.e. the contract on the exploitation of facilities.

6.7.5.3. Distribution system operatoto r and closed distribution system operator, in addition to the data from 6.7.5.2. provides to JSC EMS also available real-time data on total production and consumption in the distribution, i.e. closed distribution system.

6.7.5.4. The transmission system user has documentation related to the communication and transmission system management equipment installed in its facility. At the request of JSC

EMS, the transmission system user submits for review the documentation specified in this section.

6.7.5.5. In the event of a failure of the communication equipment, i.e. management of the transmission system, after detecting the failure or receiving information about the failure, the transmission system user informs JSC EMS without delay and is obliged to take all possible measures to eliminate the failure in the shortest possible time.

6.7.5.6. Before turning off the equipment for communication, i.e. the equipment for managing the transmission system, the transmission system user, requests the consent of JSC EMS to turn off that equipment at the latest three days before the turn off.

6.8. EES SYSTEM STABILITY DEVICE OPERATION

6.8.1. The EES system stability device is active during normal operation and operation in disturbance conditions, if required by the transmission system operator. With a reversible hydroelectric power plant, the transmission system operator can require that this device be active during both generator and pumping modes of operation.

6.8.2. The transmission system user can temporarily deactivate the EES system stability device only during the process of starting or stopping the synchronous production module.

6.8.3. If the stability analyses show that it is necessary to install a system for dampening oscillations, JSC EMS and the owner, i.e. the holder of the right to use the synchronous production module, will initiate activities for the installation of these systems.

6.8.4. All modifications of system stability devices in transmission system user facilities, i.e. on synchronous production modules that affect the stability of the transmission system, are agreed with JSC EMS.

6.9. REPORTING ON THE TRANSMISSION SYSTEM OPERATION

6.9.1. INTRODUCTION

6.9.1.1. JSC EMS monitors and analyses the operation of the transmission system based on data on the operation of individual parts, i.e. elements of this system, which are collected by:

- technical control system;
- devices for remote transmission of measurements and signals;
- the transmission system user, both orally and in writing.

6.9.1.2. Reports on the operation of the transmission system include regular and extraordinary reports. Users of the transmission system submit to JSC EMS all necessary data for the preparation of the reports specified in this section within the deadline and format determined by JSC EMS.

6.9.1.3. When preparing, submitting and publishing the report, JSC EMS pays special attention to the confidentiality of the information contained in the report.

6.9.2. REGULAR REPORTS

6.9.2.1. JSC EMS prepares regular reports on the operation of the transmission system. Regular reports contain data on:

- realized energy and power consumption;

- realized production;
- energy spent on pumping;
- taking over energy from the distribution system;
- cross-border exchange of electricity;
- technical losses in the transmission system;
- voltages at characteristic points of the networks 400 kV, 220 kV and 110 kV;
- participation of transmission system users in system services;
- unavailable production modules and electricity storages, as well as causes of unavailability;
- diagram of production, exchange and consumption;
- outages and failures in the 400 kV, 220 kV and 110 kV networks;
- disconnections and reconnections in the 400 kV, 220 kV and 110 kV networks;
- balancing and re-dispatching;
- realized production restrictions at facilities with defined operating restrictions in the connection process;
- to the provided reserve in accordance with the agreements on auxiliary services;
- analysis of the work of units in secondary regulation
- more important operation events;
- connecting buildings to the transmission system;
- significant reconstructions and additions of transmission system facilities and facilities of transmission system users;
- other data important for the operation of the transmission system.

6.9.2.2. Regular reports are prepared on a daily, weekly, monthly and annual basis, and contain certain data from point 6.9.2.1, in accordance with the content of the report.

6.9.2.3. JSC EMS prepares a regular annual report on the operation of the transmission system for the previous year and publishes it on its website no later than the 31st of March of the current year.

6.9.3. EXTRAORDINARY REPORTS

6.9.3.1. JSC EMS prepares and submits to the competent authorities and affected users of the transmission system an extraordinary report on operational events and events in the transmission system in cases where there has been an interruption in the supply of electricity from the transmission system, i.e. an interruption of the transfer to the transmission system, a reduction or cancellation of the exchange of electricity that was contracted by JSC EMS, i.e. when JSC EMS assesses that the consequences of a power event may threaten the normal operation of the transmission system in the coming period and the functioning of the electricity market, within 3 working days after the said event.

6.9.3.2. At the request of JSC EMS, the transmission system user submits to JSC EMS data on the operational event in its facility that affected the operation of the transmission system as soon as possible.

6.9.3.3. JSC EMS prepares and submits an extraordinary report to the competent authorities if it assesses that difficulties in the supply of electricity to end customers and the functioning of the electricity market can be expected in the coming period.

6.9.3.4. JSC EMS and transmission system user are obliged to ensure efficient exchange of process information (signals, measurements and alarms), as well as information on significant operating events in the shortest possible time.

CHAPTER 7: USE AND MAINTENANCE OF THE FACILITIES

7.1. INTRODUCTION

7.1.1. This chapter of the Code closely defines the use and maintenance of facilities, the content of the contract on the exploitation of the facility concluded with the end customer, the manufacturer, the operator of the distribution system and the operator of the closed distribution system, the obligations of the user and the operator of the transmission system in the functional testing and commissioning of the part of the 110 kV distribution system managed by the operator are regulated of the transmission system, as well as in the elements of the power system of the facilities of producers and end customers that affect the safe and reliable operation of the transmission system, as well as in testing the operation of protective and control devices after significant operational events or disturbances in the operation of the transmission system, as well as the training of operator personnel and users of the transmission system in the field of operational procedures, with the aim of safe and reliable operation of the transmission system.

7.1.2. The transmission system user ensures that the technical conditions for the connection of his facility to the transmission system, regulated by the regulations and the act on the connection of the facility, are fulfilled all the time during the exploitation of the facilities, and in the event that non-compliance with the stated conditions is discovered, the transmission system user takes measures to eliminate non-compliance within the period defined by JSC EMS, in accordance with point 7.6. of this Code.

7.1.4. In accordance with the regulations governing the planning and construction of buildings, the owner, i.e. the holder of the right to use the building, ensures the performance of works on the maintenance of the buildings. Regular, unannounced and specialist inspections and tests of facilities can be carried out by other legal entities that meet the prescribed requirements in terms of professional staff and equipment for performing work.

7.1.5. In the event of a breakdown in the facilities of the transmission system, JSC EMS undertakes the following activities:

- reports the accident to the competent authorities;
- temporarily removes the consequences of the object's breakdown;
- provides the necessary goods, services and works in order to remove all the consequences of the accident and bring the facility affected by the accident to the designed condition.

7.2. GENERAL TERMS AND CONDITIONS FOR THE USE OF FACILITIES

7.2.1. The general terms of use of transmission system facilities and facilities of transmission system users determine the technical and organisational conditions for the exploitation of these facilities, which are of interest for the normal operation of the transmission system and the facilities themselves.

7.2.2. All technical and organisational conditions prescribed by this Code and the rules governing the connection of the facility to the transmission system are considered to be the general conditions for the use of facilities of the transmission system and facilities of users of the transmission system.

7.2.3. If the use of facilities takes place outside the general conditions defined by this Code and the rules governing the connection of the facility to the transmission system, then the transmission system user, i.e. JSC EMS, in accordance with its obligations, undertakes measures to harmonize the use of this facility with the provisions of the aforementioned regulations.

7.2.4. If the transmission system user requires special conditions of use of his facility with which JSC EMS agrees, i.e. if the measures from Article 7.2.3 can not be implemented, then all special conditions of use are included in the contract on the exploitation of the facility.

7.2.5. The special conditions of use of the transmission system user's facility must not impair the normal operation of the transmission system.

7.2.6. The special conditions of use of the facility of one transmission system user must not create additional costs for other users of the transmission system.

7.2.7. The energy park module must not inject into the network an active power higher than the value of the approved power. In case of unavailability of the limiter that is installed in accordance with the rules governing the connection of the facility to the transmission system, JSC EMS will limit the power at the connection point to the value of the approved power.

7.3. CONTENTS OF THE CONTRACT ON EXPLOITING OF FACILITIES

7.3.1. In addition to the general elements of the contract in accordance with the law regulating the obligation relations, the contract on the exploitation of the facility contains in particular information on:

- objects to which the contract refers;
- ownership limits on primary, secondary and other equipment;
- competent control centres of JSC EMS and users of the transmission system;
- authorised personnel for technical cooperation;
- JSC EMS staff who have the right to access the transmission system users' facilities;
- technical characteristics of the facility;
- exchange of technical documentation;
- technical parameters related to electricity measurement;
- calculation parameters on the basis of which the calculation of access to the transmission system will be carried out;
- operation of protective devices, telecommunication equipment and control equipment;
- monitoring of electricity quality parameters and measuring devices related to electricity quality measurement;
- disconnection planning and performance of works on EES elements;
- planning the operation of the transmission system in accordance with the rules of interconnection, format and method of data submission;
- signals which are exchanged in real time between the technical control system of JSC EMS and the users of the transmission system;

- method of controlling the quality of supplied electricity;
- technical parameters of installed equipment necessary for modeling in the technical control system of JSC EMS;
- the manner of participation of facilities in the Defence Plans and the Plan for establishing the transmission system;
- confidential technical information.

7.3.2 In addition to the data from point 7.3.1. the contract on exploitation may also contain special conditions for the exploitation of facilities, provisions related to safety and health at work, as well as rules for the substitution of missing data for the calculation of electricity.

7.3.3 For users of the transmission system for which JSC EMS determines the need in accordance with the technical characteristics of the facility, the obligation to deliver valid and updated simulation models of facilities that faithfully simulate the behavior of those facilities in stationary and dynamic situations, as well as the format in which they are delivered, is defined.

7.3.4. The exploitation contract unencumbered in the part that refers to the general conditions of use, i.e. the standard services of the transmission system operator.

7.4. AUTHORISED PERSONNEL

7.4.1. In order to efficiently use the facilities of the transmission system and the facilities of the users of the transmission system, it is necessary that JSC EMS and the users of the transmission system mutually authorise the personnel for technical cooperation.

7.4.2. Technical cooperation staff should be appointed for the following activities:

- planning the operation of the transmission system;
- transmission system management;
- disconnection planning and execution of works on EES elements in the 400 kV, 220 kV and 110 kV networks;
- operation of the protection system;
- operation of the electrical energy measurement and calculation system;
- operation of the electricity quality system;
- operation of the communication system;
- operation of the technical control system;
- operation of local equipment for primary and secondary regulation;
- submission of technical norms, procedures and documentation;
- safety and health at work, as necessary.

7.4.3. For appointed staff, it is necessary to provide information that includes:

- Name and surname;
- name of company;
- organisational unit of the company;
- the address of the organisational unit of the company;
- phone number;

- fax number;
- Mobile phone number;
- e-mail address (*E-mail*).

The format and deadlines for the exchange of said data are determined by JSC EMS.

7.4.4. JSC EMS and users of the transmission system handle the personal data of employees from point 7.4.3, i.e. personal data, in accordance with the regulations that define the specified area.

7.4.5. In case of changes in the data from section 7.4.3. JSC EMS and the transmission system user will promptly inform the other party about changes in their lists of authorised personnel with associated data.

7.5. ACCESS TO THE FACILITY BY JSC EMS STAFF

7.5.1. After the timely notification of JSC EMS, the transmission system user guarantees access to its facility, under the conditions defined by the internal acts of the transmission system user and the contract on exploitation, in the shortest time and under all circumstances to the staff of JSC EMS, which is appointed for the following activities:

- checking the correctness and settings of protective devices on elements of the first, second and third groups of the Categorization, as well as elements that are galvanically connected to these elements;
- checking the correctness of meters and related measuring equipment;
- collection of recordings of disturbances and malfunctions, as well as chronological registration of events from protective and control devices;
- collection of information from *the SCADA* system of the transmission system user facility;
- checking the correctness of communication devices that are relevant for communication in the transmission system;
- checking the correctness of devices for collecting and exchanging data in real time with the technical management system of JSC EMS;
- checking the correctness and settings of primary regulators and local equipment for secondary regulation;
- checking the correctness and settings of voltage regulators;
- suspension of electricity supply;
- permanent disconnection of the facility from the transmission system.

Access to the facility of the transmission system user does not imply the authorization of the appointed staff of JSC EMS to perform work on the equipment of the transmission system user.

In the facilities of the distribution system operator, the aforementioned activities are additionally coordinated with the prescribed responsibilities and duties of the transmission and distribution system operator.

The transmission system user has the right to attend the mentioned activities.

7.5.2. Only representatives of JSC EMS have the right to access the sealed parts of the measuring equipment, except when the safety of staff and equipment is at risk. The owner, i.e.

the holder of the right to use the facility where the measuring equipment is located, reports such cases to JSC EMS within 24 hours after the seal is broken.

7.5.3. The transmission system user provides access to the facility to the appointed staff of JSC EMS in order to conduct the announced functional tests of the facility of the transmission system user, from point 7.6. of this Code.

7.6 . FUNCTIONAL TESTS OF TRANSMISSION SYSTEM USERS' FACILITIES

7.6.1 . Functional tests are carried out on the facilities of transmission system users in the following cases:

- mandatory when putting facilities into operation as part of the inspection fulfillment of the conditions from the approval for connection, in accordance with the rules governing the connection of facilities to the transmission system;
- periodically during the exploitation life of the facility in cases and periods that provide for the rules on the operation of the interconnection, which specifically refers to the pre-qualification for the provision of auxiliary services, i.e. the network rules that refer to the connection of facilities, which refers to the verification of the compliance of the facilities;
- optionally:
    - 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 work or changing the settings of the operating parameters of the equipment of interest to the operation of the transmission system;
    - due to the needs of users of the transmission system.

7.6.2. The method of conducting functional tests when connecting the facility to the transmission system and the criteria for successful completion of functional tests are regulated by the rules governing the connection of facilities to the transmission system.

7.6.3. For new facilities that are connected to the transmission system and are intended to provide a certain auxiliary service to the transmission system operator from chapter 6.2. of these rules, the pre-qualification of the technical capacity of the transmission system user facility to provide a certain auxiliary service is performed in the process of connecting the facility to the transmission system.

7.6.4. JSC EMS defines a protocol for the prequalification of the technical ability of the transmission system user facility to provide a certain auxiliary service, which is published on the website.

7.6.5. JSC EMS agrees with the transmission system user on the plan, method and time of pre-qualification of the facility for the provision of a certain auxiliary service.

7.6.6. The pre-qualification check is performed periodically in accordance with the rules on the operation of the interconnection, at least once every five years, or earlier if the technical requirements regarding availability change or the equipment changes.

7.6.7. If the facility of the transmission system user during the prequalification examination of the technical ability of the facility of the transmission system user to provide a certain auxiliary service does not meet the stipulated conditions, such facility cannot provide a certain auxiliary service until it removes the deficiencies and verifies it by repeated prequalification. JSC EMS and the transmission system user define the measures that need to be taken in order to eliminate the causes that led to the deficiencies, as well as the deadline for implementing these measures.

7.6.8. JSC EMS periodically checks the compliance of the technical characteristics of the facilities and operational procedures carried out by the transmission system user in accordance with the issued connection act, this Code, rules governing the connection of facilities to the transmission system, operating rules interconnection, i.e. network rules related to the connection of facilities. For facilities that do not have a decision on approval for connection, compliance is checked in accordance with the available technical documentation.

7.6.9. The compliance check is carried out, at least once every 10 years, or earlier if the technical requirements regarding availability change, the equipment changes or after irregularities in the operation of the facility are observed.

7.6.10. JSC EMS defines the protocol for checking the facility's compliance, which is published on the website.

7.6.11. JSC EMS agrees with the transmission system user on the scope, plan, method and time of checking the facility's compliance.

7.6.12. If the facility does not meet the stipulated conditions during the compliance check, JSC EMS and the transmission system user agree on the measures that need to be taken to eliminate the causes that led to the non-compliance, as well as the deadline for implementing these measures . The transmission system user is obliged to inform JSC EMS about the results of the implementation of the agreed measures within the agreed time limit.

7.6.13. After the application of appropriate measures to eliminate non-compliances, a compliance check is again carried out for the object of the transmission system user in order to confirm the removal of previously established non-compliances.

7.6.14. If, during the compliance check, it is shown that the operation of the facility of the transmission system user endangers other transmission system users, JSC EMS defines all available measures, including the suspension of supply, i.e. the taking in electricity, in order to remove this risk as soon as possible.

7.6.15. Checking the compliance of facilities from point 7.6.8. does not include the pre-qualification check from point 7.6.6. These two processes can be carried out simultaneously if it suits the transmission system user and JSC EMS.

7.7. TECHNICAL REGULATIONS, PROCEDURES AND DOCUMENTS

7.7.1. In its work, JSC EMS applies technical regulations, procedures and documentation of the transmission system users.

7.7.2. The transmission system user is responsible for the accuracy of regulations, procedures and documents and promptly informs JSC EMS of all relevant changes. Otherwise, the transmission system user bears the consequences caused by untimely informing JSC EMS.

7.7.3. The transmission system user provides for existing facilities at the request of JSC EMS:

- single-pole diagram of the facility with basic data on installed equipment;
- parameters necessary for real-time data exchange;

- procedures in case of unavailability of its control centre;
- other regulations, procedures and documentation relevant for the exploitation of the facility according to JSC EMS;

in the format required by JSC EMS.

7.7.4. The transmission system user submits to JSC EMS basic instructions on the exploitation of his facility (instructions related to the operation of the facility, how to perform manipulations in the facility, and similar).

7.7.5. If such instructions are not provided, JSC EMS is not responsible for the consequences that will arise from the lack of this information.

7.7.6. JSC EMS kindly informs the transmission system user about the current content and changes in:

- Rules;
- documents (Categorization and similar) that regulate the operation of the transmission system of interest for the use of facilities of this transmission system user;
- technical documentation of transmission system facilities of interest for the use of facilities of this transmission system user.

7.7.7. The transmission system user is obliged to implement in his facilities all new changes related to the labelling of EES elements from the Categorization, immediately after receiving the notification from JSC EMS. These labels are implemented as additional labels in relation to the labels defined by the technical documentation of the facility and are further used in the exploitation of the facility.

7.8. TRAINING OF JSC EMS AND TRANSMISSION SYSTEM USERS PERSONNEL

7.8.1. JSC EMS trains its personnel for operational procedures in accordance with the company's internal acts, interconnection work rules and Code.

7.8.2. The program, method, scope, type and persons authorised to train the personnel of the transmission system operator are adopted and determined by JSC EMS in the company's internal acts.

7.8.3. At the request of the users of the transmission system, JSC EMS can train the staff of these users, in accordance with the company's internal acts and under conditions and in a manner mutually agreed upon.

CHAPTER 8: ELECTRICITY METERING

8.1. INTRODUCTION

8.1.1. This chapter of the Code regulates the procedure for metering with the defined necessary measuring equipment, the criteria for choosing the accuracy class of the metering device and the characteristics of accompanying devices and equipment, the procedures for testing and controlling the metering equipment, putting the metering equipment into operation, metering data, use of metering data, depending on the position of the metering point in the system and the type of user of the system and the frequency and method of checking the correctness of the metering point, metering and other devices in the function of metering, the content of the control record, the method of determining unauthorised consumption.

8.2. SCOPE OF APPLICATION

8.2.1. The provisions of the Code apply to metering points at all points of electricity transmission in JSC EMS transmission facilities, user facilities connected to the transmission system and part of the distribution system managed by the transmission system operator.

8.2.2. The provisions of the Code are also applied to metering points in transformer fields 400/ x kV/kV and 220/ x kV/kV on the lower voltage side within the transmission network.

8.2.3. The provisions of the Code are also applied to metering points in the transmission fields of 400/h kV/kV, 220/h kV/kV and 110/h kV/kV facilities within the transmission network.

8.2.4. The provisions of the Code also apply to self-consumption metering points in JSC EMS facilities, except for those for which the distribution system operator is responsible, i.e. the closed distribution system operator.

8.2.5. The provisions of the Code are also applied to metering points at the medium voltage in the distribution network, if it is a line through which electricity is delivered to the neighbouring power system, and where there are electricity meters that are read and maintained by the operator of the transmission system.

8.2.6 . The position of the metering point with the necessary parameters of the metering equipment at each metering point, for the purposes of calculation or control measurement of electricity, is defined by the rules governing the connection of facilities to the transmission system.

8.2.7. The technical requirements for measuring transformers, meters, measuring circuits and accompanying equipment that must be met by the metering equipment for calculating electricity in user facilities that are in operation are defined in the rules governing the connection of facilities to the transmission system.

8.3. USE OF METERING DATA

8.3.1. According to the terms of the Code, the data obtained from the meterings represent the key bases for the following business operations:

- the balance of measured electricity flows at all inputs to the transmission network, i.e. outputs from the transmission network in the corresponding accounting period, specified by metering points, voltage levels and in the case of interconnections with physical flows reduced to the limit;

- calculation of the power diagram, i.e. the energy taken into the transmission network in the corresponding accounting period, obtained as a sum of the registered load diagrams (15-minute average power) of all measured inputs to the transmission network, whereby this diagram is broken down into the power diagram, i.e. energy of production modules, a diagram of all electricity inputs to the transmission network via interconnecting lines and a diagram of all electricity inputs from the distribution network to the transmission network;
- calculation of the power diagram, i.e. the energy delivered from the transmission network, obtained as a sum of the registered diagrams (15-minute average power) of all measured outputs from the transmission network in the corresponding calculation period, whereby this diagram is broken down into load diagram of all internal outputs (net consumption) and a diagram of all outputs of electricity from the transmission network via interconnecting lines;
- calculation the diagram of electricity, i.e. the power of technical losses in the transmission network in the corresponding accounting period;
- calculation and invoicing of access to the transmission system for each transmission system user;
- harmonization of accounting data on exchanges of electricity through interconnecting lines with neighbouring control areas;
- determination of the total monthly energy amount of technical losses in the transmission network in the process of planning the procurement of electricity to cover technical losses in the transmission network;
- calculation of the balance deviation of participants in the electricity market;
- issuance of guarantees of origin.

8.3.2. JSC EMS delivers the metering data of the transmission system user without his consent and notification:

- to its supplier, in the case of a full supply contract;
- to the balance-responsible party with balance responsibility for this user;
- competent institutions for the purposes of monitoring and transparency of the electricity market in accordance with regulations in the field of energy.

8.4. METERING DATA

8.4.1. At each Metering Point, electricity meters are measuring and recording the following quantities:

- active energy consumed (A+);
- active energy delivered (A-);
- reactive energy consumed (R+);
- reactive energy delivered (R-);
- maximum demand for the calculation period - consumption direction (A+);
- maximum demand for the calculation period - delivery direction (A-).

8.4.2. Direction of energy flows, consumption (+), or delivery (-), is observed from the transmission system user perspective.

8.4.3. At each Metering Point, a load diagram profile is registered in the form of average 15' active power, or reactive power for each single interval within the settlement period.

8.4.4. Each metering data is associated with time stamp (minute, hour, day, year), stored in the electricity meter registers of electricity meter.

8.4.5. The daily period starts at 00:00h for Metering Points on interconnections and ends at 24:00h (CET), while for all other Metering Points the daily period starts at 07:00 am, and ends the next day at 07:00 am (CET).

8.4.6. The settlement period for all Metering Points of interconnection is the calendar month and is based upon the snapshot register values from main and control meters on the first day of the month at 00:00 h and on the last day of the month at 24:00 h. The settlement period for all other Metering Points in the transmission grid is based upon the snapshot register values from main and control meters on the first day of the month at 07:00 a.m., and on the first day of the following month at 07:00 a.m.

8.4.7. The snapshot register values for consumption and delivered power to the grid for the calculating period from the meter energy register, as well as 15' load profiles of consumption and delivery of power to the grid, are the basic metering data required for the settlement referred to in Chapter 8.3 of this Code.

8.4.8. In case of disputes related to remotely acquired metering data, the relevant values are the data originated from the respective meter registers, read locally through the optical port of meter.

8.4.9. At each Metering Point it is necessary to enable visual readouts of the following data on the display of electricity meter:

- Current value of cumulative active energy registers in kWh (for secondary configuration) or in kWh or MWh (for primary configuration) and reactive energy in, KVArh or MVArh per each configured direction of power flow;
- last snapshot value of register of the meter and the current register value;
- 15' maximum demand of active and reactive power per each configured direction of power flow in W, kW or MW, namely VAR, KVAR or MVAR, for the current settlement period and for the previous settlement period;
- Current Date and Time on electricity meter;
- Current quadrant of active and reactive power;
- Presence of measuring voltages;
- Respected *OBIS* code of the measurement value;
- Fatal Alarm;
- Current Active Time of Use Tariff (if tariff switching is done within electricity meter).

8.5. PLACEMENT OF A METERING POINT

8.5.1. After works on metering equipment or its replacement, JSC EMS shall perform the following activities:

- review of characteristics of measuring equipment;
- verification of compliance tests performed by the supplier;

- configuration of meters and data registers;
- checking the meter's accuracy class;
- control of the correct galvanic connection (of all measuring and communication circuits) of the meter;
- control of the availability of local and remote reading of entered values from the meter;
- control of the correctness of the seals on the measuring equipment;
- recording of identifications of measuring equipment.

8.5.2. After performing the activities from point 8.5.1, JSC EMS shall prepare a report on the compliance of the metering point, which states whether the metering point is in compliance with the technical requirements from the rules governing the connection of facilities to the transmission system and other relevant regulations governing the electricity metering, as well as which shortcomings of the transmission system user should be removed, if any.

8.5.3. The transmission system user shall act in accordance with the protocol on the compliance of the metering point from point 8.5.2.

8.5.4. After commissioning, no changes can be made to the metering equipment without the prior written consent of JSC EMS.

8.5.5. In the event of the need for work on the equipment that is part of the metering system after commissioning, the transmission system user shall be obliged to inform JSC EMS no later than five working days before the start of the planned work or immediately after noticing the need for intervention work. In case of every change to the measuring equipment, the equipment is re-checked and put into operation according to all the functions mentioned in point 8.5.1.

8.6. METERING EQUIPMENT CONFIGURATION

8.6.1. The configuration of the measuring equipment means:

- selection and definition of transmission ratios of measuring transformers installed at the measuring point;
- selection of the quadrant in which electricity will be measured and registered, depending on the possible direction of electricity;
- configuration of meters at the measuring point in accordance with the needs of calculation of access to the transmission system and other calculations of electricity.

8.6.2. Transmission ratios of measuring transformers are defined by JSC EMS according to voltage level, connection point and transmission capacity of the equipment.

8.6.3. The meter configuration means the determination of the internal parameters of the meter, which is in accordance with the technical characteristics of the measuring point and the requirements set by JSC EMS. The configuration of the meter can be primary or secondary, depending on whether the meter displays primary or secondary values of calculated quantities. The meter configuration has its unique label (name).

8.6.4. The transmission system user can request from JSC EMS that his meter be configured so that he can monitor other quantities measured by the meter in addition to the calculation quantities.

8.6.5. The list of all set transmission ratios of measuring transformers and the configuration of meters from all measuring points is entered in the corresponding document, according to the agreement between JSC EMS and the transmission system user.

8.6.6. For each measuring point, JSC EMS defines and implements the configuration parameters of meters that are necessary for their operation, data registers, monitoring of devices and communication connections, in order to ensure:

- measurements 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 who have the right to access measurement data.

8.6.7. Only JSC EMS is authorised to change the configuration of the measuring equipment.

8.6.8. JSC EMS shall be responsible for keeping or updating the configuration of the measuring equipment, so that it is always compatible with the characteristics of the connection point.

8.6.9. JSC EMS shall inform the transmission system user about changes in the meter configuration in writing.

8.6.10. The calculation constants for electricity and power are appropriately entered in the calculation applications and can be altered only through a special written order issued by JSC EMS based on the minutes on the calculation constant change made between the authorised representatives of JSC EMS and the transmission system user.

8.6.11. JSC EMS shall deliver the operating configuration of the meter to the transmission system user as a document, upon his request.

8.6.12. JSC EMS shall record and keep in the archive the data that justifies the operating configuration of the meter.

8.7. METERING EQUIPMENT TESTING AND CONTROL

8.7.1. METERING EQUIPMENT TESTING

8.7.1.1. JSC EMS tests the correctness and accuracy of the measuring equipment at each measuring point during operation, whereby the meters are tested at least once a year.

8.7.1.2. In the process of testing the correctness and accuracy of the measuring equipment, the following activities are performed:

- checking the correctness and integrity of all seals on the measuring equipment;
- visual check of the transmission ratio of current and voltage transformers;
- checking all connections from measuring transformers to meters;
- checking the correct operation of the meter, including standard testing;
- checking the meter's status and configuration;
- checking the display on the meter display;
- checking the functioning of the meter's output contacts;
- checking the local and remote communication with the meter.

8.7.1.3. When the test results indicate that one or more components of the measuring equipment no longer meet the specified technical conditions from the connection act, the owner, or the holder of the right to use such component, replaces the defective component as soon as possible after receiving the test results. In case of failure of equipment for which there is redundancy, this term can be a maximum of 30 days.

8.7.1.4. After replacing the old or installing new measuring equipment, JSC EMS tests the newly installed equipment on the spot.

8.7.1.5. If JSC EMS or the transmission system user doubts the correct operation of the measuring equipment, JSC EMS shall organize the testing of this equipment in the shortest possible time compared to the moment when JSC EMS is informed about the doubt in the correctness of the measuring equipment.

8.7.2. CONTROL OF ELECTRICITY METERS

8.7.2.1. JSC EMS is performing control of the installed meters at least once per year.

8.7.2.2. Meter controls in operating conditions (at the point of measurement) are carried out with test standards of a better accuracy class than the meter's accuracy class. The test standard generates a report containing the date and time of the test, as well as the measured error of the meter.

8.7.2.3. For the purpose of meter control JSC EMS is conducting the following activities:

- visual examination of the proper operation of meter and the display of metering values in the meter registers;
- visual examination of seal status on the meter;
- comparison of energy values measured by the main meter with the values measured by the control meter (if such is existing) – this deviation of energy between these two meters shall be within the limits set by the accuracy class of the main and control meters;
- acquisition of signals from the monitoring devices; -
- analysis of signals and alarms recorded in the log books of the meter;
- analysis of the values of the phase voltages which are feeding the meter at the Metering Point;
- analysis of the voltage and current phase diagram and their proper sequence at the Metering Point;
- control of the deviation of on-site electricity meters accuracy by using portable reference standards;
- development of the report on electricity meters control.

8.7.2.4. The owner, i.e. the holder of the right to use the facility, shall be obliged to control meter operation in the facility via on-site monitoring and meter reading. In case of alarm occurence or a signal informing on deviations from regular meter operation, the transmission system user shall be responsible to report this to JSC EMS as soon as possible.

8.7.3. CONTROL OF METERING TRANSFORMERS

8.7.3.1. JSC EMS and the owner of instrument transformers shall conduct on-site control of installed instrument transformers in the periods specified by the Act regulating the activities of metering or when such is necessary (extraordinary control), or when are preconditions met 101 for such control to be successfully carried out (i.e. during facility repairs or disconnection of a metering point).

8.7.3.2. For the purpose of control of the instrument transformers the following activities shall be conducted:

- visual examination of instrument transformers;
- verification of the seal status of instrument transformers;
- verification of compliance of the primary connection of the current instrument transformer with the documentation;
- inspection of transmission ratio of the instrument transformer;
- inspection of secondary load of the instrument transformer;
- acquisition of signals from the monitoring device;
- analysis of the signals and alarms which are recorded in the logbooks in the facility;
- analysis of the values of phase voltage and current.

8.7.3.3. The owner of the instrument transformers, i.e. the holder of the right of their use shall be responsible for the control of regular operation of the instrument transformer by on-site monitoring and meter reading. In case of malfunction or appearance of the signal which informs on deviations from the regular operation of the instrument transformer, the transmission system user is responsible to report this to JSC EMS as soon as possible. The owner of the instrument transformers and JSC EMS shall jointly analyse the event and decide whether it is necessary to replace the instrument transformer.

8.7.3.4. In case of malfunction of the instrument transformer, the owner of the instrument transformer, or operator of the instrument transformer, shall be responsible for the replacement of such equipment. Defective instrument transformer shall be replaced in agreement with JSC EMS, as soon as possible starting from the moment when the owner or operator is informed about the doubt in the proper operation of metering equipment, with the same type of instrument transformer or similar type, according to standard period of the delivery for such type of equipment by the supplier and upon availability of transmission system to carry out such replacement.

8.7.4. THE CONTENTS OF THE ELECTRICITY METERS CONTROL RECORD

8.7.4.1. After the meter has been checked at the point of measurement, JSC EMS shall submit a report on the meter check to the transmission system user. As a rule, the meter control record contains:

- time and date of the performed control;
- marking of the measuring point;
- mark, type, manufacturer and year of manufacture of the meter;
- controlled measured quantities (active, reactive power);
- data on measured quantities during meter control;
- measured metering error;
- a statement as to whether the meter meets the declared accuracy class and other comments if necessary;
- signatures of authorised JSC EMS officials and the transmission system users.

8.8. METERING PROCEDURE

8.8.1. METERING DATABASE

8.8.1.1. EMS is keeping the record of meters, and record of measured values from metering devices, to which the provisions of the Grid Code applies.

8.8.1.2. The metering database is identifying the metering equipment in accordance to the unique identification *EIC Z* code used for determining the following:

- location of the connected facility to the transmission system;
- the connection point;
- transmission system user data;
- current supplier data, and the data of all previous suppliers of the transmission system user;
- balance-responsible party data;
- transformer ratio for each Metering Point of the user;
- structure of the metering equipment, configuration and reports of maintenance works;
- identification of measured and registered values at the connection point;
- access credentials on the metering data and preventive actions to evade unauthorised access.

8.8.1.3. It is necessary at any time and in all conditions to know the origin of each metering data in use in compliance with the purpose and the requirements of the Code.

8.8.1.4. The maximum period between meter installation or changes to the metering equipment and update of the metering database is two weeks.

8.8.1.5. The metering database shall contain original values acquired by remote or local communication to the meter, correction factor used on metering data corrected with the technical losses of electricity and substituted values in accordance with the point 8.8.4. The purpose of the database is to enable:

- identification of metering equipment which correlates to any quantity and value acquired from that metering equipment by use of its relevant code in the database;
- determination the type of quantity (kW, kWh, mWh, KVAR, KVARH, MVARH) for the provided value;
- clear and unique identification of the original value, corrected value of losses and the substituted value;
- link to the original value for each corrected or substituted value;
- time flag related to the date of acquisition of original values and the date of data substitution.

8.8.1.6. JSC EMS is making available the measured and calculated values from the metering database to the transmission system users for their facilities through which they receive and/or deliver power, as well as to their suppliers in accordance with the Act regulating the procedure of implementation of the right of end customers to access information on their own electricity consumption.

8.8.1.7. Transmission system users and their suppliers are having access to metering and settlement data via web platform which contains all data obtained by remote metering, as well

as all acquired data related to the user. Through this platform the users can review and download only the data related to their use of the transmission system, while the suppliers can download only data related to the Metering Points from the users they are supplying.

8.8.1.8. The metering database is containing all data relating to the metering equipment operation for the last 5 years.

8.8.1.9. Data older than 5 years is kept in the metering database archive. Archiving the metering database is carried out on a regular basis set by the regular maintenance of the database, while the period of keeping the data in the archive is ten years.

8.8.2. REMOTE ACQUISITION OF DATA

8.8.2.1. EMS is responsible for remote acquisition of metering data registered locally in the meter in order to fill in database.

8.8.2.2. Such remote acquisition of data is carried out in accordance with the communication protocols defined in this Code which govern the connection of the facility to the transmission system, by using communication media and interface connected to the metering equipment.

8.8.2.3. In case of longer disruption of communication, JSC EMS shall carry out local reading of meters and transfer the acquired data directly to the database. This procedure shall be performed within period of time which enables all required metering data to be available for the Settlement.

8.8.2.4. EMS is reading the metering data regularly at each facility under defined period of time. The period of reading shall be set in accordance to the requirements of Settlement of access to the transmission system, the imbalance settlement, as well as in accordance with the contractual obligations, having in mind the time necessary for the process of validation and substitution of data.

8.8.2.5. The time interval of the acquisition of data from the meter is one day. If the conditions regarding communication lines do not allow regular collection of metering data, EMS shall review the acquisition periods aiming to introducing more frequent meter reading.

8.8.3. DATA VALIDATION

8.8.3.1. JSC EMS is verifying and confirming the feasibility of acquired metering data and validate the data prior to their storing into the database..

8.8.3.2. The purpose of the validity checking of metering data is to:

- check if there are some missing data or incomplete information after acquiring data from the meters;
- check if there is ongoing control or maintenance of metering equipment, and if any local intervention was performed during the period for which data were acquired;
- check if there were any absence of auxiliary power supply in the period for which data were acquired signalized by the surveillance device;
- check if there is no deviations between local time base in the meter and system time reference during the entire settlement period;
- verify that all collected data are feasible to the expected loads at a given Metering Point.

8.8.3.3. During process of data validation, the metering data obtained from the main and control meters are compared, and the comparison of the energy calculated from the energy registries and from integration of load profiles. The metering data is also compared with data from the previous settlement period, as well as with data from the same month but from the previous years.

8.8.3.4. The permitted difference between the energy values calculated from the main and control meter shall be within the limits of declared accuracy class of the meters.

8.8.3.5. The permitted difference between energy calculated from the load and electricity profile, the one calculated from initial and final data registered at the meter shall be less than 0.1%.

8.8.4. DATA SUBSTITUTION

8.8.4.1. In the case of invalid data or the malfunction in metering, JSC EMS shall substitute the invalid, i.e. missing metering data..

8.8.4.2. JSC EMS shall substitute the invalid or missing metering data taking into account the following sequence of precedence:

- data registered in the control electricity meter, in case that such meter is an integral part of the metering equipment, and if data validation is performed;
- estimation based upon the similar preceding period of electricity exchange through the transmission grid;
- alternatively, data obtained from *SCADA* system in JSC EMS if such data is available for such Metering Point.

8.8.4.3. In the cases stipulated by the Act regulating the conditions of power supply, substitution of metering data is carried out in accordance to such regulation.

8.8.4.4. JSC EMS is documenting the substitution of metering data for the purpose of internal auditing and the control of settlement..

8.8.4.5. If during testing, or during regular or special control of the metering equipment is established that the metering or recording of metering data was incorrect, the metering data have to be substituted in the database in accordance to the provisions of substitution for the following period:

- from the starting day of malfunction to the moment of its elimination, if the starting time of malfunction can be precisely identified, but which cannot exceed maximum deadline from the one determined by the regulation which governs the conditions of electricity delivery and supply;
- which is determined on the basis of the analysis of available data, but which cannot exceed the maximum period established by the regulation which governs the conditions of delivery and supply of electricity.

8.8.4.6. If the substitution of metering data is performed when the settlement is finished, it is necessary to make a correction of the settlement and to submit the substituted data, as well as the method of the obtaining it, to the user.

8.9. ACCESS TO THE METERING DATA

8.9.1. Direct access to metering data at the meter via remote and local communication is granted only to JSC EMS authorised persons in charge of configuration, maintenance, validation, data substitution and acquisition, and to the users of metering data. The users of metering data are:

- transmission system user or his authorised representatives for the purpose of observation and collection of metering data related to its Metering Point;
- supplier of transmission system users;
- other responsible persons in accordance to the laws and regulations.

8.9.2. JSC EMS is liable for the organisation and delivering of appropriate access permits to metering data and for definition of the user's access rights, having in mind the safety of local data in the facility and in the metering database.

8.9.3. JSC EMS has to delegate the right of remote access to metering data on the meter by means of defining the list of authorised users of the metering data in order to prevent conflicts among the authorised parties. JSC EMS shall allocate the time window for the access to metering data taking into account the needs for acquisition of data by JSC EMS and the other users of metering data in accordance to the principle of non-discrimination.

8.9.4. Non-compliance to the provisions governing the allocated time window for the access to metering data shall result in cancelling the right for the access thereto.

8.9.5. JSC EMS has to ensure safety of locally registered data on the meters, as well as safety of metering database and registers inside the meters.

8.9.6. JSC EMS may alter data registered in the meters, only for the period of meter testing. A report shall be made for any on-site intervention on electricity meters and such report shall contain data of unregistered or incorrectly registered electricity.

8.10. METHOD OF DETERMINING UNAUTHORISED CONSUMPTION

8.10.1. JSC EMS shall determine the unauthorised consumption based on the regular or extraordinary control of the measuring point, i.e. on the basis of meter control, testing of measuring equipment, inspection of the measuring point and connection point, as well as analysis of other available data and information in accordance with regulations in the field of energy.

8.10.2. JSC EMS shall calculate unauthorised consumption for the period for which unauthorised consumption of electricity was determined, with the act regulating the calculation of unauthorised consumption.

CHAPTER 9: TRANSITIONAL AND FINAL PROVISIONS

9.1.1. Up to the transfer of property rights on transmission grid facilities owned by the transmission system user, JSC EMS shall manage a part of the facilities of end customers and producers, and in accordance with points 1.2.2.-1.2.4 of the Code.

9.1.2. JSC EMS shall adopt the Overfrequency Protection Plan, from point 6.3.3, within 24 months from the entry into force of the Code.

9.1.3. JSC EMS shall adopt the Transmission System Protection Plan against voltage breakdown, from point 6.3.5, within 12 months from the entry into force of the Code.

9.1.4. For transmission system users' facilities that, at the time of entry into force of these Code, provide auxiliary services from point 6.2 of the Code, pre-qualification check of the technical ability to provide a certain auxiliary service will be carried out within 5 years from the entry into force of the Code.

9.1.5. The provisions referred to in point 8.2.5. of the Code shall be applied until the metering point is taken over by the distribution system operator within the period defined by the law governing the field of energy.

9.1.6. At the request of JSC EMS, transmission system users whose facilities are connected to the transmission system at the time the Code enters into force, and for which verified simulation models have not been submitted, are required to submit the available documentation within a maximum of five years from the receipt of the request and to enable the performance of functional testing for the purposes of creating and verifying simulation models of their facilities that faithfully simulate the behaviour of these facilities in stationary and dynamic situations, in the format defined by JSC EMS.

9.1.7. On the date of entry into force of the Code, the Code on the transmission system operation number: 000-00-ROU-2/2020-002 of 17/03/2020 shall cease to be valid, except for the provisions from points 6.2.3 and 6.2.4, which are valid until the implementation of the secondary and tertiary reserve budget in accordance with chapter 6.2 of the Code.

9.1.8. Upon obtaining the consent of the Energy Agency of the Republic of Serbia, the Code shall be published on the JSC EMS website and shall enter into force on the day of publication.

CHAIRMAN OF THE ASSEMBLY

Milun Trivunac, Master of Arts in Economics

JSC EMS BELGRADE
ASSEMBLY
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