

Pursuant to Article 70 under the Law on Energy (Official Gazette of the Republic of Macedonia no. 16/2011136/11, 79/13, 164/13, 41/14, 151/14, 33/15, 192/15, 215/15, 6/16 и 53/16), and Article 19, item 18 of the by-Law, the Transmission System Operator of Macedonia, a joint stock company for electricity transmission and power system control, in state ownership „MEPSO” based on the proposal of the OEPS, with the prior approval from the Energy Regulatory Commission of the Republic of Macedonia no. 02-1780/1 dated 13 October 2016, on 19 September 2016 with decision of Board of Directors No 02-5902/2 has adopted:

## **RULES**

### **For**

### **Allocation of Cross-border Transmission Capacities**

#### Article 1

(1) These Rules for Allocation of Cross –border Capacities (hereinafter referred to as „ Rules”) set out the following, in particular:

- 1) method of calculation of available cross-border capacities,
- 2) method of allocation of available cross-border,
- 3) method of payment when using the cross-border capacities in case of congestion in interconnection lines, and
- 4) method of publishing data.

#### Article 2

(1) AD MEPSO – Skopje is, as a transmission system operator (hereinafter referred to as „AD MEPSO”), obliged to allocate the available cross-border transfer capacities in a transparent, nondiscriminatory and market oriented manner.

(2) For allocation of cross-border capacities on interconnection lines between the TSO of the Republic of Macedonia and the neighboring TSOs:

- 1) JP EMS – Republic of Serbia
- 2) ESO EAD – Republic of Bulgaria
- 3) IPTO – Republic of Greece

AD MEPSO can:

- 1) To organize auction on his part (50%) from the available cross-border transmission capacities at the respective border or
- 2) To organize joint auction on the whole available cross-border transmission capacities at the respective border in cooperation with neighboring TSO or
- 3) To participate in regional auction office for coordinated allocation of the available cross-border transmission capacities at the respective border

#### Article 3

(1) The auction related to awarding the right to usage of cross-border transmission capacities may be conducted in the following time frames:

- 1) Yearly,
- 2) Monthly,
- 3) Weekly,
- 4) Daily, and
- 5) Intra-day

#### Article 4

(1) The value of **Net Transfer Capacity** - NTC is calculated according to ANNEX 1, Methodology on Calculation of **Net Transfer Capacity** for interconnection lines in the power system of the Republic of Macedonia with the neighboring power systems, (herein after Methodology on Calculation of Net Transfer Capacity ) which is integral part of this Rules

(2) The Methodology on Calculation of **Net Transfer Capacity** referred to in paragraph 1 of this Article is in compliance with the ENTSO-E Operational Handbook – Policy 4 .

(3) The value of **Available Transfer Capacity** – **ATC** subject to auction for each interconnection with the neighboring system operators will be harmonized bilaterally between AD MEPSO and the neighboring system operators.

#### Article 5

(1) The cross-border usage right will be awarded according to “ Marginal price” principle.

(2) The participant in auction which/who has been granted the right to usage of the cross border capacity is liable to pay a fee for using the cross-border capacity only in a case of congestion of the appropriate allocation unit i.e. the principle **no congestion - no payment** will apply.

#### Article 6

- (1) Any revenues resulting from the allocation of interconnection shall be used for the following purposes
  - (a) guaranteeing the actual availability of the allocated capacity; and/or
  - (b) maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors
- (2) If the revenues from paragraf 1 cannot be efficiently used for the purposes set out in points (a) and/or (b), they can be used for calculating network tariffs.

#### Article 7

- (1) AD MEPSO has signed a Contract with Auction Office of Sought East Europe (herein after SEE CAO) for allocation of cross-border transmission capacities for the borders which are part of the SEE CAO Rules. Allocation of cross-border transmission capacities on these borders will be realized in accordance with the Auction Rules published on the SEE CAO web site, approved by the Regulatory Authority.
- (2) For the borders which are not part of the SEE CAO Contract, AD MEPSO will prepare appropriate Auction Rules for allocation of cross-border transmission capacities, and submit to the Regulatory Authority for approval.

#### Article 8

- (1) All necessary information concerning the value of available transmission capacity (ATC), the manner of allocation of available transmission capacity (ATC), allocated net transmission capacity (NTC), last accepted price "(Marginal price) e.t.c., will be published on the web site of MEPSO according to auction rules for the allocation of cross-border transmission capacities of the respective border

#### Article 9

- (1) till approval by the Energy Regulatory Commission of:

- 1) Auction rules for the allocation of cross-border transmission capacity applied by SEE CAO,
- 2) Auction rules for the allocation of cross-border transmission capacities on borders that are not covered by the contract with SEE CAO

MEPSO shall apply:

- 1) Provisional rules for the allocation of available cross-border transmission capacity on the interconnections of the power system of the Republic of Macedonia on annual basis, and
- 2) Provisional rules for the allocation of available cross-border transmission capacity on the interconnections of the power system of the Republic of Macedonia on a monthly and weekly basis,

approved by the Energy Regulatory Commission by Resolution no. 02-1154 / 1 from 01.09.2011 for approval of Provisional Rules for allocation of the available cross-border transmission capacity on the interconnections of the power system of the Republic of Macedonia on annual basis and Provisional Rules for allocation of the available cross-border transmission capacity of interconnections of power system Macedonia on monthly and weekly basis

- (2) The Auction Rules referred to in paragraph 1 of this Article, AD MEPSO is obliged to submit to the Energy Regulatory Commission within 60 days after entering into force of these Rules.

#### Article 10

- (1) These Rules shall enter into force following the day of their publication in the „Official Gazette of the Republic of Macedonia“.

## ANNEX 1

### Methodology for the calculation of net transmission capacity of interconnection lines of the power system of the Republic of Macedonia with the neighboring power systems

#### 1. DEFINITION OF INDICATORS FOR TRANSMISSION POSSIBILITIES OF POWER SYSTEM

**Total Transfer Capacity (TTC)** – means maximum exchange of power between two areas (systems) without disturbing the safety criteria in operation. TTC applies to a certain foreseen scenario of system operation: production, consumption, and configuration of network so called *basic scenario* used for calculations according to an agreed procedure. The expected value of TTC may vary from the realistic one due to imprecise projection of future system conditions, which depends on the time distance of projection.

**Transmission Reliability Margin (TRM)** – means reliable reserve which exceeds uncertainties in calculation of TTC. A part of transmission capacity is divided from the total transfer capacity of the system with the aim at increasing of system flexibility and amortizing errors in calculations and deviations from realistic situations in comparison to foreseen situations. TRM has not been defined, in a unique manner, so far; every country has its access to evaluation of TRM. Calculation of TRM is based on the following empirical equation:

$$TRM = 100 \sqrt{n}$$

where  $n$  is a number of interconnections on the appropriate border and TRM is subject to harmonization with the neighboring system operators.

**Net Transfer Capacity (NTC)** – means a maximum program of exchange of power taking into consideration N-1 security criteria:

$$NTC = TTC - TRM \quad (1)$$

**Already Allocated Capacity (AAC)** – Cross-border capacity allocated in previous proceedings

**Available Transmission (Transfer) Capacity (ATC)** – It is the part of the NTC which is the subject of allocation and is calculated in accordance with:

$$ATC = NTC - AAC$$

#### 2. CALCULATION OF NTC

MEPSO calculates the NTC on the interconnection lines between Transmission System Operator of Macedonia and the neighboring system operators:

- 1) JP EMS – Republic of Serbia
- 2) ESO EAD – Republic of Bulgaria
- 3) IPTO – Republic of Greece

At first the *basic scenario* is created containing the model of network and input system parameters: network configuration and level of consumption and electricity generation in the moment analyzed. Subject to network configuration and system parameters, a significant portion of power that is transmitted from one to another area may circulate via a third area. The model of network is necessary to be as much bigger as possible and more detailed to obtain a more precise and comprehensive presentation of physical power flows through the interconnection. The basic scenario includes exchange schedules (programs) between any two systems (areas).

In order to determine the maximum transmission capacity between two neighboring systems, the exchange increases gradually until reaching the safety limitations. Starting with exchange, which is defined in the basic scenario, the additional exchange is simulated via production increase in the system which exports and equivalent decrease in production in the system that imports electricity. The change in production is performed with a determined step until exceeding the safety criteria.

When calculating TTC from a system A to a system B, production in A increases coordinately, and decreases in B. The limiting value of change in production is indicated as  $\Delta E_{\max}^+$ . That is the surplus of power in relation to basic scenario which may be exchanged continuously from A to B where the two power systems operate in a reliable manner. The maximum capability of exchange (export) of system A from system B in compliance with the safety criteria,  $TTC^+$  is as follows

$$TTC^+ = TTC^{A \rightarrow B} = BCE + \Delta E_{\max}^+$$

While calculating TTC from system B to system A the procedure is vice versa; production in A decreases, and increases in B. The maximum capability of exchange (import) to system A from system B in compliance with the safety criteria,  $TTC^-$  is as follows:

$$TTC^- = TTC^{B \rightarrow A} = \Delta E_{\max}^- - BCE$$

In the next step, from the TTC values obtained for the two directions using the expression (1) TRM is deducted and the net transfer capacity NTC in the network obtained while exchanging power between systems A and B. The values of TTC, TRM and BTC depend on direction in which power exchange is carried out. The limiting value of total transfer capacity TTC is determined on the basis of criterion N-1.

The power that is exchanged between the two systems analyzed gradually increased until the N-1 criterion is disturbed whether it is the thermal limitations of the elements of the network or it is for voltage limits. The disturbed limitation is checked whether may be overcome via certain corrective measures. Where a problematic element is in question within the framework of a neighboring power system, the limitation should be considered in consultation with system operators from the neighboring power system. Even if then the limitation remains in force, the calculations will be stopped and the final results is obtained.

The results from calculations are sensitive on selection of generator knots in which change is simulated (increase or decrease) of produced power. The change in production may be carried out in several ways:

**Proportionally to reserve:**

Proportional change in production of all generators in the system subject to a level of share in the total production in the basic scenario.

This method is recommended to TSOs to use it under normal operating conditions because in this case the physical limit in the transmission network operation is respected.

#### **Proportionally to engagement**

In this case the selected generator units are modified proportionally to engagement at the moment. This method is used in emergency situations if the indicators for production limitations are missing or as a next step in the calculation in case that all capacities used in the first method have been utilized.

This method does not take into consideration the production limitations that may lead to an exceeding use and to unrealistic NTC values. In fact, this method indicates the theoretical NTC value of transmission network without considering the physical limitations in production.

### **3. METHODOLOGY OF NTC CALCULATION IN THE REPUBLIC OF MACEDONIA**

To calculate the *annual* values of NTC of the power system of the Republic of Macedonia winter/summer reference models of continental Europe are used which are received by exchange of models within ENTSO-E regional group of continental Europe.

To calculate the *monthly* values of NTC of the power system of the Republic of Macedonia a regional model used in which the 150, 220 and 400 kV network is detailed in the countries of South East Europe: Austria, Albania, Bosnia and Herzegovina, Bulgaria, Greece, Croatia, Hungary, Romania, Ukraine, Serbia, Monte Negro, Slovenia and Italy including the 110 kV and 400 kV network of the power network in the Republic of Macedonia. The remaining part of continental Europe is modeled with an appropriate equivalent connected on the border of Hungary, Austria Italy and Ukraine. The regional model is in the format defined within the framework of ENTSO-E.

To form the projected model of the Republic of Macedonia the following are used as input data:

- Switching condition at 110, 400 kV elements from the transmission network in the Republic of Macedonia in compliance with the monthly and weekly plan for maintainans and revisions and the interconnections with the neighboring systems in accordance with the annual maintainans plan, harmonized within SEE.
- Generation of hydro power plants and thermal power plants consistent with the electric energy balance.
- Distribution consumption forecast.
- Electricity demands from consumers connected to transmission network for the appropriate month.

Based on these data the Republic of Macedonia model is designed for the appropriate month and this is exchanged with all TSOs in the SEE region including in the framework of ENTSO-E.

To calculate the annual values of NTC, a monthly model has been used since January for the appropriate year.

Yearly and monthly models of the Macedonian power system are exchanged in a format defined within ENTSO-E.

A list of critical disconnections is produced. Critical disconnections are considered all 400 and 110 kV transmission lines in the Republic of Macedonia, and all 400 and 220 kV interconnections in the neighboring countries.

A list of monitored elements. Elements are considered all 400 and 110 kV transmission lines in the Republic of Macedonia, and all 400 and 220 kV interconnections in the neighboring countries.

A list of sub-systems is produced. In simulation of transactions two sub-systems from the countries in the region are established

- sub-system (Romania and Bulgaria)
- sub-system (Macedonia, Albania and Greece)

Results are presented in two ways: Tabular and graphical