

Pursuant to Article 70 under the Law on Energy (Official Gazette of the Republic of Macedonia no. 16/2011), 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” has adopted by Decision of UO no. 02-6277/13 dated 14 July 2011 and by Resolution made by the Energy Regulatory Commission of the Republic of Macedonia no. 02-1004/1 dated 21 July 2011 related to approval of Rules for Allocation of Cross-border Transmission Capacities as follows:

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 calculation of available cross-border capacities taking into account transmission system congestion,
- 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. For that effect AD MEPSO will conduct a joint auction with regard to awarding the usage right to a cross-border capacities on interconnection lines between the TSO of the Republic of Macedonia and the neighboring TSOs as follows:

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

Article 3

(1) The revenues achieved of AD MEPSO –Skopje as a TSO on the basis of managing the congestion on the interconnection transmission lines with the neighboring countries will be considered while determining the tariff for using the transmission system.

(2) The revenues of paragraph 1 referred to in this Article, AD MEPSO-Skopje is liable to use as a TSO to maintain or invest in increasing the interconnection capacities.

Article 4

(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 5

(1) The value of **Net Transfer Capacity** - NTC is calculated according to Methodology on Calculation of **Net Transfer Capacity** for interconnection lines in the power system of the Republic of Macedonia with the neighboring power systems, attached as Annex 1 to these 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 6

(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 7

(1) In case of congestion, the participant being awarded the usage of cross-border transmission right (CTR) for the suitable allocation unit is liable to pay a fee in the amount equal to a product of: „marginal price” [EUR/MWh], the granted transmission capacity [MW] , and periods (hours)[h] for which the usage right to cross-border transmission has been awarded for the appropriate allocation unit.

Article 8

(1) Payment received from the held auction in case of congestion will be divided equally between AD MEPSO and the neighboring System Operator (50/50).

Article 9

(1) Prices, financial obligations and payments including the financial information will be in Euro.

Article 10

(1) VAT to one half of payment for the usage right to a cross-border transmission in case of congestion, that relates to AD MEPSO, will be added in the amount and in accordance with the regulations in the Republic of Macedonia.

Article 11

(1) AD MEPSO will prepare, with every neighboring system operator, joint Auction Rules with respect to awarding of cross-border capacities that it is obliged to submit to the Energy Regulatory Commission in the Republic of Macedonia for approval.

(2) Auction Rules referred to in paragraph 1 of this Article contain, in particular:

- 1) Auction proceedings,
- 2) Time periods of auction (yearly, monthly, weekly, daily, intra day),
- 3) Right to take part in auction and Procedure of registration of participants,
- 4) Awarding of usage right of cross-border transmission capacity,,
- 5) Publication of results and information associated with Auction,
- 6) Transfer of usage right of cross border transmission capacity,
- 7) Rules for utilizing the right to usage of cross border transmission capacity ,
- 8) Method of calculation of fee for the right of usage of cross border transmission capacity and payment,
- 9) Method of reduction of already awarded right to usage of cross border transmission capacity ,
- 10) Other.

Article 12

(1) By the time of entering into force of contracts under Article 11 of these Rules, AD MEPSO is obliged to prepare and submit to the Energy Regulatory Commission for approval Provisional Rules related to Allocation of Cross-border Transmission Capacities for every borders for which there is no contract signed, whereby provisions of these Rules should be implemented.

(2) The Provisional 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 13

(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 RELATED TO CALCULATION OF NTC

1. INTRODUCTION

The Methodology related to calculation of Net Transfer Capacity is based on calculation of power flows. The Methodology includes the following main aspects:

- The calculations use the most quality possible inputs being available.
- More detailed model of network is used as much as possible.
- Data are exchanged between operators of different power systems with the aim at using the same basic scenario.
- To achieve more realistic results, any system – operator is entitled to select the manner in which it will simulate the exchange of electricity between two areas and which safety criteria will use in calculations.
- Transparency in exchange of technical data and presumptions.

2. DEFINITION OF INDICATORS FOR TRANSMISSION POSSIBILITIES OF POWER SYSTEM

In 1999 ETSO defined the basic indicators for transmission capabilities of network. Ever since then, the European systems – operators use these definitions in the calculation of transmission capacities that enable harmonization of their results.

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

Net Transfer Capacity (NTC) – means a maximum program of exchange of power between two areas (systems) where the safety standards are fulfilled applying also to the two systems, at the same time taking into consideration also the uncertainties of future condition of network

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

Already Allocated Capacity (AAC) – an indicator representing already agreed exchange of power, which engages a part of the transmission capacity of the system, and is not included in the basic scenario.

Available Transmission (Transfer) Capacity) ATC – means a portion of the NTC which shows what amount of possibility exists to make a certain transfer of power

$$ATC = NTC - AAC$$

3. CALCULATION OF NTC

Calculation of NTC is made for every pair of electric neighboring countries (systems), commercially important directions of electricity exchange. 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).

The calculation of power flows should be carried out using the model based on alternating power flows.

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 ΔE_{\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. Generally, for different directions of exchange (A→B or B→A), different results are obtained.

The limiting value of total transfer capacity TTC is determined on the basis of criterion N-1 or some other criterion defined in the Grid Codes for electricity transmission of every country. ENTSO-E recommends N-1 criterion when checking the regime of outlaid elements. Applying of the criterion will bring up to two kinds of limitations.

- Thermal limitations of elements (transmission lines, transformers;

- Voltage limitations.

The power that is exchanged between two analyzed systems increases gradually until one of the above limitations is not disturbed. The disturbed limitation is checked whether it 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 obtained.

The results from calculations are sensitive on selection of generator nodes 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.

Distributed change dependent on generator characteristics from aspect of economic dispatching.

The selection in what way the power transfer and the application of appropriate safety criteria will be simulated remains to the system operators from every country.

In order that the calculations have a usable value, similar results with those from system operators of neighboring power systems need to be obtained. A quality calculation of transmission capabilities requires an active cooperation between experts from neighboring TSOs and achievement of an efficient exchange of data and experience.

4. 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, 220, 400 kV elements from the transmission network in the Republic of Macedonia in compliance with the monthly and weekly schedules for repairs and revisions and the interconnections with the neighboring systems in accordance with the annual timetable for repair harmonized with SEE.
- Generation of hydro power plants and thermal power plants consistent with the electric energy balance.
- Projection of distribution consumption.
- Electricity demands on the side of 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 outlays is produced. Critical outlays are considered all 400, 220 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 drawn-up. 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

5. DETERMINATION OF NTC INTERCONNECTIONS IN THE REPUBLIC OF MACEDONIA

Calculation of total available yearly capacity

The total available annual transmission capacity on the appropriate interconnection is equal to the value which the neighboring TSOs on the appropriate border will be able to guarantee during the entire year and this will be harmonized between the two neighboring system operators as a percentage of Net Transferred Capacity determined during the yearly calculation.

$$ATC_{\text{yearly}} = \% NTC_{\text{yearly}}$$

Calculation of total available monthly capacity

The total available monthly transmission capacity on the appropriate interconnection is equal to difference between the value obtained for Net Transfer Capacity during the monthly calculation, and the prior allocated yearly capacity.

$$ATC_{\text{monthly}} = NTC_{\text{monthly}} - AAC_{\text{yearly}}$$

Calculation of total available weekly capacity

The total available weekly transmission capacity on the appropriate interconnection is equal to difference between the value obtained for Net Transfer Capacity during the monthly calculation, and the prior allocated yearly and monthly capacity.

$$ATC_{\text{weekly}} = NTC_{\text{monthly}} - AAC_{\text{yearly}} - AAC_{\text{monthly}}$$

Calculation of total available daily capacity

The total available daily transmission capacity on the appropriate interconnection is equal to difference between the value obtained for Net Transfer Capacity during the monthly calculation, and the prior allocated yearly and monthly capacity.

$$ATC_{\text{daily}} = NTC_{\text{monthly}} - AAC_{\text{yearly}} - AAC_{\text{monthly}}$$

Subject to the Contract with the neighboring transmission system operator, the total available cross-border transmission capacity at weekly or at daily level will be calculated.