Ad hoc Group

"Geographical Distribution of Reserves"

Document 7:

Glossary of Terms

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1. New Terms

1.1 Reserve Connecting TSO

The TSO responsible for the CONTROL AREA / CONTROL BLOCK where the reserve providing generation unit is located is the RESERVE CONNECTING TSO. The RESERVE CONNECTING TSO co-ordinates together with the RESERVE RECEIVING TSO the exchange of reserves.

1.2 Reserve Receiving TSO

The TSO responsible for the CONTROL AREA / CONTROL BLOCK which is receiving physically the contracted SECONDARY and TERTIARY CONTROL RESERVE is the RESERVE RECEIVING TSO. For PRIMARY CONTROL RESERVE it is the TSO who has contracted physical generation of PRIMARY CONTROL RESERVE within the area of the RESERVE CONNECTING TSO to fulfil its primary reserve obligations. The physical flow of PRIMARY CONTROL RESERVE will be from the RESERVE CONNECTING TSO to the area where the imbalance is located. The RESERVE RECEIVING TSO co-ordinates together with the RESERVE CONNECTING TSO the exchange of reserves.

1.3 Reserve Transiting TSO

The RESERVE TRANSITING TSO is involved in the exchange of short term reserves only for the matter of transportation. With respect to this function the RESERVE TRANSITING TSO has to be integrated in the co-ordination of transportation capacity necessary to transmit the reserves.

1.4 Schedule activated Tertiary Control Reserve

SCHEDULE ACTIVATED TERTIARY CONTROL RESERVE is activated with relation to the predefined time frame of exchange schedules, e.g. 15 min. A special exchange scheduling procedure is used.

1.5 Directly activated Tertiary Control Reserve

DIRECTLY ACTIVATED TERTIARY CONTROL RESERVE can be activated at any time, independent from a time frame of exchange schedules, but always ending at a time frame boundary. The activation procedure results in a dynamically changing exchange pattern.

2. Terms not defined in the UCTE Operation Handbook but commonly used

2.1 Total Transfer Capacity TTC (ETSO definition)

The TOTAL TRANSFER CAPACITY TTC is the maximum exchange program between two areas compatible with operational security standards applicable at each system if future network conditions, generation and load patterns were perfectly known in advance.

2.2 Net Transfer Capacity NTC (ETSO definition)

is defined as: NTC = TTC – TRM
NTC is the maximum exchange between two areas compatible with security standards applicable in both areas and taking into account the technical uncertainties on future network conditions.

2.3 Transmission Reliability Margin TRM (ETSO definition)

The TRANSMISSION RELIABILITY MARGIN TRM is a security margin that copes with uncertainties on the computed TTC values arising from:
a) Unintended deviations of physical flows during operation due to the physical functioning of load-frequency regulation
b) Emergency exchanges between TSOs to cope with unexpected unbalanced situations in real time
c) Inaccuracies, e.g. in data collection and measurements

2.4 Allocation/Allocation Procedure

ALLOCATION means that limited transmission capacity between TSOs – normally represented by NTC values - is distributed to the market participants on the basis of an agreed procedure (ALLOCATION PROCEDURE). The respective shares of the capacity can be interpreted as reservations. Once transmission capacity is allocated this does not necessarily mean that this capacity will be effectively used by the respective market participants.

2.5 Nomination

By means of the NOMINATION the market participant declares that he will effectively use his prior allocated share of the transmission capacity. Depending on the ALLOCATION PROCEDURE allocated but not nominated capacity may be re-allocated.

3. Terms defined in the UCTE Operation Handbook

3.1 Control Area

A CONTROL AREA is the smallest portion of the system equipped and operated with a Load-Frequency Control (LFC) system. A CONTROL AREA

- is responsible for primary frequency control within its territory;
- is able to maintain power interchange at the scheduled value;
- co-operates to restore frequency to its set value following a perturbation;
- is responsible for accounting within its territory

Each CONTROL AREA is physically demarcated by the points of measurements of the interchange power of the secondary controller concerned. These points must also be used for the energy accounting and the accounting of inadvertent deviations.

3.2 Control Block

A CONTROL BLOCK is composed of one ore more CONTROL AREAS and operates its LFC with respect to the other CONTROL BLOCKS of the synchronous interconnected system. A CONTROL BLOCK

- is able to maintain the total interchange schedule of the block towards all other CONTROL BLOCKS of the system;
- takes part, together with the other CONTROL BLOCKS, in the restoration of frequency to its set value following a perturbation
- is responsible for accounting in its territory
- is not responsible for primary frequency control of the whole block; this remains within the responsibility of the individual CONTROL AREAS

3.3 Primary Control

The objective of PRIMARY CONTROL is to maintain a balance between generation and consumption (demand) within the Synchronous Area, thus contributing to the keeping of the system frequency at its desired value. This is achieved by the use of frequency controlled turbine governors. By the joint action of the generation units of all interconnected undertakings / TSOs, PRIMARY CONTROL aims at the operational reliability for the power system of the Synchronous Area and stabilises the system frequency at a stationary value after a disturbance or incident within the time-frame of seconds, but without restoring the values of system frequency and power exchanges to their set point values.

According to the rules of UCTE, the maximum power deviation to be handled by PRIMARY CONTROL is set for a reference incident of 3000 MW, assuming realistic characteristics concerning system reliability and size of loads and generation units.

The PRIMARY CONTROL RESERVE must be physically distributed as evenly as possible between the different regions (usually the CONTROL AREAS / BLOCKS) in the synchronous area and within these regions.

PRIMARY CONTROL must be available continuously, not depending on the unit commitment in detail. The action of PRIMARY CONTROL starts within seconds after the beginning of the incident and its function is to activate a power contribution to the system in order to restore overall balance between generation and consumption.

Each CONTROL AREA / BLOCK must contribute to the PRIMARY CONTROL RESERVE as required. The respective shares are defined by multiplying the calculated reserve for the entire synchronous area by the contribution coefficients Ci of the various CONTROL AREAS / BLOCKS. According to UCTE rules, the contribution coefficients of the areas are based on the share of the energy generated in the area within one year in relation to the total for the entire synchronous area. The sum of all shares must be equal to the total PRIMARY CONTROL RESERVE.

3.4 Secondary Control

The aim of SECONDARY CONTROL is to maintain a balance between generation and consumption (demand) within each CONTROL AREA / BLOCK as well as the system frequency within the synchronous area, taking into account the control program, without impairing the PRIMARY CONTROL operating in the Synchronous Area.

SECONDARY CONTROL makes use of a centralised automatic control modifying the actual power set points of generation sets in order to achieve full compensation of the error within the time frame of typically 15 minutes. SECONDARY CONTROL is based on SECONDARY CONTROL RESERVES that must be under automatic control. Adequate SECONDARY CONTROL requires generation resources made available by generation companies to the TSOs.

Within each CONTROL AREA / BLOCK, the individual Area Control Error (ACE) needs to be controlled to zero on a continuous basis. The ACE is calculated as the sum of the power control error and the frequency control error.

Each CONTROL AREA / BLOCK must be operated by an individual TSO that has the responsibility for the transmission system operation of this area (usually coincident with the territory of a company or a country), including the responsibility for availability, operation and provision of SECONDARY CONTROL to maintain the power interchange of his CONTROL AREA / BLOCK at the scheduled value and, consequently, to support the restoration of frequency deviations in the interconnected network. In order to control the ACE to zero, SECONDARY CONTROL must be performed in the corresponding control centre by a single automatic secondary controller that needs to be operated on-line and in closed-loop.

In CONTROL AREAS / BLOCKS of different sizes, load variations of varying magnitude must be corrected in less than15 minutes. To this end, the recommended minimum reserve related to load variations should be based according to the following formula:

$$R = \sqrt{a\ L_{\max} + b^2} - b$$

R= the recommended SECONDARY CONTROL RESERVE in MW
L_{max}= the maximum anticipated consumer load in MW for the CONTROL AREA over the period considered. The parameters a and b are established empirically with the following values:
a = 10 MW and b = 150 MW.

An adequate SECONDARY CONTROL RESERVE must be available continuously. In case of the loss of a generating unit the SECONDARY CONTROL RESERVE is activated automatically. The function of SECONDARY CONTROL RESERVE is not only to activate a fast power contribution but also an energy contribution to the system. TERTIARY CONTROL RESERVE (minute reserve) will be required to offset the shortfall and to release the activated SECONDARY CONTROL RESERVE.

3.5 Tertiary Control

TERTIARY CONTROL uses TERTIARY CONTROL RESERVE that is usually activated manually by the TSOs TERTIARY CONTROL and replaces PRIMARY CONTROL after minutes as a supplement for SECONDARY CONTROL or frees SECONDARY CONTROL in case of sustained activation by rescheduling generation, activating switchable loads or bilateral adjustment of exchange schedules between adequate CONTROL AREAS / BLOCKS. TERTIARY CONTROL RESERVE is typically operated in the responsibility of the TSO. Two types of TERTIARY CONTROL RESERVE can be recognized. SCHEDULE ACTIVATED TERTIARY CONTROL RESERVE is activated with relation to the pre-defined time frame of exchange schedules, e.g. 15 min. It can be categorized as “energy reserve”. DIRECTLY ACTIVATED TERTIARY CONTROL RESERVE can be activated at any time, independent from a time frame of exchange schedules, but always ending at a time frame boundary. It is used for frequency restoration after large disturbances, as a supplement to the automatically activated and continuously updated SECONDARY CONTROL RESERVE and can be categorized as "power reserve”.

Each CONTROL AREA / BLOCK must have access to an amount of TERTIARY CONTROL RESERVE that equals the size of the largest unit to be able to replace activated PRIMARY and SECONDARY CONTROL RESERVE after the loss of this unit (N-1 amount). The total amount of TERTIARY CONTROL RESERVE can be a combination of different available components (e.g. reserved by the TSO, TSO-TSO co-operation, reserved by the market).The dynamic part of the TERTIARY CONTROL RESERVE (ARECTLY ATIVATED TERTIARY CONTROL RESERVE) must be large enough to cover the need of restoration of the network frequency and activated PRIMARY CONTROL RESERVE after an incident within the CONTROL AREA / BLOCK, when the available SECONDARY CONTROL RESERVE is not sufficient to achieve this within the 15 minute timeframe. The remaining part of required TERTIARY CONTROL RESERVE is needed to free already activated SECONDARY CONTROL RESERVE after the balance restoration. When the resources for the TERTIARY CONTROL RESERVE are maintained outside the involved CONTROL AREA / BLOCK, it is necessary to update the interchange programs of the involved Load Frequency Controls in a coordinated way, for both the RESERVE CONNECTING TSO and the RESERVE RECEIVING TSO.

3.6 Activation Time Interval

The time interval between the moment the Reserve Supplier is notified that his reserve is required and the moment that he is actually expected to deliver the agreed MW amount. Also known as the "lead-time". The ACTIVATION TIME INTERVAL may vary depending both on the reserve resource and on the used activation procedure.

3.7 Supply Time Period

The duration of the delivery period that is agreed between the TSO and the Reserve Supplier at the time the Supplier is notified that a certain amount of TERTIARY CONTROL RESERVE is required. The supply starts after the Activation Time Interval and continues till the completion of an agreed future schedule/accounting time frame (¼ h, ½ h, 1h).