Annex
to the General Terms

"Management of Imbalance Energy"

V 14.00

Document Management

Document History

Version	Status	Date	Supervisor	Reason for Amendment
1.00	Approved	13 Sep. 2001	E-CONTROL	Appendix to Official Notice of 13 Sep. 2001, ZI. G BKA 02/01
2.00	Approved	26 Nov. 2001	E-CONTROL	Change to market close
3.00	Approved	26 Mar. 2002	E-Control	Change to time block intervals, market makers
4.00	Approved	18 Sep. 2002	E-Control	Changeover UCTE schedules
5.00	Approved	20 Dec. 2002	E-Control	Introduction subsequent settlement, 2nd clearing
6.00	Approved	30 Sep. 2003	E-Control	Consideration of UCTE holiday rule
7.00	Approved	17 Feb. 2004	E-Control	Prolongation General Terms, secondary balancing energy procurement via an exchange; mathematical formula (Annex to Official Notice of 17 Feb. 2004)
8.00	Approved	4 Oct. 2004	E-Control	Market maker, time blocks, minutes reserve
9.00	Approved	15 Mar. 2005	E-Control	New pricing model, clearing price calculation
10.00	Approved	14 Nov. 2007	E-Control	Change to subsequent settlement, subsequent settlement schedules
11.00	Approved	20 Apr. 2009	E-Control	Adjustment to secondary redelivery period
12.00	Approved	22 Jul. 2009	E-Control	Spreads from secondary redelivery programme via a power exchange
13.00				Merger of control areas
14.00	Approved	21 Dec. 2011	E-Control	Appendix to Official Notice of 21 Dec. 2011

Note: This translation of the German text "Anhang Ausgleichsenergiebewirtschaftung" is provided for convenience purposes only.

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1 Scope of Application and Distinction between Balancing Energy and Imbalances[1]

The following provisions describe the organisation of imbalance energy management.

To distinguish between balancing energy and imbalance energy volumes, the Control Area Manager ("CAM") maintains special balance groups in which tertiary and secondary balancing energy volumes are registered separately by the Control Area Manager grouped by the electricity actually consumed by the suppliers of balancing energy and the inevitable, unintentional energy exchanged with the other grids of the European grid association for each settlement period (1/4h) due to technical requirements and metering limitations.

2 Settlement of Imbalances

The CAM ascertains the necessary capacity bandwidth in order to compensate the expected imbalance resulting from the sum of the balance groups ("BG") in the control area between production and consumption to the extent it is possible to comply with the technical rules on primary and secondary frequency power frequency control.

To clear the balancing energy volumes, the BGC maintains components on which the power consumed is recorded organized by supplier and direction. Balancing energy suppliers register with the Control Area Manager. The Control Area Manager sends the master data to the BGC to serve as basis for setting up the components.

The settlement of imbalances within a control area consists of three balancing energy components:

1) Secondary balancing energy including power outage reserve
2) Tertiary balancing energy (minute reserve)
3) Unintentional energy exchange with other control areas

If it is predictable that the bidding procedure for the tertiary balancing process will not result in any bids or in an insufficient number of bids, the CAM may appoint market makers to secure the supply of balancing energy.

With respect to the unintentional exchange of power with other control areas, the technical

[1] "Imbalance energy (*Ausgleichsenergie*): means the difference between the amount of energy scheduled and the amount actually fed in or out by a balance group during each defined measurement period, where the energy per measurement period may be either metered or calculated." (ElWOG Definition) "Balancing energy (*Regelenergie*): means energy used by TSOs to perform balancing." (ENTSO-E Definition).

rules specify that the defined quantity of a week (Monday 0:00 hrs. to Sunday 24:00 hrs.) must be valued by tariff periods and offset in the subsequent week by a compensation programme with corresponding delivery within the bandwidth and within the respective tariff period.

For the energy volumes to be made available are either tendered in an international bidding process or procured from a power exchange.

3 Disclosure Obligations and Transparency

The BGC is under the obligation according to § 23 (5) 5 Electricity Act[2] to provide information to ensure a transparent, non-discriminatory balancing energy market with as much liquidity as possible.

A basic requirement for complying with this obligation to secure the supply of power and transparency is the transmission of auction data by the Control Area Manager to Balance Group Coordinator.

The Control Area Manager notifies the primary, tertiary and secondary balances tendered by capacity to be supplied and received to the Balance Group Coordinator (BGC). To inform market participants, the BGC publishes the capacity bandwidths specified by the Control Area Manager for the balancing energy components.

As soon as the bidding procedure is completed for energy volumes and capacities for the balancing energy components of unintentional energy exchange, primary balancing capacity, secondary balancing capacity, tertiary balancing capacity and tertiary balancing energy and the bids have been awarded, the Control Area Manager communicates the volumes tendered and awarded, and the offer prices per bidder to the Balance Group Coordinator.

Information regarding the energy volumes called per bidder and offer as well the bids set to "not available" is sent by the Control Area Manager to the Balance Group Coordinator on the day following the energy called.

The Balance Group Coordinator will publish bidding quantities and prices, the quantities and prices awarded in accordance with § 23 (5) 5 Electricity Act in anonymous form.

The Balance Group Coordinator will make available to every balancing energy supplier the bids it has personally submitted, awarded and called in the auction procedure. In this manner, the balancing energy supplier is provided with a view of its balance data together with its balancing energy bids in a system defined as the "Single Point of Information". To this end, the Control Area Manager is obligated to send the data in non-anonymous form to the Balance Group Coordinator.

The preliminary control area delta determined in quarter-hour intervals is sent by the Control Area Manager to the Balance Group Coordinator for the purpose of risk management of the Balance Group Coordinator and the market participants.

[2] Elektrizitätswirtschafts- und –organisationsgesetz (EIWOG) = Austrian Electricity Industry and Organization Act

4 Technical Clearing

"Technical Clearing" comprises data receipt, "first clearing", "second clearing" and any subsequent invoicing.

The data received per clearing period include, in particular,

- from the Balance Group Representative: the internal schedules broken down by consumption and supply:
- from the Control Area Manager: the external schedules broken down by consumption and supply
- from the Control Area Manager: the withdrawal schedules for the individual balancing energy components broken down by supplier, withdrawal and supply
- from the grid operator: the sum of the aggregated load profile metering values (time-series from quarter-hour values) and aggregated synthetic load profiles, broken down by production and consumption, by supplier and balance group as well as the time-series of the grid connecting points which are the responsibility of the grid operator.

The Balance Group Coordinator defines the quantity of imbalance energy based exclusively on the schedule values made available by the Balance Group Representative and the Control Area Manager and assigned by the grid operator to the respective balance groups as well as the aggregate volume of the time-series of the actual quarter-hour metered values in kWh and the load profiles per grid operator and balance group, broken down by feed and withdrawal.

The **first clearing** takes placed monthly and determines the quarter-hour imbalance energy per balance group derived from the net balance of the aggregation of the schedules and the sum of the aggregated metered values (time-series from quarter-hour values) as well as aggregated synthetic load profiles in accordance with preliminary consumption values.

Data is delivered by the grid operator to the Balance Group Coordinator within 8 (eight) workdays as of the last day of the month for which the data are valid. If the Balance Group Coordinator subsequently requests missing data or erroneous data, the grid operators must send the data subsequently within 2 (two) further workdays.

Subsequent invoices can be sent only within six months after the close of the "first clearing" for individual months and individual balance groups upon request of the concerned Balance Group Representative and serves as a correction for quantities in the case of faulty data quality of the basic data (aggregated metering values). Within the scope of subsequent invoicing, it is also possible to change metering values and internal schedules if one of the two market

participants concerned (data supervisor) makes a request to the APCS and the second market participant consents in writing to this change (fax) within two workdays.

The Balance Group Coordinator is authorized to charge the Balance Group Representative, on whose request the subsequent invoicing is being done, a fee for the work involved in the subsequent invoicing.

The **second clearing** also takes place on a monthly basis like the "first clearing"; however, for the month 15 months before and takes into account actual energy quantities determined when reading the meter. Moreover, the "second clearing" also takes into account any open quantity corrections from the "first clearing" (e.g. replacement value, retroactive switching by customers, changes from switching dates).

At the latest on the last workday of the current month, the data for the month 14 months before must be delivered to the Balance Group Coordinator to the defined data department. For the data of the "second clearing", the same metering point names and component designations must be used as in the "first clearing".

The close of clearing for the "second clearing" is specified in the clearing calendar published on the website of APCS. After the close of clearing, the market participants have a period for reviewing their data until the cutoff date "quality review until" according to the clearing calendar. After the cutoff date, it will no longer be possible to change the data.

Retroactive changes to schedules (these include grid loss schedules) within the scope of the "second clearing" is not permitted. With the second clearing, the entire clearing process is completed. Subsequent invoicing of the second clearing is therefore not permitted.

5 Invoicing Imbalance Energy

The invoicing of imbalance energy to the Balance Group Coordinator has two price components:

- Clearing price 1 for the imbalance energy calculated pursuant to clause 4 (energy supply pursuant to VAT Act).

  Clearing price 1 is billed per quarter-hour and is the same for imbalance energy delivered and consumed.

- Clearing price 2 based on volume consumed (other services pursuant to VAT Act for imbalance management).

  Clearing price 2 is a constant value for the entire month. The volumes consumed correspond to the "volume consumed subject to taxation" defined in the Clearing Fee Regulation issued by E-Control.

The proceeds from the invoicing of the two clearing prices cover the costs and proceeds billed to the Balance Group Coordinator by the Control Area Manager in accordance with legal provisions. These comprise:

- Costs and proceeds arising from the energy supplied bought and sold by the Control Area Manager within the tertiary balancing process
- Costs and proceeds for additional power capacities bought within tertiary balancing process
- Costs and proceeds arising from energy and capacities bought and sold for the secondary balancing process
- Costs and proceeds arising from unintentional energy exchange from energy deliveries bought and sold
- Other costs and proceeds (e.g. fines)

The auctions are conducted by the Control Area Manager. The costs and proceeds involved per month are billed after the end of the month to the Balance Group Coordinator by the Control Area Manager in accordance with the aforementioned explanations. In this context, the Control Area Manager accrues the costs and proceeds by month to ensure that the costs are correctly allocated to the month.

The costs and proceeds mentioned above are allocated to clearing price 1 and clearing price 2 in accordance with the procedure for calculating the price of imbalance energy pursuant to clause 5.1.

The targeted distribution ratio determines which share of the total imbalance costs must be raised by the two clearing prices.

If due to extreme values, the limits of maximum the allocation function ($U_{Max, MIN}$ and $U_{Max, MAX}$ pursuant to clause 5.1.4) are exceeded, the actual distribution ratio (s') is applied according to the procedure described in clause Pkt. 5.1.2 instead of the distribution ratio (s) aimed for.

5.1 Procedure for Calculating the Imbalance Energy Price

5.1.1 Calculation of the imbalance market price

The following values are given for a "quarter-hour interval" t:

$E_{1,i,t}$. . . . Energy of the withdrawal in this quarter-hour

$P_{1,i,t}$. . . . Corresponding price per unit

$E_{2,j,t}$. . . . .Energy from redelivery in this quarter-hour

$P_{2,j,t}$. . . . .Corresponding price per unit

The imbalance market price Pt is calculated in "quarter-hour intervals" t as

$$P_t := \frac{\sum E1_{,i,t} \cdot P1_{,i} + \sum E2_{,j,t} \cdot P2_{,j}}{\sum E1_{,i,t} + \sum E2_{,j,t}}$$

where the sum of all withdrawals and redeliveries is calculated in quarter-hour intervals.

If there were no withdrawals or redeliveries in the quarter-hour, P_t is defined as follows:

Whereas $P_{V,t}$ is the price of the cheapest sell offer that applies in this quarter-hour.

Whereas $P_{K,t}$ is the price of the highest buy offer of this quarter-hour.

If there were both sell and buy quotes in the quarter hour, then:

$$P_t := \frac{P_{V,t} + P_{K,t}}{2}$$

If there is only one sell offer, then:

$$P_t := P_{V,t}$$

If there is only buy offer, then:

$$P_t := P_{K,t}$$

If there are no sell or buy offers, then:

$$P_t := 0$$

5.1.2 Calculation of Clearing Price 1

Whereas V_t is the delta (with a minus/plus sign) of the control area (i.e. of the system) in a quarter-hour as energy.

This means that V_t indicates how much energy in total must be supplied or redelivered in the control areas (imbalance market, secondary balancing and unintentional exchange) through balancing measures.

V_t is positive if, in total, balancing energy had to be fed into the system, and negative if it had to be withdrawn.

Furthermore, $P_{X,t}$ is the exchange price in the quarter-hour t.

As a basis for the calculation of the clearing price, a **base price** $P_{B,t}$ is used that is derived from

$$P_{B,t} := \begin{cases} \min(P_t; P_{X,t}) & V_t < 0 \\ \max(P_t; P_{X,t}) & V_t > 0 \end{cases}$$
$$= \mathrm{sgn}(V_t) \cdot \max\left(\mathrm{sgn}(V_t) \cdot P_t; \mathrm{sgn}(V_t) \cdot P_{X,t}\right)$$

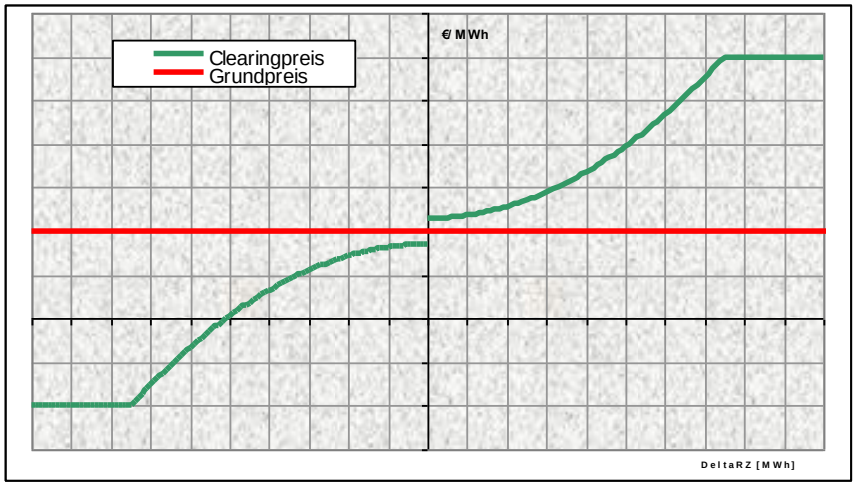
(if no exchange price is available, then the base price equals the imbalance market price) and an **allocation function** T

$$T(V_t, U_{Max}, U_{Min}, V_{Max}) := \begin{cases} U_{Min} + \dfrac{U_{Max} - U_{Min}}{V_{Max}^2} \cdot V_t^2 & |V_t| < V_{Max} \\ U_{Max} & |V_t| \geq V_{Max} \end{cases}$$

which depends on the delta of the control area, a maximum value calculated for the full month U_{Max}, a constant minimal value for the full month U_{Min} and a value at which the maximum is reached (V_{Max}) – see 0 for the current values defined.

Clearing price 1 $P_{C,t}$ for the quarter-hour t then results in:

$$P_{C,t} := P_{B,t} + \mathrm{sgn}(V_t) \cdot T(V_t, U_{Max}, U_{Min}, V_{Max}) .$$



Text in Chart:
Clearing price
Base price

To determine U_{Max} for one month, the following procedure applies:

The amount *K,* which is collected in the month by the clearing price 1, is:

$$K := \sum_{t \in M} V_t \cdot P_{C,t}$$

In clause 0 a target distribution ratio *s* is defined and for the respective month, the sum of all costs and proceeds is determined by K_C which results in the equation

$$K = (1-s) \cdot K_C$$

Based on this equation, the target value for *UMax* is explicitly derived by transformation:

$$U_{Max,S} := \frac{1}{C} \cdot \left[(1-s) K_C - \sum_{t \in M} V_t P_{B,t} - U_{Min} \sum_{\substack{t \in M \\ |V_t| < V_{Max}}} \left(|V_t| - \frac{|V_t|^3}{V_{Max}^2} \right) \right]$$

where *M* is the quantity of all "quarter-hours" of the month and *C* is defined by

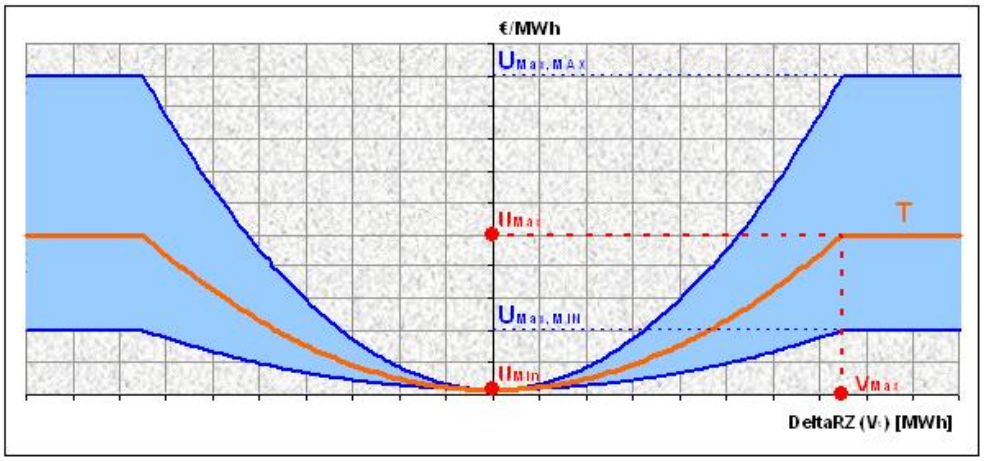
$$C := \sum_{\substack{t \in M \\ |V_t| < V_{Max}}} \frac{|V_t|^3}{V_{Max}^2} + \sum_{\substack{t \in M \\ |V_t| \geq V_{Max}}} |V_t|$$

To avoid a too low or too high a value for U_{Max} it is necessary for this value to be within the limits defined for the month $U_{Max,MIN}$ and $U_{Max,MAX}$ (see 0), i.e.:

$$\text{i.e.: } U_{Max} := \begin{cases} U_{Max,S} & U_{Max,MIN} \leq U_{Max,S} \leq U_{Max,MAX} \Rightarrow s' = s \\ U_{Max,MIN} & U_{Max,S} < U_{Max,MIN} \Rightarrow s' < s \\ U_{Max,MAX} & U_{Max,MAX} < U_{Max,S} \Rightarrow s' > s \end{cases}$$

Amount *K,* which is collected in the month through clearing price 1, is then: $K := \sum_{t \in M} V_t \cdot P_{C,t}$

Graphic presentation of the allocation:



The monthly accrual of the costs is done by equally distributing these to the quarter-hours of the period during which these occur.

If all control area deviations for the previous month, and all costs and proceeds from the bidding procedure of the previous month are known, clearing price 1 is published.

5.1.3 Calculation of Clearing Price 2

For the full month, the constant clearing price 2 P_S (in €/MWh) is defined as

$$P_S := (K_C - K) / E$$

where *E* in this formula is the volume consumed by all balance groups in the month, and *K* and K_C are defined in clause **Fehler! Verweisquelle konnte nicht gefunden werden.**.

After all volumes consumed are available, which is usually after the end of the data delivery grace period for the first clearing, clearing price 2 is published.

5.1.4 Current Parameter Definitions for Calculating Clearing Prices

The current values of the free parameters used in the calculation of the clearing prices are:

U_{Min}	minimal value of the allocation function	3.00 €/MWh
$U_{Max,MIN}$	lower limit of maximum of the allocation function	40.00 €/MWh
$U_{Max,MAX}$	upper limit of the maximum of the allocation function	200.00 €/MWh
V_{Max}	value of the control area delta at which the allocation maximum is reached	75.00 MWh
s	targeted distribution ratio for clearing price 2	0.20 (d.h. 20%)

Exchange price Px is the spot market price determined by EXAA Energy Exchange Austria. Should EXAA discontinue its activities and it is therefore no longer possible to determine the price via EXAA, the spot market price of ECC (European Commodity Clearing AG) is to be used with immediate effect as of this time.

5.1.5 List of Abbreviations for Chapter 7

C	Constant value, results from all control area deviations in a month
E	Volume consumed by all balance groups
K	Monthly amount that must be covered by clearing price 1
K_C	Total clearing costs to be covered per month
M	Volume of all quarter-hours in the month
$P_{B,t}$	Base price per quarter-hour
$P_{C,t}$	Clearing price per quarter-hour
P_S	Clearing price 2
$P_{X,t}$	Exchange/spot market price in the quarter-hour
s	Target distribution ratio for clearing price 2
s'	Actual distribution ratio for clearing price 2
U_{Max}	Maximum value t of the allocation function
$U_{Max,MAX}$	Upper limit of the maximum of the allocation function
$U_{Max,MIN}$	Lower limit of the maximum of the allocation function

$U_{Max, s}$	Upper limit of the maximum of the allocation function at the target distribution ratio
U_{Min}	Minimal value of the allocation function
V_{Max}	Value of the control area delta at which the allocation maximum is reached
V_t	(with minus/plus sign) control area delta in a quarter-hour as energy.
$T(V_t, U_{Max}, U_{Min}, V_{Max})$	Allocation function