2.sz. melléklet: A HUPX Szervezett Villamosenergia-piaci Szabályzat módosításának és kiegészítésének eredeti angol nyelvű változata

HUPX Market Rules' Article 5.7 on Order Categories

Orders may relate to one Expiry only (Single-Contract Orders) or to several Expiries (Block Orders).

HUPX Operational Rules' Article 1.3 on Segments

HUPX DAY-AHEAD AUCTION	
General Information	
Trading procedure	*Daily Auction*
Trading days	*Year-round*
Tradable Contracts (Expiries)	*1 hour of the day* *Hour 01: the period between midnight and 1.00 am* *Hour 02: the period between 1.00 am and 2.00 am, and so on and so forth* *Hour 24: the period between 11.00 pm and midnight*
Order Book opening	*24 hrs per day starting forty-five days preceding the Delivery Day*
Order Book closes	*Daily at 10:45 am*
Publication time	*As soon as possible from 10:55 am*
Second Auction	*10:50 am (earliest) / Publication time: as soon as possible from 11:00 am*
Clearing and Settlement	*Trade information transmitted by HUPX to the Central Counterparty, ECC AG for Settlement and Delivery of the Contracts*
Delivery procedure	*Nomination by HUPX (together with ECC) and by the Balance Group Responsible of the HUPX Member to the TSO (MAVIR Ltd.) on the base of the regulations of the Commercial Code of the Hungarian Electricity System*
Minimum and maximum prices	*0.01 €/ 3000.00 €*
Admissible Orders	*Defined hereunder.* *On the day of the switch from summer time to winter time, the hour no. 3 is considered twice automatically for the purposes of pricing. On the day of the switch from winter time to summer time, the hour no. 3 cannot be traded.*
Price characteristics	*In euro per MWh with two decimal digits*
Quantity characteristics	*in MW with one decimal digit*
Single Hours Orders	
Minimum and Maximum	*2 and 256*

numbers of price/quantity combinations for Single-Contracts orders	
Block Orders	
Definition	*Combined Single Contract Orders with a minimum of two (2) hours of the day, which depend on each other in their execution. Pre-defined block orders exist but the Exchange Participant is not restricted in the determination of the Block Orders.*
Pre-defined block orders	*The following Block Orders are pre-defined in the system:* • *Block Baseload covering hours 1 to 24* • *Block Peakload covering hours 9 to 20* • *Block Off-peak 1 covering hours 1 to 8 and 21 to 24* *Additionally, user defined Block Orders may be determined consisting of both continuous and discontinuous blocks.*
Specific conditions	• *All-or None* • *Maximum volume for a Block Order is 5 MW* • *Maximum of 5 Block Orders per Delivery Day and per portfolio can be entered by the Exchange Members*

HUPX Operational Rules' Article 1.5 on Block Orders within Order Categories

Block Orders shall contain one price/quantity combination per Order, subject to the matching rules specified in articles 1.5 to 1.6 of these Operational Rules. They can only be totally matched with Block Orders or with the same combination of individual hours.

HUPX Operational Rules' Article 1.6 on Determining Auction Prices and Quantities within Order Matching and Processing

The Auction takes place daily, after the Order Book has closed. The price corresponds to the matching of Members' aggregate supply and demand curves of both Single Orders and Block Orders for each Contract. The Price determined by the algorithm at the time of Auction is the Price at which all Trades will be executed.

For Price determination purposes, the Member's interest is assumed to be linear between two price/quantity combinations.

The Price determination algorithm aims at optimizing the total welfare, i.e. the Seller Surplus, the Buyer Surplus and the Congestion Rent (if applicable). The presence of All-or-None Block Orders in the order book makes necessary the use of a specific search algorithm, in order to determine a market clearing Price.

The problem can be formulated as a Mixed Integer Quadratic Program (MIQP) allowing modeling the All-or-None condition of Block Orders. The state-of-the-art method used to solve MIQP is called branch-and-bound. The COSMOS algorithm has been designed as a branch-an-bound algorithm for solving the MIQP corresponding to the Order Matching

Problem Cosmos consists of a systematic enumeration of all candidate solutions, where large subsets of fruitless candidates are discarded en masse, by using upper and lower estimated bounds of the quantity being optimized and adding constraints (or cuts). COSMOS proceeds step by step. At the first step, COSMOS will allow all Block Orders to be partially executed. In the next steps, COSMOS will enforce the Block Orders as rejected or executed one by one in order to obtain a solution which respects the All-or- None condition of Block Orders. At a given step, two situations can occur:

- *COSMOS has produced a solution in which some Block Orders are either fully executed or rejected and some Block Orders are partially executed. Since it contains partially executed Block Orders, it is called a partial solution. The property of this partial solution is that its objective value is an upper bound of the welfare of any solution that could be produced by completing this partial solution. Two cases can occur:*
  - *Sub-case a: If the upper bound associated to this partial solution is smaller than the welfare of the best solution already found by COSMOS, COSMOS will discard this partial solution and will not consider it any more.*
  - *Sub-case b: Otherwise, COSMOS will select a Block Order partially executed and create two new steps to be analyzed: in the first of these new steps, the Block Order is enforced to be executed, and in the second, one it is forced to be rejected.*
- *COSMOS has produced a solution in which all Block Orders are either fully executed or fully rejected (even those that were not enforced). In this case, Cosmos must still check whether there exist Prices that are compatible with this solution and with the constraints (which is done by verifying that all properties set out in Article 1.6.4. are satisfied). Two cases can occur:*
  - *Sub-case c: If such prices exist, COSMOS has found a feasible solution. If this solution is better than the best one found so far, it is marked as such. COSMOS will proceed a new step by examining a new partial Block Orders selection if any remains pending*
  - *Sub-case d: If no such prices exist, then a new step is created with a transformed problem containing additional constraints to exclude this non feasible solution.*

During the course of its execution, COSMOS might sometimes increase the number of partial Block Orders selections that it has yet to consider (e.g. sub-case b) or reduce it (subcases a and c). When there remains none, this means that COSMOS has finished and has found the best possible solution. Possibly, COSMOS will reach the time limit although there remain some partial solutions that were not analyzed. In this case, COSMOS will output the best solution found so far.

Because of the iterations of the Auction algorithm, it may happen that Block Orders are not executed even though their Price would have permitted execution at the market clearing Prices. The reason for this is that when carrying out a price calculation, which takes the Block Order into account, the Price is influenced to such an extent that the limit criteria of the Block Order is not fulfilled. However, should the Block Order be withdrawn, the determined

Price changes, so that the limit criterion is fulfilled. However, the algorithm discards during its computation the solutions with paradoxically rejected blocks which Price is significantly better than market clearing Price.

HUPX Operational Rules' Article 1.6 on Outcome properties within Order Matching and Processing

- *Single-Contract sell Orders shall not be executed for quantities offered, above the market clearing Price.*
- *Single-Contract buy Orders shall not be executed for quantities bid, below the market clearing Price.*
- *Single-Contract sell Orders shall be executed for quantities offered, strictly below the market clearing Price.*
- *Single-Contract buy Orders shall be executed for quantities bid, strictly above the market clearing Price.*
- *Single-Contract Orders may not be executed or may be partially executed for quantities offered or bid, at a Price equal to the market clearing Price.*
- *A block sell Order shall not be executed when its Price is higher than the average market clearing Prices for the hourly Contracts to which it relates.*
- *A block buy Order shall not be executed when its Price is lower than the average market clearing Prices for the hourly Contracts to which it relates.*
- *Block Orders are executed for their full quantity only.*
- *Orders may not be executed for quantities greater than the quantity named in the Order.*

HUPX Operational Rules' Article 1.7 on Second Auction Procedure

If the market is in Curtailment (imbalance of purchases and sales leading to out-of-scale prices) or if the auction can lead to a Price that can be considered as abnormal given current market conditions (one or several hourly prices are significantly different from the other hours of the day or from the same hour(s) of a comparable day), then HUPX may trigger a Second Auction. In this case, it will inform all HUPX Members that:

- *either sales or purchases are required on one or several specific hours, or*
- *the Order Book gate closure time is postponed in order to leave enough time to Members to modify the Orders they sent if they wish to do so. In case of a Second Auction, only Order modifications which improve the balance between purchase and sale are allowed.*

If in spite of the Second Auction procedure, purchase and sale quantities still cannot be filled in their entirety at the maximum or the minimum Prices specified in the Orders, all block Orders which contain the respective hour(s) and which unfavorably influence the determination of intersections between the sales and purchase curves may be rejected and quantities will be allocated in proportion to buyers' and sellers' Single Contract Orders.

HUPX Operational Rules' Article 1.8 on Outcome and Publication of the Outcome

The outcome of the Auction is made available not earlier as mentioned in the contracts specifications (Chapter 1 above). The Auction outcome includes:

- *the Price and total quantity executed for each Contract,*
- *the purchase and sale quantities relating to Transactions, per Contract and Trading Account.*

HUPX Ltd. sends Members a trade confirmation containing the following information:

- *the Price and total quantity determined by the Auction algorithm for each Contract,*
- *Transactions, per Contract and Trading Account,*
- *the Transaction summary for Block Orders.*

Once the outcome is published and validated, Members agree to be bound by the terms of the Transactions that they have effected in the Contracts.

Members are deemed to have taken note of the outcome as soon as it is made public.