# Appendix No. 3

# Business Terms of the OTE, a.s. for the Power Sector

# Revision 38 – June 2025

## DAY-AHEAD MARKET AND INTRA-DAY AUCTION EVALUATION ALGORITHM

# Contents

# 1    TERMS

The same abbreviations and terms used in the Business Terms of OTE, a.s. for the Power Sector apply to this document. In addition, the following terms are used:

1.1    Accepted bids – matched active bids to sale/buy electricity on DM or IDA that are an integral part of the algorithm's valid solution, i.e. they have been matched;

1.2    Algorithm – day-ahead market (DM) and IDA evaluation algorithm allocating the volume of electricity accepted for each accepted bid on the relevant market (DM and IDA) at every trading interval of the particular delivery day;

1.3    Curve of bids – a discrete aggregated curve consisting of degrees arisen from blocks of sale bids gradually put together at a particular trading interval of the delivery day from all placed sale bids according to the price in ascending order and independently from the sale bid it belongs to;

1.4    Curve of demands – a discrete aggregated curve consisting of degrees arisen from blocks of buy bids gradually put together at a particular trading interval of the delivery day from all placed buy bids according to the price in descending order and independently from the buy bid it belongs to;

1.5    Effective acceptance ratio – the percentage of the amount of the matched quantity of the bid as a ratio of the matched quantity to the volume limit of the bid;

1.6    ID RMP – registration number of a short-term electricity and/or gas market participant in CS OTE;

1.7    Matching – determination of the equilibrium points at the intersection of the curve of demands and the curve of bids for each Trading Interval of the Delivery Day, based on which matched prices and traded (accepted) quantities for buying and selling are determined, i.e. the set of bids for selling and bids for buying that succeeded in terms of matching in each Trading Interval of the Delivery Day (i.e. accepted bids);

1.8    Minimum acceptance ratio – the percentage of the required minimum amount of the matched quantity of the profile block bid in relation to the volume limit of the profile block bid, thus determining the degree of divisibility of the volume limit of the profile block bid. If the minimum acceptance ratio = 100 %, then the profile block bid is indivisible;

1.9    Social welfare – is defined as: consumer surplus + producer surplus + congestion revenue across the region. It is the objective function of evaluation algorithm – solution with maximal welfare is the final solution;

1.10    Trading interval – the period for which a Product is defined on the Day-ahead or Intraday electricity market. Trading intervals available on the Day-ahead or Intraday electricity market organized by the Market Operator are listed on OTE's website;

1.11    Limiting condition – a condition of full or partial indivisibility of a profile block bid;

1.12    Paradoxically rejected bids – profile block bids unmatched due to volume indivisibility constraint or only partial volume divisibility even if their price is lower/higher or equal to the matched price, and/or standard bids with a coarser resolution than the smallest trading interval of the market area that have not been matched in order to maintain the matched price within the price limits while maintaining a financially balanced market, even though their price is lower/higher than or equal to the

matched price;

1.13    Element of bid – a bid for sale / purchase of a specific electricity volume at a specific trading interval of a particular delivery day of a short-term market participant for minimum / maximum price which the short-term market participant is willing to accept;

1.14    Matched price – the price determined by the algorithm found after the matching of bids covering the given trading interval on the delivery day;

1.15    Standard bids – this term refers to unconstrained buy/sell bids that are transformed into EUPHEMIA as aggregated buy and sell curves, where a single standard buy or sell bid consists of a set of bid elements with a defined price limit and volume limit for a selected combination of trading intervals and segments;

1.16    EUPHEMIA – an algorithm to perform matching for a) the day-ahead market coupling, b) intra-day auctions or c) for isolated markets. EUPHEMIA is a branch-and-bound algorithm designed to solve the problem of coupling auction markets;

1.17    Balance (NP) – balance of the market area;

1.18    QP – a Quadratic optimization program.

# 2 DAY-AHEAD MARKET (DM) EVALUATION ALGORITHM

2.1      A list of bids valid and submitted to the DM pursuant to Business Terms  for the delivery day is acquired, which is determined for evaluation of one or more market areas and, subsequently, bid and demand curves are created, acceptance of bids is determined, matched prices for individual trading intervals are calculated, and not rounded and rounded values of balance for the smallest trading interval of the market area are determined. In case of several market areas, the capacity limitations of transmission system operators is taken into account. The matched price for the smallest trading interval of the market area is the clearing price.

2.2      Profile block bids price limit is equal to the price limit of the given bid.

2.3      Bids without limiting conditions (standard bids) are processed for a particular bid element (a particular trading interval and particular segment) according to the following criteria:

   2.3.1    A standard bid for sale is rejected when the matched price is lower than the bid price limit.
   2.3.2    A standard bid for purchase is rejected when the matched price is higher than the bid price limit.
   2.3.3    A standard bid for sale is matched when the matched price is higher than the bid price limit.
   2.3.4    A standard bid for purchase is matched when the matched price is lower than the bid price limit.
   2.3.5    A standard bid for sale with a resolution coarser than the smallest trading interval of the market area and a bid price limit lower than the matched price may be rejected entirely (such a bid is then referred to as a "Paradoxically rejected bid"), if it is necessary to maintain the matched price within the price limits while maintaining a financially balanced market in accordance with the rules described in the detailed description of the algorithm under paragraph 2.9.
   2.3.6    A standard bid for purchase with a resolution coarser than the smallest trading interval of the market area and a bid price limit higher than the matched price may be rejected entirely (such a bid is then referred to as a "Paradoxically rejected bid"), if it is necessary to maintain the matched price within the price limits while maintaining a financially balanced market in accordance with the rules described in the detailed description of the algorithm under paragraph 2.9
   2.3.7    A standard bid (for purchase and sale) with a resolution identical to the smallest trading interval of the market area may be partially matched if and only when the matched price is equal to the price limit of that bid.
   2.3.8    A standard bid (for purchase and sale) with a resolution coarser than the smallest trading interval of the market area may be partially matched

   2.3.8.1 if the matched price is equal to the price limit of that bid, or

   2.3.8.2 if it is necessary to maintain the matched price within the price limits while maintaining a financially balanced market (such a bid is then referred to as a partially "Paradoxically rejected bid") in accordance with the rules described in the detailed description of the algorithm under paragraph 2.9.
   2.3.9    A standard bid (for purchase and sale) is not entirely matched if the volume limit specified in the bid cannot be fully satisfied.

2.4      Profile block bids are processed at a particular trading interval according to the following criteria:

   2.4.1    A profile block bid / demand is not matched when the weighted average of the sum of the product of the matched price and the accepted volume in block intervals divided by the sum of accepted volumes of all block intervals is lower / higher than the price limit of this profile block bid / demand. A profile block bid can only be matched at all trading intervals

simultaneously, for a quantity equal, in the event of a bid with the minimum acceptance ratio = 100 %, to the volume limits in the given trading intervals specified in the bid, or for a quantity in the given trading intervals that is equal to the volume limits reduced up to a maximum of the level of minimum acceptance ratio specified in the bid below 100 %;

2.4.2 All profile block bids with the minimum acceptance ratio = 100 % can only be either matched fully, or rejected fully. Because of this constraint – called the "fill or kill constraint" some profile block bids can be rejected even if they correspond to the matched price (bid price limit is below the weighted average matched price in the profile block bid intervals), in which case they are called "Paradoxically rejected bids";

2.4.3 All profile block bids with the minimum acceptance ratio below 100 % can be at least partially matched with a reduction of the volume limits up to a maximum of the level of minimum acceptance ratio specified in the bid, or may be rejected fully. Because of this constraint some divisible profile block bids can be rejected even if they correspond to the matched price (bid price limit is below the weighted average matched price in the profile block bid intervals), in which case they are called "Paradoxically rejected bids";

2.4.4 Bids within the group of linked profile block bids are matched according to the following criteria:

2.4.4.1 Parent profile block bid must be matched with at least the same effective acceptance ratio of matched volume as its child profile block bid;

2.4.4.2 Parent profile block bid can be matched even if it is "not in the price range", provided that the yield for all its child profile block bids is of such amount that it compensates the loss of this parent profile block bid "not in the price range";

2.4.4.3 Child profile block bid, which is "not in the price range" cannot be matched even if its parent profile block bid shows the yield that would compensate for the loss incurred for this child profile block bid.

2.4.5 Bids within the exclusive group of the profile block bids are matched according to the criteria, where the sum of effective acceptance ratios of matched volume for all profile block bids within the particular exclusive group of profile block bids must not exceed the value of 100 %.

2.5 If the intersection of the bid curve and the demand curve is on the horizontal bid curve and there is no valid bid with an indivisible condition for this price, the volume of electricity earmarked for division shall be proportionately distributed for this price among valid bids. If the intersection of the bid and the demand curves is on the horizontal demand curve, the electricity volume for division shall be proportionally distributed among valid buy bids for this price.

2.6 For the purpose of proportional distribution of the offered electricity volume among elements of buy bids or the demanded electricity volume among elements of sale bids, the volume of electricity earmarked for distribution shall be divided by total electricity volume offered or demanded for a particular matched price and, subsequently, each bid element shall be allocated the result of the said division multiplied by the demanded/offered volume of the bid element.

2.7 An evaluation algorithm proceeds step by step:

2.7.1 At the first step, algorithm solves a market coupling QP without fill or kill constraints (fully matched or fully rejected bids), hence allowing all profile block bids to be partially matched. By chance, the solution of this problem might satisfy the fill or kill condition for all profile block bids and is therefore a feasible solution of the market coupling problem. In this case, the solution that has been found is the optimal solution;

2.7.2 Otherwise, algorithm gradually forces the partially matched indivisible profile block bids to be either fully rejected or fully matched, or the partially matched divisible profile block bids to be either fully rejected or partially matched at least up to the amount of the required minimum acceptance ratio, in subsequent steps, in order to obtain a solution to the market coupling problem which respects all fill or kill constraints;

2.7.3 At a given step, two situations can occur:

2.7.3.1 Algorithm has produced an invalid solution in which some profile block bids are either fully matched or partially matched at least up to the amount of the required minimum acceptance ratio or fully rejected and some indivisible profile block bids are partially matched or other divisible blocks are partially matched but do not meet the condition of the minimum acceptance ratio. This solution has been computed by solving the initial QP, but in which some profile block bids have been forced to be matched or rejected (as the result of some previous steps). Since it contains partially matched indivisible profile block bids or divisible profile block bids partially matched at an amount lower than defined in the condition of minimum acceptance ratio, it is called a partial solution. The property of this solution is that its objective value is an upper bound of the social welfare of any solution that could be produced by extending this partial solution into a feasible solution by adding further constraints. Two sub-cases can occur:

2.7.3.1.1 If the objective function (degree of social welfare) associated to this partial solution is smaller than the welfare of the best feasible solution found so far, algorithm will discard this partial solution and won't consider it anymore;

2.7.3.1.2 Otherwise, algorithm will select a profile block bid partially matched and create two new solutions to be analysed: in the first of these new solutions, the selected profile block bid is forced to be matched, and in the second one it is forced to be rejected.

2.7.3.2 Algorithm has produced a solution in which all profile block bids are either fully matched or partially matched at least up to the amount of the required minimum acceptance ratio or fully rejected (even those that were not forced to). In this case, algorithm must still check whether there exist prices that are compatible with this solution and the constraints (which is done by verifying that all market and network constraints are satisfied). Two sub-cases can occur:

2.7.3.2.1 If such prices exist, algorithm has found a feasible solution. If this solution is better than the best one found so far, it is marked as such;

2.7.3.2.2 If no such prices exist, then a new step is created with a transformed problem containing additional constraints to exclude this non feasible solution.

2.7.4 Under certain circumstances, algorithm might sometimes increase the number of steps that it has yet to consider (sub-cases 2.7.3.1.2 and 2.7.3.2.2) or reduce it (sub-cases 2.7.3.1.1 and 2.7.3.2.1). When there remains none, this means that algorithm has finished and has found the best possible solution. Possibly, algorithm will reach the time limit although there remain some partial solutions that were not analysed. In this case, algorithm will output the best solution found so far without being able to prove whether it is the very best possible one.

2.8 The goal of the algorithm is to achieve the following:

2.8.1 The degree of social welfare generated by the matched bids is maximal;

2.8.2 Bids and prices are coherent;

2.8.3 The power flows induced by the matched bids resulting in the balance of export/import between areas do not exceed the capacity of the relevant network elements.

2.9 Detailed description of the match up algorithm is available to the short-term market participants in document "EUPHEMIA Public Description" on the Market Operator's website.

2.10 On the basis of the outputs provided by the algorithm for the given trading intervals and in

accordance with Article 2.6, the CS OTE system will reallocate the matched quantity to the specific bids of short-term market participants and determine the preliminary agreed quantities of electricity of individual short-term market participants to one decimal place (MW).

2.11     After successful preliminary reallocation of the matched quantity to specific bids of short-term market participants in the Market Area according to Article 2.10, the CS OTE system shall determine the rounded $NP^{OTE}_{round}$ balance value for each trading interval at a resolution corresponding to the resolution of the market area as the difference of the rounded values of the total matched quantity of sales and purchases (in aggregate for all matched bids of all resolutions) in the given trading interval.

2.12     After determining the rounded $NP^{OTE}_{round}$ balance value, the CS OTE system shall determine for each trading interval at a resolution corresponding to the resolution of the market area the $\Delta NP$ balance deviation as the difference between the rounded $NP^{ALG}_{round}$ balance obtained within the outputs provided by the algorithm and the rounded $NP^{OTE}_{round}$ balance obtained according to Article 2.11:

$$\Delta \text{NP} = \text{ABS}(\text{NP}^{\text{ALG}}_{\text{round}}) - \text{ABS}(\text{NP}^{\text{OTE}}_{\text{round}})$$ (MW), where

$NP^{ALG}_{round}$ - the rounded value of the market area balance for a given trading interval, which is calculated by the algorithm as the sum of the algorithm-determined rounded cross-border flows to 1 decimal place in that market area (MW);

2.13     If the deviation according to Article 2.12 is zero, the negotiated quantities of electricity of individual short-term market participants according to Article 2.10 for the given trading interval are considered final; if not, the $\Delta NP$ balance deviation determined according to Article 2.10 will be settled and the negotiated quantities of electricity of short-term market participants for the given trading interval will be adjusted accordingly on the basis of the procedure described below:

   2.13.1  If the $\Delta NP$ value is positive
      2.13.1.1   Then we first include the given excess purchase in the partially matched standard bids for sale in the given trading interval;
      2.13.1.2   The partially matched bids for sale are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;
      2.13.1.3   According to the above-mentioned order, the bids are successively increased by the value of the quantity step (0.1 MW);
      2.13.1.4   The quantity increases for the selected bids are made incrementally according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity increase for the currently changed bid could lead to a matched quantity higher than the offered quantity;
      2.13.1.5   If the positive $\Delta NP$ is still non-zero, it shall be included in the partially matched standard buy bids;
      2.13.1.6   Partially matched buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;
      2.13.1.7   According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);
      2.13.1.8   The quantity reduction for the selected bids is progressively applied according to

the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW);

2.13.1.9 If the positive $\Delta NP$ is still non-zero, it shall be included in the fully matched standard buy bids in the trading interval;

2.13.1.10 Fully matched standard buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by their price in ascending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

2.13.1.11 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

2.13.1.12 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW).

2.13.2 If the $\Delta NP$ value is negative

2.13.2.1 Then we first include the given excess sale in the partially matched standard buy bids in the given trading interval;

2.13.2.2 The partially matched buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

2.13.2.3 According to the above-mentioned order, the bids are successively increased by the value of the quantity step (0.1 MW);

2.13.2.4 The quantity increases for the selected bids are made incrementally according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity increase for the currently changed bid could lead to a matched quantity higher than the offered quantity;

2.13.2.5 If the negative $\Delta NP$ is still non-zero, it shall be included in the partially matched standard sale bids;

2.13.2.6 Partially matched sale bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

2.13.2.7 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

2.13.2.8 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW);

2.13.2.9 If the negative $\Delta NP$ is still non-zero, it shall be included in the fully matched standard sale bids in the trading interval;

2.13.2.10 Fully matched standard sale bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by their price in ascending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

2.13.2.11 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

2.13.2.12 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW).

2.14    In the event that there are insufficient standard bids in the system to make a full reallocation of $\Delta NP$, or in the extreme case where there are no standard bids in the system for reallocation, it will be necessary to reallocate the $\Delta NP$ balance deviation in a given trading interval in profile block bids as follows:

    2.14.1    First, the reallocation of the $\Delta NP$ balance deviation within a given trading interval shall be carried out for already partially matched divisible profile block bids, applying the identical procedure as for partially matched standard bids.

    2.14.2    In the event that there are no partially matched divisible profile block bids in the system, it will be necessary to reallocate the $\Delta NP$ balance deviation in a given trading interval within fully matched profile block bids, where the identical procedure as for fully matched standard bids is applied – this may result in partially matched indivisible profile block bids.

2.15    If it becomes necessary to include the $\Delta NP$ balance deviation in profile block bids under Article 2.14, due to changes in the quantity of the block and taking into account the conditions of the matching of profile block bids pursuant to Article 2.4, a situation may arise where blocks are paradoxically accepted or where the condition of the matching of divisible linked blocks is violated.

2.16    If trading of products is permitted in the market area at trading intervals with a resolution coarser than the smallest trading interval of the market area, the algorithm also determines the price for these trading intervals at the given resolution.

# 3    INTRA-DAY AUCTION (IDA) EVALUATION ALGORITHM

3.1    A list of bids valid and submitted to the IDA pursuant to Business Terms  for the delivery day or the IDA is acquired, which is determined for evaluation of one or more market areas and, subsequently, bid and demand curves are created, acceptance of bids is determined, matched prices are calculated, and not rounded and rounded values of balance for the individual delivery trading intervals are determined. In case of several market areas, the capacity limitations of transmission system operators is taken into account. The matched price for the smallest trading interval of the market area is the clearing price.

3.2    Profile block bids price limit is equal to the price limit of the given bid.

3.3    Bids without limiting conditions (standard bids) are processed for a particular bid element (a particular trading interval and particular segment) according to the following criteria:

    3.3.1    A standard bid for sale is rejected when the matched price is lower than the bid price limit.

    3.3.2    A standard bid for purchase is rejected when the matched price is higher than the bid price limit.

    3.3.3    A standard bid for sale is executed when the matched price is higher than the bid price limit.

    3.3.4    A standard bid for purchase is executed when the matched price is lower than the bid price limit.

    3.3.5    A standard bid (Bid / Demand) may be partially executed if and only when the matched price is equal to the price limit of that bid.

    3.3.6    A standard bid (Bid / Demand) is not executed for a quantity in excess of the volume limit specified in the bid.

3.4     Profile block bids are processed at a particular trading interval according to the following criteria:

   3.4.1   A profile block bid / demand is not matched when the weighted average of the sum of the product of the matched price and the accepted volume in block intervals divided by the sum of accepted volumes of all block intervals is lower / higher than the price limit of this profile block bid / demand. A profile block bid can only be matched at all trading intervals simultaneously, for a quantity equal, in the event of a bid with the minimum acceptance ratio = 100 %, to the volume limits in the given trading intervals specified in the bid, or for a quantity in the given trading intervals that is equal to the volume limits reduced up to a maximum of the level of minimum acceptance ratio specified in the bid below 100 %;

   3.4.2   All profile block bids with the minimum acceptance ratio = 100 % can only be either executed fully, or rejected fully. Because of this constraint – called the "fill or kill constraint" some profile block bids can be rejected even if they correspond to the matched price (bid price limit is below the weighted average matched price in the profile block bid intervals), in which case they are called "Paradoxically rejected bids";

   3.4.3   All profile block bids with the minimum acceptance ratio below 100 % can be at least partially executed with a reduction of the volume limits up to a maximum of the level of minimum acceptance ratio specified in the bid, or may be rejected fully. Because of this constraint some divisible profile block bids can be rejected even if they correspond to the matched price (bid price limit is below the weighted average matched price in the profile block bid intervals), in which case they are called "Paradoxically rejected bids";

   3.4.4   Bids within the group of linked profile block bids are matched according to the following criteria:

      3.4.4.1   Parent profile block bid must be matched with at least the same effective acceptance ratio of matched volume as its child profile block bid;

      3.4.4.2   Parent profile block bid can be matched even if it is "not in the price range", provided that the yield for all its child profile block bids is of such amount that it compensates the loss of this parent profile block bid "not in the price range"   ;

      3.4.4.3   Child profile block bid, which is "not in the price range" cannot be matched even if its parent profile block bid shows the yield that would compensate for the loss incurred for this child profile block bid.

   3.4.5   Bids within the exclusive group of the profile block bids are matched according to the criteria, where the sum of effective acceptance ratios of matched volume for all profile block bids within the particular exclusive group of profile block bids must not exceed the value of 100 %;

3.5     If the intersection of the bid curve and the demand curve is on the horizontal bid curve and there is no valid bid with an indivisible condition for this price, the volume of electricity earmarked for division shall be proportionately distributed for this price among valid bids. If the intersection of the bid and the demand curves is on the horizontal demand curve, the electricity volume for division shall be proportionally distributed among valid buy bids for this price.

3.6     For the purpose of proportional distribution of the offered electricity volume among elements of buy bids or the demanded electricity volume among elements of sale bids, the volume of electricity earmarked for distribution shall be divided by total electricity volume offered or demanded for a particular matched price and, subsequently, each bid element shall be allocated the result of the said division multiplied by the demanded/offered volume of the bid element.

3.7     An evaluation algorithm proceeds step by step:

   3.7.1   At the first step, algorithm solves a market coupling QP without fill or kill constraints, hence allowing all profile block bids to be partially matched. By chance, the solution of this problem might satisfy the fill or kill condition for all profile block bids and is therefore a feasible solution of the market coupling problem. In this case, the solution that has been found is the optimal solution;

3.7.2  Otherwise, algorithm gradually forces the partially matched indivisible profile block bids to be either fully rejected or fully matched, or the partially matched divisible profile block bids to be either fully rejected or partially matched at least up to the amount of the required minimum acceptance ratio, in subsequent steps, in order to obtain a solution to the market coupling problem which respects all fill or kill constraints;

3.7.3  At a given step, two situations can occur:

    3.7.3.1  Algorithm has produced an invalid solution in which some profile block bids are either fully matched or partially matched at least up to the amount of the required minimum acceptance ratio or fully rejected and some indivisible profile block bids are partially matched or other divisible blocks are partially matched but do not meet the condition of the minimum acceptance ratio. This solution has been computed by solving the initial QP, but in which some profile block bids have been forced to be matched or rejected (as the result of some previous steps). Since it contains partially matched indivisible profile block bids or divisible profile block bids partially matched at an amount lower than defined in the condition of minimum acceptance ratio, it is called a partial solution. The property of this solution is that its objective value is an upper bound of the social welfare of any solution that could be produced by extending this partial solution into a feasible solution by adding further constraints. Two sub-cases can occur:

        3.7.3.1.1  If the upper bound associated to this partial solution is smaller than the welfare of the best feasible solution found so far, algorithm will discard this partial solution and won't consider it anymore;

        3.7.3.1.2  Otherwise, algorithm will select a profile block bid partially matched and create two new steps to be analysed: in the first of these new steps, the selected profile block bid is forced to be matched, and in the second one it is forced to be rejected.

    3.7.3.2  Algorithm has produced a solution in which all profile block bids are either fully matched or partially matched at least up to the amount of the required minimum acceptance ratio or fully rejected (even those that were not forced to). In this case, algorithm must still check whether there exist prices that are compatible with this solution and the constraints (which is done by verifying that all market and network constraints are satisfied). Two sub-cases can occur:

        3.7.3.2.1  If such prices exist, algorithm has found a feasible solution. If this solution is better than the best one found so far, it is marked as such;

        3.7.3.2.2  If no such prices exist, then a new step is created with a transformed problem containing additional constraints to exclude this non feasible solution.

3.7.4  During the course of its execution, algorithm might sometimes increase the number of steps that it has yet to consider (e.g. sub-cases 3.7.3.1.2 and 3.7.3.2.2) or reduce it (sub-case 3.7.3.1.1 and 3.7.3.2.1). When there remains none, this means that algorithm has finished and has found the best possible solution. Possibly, algorithm will reach the time limit although there remain some partial solutions that were not analysed. In this case, algorithm will output the best solution found so far without being able to prove whether it is the very best possible one.

3.8  The goal of the algorithm is to achieve the following:

3.8.1  The degree of social welfare generated by the matched bids is maximal;

3.8.2  Bids and prices are coherent;

3.8.3  The power flows induced by the matched bids, resulting in the net positions do not exceed the capacity of the relevant network elements.

3.9     Detailed description of the match up algorithm is available to the short-term market participants in document "EUPHEMIA Public Description" on the Market Operator's website.

3.10     On the basis of the outputs provided by the algorithm for the given trading intervals and in accordance with Article 3.6, the CS OTE system will reallocate the agreed quantity to the specific bids of short-term market participants and determine the preliminary agreed quantities of electricity of individual short-term market participants to one decimal place (MW).

3.11     After successful preliminary reallocation of the agreed quantity to specific bids of short-term market participants in the Market Area according to Article 3.10, the CS OTE system shall determine the rounded $NP_{round}^{OTE}$ balance value for each trading interval as the difference of the rounded values of the total agreed quantity of sales and purchases in the given trading interval.

3.12     After determining the rounded $NP_{round}^{OTE}$ balance value, the CS OTE system shall determine for each trading interval the $\Delta NP$ balance deviation as the difference between the rounded $NP_{round}^{ALG}$ balance obtained within the outputs provided by the algorithm and the rounded $NP_{round}^{OTE}$ balance obtained according to Article 3.11:

$$\Delta NP = ABS(NP_{round}^{ALG}) - ABS(NP_{round}^{OTE})$$ (MW), where

$NP_{round}^{ALG}$ - the rounded value of the market area balance for a given trading interval, which is calculated by the algorithm as the sum of the algorithm-determined rounded cross-border flows to 1 decimal place in that market area (MW);

3.13     If the deviation according to Article 3.12 is zero, the negotiated quantities of electricity of individual short-term market participants according to Article 3.10 for the given trading interval are considered final; if not, the $\Delta NP$ balance deviation determined according to Article 3.12 will be settled and the negotiated quantities of electricity of short-term market participants for the given trading interval will be adjusted accordingly on the basis of the procedure described below:

    3.13.1   If the $\Delta NP$ value is positive

        3.13.1.1   Then we first include the given excess purchase in the partially matched standard bids for sale in the given trading interval;

        3.13.1.2   The partially matched bids for sale are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

        3.13.1.3   According to the above-mentioned order, the bids are successively increased by the value of the quantity step (0.1 MW);

        3.13.1.4   The quantity increases for the selected bids are made incrementally according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity increase for the currently changed bid could lead to a matched quantity higher than the offered quantity;

        3.13.1.5   If the positive $\Delta NP$ is still non-zero, it shall be included in the partially matched standard buy bids;

        3.13.1.6   Partially matched buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

        3.13.1.7   According to the above order, the bids are successively reduced by the value of

the quantity step (0.1 MW);

3.13.1.8 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW);

3.13.1.9 If the positive $\Delta NP$ is still non-zero, it shall be included in the fully matched standard buy bids in the trading interval;

3.13.1.10 Fully matched standard buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by their price in ascending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

3.13.1.11 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

3.13.1.12 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW).

3.13.2 If the $\Delta NP$ value is negative

3.13.2.1 Then we first include the given excess sale in the partially matched standard buy bids in the given trading interval;

3.13.2.2 The partially matched buy bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

3.13.2.3 According to the above-mentioned order, the bids are successively increased by the value of the quantity step (0.1 MW);

3.13.2.4 The quantity increases for the selected bids are made incrementally according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity increase for the currently changed bid could lead to a matched quantity higher than the offered quantity;

3.13.2.5 If the negative $\Delta NP$ is still non-zero, it shall be included in the partially matched standard sale bids;

3.13.2.6 Partially matched sale bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

3.13.2.7 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

3.13.2.8 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could lead to a matched quantity less than the quantity step (0.1 MW);

3.13.2.9 If the negative $\Delta NP$ is still non-zero, it shall be included in the fully matched standard sale bids in the trading interval;

3.13.2.10 Fully matched standard sale bids are sorted by market type (first spot, then derivatives), then by matched quantity in descending order, then by their price in ascending order, then by the timestamp of bid entry in ascending order and by ID RMP in ascending order;

3.13.2.11 According to the above order, the bids are successively reduced by the value of the quantity step (0.1 MW);

3.13.2.12 The quantity reduction for the selected bids is progressively applied according to the above order and repeatedly as necessary until the value of $\Delta NP$ = 0 or until a situation arises that the quantity reduction for the currently changed bid could

lead to a matched quantity less than the quantity step (0.1 MW).

3.14    In the event that there are insufficient standard bids in the system to make a full reallocation of $\Delta NP$, or in the extreme case where there are no standard bids in the system for reallocation, it will be necessary to reallocate the $\Delta NP$ balance deviation in a given trading interval in profile block bids as follows:

3.14.1    First, the reallocation of the $\Delta NP$ balance deviation within a given trading interval shall be carried out for already partially matched divisible profile block bids, applying the identical procedure as for partially matched standard bids.

3.14.2    In the event that there are no partially matched divisible profile block bids in the system, it will be necessary to reallocate the $\Delta NP$ balance deviation in a given trading interval within fully matched profile block bids, where the identical procedure as for fully matched standard bids is applied – this may result in partially matched indivisible profile block bids.

3.15    If it becomes necessary to include the $\Delta NP$ balance deviation in profile block bids under Article 3.14, situations of paradoxically accepted blocks or breaches of the condition for matching divisible linked blocks may arise due to a change in block quantity and taking into account the conditions for matching profile block bids under Article 3.4.