CRM Design Note: Auction Process

2 October 2019

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Introduction and context

The purpose of the present design note is to provide all stakeholders with a clear view on the design of the auction algorithm that will apply during the primary CRM Auctions for capacity (hereafter "Auctions"*)*.

In line with the Electricity Law as defined further, Art. 7undecies §6, two such Auctions for each Delivery Period are foreseen, i.e. one Auction four years ahead of the Delivery Period (Y-4 Auction) and another Auction one year ahead of the Delivery Period (Y-1 Auction). Auctions will take place yearly as from 2021 starting October 1 at the latest and will conclude with the publication of the Auction results on October 31.

Grid feasibility constraints that will be incorporated in the auction algorithm design are discussed in the present design note as well. These auction algorithm grid feasibility constraints are not to be confused with the existing grid connection procedures, which remain applicable and aim at assessing the grid feasibility of the individual connection request. The auction algorithm grid feasibility constraints are applied in complement to the above mentioned individual grid feasibility check to ensure that the combination of CMUs is grid feasible.

Furthermore, this design note also elaborates on the treatment of so-called Opt-Out Volumes (i.e. capacity volumes that for one reason or another do not participate in the Auction) and discusses transparency on the Auction results (i.e. the validation of Auction results and the sharing of information on different Auction aspects in a transparent manner to allow the market to follow-up on the CRM).

Note that each Auction obviously relies crucially on a supply and Demand Curve. While the supply curve depends on the Prequalified CRM Candidates' Bids, the Demand Curve is set in an administrative way, according to the legal framework as determined by Royal Decree (its design is therefore not elaborated upon in the present design note). Importantly though, the presented rules in this design note on the auction algorithm are generally applicable, irrespective of the shape of the Demand Curve.

In addition to this design note, a single detailed list of definitions will be provided and publically consulted upon. As several concepts are relevant for different design aspects, a centralized approach via a single list is opted for at this stage.

About the public consultation

This design note is put for formal public consultation and any remark, comment or suggestion is welcome. It builds further on the discussions and proposals already made in the different TF CRM meetings gathering all relevant stakeholders and in the follow-up committee, the latter consisting of representatives of the CREG and Elia, under the presidency of the FPS Economy.

This public consultation runs in parallel with a public consultation on other design notes. Reactions to this public consultation can be provided to Elia via the specific submission form on Elia's website no later than Wednesday 30 October 2019 at 6pm.

On 13 September 2019 a first set of design notes has already been launched by Elia for public consultation.[1]

Note that, in line with their roles and responsibilities and the foreseen governance in the Electricity Law, also the FPS Economy and the CREG will consult on aspects within their competence according to their procedures.

Legal framework

The Law setting up a Capacity Remuneration Mechanism adopted on April 4th 2019[2] (hereafter "CRM Law"), modifying the Electricity law of 29 April 1999 on the organization of the electricity market (hereafter "Electricity law") defines in Art. 2 an Auction ("veiling/ mise aux enchères") as (own translation) "the competitive process in which Capacity Holders are offering a price for making available capacity."

The Electricity Law Art. 7undecies §6 defines that only Prequalified CRM Candidates can participate in the Auction. Besides, while production Capacity Holders situated in the Belgian control zone are obligated to prequalify, Art. 7undecies §6 determines that a Capacity Holder may decide not to offer its entire or part of its capacity into Auction – which is further referred to as the "Opt-Out Volume" – provided that prior notification of this decision is given to the grid operator.

The Electricity law further sets the governance framework of the auction algorithm design rules. Following Art. 7undecies §8 these rules are to be proposed by Elia and are included in the broader set of Market Rules to be approved by CREG. On a yearly basis, a consultation procedure of the market actors is foreseen, prior to presenting the Market Rules regarding the auction algorithm for proposal to the regulator.

Structure of the design note

In what follows firstly the auction format is presented. Secondly, this design note describes the pricing rule that will apply during the Auctions, determining the Capacity Remuneration Capacity Providers will receive when being selected in the Auction. Thirdly, the bidding requirements define how to make a Bid into the Auction. Fourthly, the section on market clearing begins with explaining the objective function of the clearing algorithm, after which grid feasibility constraints and the tie-breaking rules are discussed. Next, section five describes how Opt-Out Volumes will be treated in the different Auctions. In a sixth and final section, an overview is given of the transparency rules with respect to the information sharing on different CRM aspects.

1 https://www.elia.be/en/public-consultation/20190913_formal-public-consultation-on-the-crm-design-notes-part-i
2 http://www.ejustice.just.fgov.be/eli/wet/2019/04/22/2019012267/staatsblad

1 Auction format

Design Proposal #1:

Each Bid shall be submitted into the Auction as sealed Bid, meaning that no information about this Bid is shared with other participating bidders. When all Bids have been submitted in the Auction, the auctioneer will clear the market in one single-round, meaning that the bidder cannot update or withdraw his Bid during the clearing process.

The auction format sets the contours of the auction algorithm design and defines how the Auction process takes place. Given the Belgian context with the presence of a few large incumbents, the single-round sealed Bid auction format is considered the most appropriate choice (and not the multi-round descending clock format, cf. infra) in order to ensure a level-playing field among market participants (cf. section 1.2) and limit the potential for market power abuse (cf. section 1.1). Under the single-round sealed Bid format, market participants must submit their Bid(s) without knowing other participants' Bids, after which the market is cleared by the auctioneer in one single round (see illustration in Figure 1 below). The sealed bid auction format is currently also in use in capacity markets in Ireland, in the Eastern USA capacity markets in PJM, MISO and NYISO, in the capacity market in Alberta, Canada. Additionally, as pointed out in section 1.3, complexity and flexibility in the auction clearing are best managed via such single-round sealed bid approach.

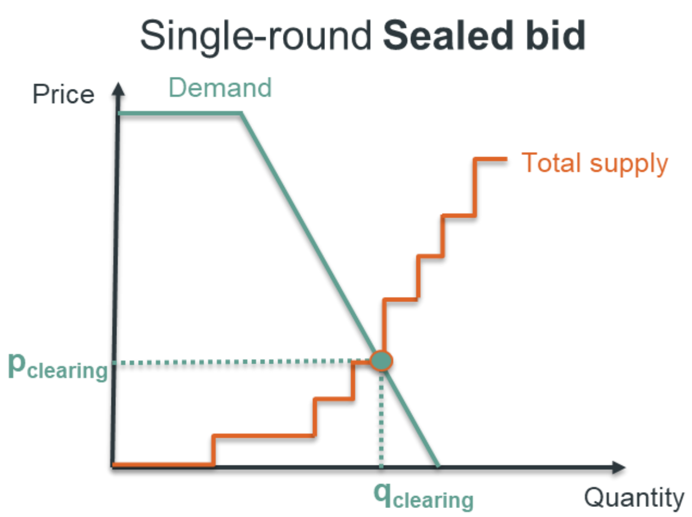

Figure 1: Single-round sealed bid auction format

1.1 Market power mitigation

The single-round sealed bid auction format is less susceptible to market power abuse in comparison to its main alternative in a CRM context, i.e. the multi-round descending clock auction format. This is especially valid for small and concentrated markets. For instance, in both the New England capacity market in the USA and the Colombian capacity market – applying the descending clock format – market power abuse in the form of capacity withholding has been observed in the past (cf. infra) and has resulted in evolving to a sealed bid format instead.

1.1.1 Capacity withholding in a descending clock auction format setting

A descending clock auction market clearing takes place over several sequential rounds, as illustrated in Figure 2 below. In the first round, the market opens at a high price range (e.g. between p0 and p1 as indicated in Figure 2) and bidders are requested to submit their Bids within this price range. If at the end of a round, the offered quantity at the lower price bound (e.g. p1 at the end of round 1) is in excess of the demanded volume, the Auction progresses to the next round with a lower price range. In each round, bidders may withdraw from participating in subsequent Auction rounds. The Auction process finishes when the offered capacity intersects with the Demand Curve and the market clearing price and quantity are set at this intersection.

A conceptual example of strategic capacity withholding is illustrated in Figure 2 below. Suppose that at the end of round 3, the market arrives at the blue point. There is still some excess offer capacity, so the Auction proceeds to round 4. Given that the Demand Curve is perfectly known beforehand to all market participants and the volume of excess capacity is communicated at the end of each round, assume that one bidder realizes its pivotal position. By withholding just enough capacity in round 4, this bidder can push up the price so that the market clears at a price level at or very near to the opening price of round 4 (i.e. the higher price bound), depicted by the red dot on the graph. This way, the pivotal bidder can ensure a high clearing price for all other capacity within its portfolio, situated in the lower part of the merit order.

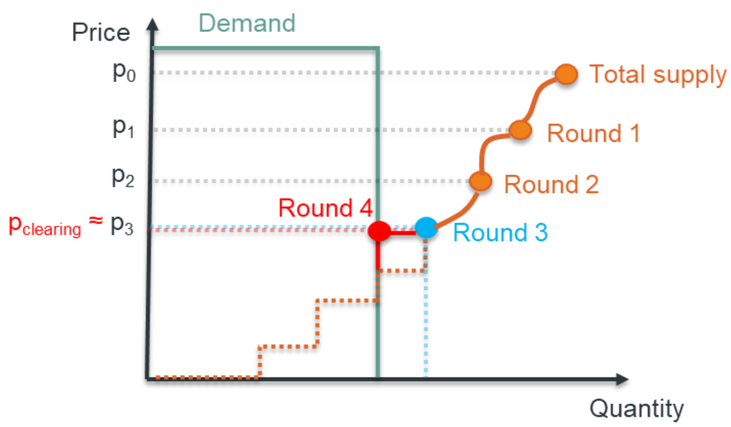

Figure 2: Capacity withholding in multi-round descending clock auction format

The threat of capacity withholding and hence price manipulation in the descending clock auction format setting is all the more pronounced when key information is shared (e.g. Demand Curve perfectly known before the Auction and excess capacity transparently communicated at the end of each round) and when a few large bidders dominate the bidding. Larger players obviously have more potential to be pivotal, know more about the offer curve given their larger share in it and are often also better equipped to process any information that would be released between the different rounds (cf. also section 1.2).

A sloped Demand Curve, in contrast to a perfectly inelastic Demand Curve assumed in Figure 2 above for illustrative purposes, reduces the potential for market power abuse somewhat, as strategic bidders would then have to make a trade-off between pushing up the price and a lower accepted volume. The potential for market power abuse can also be mitigated – more effectively – by implementing a restrictive information policy. For example by masking the actual Demand Curve to bidders by adding an artificial tolerance band around the Demand Curve or by only sharing a range of excess supply at the end of each round and not the exact volume. However, reducing the information revealed to the market neutralizes what is in fact a descending clock auction's main advantage, namely to provide price discovery information to the market thereby encouraging participation. Indeed, a descending clock auction with no information reported between rounds is essentially equivalent to a sealed bid auction.

1.1.2 Case study 1: Capacity withholding observed in FCM New England

The ISO (Independent System Operator) of New England (NE) has implemented a capacity market referred to as FCM (Forward Capacity Market) and in this respect organizes regular FCAs (Forward Auctions).

In its report titled *2015 Assessment of the ISO New England Electricity Markets*[3], the external market monitor for ISO-NE observed: (underlining by Elia) "In FCA 9, the descending clock auction format would have provided information of strategic value to any bidder that was interested in setting a higher clearing price at the interface. Specifically, at the end of Round 3, participants were informed that the System-wide region had cleared at a price of $9.55/kW-month and that 1,154 MW was still competing at the New York AC Ties interface (equal to 1,054 MW). <u>In this situation, any supplier would know that withdrawing 100 MW would stop the clearing price from falling further. Not surprisingly, 100 MW was withdrawn moments after Round 4 started at a price of $8.00/kW-month, setting a clearing price of $7.97/kW-month</u>".

In the same report, the external market monitor for ISO-NE states: (underlining by Elia) "The descending clock auction format is sometimes touted over sealed bid formats because it provides auction participants with information about the value of a good. However, in the FCA, sellers do not receive any information that may be useful in establishing a competitive offer. Instead, <u>the information learned through the auction</u>

[3] https://www.potomaceconomics.com/wp-content/uploads/2017/02/isone_2015_emm_report.pdf

process is primarily useful in determining when to leave the auction in order to set the highest price and receive the highest capacity revenue possible."

In conclusion, one of the recommendations put forward by the external market monitor in the report is to replace the descending clock auction format with a sealed bid auction format instead in order to eliminate the information provided during the Auction that effectively reduced the competitiveness of the Auction.

1.1.3 Case study 2: Capacity withholding observed in reliability market Colombia

In 2006, replacing their original regulated capacity payment mechanism, Colombia introduced a reliability capacity market. Through so-called FEOs (Firm Energy Obligations), this reliability market imposes commitments on electricity generation capacity during critical conditions. These critical conditions correspond mainly with periods of drought, which are the main cause for concern in the Colombian power system that is largely dominated by hydro generation capacity.

In a report titled *Britain's electricity capacity auctions: lessons from Colombia and New England* [4], the authors note that: (underlining by Elia) "The CREG [Colombian Commission for the Regulation of Energy and Gas] has now held two capacity auctions using the descending clock auction format: the first in May 2008 and the second in December 2011. The 2008 auction ended early at the first point at which a large bidder could see that it had become pivotal and able to withdraw one of its offers to set a high capacity price. To avoid this happening again, in 2011 the CREG adopted measures to make this strategy harder by reducing the amount of information on demand and supply revealed to bidders during the auction. This was not sufficient, however, and the auctioneers abandoned the auction after the initial two rounds and effectively held a sealed-bid auction in its place. They subsequently recommended changing the auction format to a combinatorial clock auction followed by a sealed-bid stage to reduce the risk of this being repeated in the future".

1.1.4 Reflections for Belgium

The potential for market power abuse in descending clock auctions is clearly demonstrated through the New England and Colombian case studies. While these power systems and the design of their capacity markets differ from the Belgian context in several respects, the fundamentals explaining the potential for market power abuse are equally valid. Particularly in small markets with a presence of one or a few large incumbent market players, the information provided to the market in descending clock auctions poses a clear threat in terms of strategic behavior, potentially resulting in

[4] https://mpra.ub.uni-muenchen.de/56224/1/MPRA_paper_56224.pdf

windfall profits and unnecessarily inflating the cost of the CRM. Although market power mitigation measures will have to be considered in several other CRM design elements as well, the single-round sealed bid auction format is believed to be an important step towards the avoidance of market power abuse and hence a limitation of the overall CRM cost.

1.2 Level-playing field

In the Belgian context with the presence of a few large incumbents, the sealed bid auction format is not deemed inferior to the descending clock auction format in terms of stimulating competition and providing a level-playing field for all. The descending clock auction is indeed sometimes touted over a sealed bid auction for this reason, arguing that the information shared in a descending clock auction provides price discovery information and thereby encourages participation. However, the presence of a few large incumbents (and associated potential for market power abuse) undermines the claimed competition stimulating advantage of a descending clock format in the following ways:

- Firstly, it is expected that in case the descending clock auction format would be applied in the Belgian CRM, a restrictive information policy would have to be implemented in order to reduce the threat of market power abuse, thereby removing the price discovery information argument to stimulate competition.
- Secondly, when bidders of different size compete, the information provided under the descending clock auction format might be of use especially to large incumbents who are better able to take advantage of this information because of their established position and better knowledge of the system in general. This way, new entrants are not stimulated to compete and incumbents are given an additional competitive advantage instead.
- Thirdly, as argued by the external market monitor for ISO-NE (cf. supra), the information provided in the context of capacity market auctions may actually have limited value given costs and/or revenues may be quite specific to every unit individually.

1.3 Complexity and flexibility

In addition to the fundamental arguments raised above, sealed bid auctions are also less complex, both from a bidder’s and auctioneer’s perspective.

Unlike in descending clock auctions, bidders are not tied up for (typically) 2-3 days in which they should act upon the information provided to them. In this sense, a sealed bid auction format presents lower entry barriers for smaller and less established market players.

Also from the auctioneer’s perspective, a sealed bid auction is less complex in terms of set up. Moreover, this auction format provides more flexibility in terms of possible pricing rules and dealing with relevant market clearing constraints (cf. infra).

2 Pricing rule

Design Proposal #2:

The auction algorithm shall apply a pay-as-bid pricing rule in the first two Auctions that will be organized (i.e. Y-4 Auctions in 2021 and 2022) and apply a pay-as-cleared pricing rule in all subsequent Auctions (both Y-4 and Y-1) that will be organized.

Under a pay-as-bid pricing rule, Capacity Providers for each selected Bid receive a Capacity Remuneration equal to the corresponding Bid Price of this Bid.

Under a pay-as-cleared pricing rule, Capacity Providers for each selected Bid receive a Capacity Remuneration equal to the Bid Price of the most expensive Bid selected among all submitted Bids of all Capacity Providers, however limited to maximally the Intermediate Price Cap for each Bid that is subject to the Intermediate Price Cap.

In what follows, the rationale for applying a pay-as-cleared pricing rule in the long-term and the application of a pay-as-bid pricing rule in the initial Auctions is elaborated upon. Furthermore, this section explains why it is proposed to shift from pay-as-bid to pay-as-cleared based on a fixed ex-ante determined schedule.

Note that an Intermediate Price Cap shall apply to some Bids, restricting both the Bid Price and Capacity Remuneration that can be received for these Bids. The topic of Intermediate Price Cap is treated in a separate design note launched mid-September, titled *CRM Design Note: Intermediate Price Cap*.

2.1 Pay-as-cleared in the long-term

In the long-term, the pay-as-cleared pricing rule is considered the better choice in order to stimulate competition, provide a transparent price signal and allow Capacity Remunerations to tend to zero. Besides, the pay-as-cleared pricing rule is also the most widespread approach used in capacity mechanisms throughout the world.

The rational bidding behavior under pay-as-cleared is to bid in at true costs, which in a CRM context means at the truly expected level of missing-money. There is no better strategy for bidders: bidding higher would risk not to be selected although the bidder would have actually received a Capacity Remuneration sufficient to cover its missing money, bidding lower risks to be selected while not covering all the missing money.

Unlike under pay-as-bid where the Bid Price determines the possible Capacity Remuneration, under pay-as-cleared all selected bidders receive the market clearing price anyway. So except when a bidder knows he is pivotal and as such is able to influence the market clearing price (which should be avoided by means of adequate market power mitigation measures), he has no incentive to bid in higher than its truly expected level of missing-money.

Because of this rational bidding behavior, the pay-as-cleared pricing rule has the following advantages. Firstly, an efficient selection – i.e. selecting CMUs with lowest missing-money – in the Auction is guaranteed. Secondly, the Auction's clearing price can naturally tend to zero when the missing-money in the market reduces. In contrast, under the pay-as-bid pricing rule, bidders never have a true incentive to bid in at zero. Thirdly, pay-as-cleared pricing provides a more transparent price signal over time towards the market. This information can be particularly valuable to small units and new market players, as it may give them a better idea about current and future expected market conditions, thereby encouraging participation over time. The transparent price signal under pay-as-cleared also facilitates the contractual arrangements small players could have to make with aggregators or other facilitators in the process.[5]

2.2 Pay-as-bid in initial Auctions

Given the anticipated Belgian adequacy situation towards 2025 requiring new investments, it is expected that new CMUs will compete with existing CMUs in the initial Y-4 Auctions. Since it is reasonable to expect that new CMUs requiring substantial capex investments are associated with significantly higher levels of missing-money than existing CMUs currently already operating in the market, it makes sense to apply an Intermediate Price Cap, as further elaborated upon in the *CRM Design Note: Intermediate Price Cap*. However, while an Intermediate Price Cap is able to skim an important part of the – in a CRM context – inappropriate inframarginal rents from the CRM Auction, it cannot avoid inframarginal rents entirely. For instance, within the category of CMUs applying for multi-year Capacity Contracts also varying levels of missing-money and hence potential for windfall profits from the CRM Auction could arise when pay-as-cleared would apply to them. Note that in a capacity market context, as argued in the design note on the Intermediate Price Cap, inframarginal rents are to be considered as windfall profits.

Because a certain degree of uncertainty related to the would-be pay-as-cleared clearing price in the first Auctions that are organized in the context of a CRM is unavoidable, it is believed that applying a pay-as-bid pricing rule in the initial Auctions may result in a lower cost of CRM as some market players could act more prudently due to this uncertainty. Stated otherwise, although it is known that the rational bidding behavior under pay-as-bid is to bid in close to the estimated clearing price, i.e. the estimated Bid Price of the most expensive selected Bid, uncertainty might induce lower missing-money participants to bid in lower than the would-be market clearing price under pay-as-cleared. Moreover, market participants might also bid in rather carefully to avoid the risk of not being selected, especially when multi-year Capacity Contracts are at stake, which would be the case for investment-intensive CMUs.

[5] Cf. also mentioned in ODE's position paper "Standpunt over capaciteitsvergoedingen voor bevoorradingszekerheid" (https://www.elia.be/-/media/project/elia/elia-site/users-group/crm-implementation/documents/20190718_ode_standpunt_crm.pdf)

In conclusion, bearing in mind the need for new capacity given the Belgian adequacy context, applying a pay-as-bid pricing rule in the initial capacity Auctions is expected to result in a lower cost of CRM, skimming more CRM-inframarginal rents than would be the case when only an Intermediate Price Cap is implemented. Both within the category of CMUs that is subject to the Intermediate Price Cap and within the category of CMUs that apply for multi-year Capacity Contracts and are thus not subject to the Intermediate Price Cap, a pay-as-bid pricing rule has the potential to further reduce windfall profits.

Note that the CRM as being deployed in Belgium is conceived as a remuneration mechanism complementary to the energy market (incl. ancillary services) to ensure that Capacity Providers are capable to cover their costs including a reasonable and fair rate of return. Being complementary to the energy market implies that the initial sources of revenues should come from the energy market and that only the residual part, i.e. the so-called missing money, is ensured via the CRM. As this missing-money level is specific to each CMU and may therefore be different, it makes sense not to reward all Capacity Providers with the same Capacity Remuneration.

2.3 Switch from pay-as-bid towards pay-as-cleared

It makes sense to switch from a pay-as-bid to a pay-as-cleared pricing system after a while and especially to avoid being locked-in for too long in a pay-as-bid pricing system, whose disadvantages come into play particularly when repeated Auctions with a pay-as-bid pricing rule are held. Indeed, recurring pay-as-bid Auctions are expected to result in a "flat" offer curve, as market participants begin to anticipate the reference market clearing price, thereby diluting a transparent price signal.

It is proposed to switch from a pay-as-bid towards a pay-as-cleared pricing rule based on a predetermined schedule. More specifically, it is proposed to apply a pay-as-bid pricing rule for the first two Auctions (i.e. Y-4 Auctions for Delivery Periods starting in November 2025 and November 2026 respectively), after which all following Auctions shall apply a pay-as-cleared pricing rule.

A clear advantage of the fixed schedule approach is its simplicity and upfront transparency towards all market actors. Furthermore, the organization of two initial pay-as-bid Auctions is expected to serve its purpose, namely to avoid as much as possible inappropriate CRM inframarginal rents, which are to be considered as windfall profit in a capacity market context.

3 Bidding requirements

All Prequalified CRM Candidates are allowed to submit a Bid into the Auction for their respective CMUs. However, in line with the treatment of Opt-Out Volumes as foreseen in the Electricity Law and discussed later in this design note, Prequalified CRM Candidates are not obligated to submit a Bid, or can submit a Bid for only part of their capacity. This is only possible though when the Prequalified CRM Candidate has notified the grid operator of such opt-out decision prior to the Auction. As a consequence, all prequalified capacity that is not part of an opt-out decision, is obligated to be offered into the Auction.

In what follows, firstly an overview of the general Bid requirements is provided, explaining the high-level rules each Bid should comply with. Next, an additional Bid requirement related to the capacity volume of Bids to be in line with the opt-out rules is presented. Finally, special bidding requirements regarding linked Bids and mutually exclusive Bids are discussed.

3.1 General Bid requirements

Design Proposal #3:

Each Bid into the Auction shall comply with the following requirements:

● Each Bid shall correspond to a single CMU

● Each Bid shall include one single volume (expressed in MW with a precision of 0,1MW), one single price (cf. the Bid Price, expressed in €/MW/year with a precision of 0,01€/MW/year) and the preferred Capacity Contract Duration (expressed in number of years with a precision of 1 year) component

● The volume of each Bid related to a CMU, as well as the maximum selectable volume by the auction algorithm of a combination of Bids related to a CMU (taking into account all bids related to a CMU including linked Bids and mutually exclusive Bids), shall not be higher than the Eligible Volume of the corresponding CMU as determined during the Prequalification Process

● The volume of each Bid shall not be lower than the Minimum Threshold as defined in the Royal Decree meant in Art. 7undecies §4 of the Electricity Law.

● The Bid Price of each Bid shall not be higher than the Global Auction Price Cap defined in accordance with the rules set out in the Royal Decree meant in Art. 7undecies §2 of the Electricity Law.

● The Bid Price of each Bid applying for a 1-year Capacity Contract shall not be higher than the Intermediate Price Cap defined in accordance with the rules set out in the Royal Decree meant in Art 7undecies §2 of the Electricity Law.

● Each Bid shall be indivisible, meaning that it can only be accepted in its entirety or not at all

The obligation for a Bid to correspond to a single CMU (hence not allowing portfolio bidding in the Auction across several CMUs) is in the first place a market power mitigation measure, to avoid as much as possible the potential for market players to exploit a pivotal position. However, CMU-based bidding may also lead to a more cost-efficient market clearing, as it provides the auctioneer with a more granular set of Bids to find the most cost-efficient solution. Note also that this rule does not obstruct the introduction of one Bid for a portfolio of aggregated (<25MW) capacities, as long as these aggregated capacities are accumulated into one CMU.

However, an exception applies for Bids corresponding to CMUs that are covered by a signed technical agreement, for which linked Bids are allowed (cf. infra).[6] Still, one Bid per CMU has to be introduced, but the various Bids corresponding to CMUs covered by the same signed technical agreement may (and should be to comply with all bidding requirements, cf. especially Design Proposal #5) linked.

The fact that only indivisible Bids are allowed does not obstruct Prequalified CRM Candidates in terms of expressing their specific preferences or constraints related to one or more CMUs when mutually exclusive sets of Bids are allowed (cf. infra).

3.2 Capacity volume of Bids to respect opt-out rules

Design Proposal #4:

For each CMU, the volume of at least one Bid or the maximum selectable volume by the auction algorithm of a combination of Bids related to this CMU (taking into account all bids related to a CMU including linked Bids and mutually exclusive Bids) shall be equal to the Eligible Volume for the corresponding CMU as determined during the Prequalification Process.

This rule aims at the prevention of strategic behavior of bidders in the form of physical withholding to exploit a pivotal position. By withholding capacity, pivotal bidders could push up the market clearing price that would then benefit all other capacity within their portfolio. Physical withholding is in the first place neutralized through the opt-out rules, as capacities are obligated to give prior notification about this decision to the grid operator so that the auction volume can be reduced accordingly if needed and as such eliminating the potential to exploit a pivotal position (cf. infra).

If bidders would not offer the entire Eligible Volume of a CMU in the Auction though, this

[6] A signed technical agreement is a prerequisite to prequalify to ensure compliancy with the grid connection process foreseen in the Federal Grid Code. Today this compliancy corresponds to the delivery of a detail study (later on in the document referred to as "EDS")

would in fact be an opt-out only during the Auction, for which the auction volume cannot be reduced anymore. This is not allowed, since – in line with the Electricity Law Art.7undecies §6 – a Capacity Holder has to decide on a (partly or full) opt-out before the Auction takes place.

3.3 Linked Bids

Design Proposal #5:

Bidding has to respect signed technical agreements, as required during the Prequalification Process. This means that no independent Bid can be made corresponding to a CMU (or a subset of Bids corresponding to CMUs) that is covered by a signed technical agreement if there is no signed technical agreement for this individual CMU (subset of CMUs).

Bids that correspond to CMUs that are covered by the same signed technical agreement may be linked, meaning that those bids can only be accepted together or not at all. The Bid Price, as well as the preferred Capacity Contract duration, shall be equal across linked Bids related to the same signed technical agreement.

During the Prequalification Process, CMUs related to additional capacity require a signed technical agreement to ensure compliancy with the grid connection process foreseen in the Federal Grid Code. Such technical agreement may cover multiple CMUs.

To be able to evaluate grid feasibility constraints, as elaborated below, bidding has to respect signed technical agreement agreements. Therefore, linking of Bids is for bids corresponding to CMUs covered by a signed technical agreement, such that bidding respects the signed technical agreements.

Linked Bids should be interpreted as a combined Bid across multiple CMUs, which can only be accepted in its entirety or not at all, characterized by a single and equal Bid Price and a single and equal preferred Capacity Contract duration.

3.4 Mutual exclusivity of Bids

Design Proposal #6:

Prequalified CRM Candidates may submit one or more sets of mutually exclusive Bids.[7] From each set of mutually exclusive Bids, maximally one Bid shall be selected by the auction algorithm.

[7] Notwithstanding restrictions on the number of sets of mutually exclusive Bids and/or restrictions on the number of Bids within such a set following algorithm complexity considerations.

Bids within a set of mutually exclusive Bids may include linked Bids (as defined in Design Proposal #5), which are within a set of mutually exclusive Bids interpreted as a single Bid. Different Bids within a set of mutually exclusive Bids may (although individually required to respect all rules as defined in Design Proposal #3) correspond to different CMUs, also for Bids not corresponding to CMUs covered by a signed technical agreement.

Mutually exclusive Bids allow Prequalified CRM Candidates to express their specific preferences in terms of flexibility and/or constraints while maximizing the chance of being selected in the Auction, and despite the requirement that all Bids are indivisible Bids.

An overview of some potential use cases of mutually exclusive Bids:

1. Assume a market player with plans to construct a new power plant, considering a CCGT configuration consisting of CMU1=GT, CMU2=GT and CMU3=ST or an OCGT configuration consisting of CMU1=GT. Assume that the Prequalified CRM Candidate holds a signed technical agreement for both configurations. Of course, both configuration cannot be constructed at the same time. The Prequalified CRM Candidate can submit a mutually exclusive set of Bids including on the one hand the linked Bids for the CCGT configuration (three Bids in total, one Bid for each of the CMUs involved in the CCGT configuration) and on the other hand the one Bid for the OCGT configuration corresponding to CMU1. As such, either the linked Bids (CCGT configuration) or the single Bid (OCGT configuration) can be selected by the auction algorithm.
2. Assume an aggregator composing a pool of demand response capacities. After an initial fixed investment cost (e.g. to develop a monitoring and steering platform), economies of scale may lead to a lower per unit price as more capacity is added to the pool. This Prequalified CRM Candidate may have different options ranging from bidding in a smaller pool at a higher Bid Price or a bigger pool at a lower Bid Price. Of course, both options cannot be selected at the same time. This Prequalified CRM Candidate can therefore submit a set of mutually exclusive Bids related to the same CMU characterized by different capacity volumes and different Bid Prices.
3. Assume a market player with plans to construct a new OCGT unit, at two possible locations. As long as this Prequalified CRM Candidate complies with all individual grid connection requirements for both locations and has successfully prequalified both CMUs, he can submit a set of mutually exclusive Bids with two Bids, relating to the CMUs at two different locations, from which only one will be selected by the auction algorithm.

4 Auction clearing

Design Proposal #7:

The auction algorithm shall clear the Auction by selecting the grid feasible combination of Bids that results in the highest social welfare, taking into account on the Bids received by the Prequalified CRM Candidates and the administratively determined Demand Curve.

In case multiple grid feasible combinations of Bids lead to the same social welfare, the following tie-breaking rules shall apply:

(1) Select the combination of Bids with the lowest weighted average emission factor, calculated as the Bid volume weighted average of the emission factors of all Bids, as determined during the Prequalification Process

(2) In case of remaining equivalence after rule (1), random selection

The objective of the auction clearing is to select the social welfare maximizing combination of Bids, taking into account the administratively determined Demand Curve and all submitted Bids. At the same time though, the selected combination of Bids also has to be grid feasible.

In what follows, firstly the objective function is discussed in more detail, after which an overview is given of the grid feasibility constraints and how they are incorporated into the auction clearing process. Finally, this chapter elaborates on the tie-breaking rules that will apply in case of equivalent economic (social welfare maximizing) and technical (grid feasible) auction outcomes.

4.1 Objective: Maximize social welfare

For the sake of clarity, in this section on the objective function, grid feasibility constraints are considered not active and therefore not influencing the auction algorithm. Grid feasibility constraints are discussed later in section 4.2. The objective remains the same with or without grid constraints though, as grid constraints only restrict the set of plausible auction outcomes, i.e. by rejecting certain combinations of Bids which are together not grid feasible.

The objective function of the clearing algorithm shall maximize social welfare, which is equivalent to pursuing the most cost-efficient combination of Bids, taking into account the administratively determined Demand Curve (cf. infra). This objective shall be applicable regardless of the implemented pricing rule, i.e. in both a pay-as-cleared and pay-as-bid mechanism. In the context of a CRM, social welfare (also illustrated in Figure 3 on the left below) is to be interpreted as the sum of

1. Surplus for society from satisfying capacity demand at a price below the willingness-to-pay for capacity, as defined by the Demand Curve (also referred to as “Consumer Surplus”)

2. Surplus for Capacity Providers from the selection of their Bids at a price above the Bid Price (also referred to as “Producer Surplus”)

From Figure 3 (on the left), it can be derived that the social welfare maximizing solution is found by accepting all orange-colored Bids. Indeed, selecting an additional grey Bid would decrease social welfare, as the willingness-to-pay for this additional capacity (defined by the area under the Demand Curve) is clearly lower than the cost of accepting this Bid (defined by the grey block that defines the Bid).

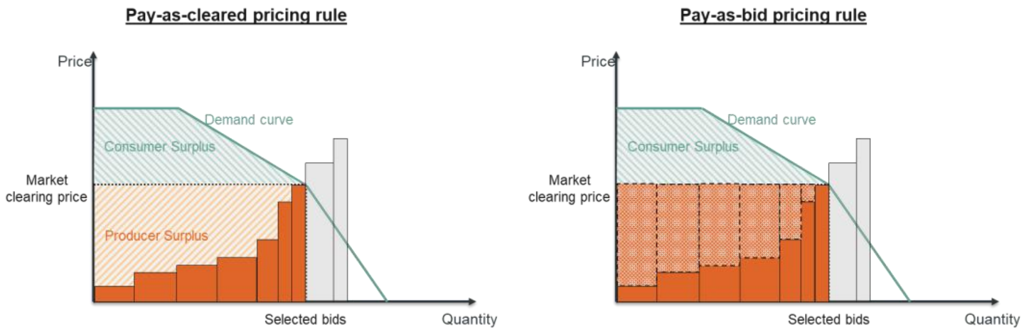

Figure 3: Market clearing under pay-as-cleared (left) and pay-as-bid (right) with perfect information

As explained in the design note titled *CRM Design Note: Intermediate Price cap*, there is in fact no rationale for inframarginal rents (i.e. Producer Surplus) to Capacity Providers in a CRM Auction context, which can be regarded as windfall profits. The application of an Intermediate Price Cap serves in particular to avoid as much as possible these windfall profits. However, in a market clearing, and especially when projects with various levels of missing-money compete, some inframarginal rent towards Capacity Providers cannot be avoided. Also a pay-as-bid pricing rule cannot eliminate these inframarginal rents, although under pay-as-bid there is in fact no explicit producer surplus (see Figure 3 on the right). Since bidders are known to have an incentive to Bid in at the expected market clearing price under pay-as-bid, some producer surplus is likely implicitly incorporated in the Bids. For illustrative purposes only, a theoretical illustration of market clearing under a pay-as-bid pricing rule when the market has perfect information, is shown in Figure 3 on the right. From this illustration it can be derived that under pay-as-bid, bidders with perfect information would update the Bid Prices of their Bid to exactly the would-be market clearing price under pay-as-cleared. In the end therefore, the market outcome would be the same.

Note that because of the presence of indivisible Bids, it may happen that the social welfare maximizing solution does not exactly correspond with a point on the Demand Curve (contrary to the illustration in Figure 3). In determining the social welfare maximizing solution therefore, the auction algorithm will always make a trade-off between willingness-to-pay for additional capacity and the cost for additional capacity. Furthermore, in doing so, the entire set of Bids is considered. These principles are illustrated in Figure 4 below (note that also the would-be market clearing price under a pay-as-cleared pricing rule is indicated in the figure):

- In example 1, Bid E is accepted, because the willingness-to-pay for the extra capacity of Bid E is higher than the cost for extra capacity (yellow triangle > red triangle).
- In example 2, Bid E is not accepted, because the willingness-to-pay for the extra capacity of Bid E is lower than the cost for extra capacity (yellow triangle < red triangle).
- Finally, example 3 shows how another Bid – Bid F in the example – that is actually situated higher up in the merit order (higher Bid Price) but is a better fit regarding the Demand Curve, could be accepted at the expense of a Bid a lower price Bid – Bid E in the example.

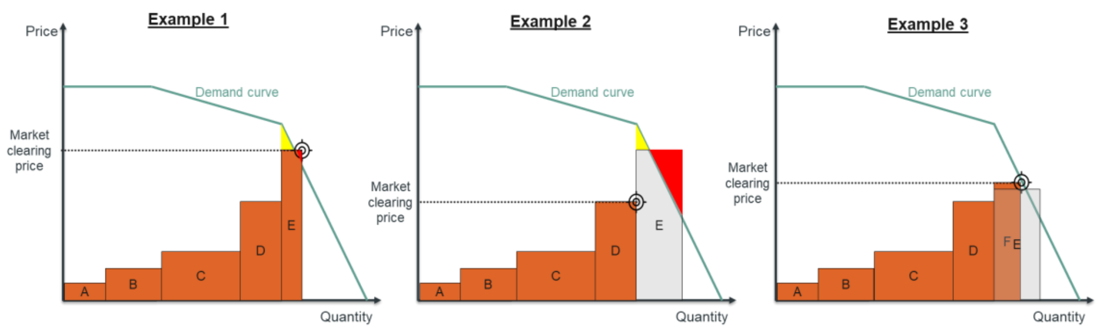

Figure 4: Dealing with indivisible Bids

To illustrate more clearly that the social welfare maximization objective does indeed minimize the cost of the CRM Auction, consider the following alternative formulation of the objective function. The social welfare maximization objective can alternatively be formulated as "minimizing the total cost of the CRM Auction". The total cost of the CRM Auction is to be interpreted as the cost of the Bids that are selected (indicated by the orange-colored Bids in Figure 5 below) and the cost of unserved capacity demand (indicated by the green-colored area in Figure 5 below). Selecting the orange-colored Bids minimizes the total cost. Indeed, accepting an additional grey-colored Bid would increase the total cost, as the cost of accepting this Bid is higher than the cost of unserved demand related to the capacity volume of the Bid.

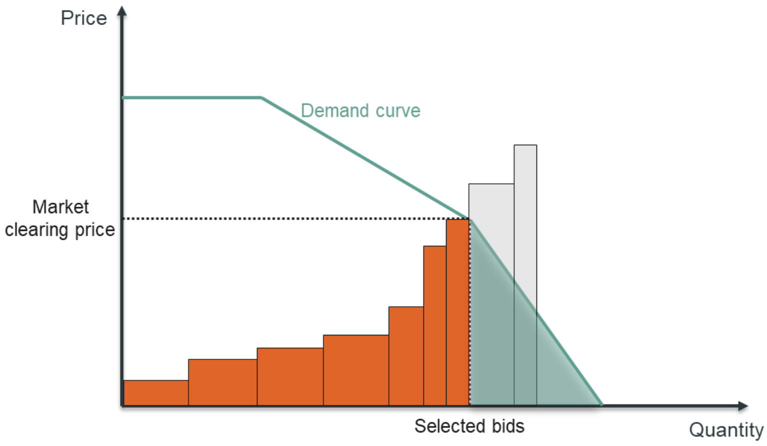

Figure 5: Alternative formulation of the auction clearing objective in terms of total cost

Note also that towards finding the highest social welfare combination of Bids, the Capacity Contract Duration for which Bids apply, is not considered. Indeed, the Bids are only judged based on their Bid Price, which has a 1-year granularity (i.e. Bid Price expressed in €/MW/year). The impact of taking into account the Capacity Contract Duration on the cost-efficiency of the CRM Auction outcome is not straightforward and depends on a number of assumptions. For instance, there is no formal data on the future cost of capacity compared to the cost of current contracts, so any welfare-optimizing choice would be based on assumptions regarding the anticipated trend of the cost of capacity. Furthermore, it would not be fair towards Prequalified CRM Candidates to judge on Bids based on the Capacity Contract Duration, which serves in the first place to create a level-playing field among CMUs requiring more/less investments.

4.2 Ensuring grid feasibility

4.2.1 What are grid constraints and why are they needed for the CRM?

A grid constraint is a limitation on the combination of offers for additional capacity (to be set on the target horizon) originating from one or more technical constraints on the grid, which form the boundaries of the technical solution space, within which the social welfare maximization can take place.

Technical constraints are already taken into account for individual units during the relevant connection processes on a case by case basis. However, in the framework of a market-wide CRM, application of such technical constraints ensures the technical feasibility from a public grid perspective of any CRM Auction outcome, for any specific combination of CMUs. In this document grid constraints refer to the latter application. Such grid constraints could originate from the transmission grid, the distribution grids or other. The principles described in this design note can be applied on all such kinds of grid constraints. The technical feasibility check ensures that it allows, based on the expected grid structure by the commissioning date of the considered CMUs, all operations & market criteria to be respected.

For what concerns the transmission system, Elia is responsible for proposing and realizing investments in the grid, which aim at increasing socio-economic welfare, ensuring a reliable system as well as enabling the national and regional objectives in terms of energy mix and electrical sector evolution; all at an optimal overall cost for society. In practice, these responsibilities translate into a complex multi-objective optimization, resulting intrinsically into some temporary limitations of grid hosting capacity pending the realization of further scheduled grid reinforcements as either planned in the last approved Federal Development Plan 2020-2030 or that might originate from specific client connection requests.

The application of grid constraints in the CRM will be subject to the following:

- Combination of offers:
  The feasibility of single Bids is determined and verified through the Prequalification Process. In this Prequalification Process multiple criteria are verified, which include constraints on the level of the public transmission grid, distribution grid or other; but always on single grid user (project) connection level. Specifically for the transmission grid, amongst other prequalification criteria the existence and validity of a detailed study (EDS) and a positive technical agreement will be verified. An EDS is a specific milestone deliverable from the TSO towards the grid user in the standard grid connection process in order to obtain a capacity reservation, and is a precondition for signing a connection contract, at which point in time the local grid hosting capacity will be finally allocated to the client, as described in the Federal Grid Code.

- Additional capacity:
  Only additional to be built capacity (generation, demand or storage), meaning capacity without or not fully considered in an existing connection contract with intention to participate to a CRM Auction, is considered and potentially subject to grid constraints in the CRM Auction algorithm.
  Opposed to additional capacity, existing capacity is capacity with a valid connection contract at the time the CRM Prequalification Phase takes place (which did not announce decommissioning prior) or capacity that is known to be commissioned outside of the CRM at the moment of gate closure time of CRM Prequalification Phase, which is then taken as a given in the reference grid.
  This existing capacity is considered grid feasible, as it has passed necessary steps in the connection processes in the past, and the relevant owner has the choice whether or not to maintain the existing connection irrespective of the CRM Auction outcome. Within the CRM Auction therefore, these existing allocated capacities are considered to be maintained from a grid perspective, except if the permanent closing of the concerned capacity has been announced officially by the owner before the CRM Auction.

- Technical constraints:
  Constraints that are technical in nature and result from physical limitations. In particular within the framework of CRM, they result from application of grid security rules and/or geographic spacing limitations in/towards substations, as specified in §4.2.3.

- Boundary conditions:
  The grid constraints will have to be calculated based on a certain situation, in which notably the reference grid for the given Delivery Period will be key. For the first CRM Auction in Y-4 for example, the nuclear phase-out law will be taken into account. For the transmission grid, the choice for the final reference grid will principally be based on the planned and approved grid development projects as listed in the Federal development plan (i.e. for the first Auction in 2021 the latest Federal Development Plan 2020-2030).

As detailed in the specific design note related to the prequalification and pre-delivery monitoring processes (section 3.4.3.1), ELIA verifies the compliancy of each capacity with the grid connection process as foreseen in the Federal Grid Code. This procedure gives the confirmation to ELIA that the proposed capacity can effectively be connected to the grid before the start of Delivery Period and details to the CRM Candidate both the technical and financial elements related to the connection. This confirmation, formalized by the signature of a technical agreement between the grid user and ELIA and being a pre-requisite verified in the CRM Prequalification Process is hereafter called "EDS" in this document (sections 4.2.2 – 4.2.7). Depending on outcome of on-going discussions to adapt the current grid connection process in the Federal Grid code, other possibilities to sign a technical agreement with ELIA might be added (e.g: "EDS CRM").

Design Proposal #8:

The grid constraints will only be determined for additional capacity, if any. For all existing connections no grid constraints will be considered in the CRM Auction selection algorithm.

4.2.2 When are grid constraints related to the transmission grid needed in the framework of a CRM?

This section describes the interaction with the Federal Grid Code (FGC) for what concerns the connection of additional grid user capacities to the transmission grid. In particular, the state of the Federal Grid Code (whether it remains as is or will be amended) will affect whether or not grid constraints related to the transmission grid might be needed in the framework of a CRM. The requirements from the existing regional grid codes of course also remain valid and need to be respected where applicable; however the latter are not discussed further in this section.

► Interaction with FGC stipulations

The current FGC, as adopted on 22nd April 2019, handles connection requests sequentially on a first come, first serve basis. Any technical constraints are hence handled implicitly for each individual EDS and on an ad-hoc basis for additional grid user capacity.

For example, this implies that for 2 separate projects that would be competing for the same limited hosting capacity (e.g. at a given substation) of the grid, the 1st project would get the approved capacity reservation from the TSO, whereas the second project would not be acceptable for the grid on the concerned electrical location. In practice, the 2nd project would then be offered another grid connection (if feasible) or would be offered to wait on the further development of the grid before being able to be accepted due to the fact that the 2nd project has to take into account all already reserved (in casu the 1st project) & existing capacities in the reference grid on the target horizon.

In case the current FGC remains as-is, it is expected that with respect to the transmission grid no additional grid constraints would be required in the CRM framework for new (additional) capacity, as they would be implicitly incorporated in all approved EDS that will be part of the CRM prequalification criteria. This connection process however has some major drawbacks in the framework of the CRM, since it allocates capacity in function of a first come first served order before offering in the CRM Auction, which implies no level playing field for competitors interested in capacity on the same or linked electrical locations, hence potentially limiting CRM market liquidity & competition within the CRM Auction.

Currently, discussions are ongoing within the working group Belgian Grid about evolutions potentially revising the FGC in the light of the expected CRM Auction.[8] The discussions are not conclusive at the time of the consultation on this design note and focus on the necessity to adapt the existing connection process for potential new (additional) capacity that may arrive in bulk in the framework of the CRM to allow for competition. The potential revision aims at avoiding an arbitrary allocation of scarce & limited grid hosting capacity on such first come, first serve basis and instead proposes allocation of grid capacity through the competition organized in the CRM Auction based on a total cost optimization for society. The goal of the potential revision is to increase the level playing field for competitors and ensure a maximum liquidity & competition for the CRM.

Any FGC revision in this respect should ensure the balance with the existing connection process, since the CRM Auctions are non-continuous but rather limited to one Y-4 and one Y-1 Auction per year for a given target Delivery Period. The intended revised FGC therefore needs to specify a certain freeze period, which temporarily blocks capacity

[8] https://www.elia.be/-/media/project/elia/elia-site/users-group/crm-implementation/documents/20190805_federal-grid-code-v2-final-proposal_nl.pdf?la=en

reservation & allocations, in order to ensure a firm solution space for the CRM Auction with clear rules including clarity on the ongoing client connection projects for inclusion or exclusion into/out of the reference grid.

In the case where such a revised FGC would be operational and enforced before the first CRM Auction, grid constraints – as described in this chapter 4.2.3 – are necessary to ensure the grid feasibility of certain EDS combinations for the transmission grid.

► **Application in the CRM auction algorithm**

Only in case certain combinations of projects for additional grid user capacities (for which a detailed connection study (EDS) was executed) are not feasible (for instance: when too many grid users want to connect in the same region), binding grid constraints will be calculated and included in the CRM auction algorithm. In case no restrictions apply, no additional grid constraints will be included – which implies a maximum freedom of selection for the algorithm in such cases.

Design Proposal #9:

● The FGC potential revision will determine whether explicit grid constraints will be needed within the CRM-framework or not. In case the current FGC, as adopted in April 2019 remains as-is, all grid constraints will be implicitly applied on each EDS individually.

● Elia will only calculate and apply grid constraints for those cases where the latter are needed (eg. when too many grid users want to connect to the same region), in respect of grid security rules & physical limitations. In all other cases, no further restrictions will apply to give maximum freedom of selection for the CRM auction algorithm.

4.2.3 Which drivers cause which types of grid constraints within the framework of the CRM?

Elia proposes to ensure the overall grid feasibility of the CRM outcome based on all relevant technical constraint types that can arise from two distinct sources which objectively limit the available grid hosting capacity on the target horizon. The proposed technical constraints are objective & transparent in order to facilitate auditable results, and could apply to any type of public grid (transmission, distribution or other). The two drivers for grid constraints considered for the limitation of the available grid hosting capacity are:

(1) Grid security

Grid and system operators have to apply certain rules to ensure security of the overall grid.

For the electricity grid, such grid constraints aim to ensure that European & Belgian legislation addressing power system planning and addressing the future power system operation will be respected. This brings forth limitations of maximal acceptable power flows throughout the grid from both a market and grid perspective, minimum and maximum voltages or short-circuit currents ensuring a secure and reliable power system as well as electrical safety.

Concerning the transmission grid, and similar to what is described in the connection procedures following the FGC, the TSO must apply mandatory grid security rules, such as the application of the relevant N-1 (relevant incidents) security criteria in order to ensure compliance with all relevant EU legislation & Network Codes (System Operation Guideline (SOGL), Clean Energy Package (CEP), …) as well as all relevant national legislation (Federal Technical Grid Code (FGC), Belgian Electricity Law, …) in order to assess the acceptability of combinations of certain CRM projects. In particular, the Electricity Law Art. 7undecies §8 stipulates – related to the CRM Market Rules –that the technical restrictions of the grid should be respected and should take into account the connection process as defined in the FGC.

(2) Physical spacing limitations

This limitation refers to the available physical space within available terrains at the relevant substations, which is required for the connection of new power plants or demand/storage units (i.e. additional capacity). These limitations might occur for following cases:

- The connection of new power plants to substations requires the availability of sufficient dedicated connection bays (and potentially other elements such as transformers), which in their turn require the necessary physical space to place the necessary equipment, which needs to ensure secure operation as well. Owning sufficiently large terrains and acquiring the necessary permits in due time before the start of the CRM Delivery Period is therefore required.
- In case the same connection path (from the power unit to the substation) is required for 2 (or more) separate projects, their combination might be not feasible due to spacing limitations in or towards the relevant substation.

Application of the 2 drivers for grid constraints, result in a multitude of technical constraints that could occur. For didactic & illustration purposes, the 3 most probable technical constraint clusters are listed & explained in more detail below.

(1) Power flow limitations to avoid overloads on grid elements (typically lines, cables & transformers for the electrical system) and to keep the voltage/power quality /stability within limits. Power flow limitations result from the apparent power [MVA] that is to be transported in an N-1 secure fashion throughout the grid, from the direct connection of a power plant in conjunction with other relevant internal & cross-border market flows.

(2) Short circuit power (SCP) limitations that arise in relevant materials or structures of the considered substation(s), from the directly connected generation/storage or demand project considered in conjunction with other relevant sources for SCP that are present in the reference grid. The FGC sets specific limitations on the SCP contribution of power units (usually expressed in short-circuit current contribution or Isc in [kA]) and also requires the TSO to ensure in general a safe exploitation of the grid in such short-circuit conditions.

(3) Spacing limitations, that limit the acceptable number of connection bays (and potentially other relevant elements such as transformers) within or connections towards the considered substations that inherently limit the grid hosting capacity on individual substations of the reference grid on the target horizon.

Illustrations of some technical constraint types

1) Power flow limitations

In the examples (Figure 6 and Figure 7) below, we show a theoretic case where on individual basis, both EDS 1 (P = 600MW) and EDS 2 (P = 900MW) are acceptable from a power flow point of view, since no overloads are created in N nor N-1 situations. For simplicity reasons, no other internal flows nor market flows are assumed to be transported through the depicted lines.

However, if both EDS 1 and 2 are combined, this would in fact cause an overload on line 1 or 2 in case of incident on the other line (N-1), since the transport capacity of the other line is limited and not sufficient to withstand the active power flow. In such a case, EDS 1 and 2 together are not acceptable from grid hosting capacity point of view and a binding grid constraint should be calculated to avoid the CRM-Auction having access to such EDS combination. Figure 6 illustrates a case for limited hosting capacity solely on substation A and Figure 7 illustrates a case for limited hosting capacity on the combination of substations A and B.

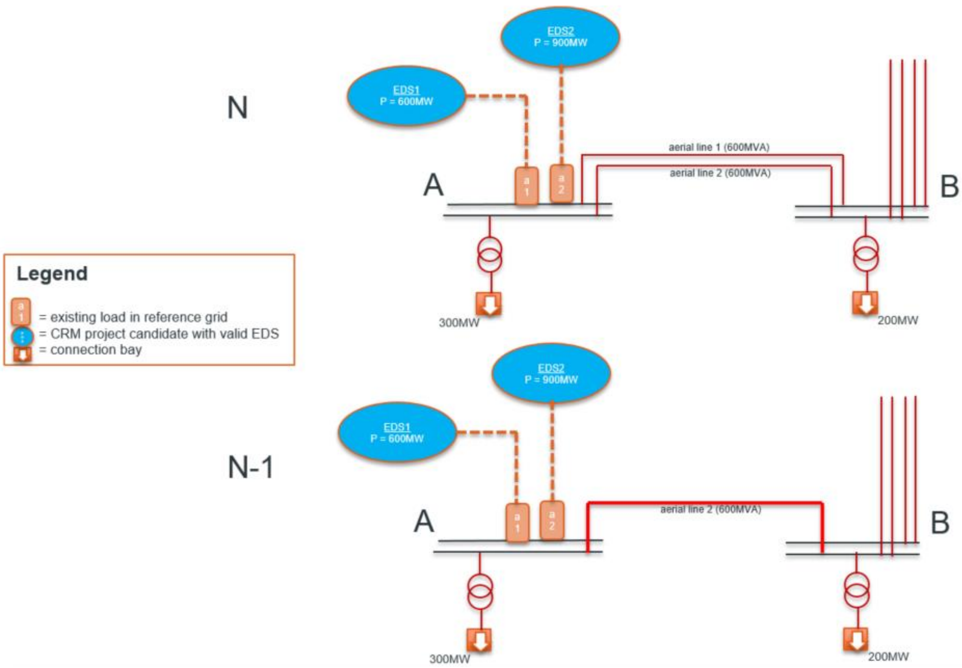

Figure 6: Power flow limitation illustration (substation A)

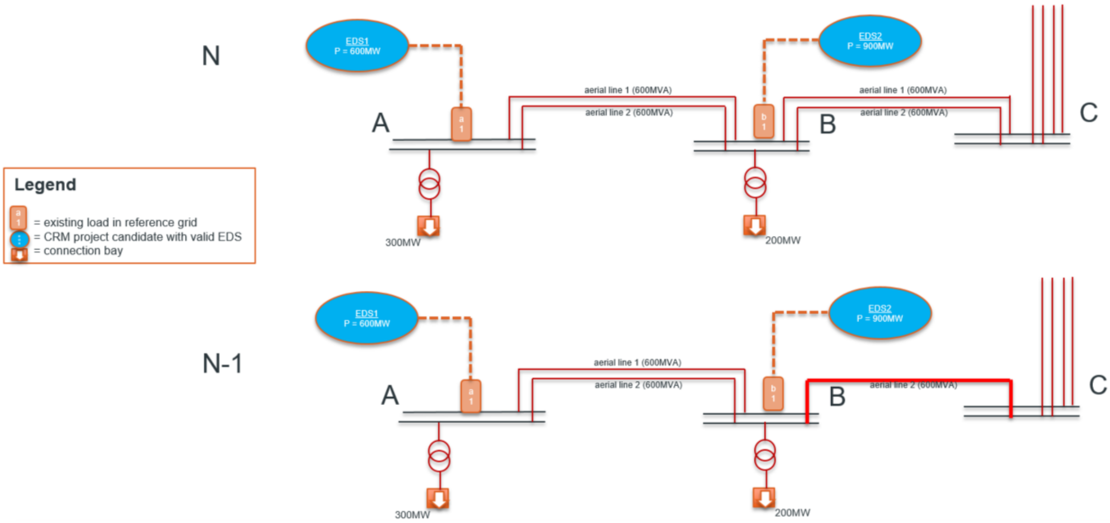

Figure 7: Power flow limitation illustration (substation A + B)

2) Short-circuit current limitations

In the example (Figure 8) shown below, we show a theoretic case where the substation material & structures can only withstand a maximum short-circuit current Isc of 63 kA and where in the initial situation (prior to new connections) the existing maximum short-circuit current is 55kA for substation A – which is assumed to be caused by the existing generator and short-circuit current contributions from other generations via the lines shown.

For both EDS 1, with an assumed maximum active power of 900MW and individual short-circuit current contribution of 5,5kA, as well as for EDS 2, with an assumed maximum active power of 600MW and a short-circuit current contribution of 3,6 kA, the short-circuit current limitations of substation A are respected and hence both EDS are acceptable on individual level.

However, in the case of the combination of EDS 1 and EDS 2, the maximum short-circuit level would become 64,1kA – which is not acceptable considering the limit of 63kA that applies. In such a situation, EDS 1 and 2 together are not acceptable and a grid constraint should be introduced to avoid the CRM Auction having access to such EDS combination.

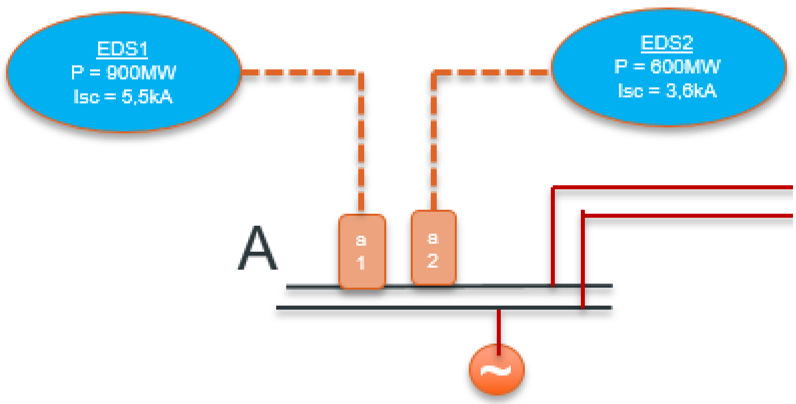

Figure 8: Short-circuit current limitation illustration

3) Spacing limitations

In the example (Figure 9) shown below, we show a theoretic case where due to spacing limitations in substation A, only 1 connection bay is available for connection of a new power plant (or demand/storage unit), and where it is impossible to extend the substation in order to construct additional bays. Indeed, on individual level both EDS 1 and EDS 2 are acceptable since they only require 1 connection bay to connect their individual power plants, however when they are combined this results in an infeasible situation due to the limitation in number of available connection bays. In this case, the limitation will require a grid constraint in order to avoid such infeasible case where both EDS are combined.

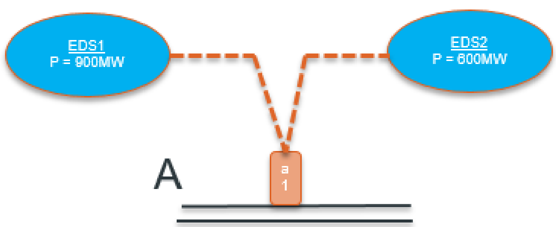

Figure 9: Spacing limitation illustration

External constraints on EDS combinations

In section 4.2.3 the focus is laid on constraints originating from within the electrical transmission grid. Other external constraints on certain combinations of CRM projects for additional capacity could be needed, this is subject to further analysis. In any case, as explained in §4.2.1, the methodology for determining grid constraints based on acceptable EDS combinations allows for the potential inclusion of such external constraints, if needed.

Design Proposal #10:

● Elia will consider 2 drivers (grid/system security & physical limitations) for verification of any technical constraints that might result out of these 2 drivers and which potentially translate in the need to apply grid constraints within the CRM auction selection algorithm. These resulting grid constraints are therefore objective & transparent to facilitate the auditability of the CRM auction.

● External constraints (originating outside of the transmission grid) on combinations of CRM-projects for additional capacity could be facilitated by the proposed methodology.

4.2.4 Interaction CRM bidding and EDS requirements

In order to verify the grid feasibility for additional capacity as described in 4.2.3 to determine and apply the resulting grid constraints in the CRM auction algorithm, Elia needs a direct one-on-one link between the relevant technical and financial information presented in the related EDS and the individual CRM Bids, in order to ensure respect of the FGC and the Electricity Law Art. 7undecies §8, so that in the end for each Bid:

- Elia knows the detailed technical information from the related EDS, so that the grid constraints can effectively be calculated & subsequently applied in the CRM auction algorithm;
- The CRM candidate has the adequate financial information that will allow him to prepare his bid.

It should suffice to indicate in each CRM Bid the link to the respective individual EDS & technical information – for instance via a unique identification number – in order not to duplicate the information already present in the content of the respective EDS, which also avoids potential inconsistencies.

In order to be eligible for submitting a CRM Bid – apart from other prequalification rules – this unique one-to-one link needs to be specified during the bidding process (between GOT and GCT) in addition to having obtained such a valid EDS prior to the start of the grid constraints calculation (after publication of Auction rules and around start of the freeze period). The indivisible volume, for each EDS, that can be submitted in the CRM Auction will be fully known in advance, to facilitate the accurate calculation of the grid constraints and to ensure the grid connection proposed in an EDS is always adequate from a technical point of view & connection cost perspective).

In order to build the grid constraints, in essence Elia will use following technical information which is contained in each EDS:

► The maximum active power in [MW] and apparent power in [MVA] of the power plant (or storage or demand unit), based on the concerned underlying power units (potential different CMUs) and how these are linked to the relevant bays for each relevant substation(s) to ensure verification of the technical constraints (§4.2.3). The maximum active power & apparent power (not derated power) of the power plant (or storage/demand unit), which will be offered in CRM with link to an individual EDS will be considered indivisible for determination of the grid constraints.

- ► The short-circuit power (SCP) contribution in [MVA/MW] for each power unit on the relevant bay of the relevant substation(s) in order to calculate the short circuit current (Isc) limitations (if any). This Isc contribution in [kA], can be compared to the existing and expected short-circuit current levels to verify if sufficient margin remains available to accept the combination of CRM projects.
- ► The relevant connection type and trajectory (part B) assumed i.e. the connection between the site of client (part C) and the relevant bays of the concerned substation(s) of the Elia grid (part A) for each power unit in order to calculate the spacing limitations (if any) in or towards the relevant substation(s).

In order to successfully participate in a CRM Auction, for additional capacity as specified under §4.2.1, an applicant must:

- ► Respect the requirements as specified in the design note on prequalification a.o. §3.4.3.1 (passing prequalification & having a valid EDS);
- ► Indicate for each CRM-Bid, between Gate Opening Time & Gate Closing Time, the link to the individual EDS & CMU(s) , in order to for Elia to be able to apply the calculated grid constraints in the CRM auction algorithm

Design Proposal #11:

● Calculation of the grid constraints requires the final list of valid EDS to be known to Elia after the publication of Auction rules and latest prior to GOT.

● Participation to CRM Auction for additional capacity, requires market actors / grid users to:

– respect the requirements as specified in the design note on prequalification – a.o. §3.4.3.1 (passing prequalification & having a valid EDS)

– indicate for each CRM-Bid the link to the individual EDS & resp. CMU(s) – in order for Elia to apply the grid constraints to the proper CRM Bids within the CRM Auction selection algorithm

4.2.5 Methodology for calculating CRM grid constraints for the transmission grid

The section below will describe the methodology to calculate the CRM grid constraints that Elia will apply for the transmission grid. The first part will describe the theoretic methodology, after which in the second part a concrete illustration is included for a theoretic case. In terms of concrete application for the CRM-auction, 2 options exist which will be described further below.

Methodology Description

Step 0)

Elia proposes to calculate the grid constraints considering all relevant EDS combination sets for additional capacity in the CRM-framework, based on the relevant reference grid & market scenario for the relevant CRM-Auction, together with some specific sensitivities if relevant.

►The reference grid for the CRM Auction will be based on the most recent status of the projects included in the latest approved & relevant Development and Investment Plans and includes the planned projects with expected commissioning date before the start of the Delivery Period. For the first Auction, the hypothesis on (snapshot of) the reference grid will be finally determined in summer 2021 for the first CRM Y-4 Auction – somewhere between the publication of Auction rules (15 may 2021) and CRM Gate Opening Time – and ideally at the start of the freeze period in 2021 to leave sufficient time for calculation of the grid constraints. This ensures that the latest most accurate information is used. In practice, the reference grid will be based on:

- existing network & existing users;
- scheduled reinforcements – based on latest information & status of projects included in both federal & regional development plans – that are expected to be commissioned before the start of the CRM Delivery Period;
- any potential connections of generation/demand/storage that are or will have been realized with the validity of their grid user capacities allocated before the start of the CRM Delivery Period and including those projects (outside of CRM) that have obtained the right to connect to the grid at a fixed moment in the future, with the validity of their grid user capacities reserved, in line with FGC connection process stipulations;
- excluding generation/demand or storage capacity that has given a definitive closure notification prior to the CRM Prequalification Phase.

► The market scenario proposal used here shall be consistent with the one determined to calibrate the volume to be procured through the CRM auction as defined in the Royal Decree meant in Art. 7undecies §2 of the Electricity Law.

It is proposed to use an EDS combinatorial approach allowing to limit the search space and calculation time, since all valid EDS in the CRM-framework must be known prior to the CRM gate opening time (GOT) which avoids the extremely complex exercise of an exhaustive hosting capacity calculation on all combinations of substations. The proposed methodology makes sense in light of the limited time available to determine the grid constraints.

Step 1) The final list of individually valid EDS for additional capacity for grid users in the CRM framework will be known to Elia somewhere between the start of the freeze period (after publication of Auction rules) and the gate opening time (GOT) of the relevant CRM Auction. Only the relevant valid EDS which are accepted within the CRM framework via the CRM Prequalification Process and which respect the above mentioned timings will be considered in calculating and building the relevant grid constraints based on the relevant reference grid & market scenario as defined in step 0.

Step 2) An EDS combination matrix will be set up by Elia, that explicitly enumerates all possible options – hence 2^n – 1 combinations with n = # individual valid EDS.

Step 3) The assessment of each EDS combination is performed by Elia, based on the technical constraint types that can result from the application of the 2 drivers as specified in §4.2.3, which ultimately result in acceptance (OK) or non-acceptance (NOK) from a grid feasibility point of view. The specific technical constraint for a NOK will be logged (e.g. overload of line xx, unacceptable level of short-circuit current on substation yy, connection bay limitation on substation zz, etc.) in order to ensure auditability of the grid constraints which will serve as input for the CRM auction algorithm. A report can be set up with all relevant (non-redundant) information for communication to the regulator.

Step 4) Elia maps the outcome of the binary OK/NOK assessments on individual & combined substation level and translates the information to active power limitations, only where and if relevant, in order to anonymize the individual EDS information & their combinatory acceptance. This anonymization step taken by Elia intends to avoid market collusion for CRM bidding, limits the redundant information and intends to improve the auditability & transparency of the grid feasibility assessment results.

In essence, the mapping process allows for a translation of discrete binary feasibility assessment of any EDS combination to an overarching continuous constraint in terms of active power on individual & combined substation level, which when applied in the CRM auction algorithm, ensures that no infeasible combinations can be selected. This substation mapping approach gives a set of binding grid constraints for application in the CRM auction algorithm. The final set of binding grid constraints can be further limited, by removing potential redundant information and only keeping the relevant ones. This action further reduces complexity as well as the number of individual constraint that the CRM Auction selection algorithm will have to handle together, thus reducing overall pre-solver execution time and increasing auditability during and after the clearing.

Step 5) The CRM Auction selection algorithm uses the final list of feasible EDS combinations or the final list of binding grid constraints in order to determine the social welfare maximizing solution.

Step 4 is only feasible if it is possible to effectively translate all technical constraints to an anonymized hosting capacity at substation level (in terms of MW's) which is not 100% clear at the time of writing of the design note, therefore in terms of application and communication regarding the grid constraints, in principle 2 options exist:

- Option 1: the methodology is applied until step 3 with the result report available for the regulator;
- Option 2: the methodology is applied until step 4 where the anonymized results are available for the market parties.

Both options can serve application of the grid constraints in the CRM Auction selection algorithm, where in option 1 all discrete constraints will exhaustively be added and in option 2 only the set of binding grid constraints on substation level are added. Both options should yield the same constraint information and clearing result.

Based on the above, Elia proposes option 1, also since the CRM bidding volumes & prices should not be affected by the grid constraint information. Indeed, since all individual EDS for additional capacity will be known prior to gate opening time and since a unique one-to-one link should exist between an EDS and CRM bidding volumes, there is no strict necessity for the market actors to know the grid constraint information prior to the bidding process. In terms of transparency & auditability, option 1 suffices. Publication of option 1 results also to the market parties – containing detailed information on which EDS combinations are possible between the same or different market actors – is not proposed to avoid market collusion within the CRM bidding, which in low liquidity cases could cause potential price inflation of CRM-bids.

Design Proposal #12:

● The reference grid needs to be determined latest before GOT and not before the publication of the Auction Rules, in order to apply the most accurate assumptions at that point in time. The reference grid will be based on the latest approved development and investment plans.

● The market scenario will be aligned with the one determined to calibrate the volume to be procured through the CRM as defined in the Royal Decree meant in Art. 7undecies §2 of the Electricity Law.

● The methodology for determination of grid constraints will follow the described stepwise approach and the results of step 3 will be communicated to the regulator.

Methodology illustration

The Figure 10 below shows a theoretic setup of a reference grid, including some existing generation and offtake. In Figure 11 below, there are 5 potential EDS candidates for inclusion into this reference grid in the CRM framework. Some combinations of EDS will be allowed and some are not acceptable, as will be illustrated – following the step-wise approach as specified in the methodology description before. A summary of the full methodology application is given in the end of this section in Figure 15.

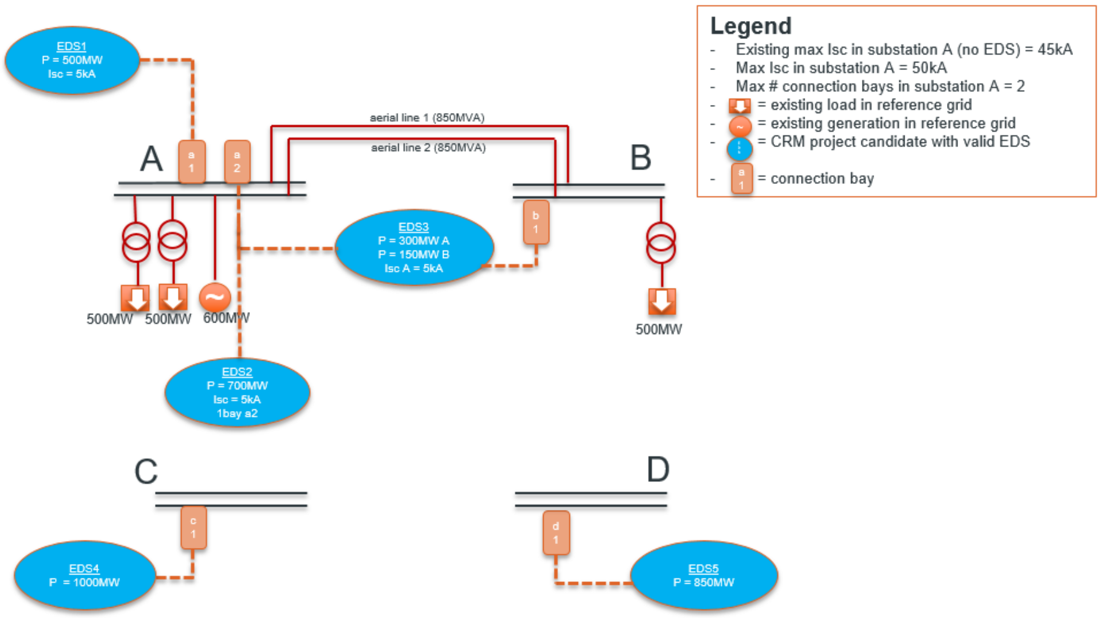

Figure 10: Example grid setup for methodology illustration

EDS	Pmax @substation	PQ status
EDS 1	500MW @A	OK
EDS 2	700MW @A	OK
EDS 3	300MW @A + 150MW @ B	OK
EDS 4	1000MW @C	OK
EDS 5	850MW @D	NOK

Figure 11: Example EDS list for methodology illustration

Step 0-1)

- EDS 5 – with envisioned connection at substation D on bay d1 for a Pmax of 850MW, is assumed to not have passed the CRM prequalification, due to non-respect of one of the criteria, for instance not feasible before the required go-live date of the CRM Delivery Period. This EDS will hence not be considered further in the calculation of grid constraints.

Step 2)

- Explicit enumeration of all options in an EDS combination matrix only considers EDS 1 – 4 – which results in 15 potential combinations.

EDS EDS combo ID	1	2	3	4
1	1	0	0	0
2	1	1	0	0
3	1	0	1	0
4	1	1	1	0
5	0	1	0	0
6	0	1	1	0
7	0	0	1	0
8	1	0	0	1
9	1	1	0	1
10	1	0	1	1
11	1	1	1	1
12	0	1	0	1
13	0	1	1	1
14	0	0	1	1
15	0	0	0	1

Figure 12: EDS combination matrix (full)

- EDS 4 – with envisioned connection at substation C on bay c1 for a Pmax of 1000MW, is assumed for the remaining illustration not to influence the set of EDS (1, 2, 3) due to a long electrical distance between those projects. To reflect this assumption, no direct connections are illustrated in Figure 10 between substations A, B and C. We will hence only focus on the remaining cross impacts within the set of EDS (1, 2, 3) for the illustration.

Step 3)

EDS EDS combo ID	1	2	3	OK or NOK For grid	Reason for NOK
1	1	0	0	OK	
2	1	1	0	OK	
3	1	0	1	OK	
4	1	1	1	NOK	Flux: overload line 1/2 SCP: overload @ substation A Bay limitation @substation A Same connection offered
5	0	1	0	OK	
6	0	1	1	NOK	Same connection offered
7	0	0	1	OK	

Figure 13: EDS combination matrix for relevant subset EDS 1-3

- Within the set of EDS (1, 2, 3):
  - Individually, they all pass the technical criteria resulting from application of the 2 drivers, as defined in §4.2.3, in addition to having passed the CRM-prequalification step. EDS-sets (1, 2) and (1, 3) are also combinable, hence also do not create specific grid constraints.
  - EDS-set (2, 3) is not combinable, violation detected:
    - Same connection path B offered, which is detected not combinable for this illustration.

- EDS-set (1, 2, 3) is not combinable, violations detected:
    - Max 2 bays @substation A
    - Max short circuit circuit (Isc) @substation A = 50kA
    - Max power flow on lines 1 and 2 (in case of incident on one of both lines)
    - Same connection path B offered, which is detected not combinable for this illustration

The information, as shown in Figure 13 in column "reason for NOK", can be summarized in a report with all relevant information for communication towards the regulator – to serve a potential audit process.

Step 4)

Elia maps for all combination IDs the binary assessment (OK/NOK) towards hosting capacity levels on individual & combinations of all relevant substations in terms of active power, in this case for substations A and B. Based on this process, the following 4 binding grid constraints result for the example:

- MW (A) + MW (B) <= 1200MW
- MW (A) < 1500MW
- MW (B) <= 150MW
- 1000MW (A) + 150MW (B) = NOK

	SUBSTATION LEVEL	
Feasibility	A [MW]	B [MW]
OK	500	0
OK	1200	0
OK	800	150
NOK	1500	150
OK	700	0
NOK	1000	150
OK	300	150

Figure 14: EDS combination matrix mapping to active power on substation level

Elia further removes redundant grid constraints in order to derive the leanest set of constraints that are binding. In this case, only MW(A) + MW(B) <= 1200MW and 1000MW(A) + 150MW (B) = NOK are applicable. Note that, the specific spacing constraint of not accepting 1000MW on A together with 150MW on B is only related to this specific EDS combination, due to violation of same connection path. This can therefore not be translated into a continuous constraint based on a MW limitation.

Step 5)

This binding grid constraints (MW(A) + MW(B) <= 1200MW and 1000MW (A) + 150MW (B) = NOK) are added to the CRM Auction selection algorithm to ensure that the infeasible combinations will not be selected.

Summary of the CRM grid constraint calculation methodology

Figure 15 below illustrates a schematic overview of the different steps 1 to 5

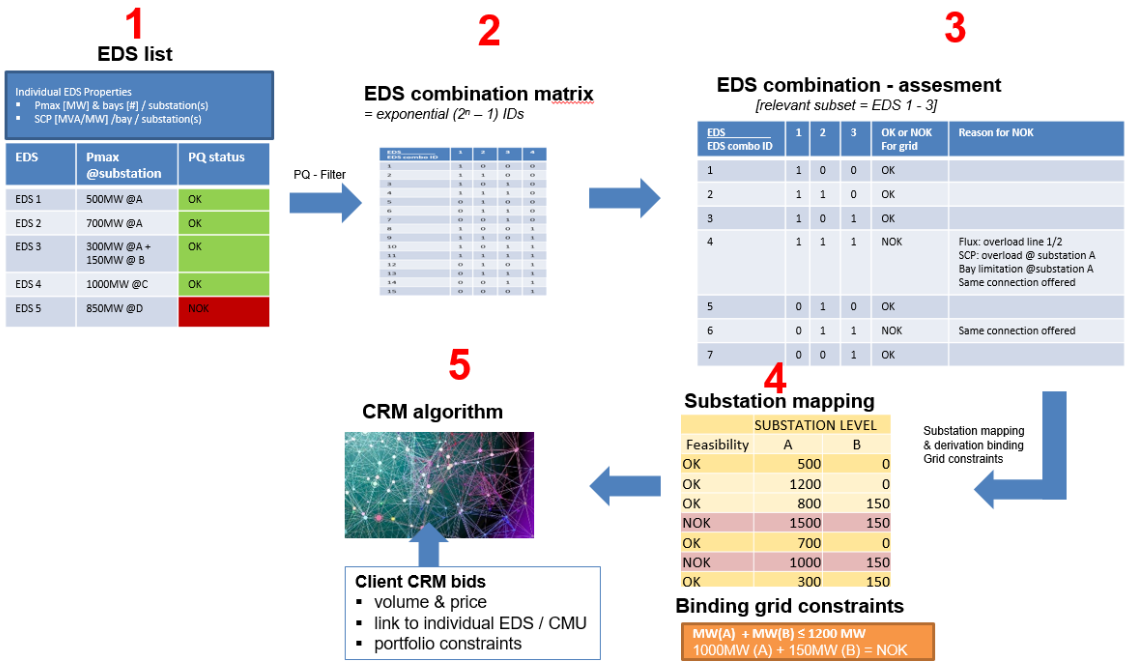

Figure 15: Summary of methodology for CRM grid constraint calculation

4.2.6 Implications on CRM Auction selection outcome

Application of the grid constraints will result in the possibility of paradoxically rejected Bids, meaning no simple merit order selection can be applied based on unity pricing of the CRM Bids. Indeed, application of grid constraints could result in a selection that minimizes total cost for society, with some unselected Bids with unity prices cheaper than the marginal selected Bid, due to the non-acceptance of their coexistence with the other EDS-Bids in the set to ensure grid feasibility.

4.2.7 Timing of CRM grid constraints calculation

Elia proposes to determine any required grid constraints for application in the CRM clearing algorithm “ex-ante” (prior to CRM clearing). This allows to ensure auditability of the CRM-Auction. In order to do so, Elia must know the final list of valid EDS for participation in the CRM (for additional capacity as mentioned in §4.2.1) prior to gate opening time – with some sufficient margin in order to allow for the (potentially significant) calculation time.

A potential fallback solution would be to apply the concept of grid constraints only during the CRM clearing (i.e. after GCT). In such a case, the same 2 drivers for grid constraints will be applied to verify whether any technical constraints exist for the combination of certain CRM-projects, but only on the cost-optimal solution as selected in the CRM Auction selection algorithm. This fallback solution can be considered an 'ex-post' approach, which potentially could require some iterative steps in order to arrive to the final CRM-optimal solution that respects all constraints – but which will equally yield the overall cost-optimal selection as with the ex-ante approach. When comparing the ex-ante approach to the ex-post approach, it is clear that the ex-post approach is less transparent & auditable (potentially an issue, considering the legal timing restriction of 1 month maximum between the GCT & the required communication of the CRM Auction results, as specified in CRM law), however still yields the overall cost optimal solution but with much more limited calculation complexity. Elia focusses only on the development of the ex-ante approach.

Design Proposal #13:

The grid constraints shall be determined ex-ante, prior to the start of the CRM bidding process i.e. before GOT.

4.3 Tie-breaking rules

In case of multiple grid feasible CRM Auction outcomes (i.e. an Auction outcome is to be interpreted as a combination of Bids) which are equivalent in terms of the objective function maximizing social welfare, tie-breaking rules have to be applied to decide which combination of Bids is ultimately selected. It is proposed to apply the following tie-breaking rules:

1. Select the combination of Bids leading to the lowest carbon emissions
2. In case of still equivalence after rule 1, random selection

To apply the first tie-breaking rule that aims to select the combination of Bids with the lowest carbon emissions, an overall carbon emission factor has to be computed from the combination of Bids considered. To this end, a weighted average emission factor will be calculated based on the carbon emission factor of individual Bids, as determined during the Prequalification Process. The weighing will be done based on the volume of each Bid as offered into the Auction.

5 Treatment of Opt-Out Volume

Design proposal #14:

● In line with the Electricity Law Art. 7undecies §6, a CRM Candidate may decide not to offer (part of) its prequalified capacity into an Auction towards a Delivery Period, provided that the CRM Candidate notifies the grid operator of such decision (i.e. the "opt-out notification") at the latest by the end of the Prequalification Process related to this Auction. The capacity subject to an opt-out notification is hereafter referred to as "Opt-Out Volume".

● A CRM Candidate who submits an opt-out notification is required to indicate to the grid operator if the Opt-Out Volume is associated with a definitive or temporary notification for closure or a structural reduction of capacity, as referred to in Art. 4bis of the Electricity Law.

● A CRM Candidate who submits an opt-out notification towards a Y-1 Auction for Opt-Out Volume that is not associated with a definitive or temporary notification for closure or a structural capacity reduction, is required to indicate to the grid operator in its opt-out notification if the Opt-Out Volume will be contributing to adequacy (category 'IN') or not (category 'OUT'). When indicating that the Opt-Out Volume will not be contributing to adequacy (category 'OUT'), a signed motivation letter is required to support this claim.

This section aims to provide all stakeholders with a general overview on the treatment of Opt-Out Volumes, which touches not only on the auction algorithm but on other CRM aspects as well, such as the Prequalification Process during which the opt-out notification has to be submitted and the Secondary Market to which the Opt-Out Volume may or may not participate.

The opt-out notification allows Capacity Holders that are obligated to prequalify, or have been prequalified in the past, to refrain from offering capacity in an upcoming CRM Auction, while at the same time also informing the grid operator of the capacity that will not be offered in the upcoming CRM Auction.[9]

Various reasons are possible for a CRM Candidate to (partially) opt-out of a CRM Auction, such as a notified temporary or definitive closure, extensive maintenance plans during the Delivery Period to which the Auction relates, an alternative view on the technical derating for its installation, the estimation that not participating in the CRM could prove more profitable, etc.

[9] In line with the Electricity Law Article 7undecies §4, eligible production Capacity Holders are obligated to prequalify. Note that the fast track prequalification, as further discussed and detailed in the design note *CRM Design Note: Prequalification & Pre-delivery Monitoring,* by default leads to an opt-out.

Depending on the reason for opt-out, an opt-out notification might have different implications, first of all related to the CRM Required Volume that may or may not have to be reduced with the Opt-Out Volume. Secondly, also towards Secondary Market participation there may be consequences of an opt-out notification, in terms of whether or not the Opt-Out Volume is still entitled to participate. In general, Secondary Market participation should be allowed to a maximum extent possible to ensure liquidity, while obviously avoiding double counting of capacity – meaning that capacity that is already counted upon to contribute to adequacy should not at the same time be allowed to participate in the Secondary Market as well.

Legal framework

The Electricity Law Art. 7undecies §6 determines the right for each CRM Candidate to decide not to offer (part of) its capacity into the Auction, provided that the CRM Candidate notifies the grid operator of this decision prior to the Auction. Furthermore, this same article states that the grid operator will treat this Opt-Out Volume according to the Market Rules.

In what follows, an overview is given on the treatment of Opt-Out Volumes. A differentiation is made between opt-out supported by definitive closure notification, opt-out supported by temporary closure notification and opt-out without closure notification. The treatment of capacity having followed the fast track Prequalification Process - and is therefore by default considered as opt-out - is discussed separately. The chapter concludes with other considerations and practical implementations regarding Opt-Out Volumes.

A global overview of the treatment of the different categories of Opt-Out Volumes towards Y-4 and Y-1 Auctions, in terms of impact on the volume requirement and Secondary Market participation, is given in Figure 16 below. The following sections zoom in on this overview and provide examples when deemed useful.

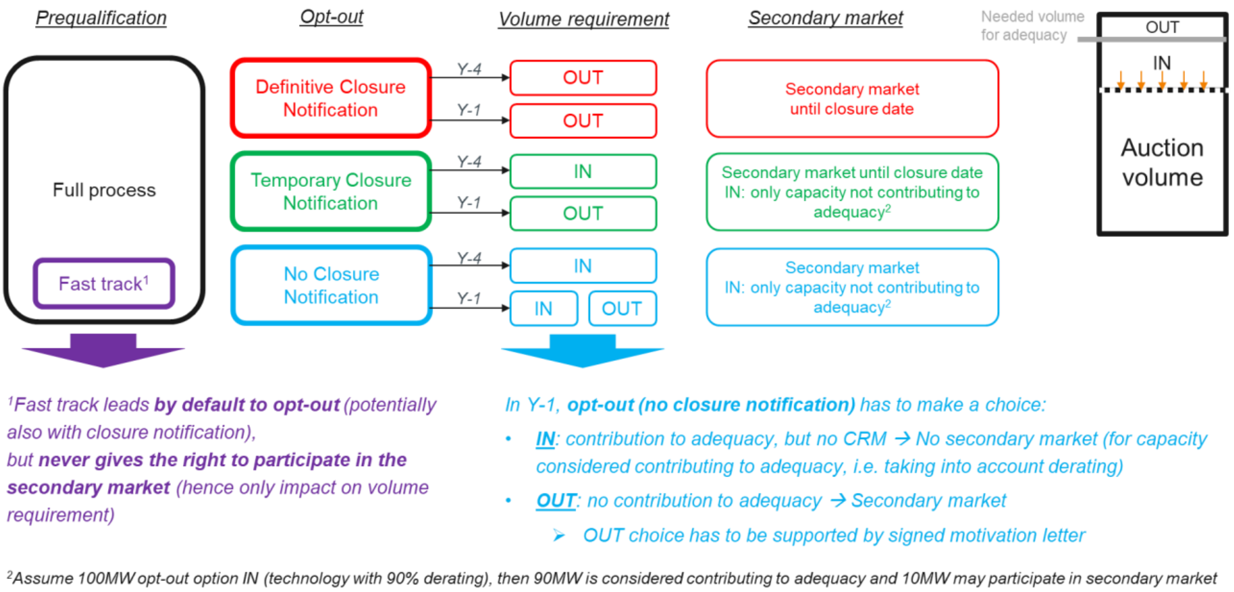

Figure 16: Treatment of Opt-Out Volumes towards Y-4 and Y-1 Auction

5.1 Opt-out supported by definitive closure notification

Design proposal #15:

● The CRM Required Volume for a Y-4 Auction is not reduced by Opt-Out Volume that is associated with a definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law.

● The CRM Required Volume for a Y-1 Auction is not reduced by Opt-Out Volume that is associated with a definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law.

● Opt-Out Volume that is associated with a definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law, is allowed to participate in the Secondary Market for the Delivery Period to which the Opt-out notification relates, but only until the definitive closure or structural capacity reduction date as included in the notification as referred to in Art. 4bis of the Electricity Law.

Opt-Out Volume supported by a definitive closure (or structural capacity reduction) notification in line with Art. 4bis of the Electricity Law is treated as firm both towards the Y-4 and Y-1 Auction. In other words, this category of Opt-Out Volume is considered not contributing to adequacy in the relevant Delivery Period (OUT).

Therefore, the CRM Required Volume both towards Y-4 and Y-1 will not be corrected with the Opt-Out Volume with a definitive closure notification, meaning that other capacity is to be contracted instead.

Secondary Market participation in the relevant Delivery Period is possible if relevant and only until the definitive closure date.

5.2 Opt-out supported by temporary closure notification

Design proposal #16:

● The CRM Required Volume for a Y-4 Auction is reduced by a share of the Opt-Out Volume that is associated with a temporary notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law, equal to the Opt-Out Volume multiplied by the applicable Derating Factor.

● The CRM Required Volume for a Y-1 Auction is *not* reduced by Opt-Out Volume that is associated with a temporary notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law.

● Opt-Out Volume that is associated with a temporary notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law and limited to the share of Opt-Out Volume that has not resulted in a reduction of the CRM Required Volume, is allowed to participate in the Secondary Market for the Delivery Period to which the Opt-out notification relates, until the temporary closure or structural capacity reduction date as included in the notification.

Opt-Out Volume supported by a temporary closure (or structural capacity reduction) notification in line with Art. 4bis of the Electricity Law is only treated as firm towards the Y-1 Auction (OUT). Towards the Y-4 Auction, this category of Opt-Out Volume will still be considered contributing to adequacy as a temporary closure could still be revoked, e.g. when market conditions change or for other reasons (IN). By considering a temporary closure notification firm only towards the Y-1 Auction, potential abuse of the temporary closure notification and consequently overprocurement of capacity is avoided. Besides, since there is still a Y-1 Auction for the relevant Delivery Period, the Y-4 Auction is not yet the final call for the system to close its adequacy position.

An example to illustrate the treatment of Opt-Out Volume supported by a temporary closure notification towards respectively the Y-4 and Y-1 Auction is provided in Figure 17 below.

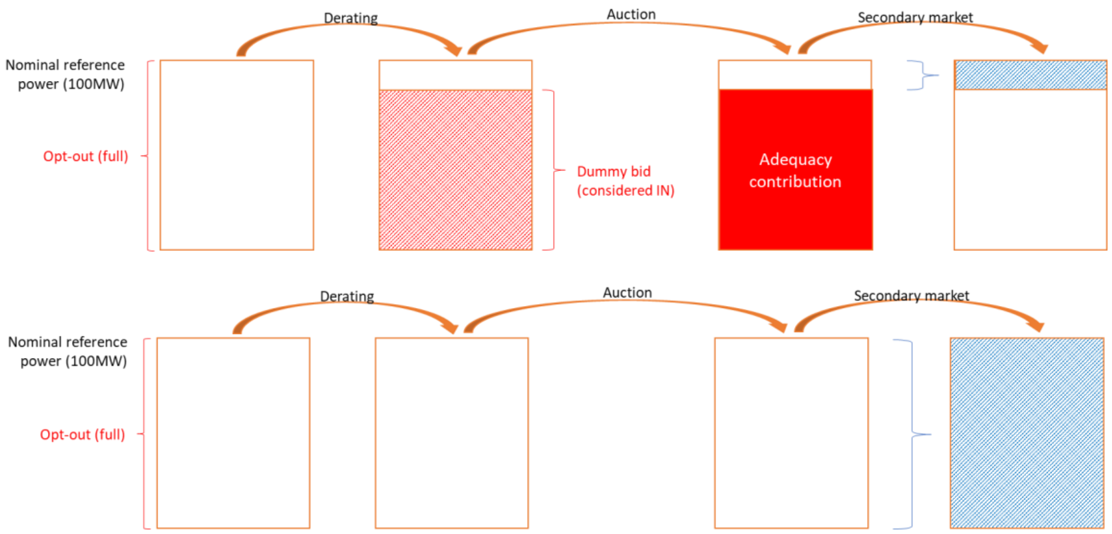

Figure 17: Full opt-out of CMU of 100MW supported by temporary closure notification towards Y-4 Auction (top) and Y-1 Auction (bottom)

As illustrated in Figure 17 (top), a dummy Bid will be inserted into the Y-4 Auction related to the Opt-Out Volume with a temporary closure notification. However, the same Opt-Out Volume with a reconfirmed temporary closure notification will not lead to a dummy Bid into the Y-1 Auction (Figure 17, bottom). In other words, towards the Y-1 Auction, a temporary closure notification is considered firm and the capacity is considered not contributing to adequacy, meaning that other capacity is to be contracted instead.

Secondary Market participation in the relevant Delivery Period is possible if relevant and only until the definitive closure date. As Opt-Out Volume supported by a temporary closure notification is still considered contributing to adequacy towards the Y-4 Auction, at this moment only the capacity not considered contributing to adequacy can participate in the Secondary Market (see blue rectangle on the right in Figure 17 (top)).

5.3 Opt-out without closure notification

Design proposal #17:

● The CRM Required Volume for a Y-4 Auction is reduced by a share of the Opt-Out Volume that is not associated with a temporary or definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law, equal to the Opt-Out Volume multiplied by the applicable Derating Factor.

● The CRM Required Volume for a Y-1 Auction is reduced by a share of the Opt-Out Volume (category 'IN') that is not associated with a temporary or definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law, equal to the Opt-Out Volume multiplied by the applicable Derating Factor.

● The CRM Required Volume for a Y-1 Auction is *not* reduced by Opt-Out Volume (category 'OUT') that is not associated with a temporary or definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law.

● Opt-Out Volume that is not associated with a temporary or definitive notification for closure or a structural reduction of capacity as referred to in Art. 4bis of the Electricity Law and limited to the share of Opt-Out Volume that has not resulted in a reduction of the CRM Required Volume, is allowed to participate in the Secondary Market for the Delivery Period to which the Opt-out notification relates.

Opt-Out Volume without closure notification is always considered as contributing to adequacy towards the Y-4 Auction (IN). This way, overprocurement of capacity is avoided and there is not yet a risk of an adequacy gap, as there will still be a Y-1 Auction for the relevant Delivery Period.

In contrast, towards the Y-1 Auction, this category of Opt-Out Volume has to make an explicit choice:

1. IN: Indication that the Opt-Out Volume will contribute to adequacy, but will not participate to the CRM
2. OUT: Indication that Opt-Out Volume will not contribute to adequacy. Such OUT-choice has to be supported by a signed motivation letter explaining why capacity will not be contributing to adequacy.

An example to illustrate the treatment of Opt-Out Volume without closure notification towards the Y-4 and Y-1 Auction (in the latter, an OUT choice has been made) is provided in Figure 18 below.

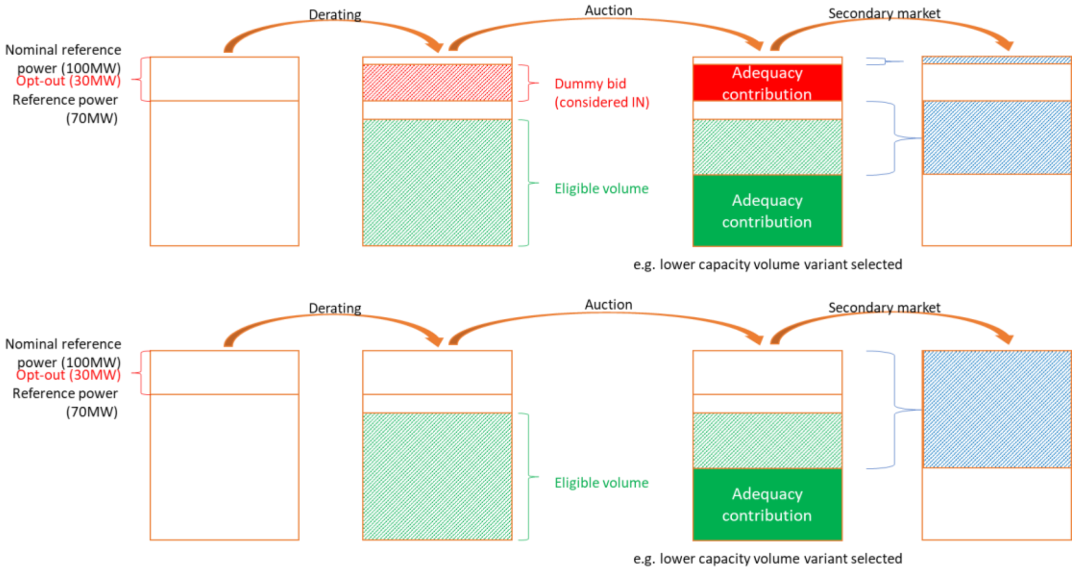

Figure 18: 100MW CMU with 30MW opt-out without notification towards Y-4 Auction (top) and Y-1 Auction with choice OUT (bottom)

As illustrated in Figure 18 (top), a dummy Bid will always be inserted into the Y-4 Auction related to the Opt-Out Volume with a temporary closure notification. The same Opt-Out Volume will only lead to a dummy Bid when option IN has been chosen, but not when option OUT has been chosen and motivated. Figure 18 (bottom) assumes such OUT choice towards the Y-1 Auction. This means that for the Opt-Out Volume without notification (option OUT), in the Y-1 Auction, other capacity is to be contracted instead.

In general, as illustrated in Figure 18, Secondary Market participation is allowed for all capacity that has not been considered contributing to adequacy. Note that, regarding the Opt-Out Volume without notification that is considered contributing to adequacy (towards Y-4 Auction or option IN towards Y-1 Auction), still the capacity on top of the derated Opt-Out Volume is allowed to participate in the Secondary Market.

5.4 Prequalification fast track

Design proposal #18:

A CRM Candidate that goes through the fast track Prequalification Process is automatically considered as submitting an opt-out notification and therefore has to comply with all above requirement related to such opt-out notification.

Capacity that goes through the fast track Prequalification Process – as further discussed and detailed in the design note *CRM Design Note: Prequalification & Pre-delivery Monitoring* – instead of the full Prequalification Process is by default considered as Opt-Out Volume.

Opt-Out Volume resulting from fast track prequalification, can still be classified into each of the three opt-out categories as discussed above: opt-out supported by definitive closure notification, opt-out supported by temporary closure notification or opt-out without closure notification. The same rules apply for Opt-Out Volume resulting from fast track prequalification with respect to the volume requirement. Note that without closure notification, a choice between 'IN' and 'OUT' (of which IN is the default choice as OUT has to be motivated) towards the Y-1 Auction is also required for capacity that has gone through the fast track Prequalification Process.

Consequences in terms of Secondary Market participation are different though, since a fast track prequalification never gives the right to participate in the Secondary Market. Indeed, capacity going through the fast track Prequalification Process is not duly prequalified. A full process prequalification is a prerequisite for being able to participate in the Secondary Market (and also the primary CRM Auction by the way).

5.5 Other considerations and practical implementations

Design proposal #19:

● An Opt-out notification regarding the Y-4 Auction towards a Delivery Period has no implications for the opt-out possibilities regarding the Y-1 Auction towards the same Delivery Period, meaning that the Opt-out notification may be changed.

● A reduction of the CRM Required Volume, if applicable, is done by means of a dummy Bid that is artificially introduced by the auctioneer. Such dummy Bid corresponds with a Bid at 0 €/MW/year, is not linked to a Capacity Provider and does not result in any contractual obligations.

● A Capacity Holder who does not submit a prequalification file, despite a legal obligation to do so as defined in the Electricity Law Art. 7undecies §4, is considered as submitting an Opt-out notification and always considered contributing to adequacy (category 'IN')

A Y-4 opt-out decision has no implications for Y-1 opt-out possibilities. This principle is based on the idea that conditions may change over time, and as such also choice to opt-out or not.

An opt-out notification during the Prequalification Process will be made related to the Nominal Reference Power level. Volume corrections, if required, will take into account a derated capacity volume to reflect the adequacy contributing volume. To this end, the predefined Derating Factor depending on the technology of the CMU will be applied. A partial opt-out will be derated by the same Derating Factor as a full opt-out.

For the sake of simplicity, an CRM Required Volume correction will always be done during the Auction process, by means of a dummy offer curve Bid (increase offer) instead of through a Demand Curve shift (reduce demand). In the end, both options lead to the same outcome. The dummy Bid will be an artificial Bid foreseen by the auctioneer (not implying any action of the CRM Candidate that has opted out) for the derated Opt-Out Volume to be corrected for, introduced by the auctioneer at 0 €/MW/year, not linked to a Prequalified CRM Candidate and not resulting in any contractual obligations.

The Electricity Law Art. 7undecies §4 requires all eligible production Capacity Holders to prequalify. In case this Capacity Holder does not enter a prequalification file, despite an obligation to do so and regardless of other legal implications this may have, its capacity will be considered as Opt-Out Volume and always assumed contributing to adequacy (category ‘IN’).

6 Validation of auction results and transparency

This section aims to provide all stakeholders with an overview of the general principles regarding the validation of the Auction results and transparency regarding the CRM Auction results in general.

6.1 Validation of auction results

It is important that the Auction results are correctly determined and that the market parties and society as whole have the necessary comfort on the correctness of the result. In this respect, Elia (appointed as auctioneer for the CRM Auctions, cf. Electricity Law Art 7undies §6) considers several options, including the involvement of a third party, e.g. as an external monitor during the Auction process. Also CREG will be involved in this validation process.

The precise implementation of the result validation process will be elaborated during the development phase of also other necessary tools and processes in the context of the CRM.

6.2 Transparency on Auction results

The general goal regarding transparency is to provide all stakeholders with sufficient information such that the market can follow up on the CRM and learn from subsequent Auctions, while at the same time avoiding that too much information is shared to the extent that it could negatively impact the CRM. Therefore, as a main principle, it is proposed to provide only aggregated information on the different CRM aspects in a transparent way to all market parties. Furthermore, information will only be shared after Auction closure, i.e. by 31 October when the final and validated Auction results are available.

In what follows, the information that will be shared on the Auction results is further detailed into the following categories: information on the Auction clearing price, on the offered and selected capacity, and on the Opt-Out Volume. A schematic overview only for illustrative purposes on the Auction result categories of information that will be provided is given in Figure 19 below.

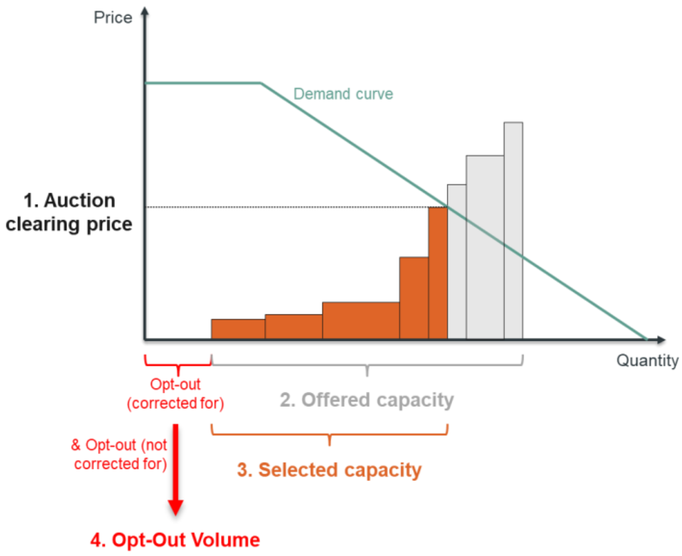

Figure 19: Overview of Auction result information categories

6.2.1 Auction clearing price

- The **Auction clearing price**, *in €/MW/year*. In case of pay-as-bid, the price of the most expensive selected Bid will be shared, as an approximation of the would-be Auction clearing price under pay-as-cleared.
- The **cross-border clearing prices**, *in €/MW/year per participating neighboring country*, determined as the most expensive selected Bid in each country. → This element provides information on the competitiveness of foreign capacity compared to Belgian capacity participating in the Belgian CRM.

6.2.2 Offered & selected capacity

The following information will be shared separately for all offered and all selected capacity, allowing to compare these information elements specifically between offered and selected capacity.

Information on capacity volumes[10]:

- Capacity per Capacity **Contract Duration**, *in #MW with 1-year contract, #MW with 2-year contract, etc.*
- Capacity per **technology** according to the derating categories, *in #MW DSR (per SLA), #MW CCGT, etc.*
- Capacity per **country**, *in #MW in Belgium, #MW in France, etc.*

[10] Capacity volumes will be reported as derated capacities, unless stated otherwise.

- Capacity **TSO-connected vs. DSO-connected**, *in #MW TSO-connected and #MW DSO-connected*

On Bids into the Auction:

- **Weighted average price of all Bids**, *in €/MW* weighted by the capacity volume of the Bids
  → This element allows to compare the average price of Bids to the price of the price-setting (or highest price) Bid, i.e. Auction clearing price, as such giving information on the shape of the offer curve. By providing this information both on all offered Bids and on all selected Bids, information is given also on the share of the offer curve that has not been selected.
- **Average capacity volume of all Bids**, *in #MW*
- **Number of Bids**
  → This element provides information on competition in the CRM
- **Number of CMUs**
  → This element provides information on competition in the CRM
- **Number of unique bidders**
  → This element provides information on competition in the CRM

Specifically related to the monitoring process following up on new capacity being developed towards the Delivery Period and hence relevant for selected capacity only, a reporting will be done on the **evolution of selected capacity that requires monitoring** towards the Delivery Period, *in #MW monitored and #MW drop-out/delayed, etc. on a yearly basis*.

6.2.3 Opt-Out Volume

Specifically regarding Opt-Out Volume, information on capacity volumes will be shared, categorized into:

- Opt-Out Volume supported by **definitive closure (or structural capacity reduction) notification**, *in #MW*
- Opt-Out Volume supported by **temporary closure (or structural capacity reduction) notification**, *in #MW*
- Opt-Out Volume **without closure notification**, *in #MW contributing to adequacy and #MW not contributing to adequacy*

The above capacities will be reported in non-derated form, in line with how Opt-Out Volume is notified to the grid operator during the Prequalification Process. However, next to the above described information, the **total Opt-Out Volume assumed contributing to adequacy**, *in #MW (derated)* will also be provided as this volume will impact the volume to be procured in the Auction (i.e. dummy bids).

Note that although no aggregated information is shared to all stakeholders at the end of the Prequalification Process, the information on offered capacity related to the Auction (Section 6.2.2) together with the information on Opt-Out Volume (Section 6.2.3) does give a full overview of the results of the Prequalification Process.

6.3 Transparency towards the start of the Delivery Period

Prior to the start of a Delivery Period, Elia will publish a report with aggregated information of the Contracted Capacities for that Delivery Period thereby indicating, amongst others, the remaining Capacity Contract Duration of different Contracted Capacities, the applicable Strike Price levels and the level of capacity corresponding to each Strike Price level. Such report should provide all market parties with the necessary (aggregated) information, allowing them, for instance, to be better informed on the link between the CRM and the energy market during the concerned Delivery Period.

The details of this reporting will be further developed towards the start of the first Delivery Period.