Overview of Belgian CRM Design: list of definitions (update)

March 2020

Table of contents

1 Introduction and Context

About the status of this document

This document is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

The list below is an updated version of this definition list and is to be interpreted as follows:

- Definitions in green and marked by the asterisks (**): Definitions are updated in line with the list of definitions included in the Market Rules.
- Definitions in orange and marked by the asterisks (***) are updated/new compared to the definitions in the Market Rules (e.g. as a result of feedback received on the Royal Decree for methodology).

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn3_crm-design-note---prequalification-and-pre-delivery-monitoring.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf

Introduction

For the different methodologies and rules that Elia has to propose, a wide range of definitions are required. At the initial stage in the process characterized by multiple design notes referring regularly to the same concepts, Elia had opted for a glossary with proposed definitions.

At a later stage, when formalizing the final proposals, these definitions were updated (i.e. to take into account feedback during the public consultation) and integrated into the different deliverables, such as Elia's proposal for Market Rules or Elia's proposal for methodology in a Royal Decree.

More specifically, the list of definitions has been evolved as follows:

- A first list of definitions was made public during the first consultation phase, which started the 13th of September 2019.
- An updated version of the list of definitions was made public during the second consultation phase, which started the 2nd of October 2019.
- A further updated version of the list of definitions was included in the Market Rules, published on the 29th of November 2019 (incorporating feedback received during the public consultation on the design notes).

The list below is an updated version of this definition list and is to be interpreted as follows:

- Definitions in green and marked by the asterisks (**): Definitions are updated in line with the list of definitions included in the Market Rules.
- Definitions in orange and marked by the asterisks (***) are updated/new compared to the definitions in the Market Rules (e.g. as a result of feedback received on the Royal Decree for methodology).

For reasons of completeness and informational purposes only, the list of definitions hereunder also includes the relevant terms already defined in the Electricity Act or in the European legislation. For these definitions already provided under the Electricity Act a non-official English translation made by Elia is provided for the sake of clarity. These definitions foreseen in the Electricity Act and in the European legislation are clearly marked in the table (marked by an asterisk (*) and included in red & italic). Obviously, by no means, those definitions already defined by the Electricity Act or in the European legislation can be altered as a consequence of the public consultation of these CRM design notes. Furthermore, those definitions already provided for under the Electricity Act or the European legislation will not be repeated in the future Royal Decree.

At the end of this document also a list of abbreviations is provided.

2 List of Definitions

Term	Definition
Access Point**	As defined in article 2 §1 (29) of the Federal Grid Code. For an access to the Elia Grid other than the transmission grid, or to a Public Distribution Grid, or to a CDS: a point, defined by the physical location and voltage level, at which access to the Elia Grid other than transmission grid, or to a Public Distribution Grid, or to a CDS is granted, with a goal to injecting or taking off power, from an electricity generation unit, a consumption facility, a non-synchronous storage facility, connected to this grid.
Additional Capacity***	Capacity that, at the moment of submission of the Prequalification File, could not inject electricity or reduce its consumption in the market or behind the meter.~~Capacity for which, at the time of prequalification file submission, no Nominal Reference Power can be calculated based on 15 minutes measurements or which requires a signed technical agreement with Elia as per connection process in Federal Grid Code.~~
Aggregation*	*According to Directive (EU) 2019/944, article 2, 18°: a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market.*
AMT Hour**	An hour identified by exceeding the Availability Monitoring Trigger.
AMT Moment	A series of consecutive AMT Hours.
AMT Price or p_{AMT}**	The ex-ante defined price level for a Delivery Period identifying AMT Hours.
Auction*	*According to the Electricity Act, article 2, 73°, the competitive process in which Capacity Holders are offering a price for making available capacity.*
Auction Platform**	The set of information systems within the control of Elia used to perform their functions under the Auction.
Available Capacity**	The CMU's capacity that is available as a result of the Availability Monitoring Mechanism or the Availability Test. Available Capacity can consist of both Proven Availability and Unproven Availability.
Availability Monitoring Mechanism**	The process to monitor whether the CMU's Available Capacity equals at least its Obligated Capacity during AMT Hours as referred to in article 7undecies § 7 of the Electricity Act.

Availability Monitoring Trigger (AMT)**	A pre-defined trigger in a pre-defined market segment, equal to or above which AMT Hours are identified.
Availability Obligations**	The obligation of a CMU to have an Available Capacity that equals at least its Obligated Capacity during AMT Hours or an Availability Test.
Availability Penalty**	The amount payable to which the Capacity Provider is exposed in case of Missing Capacity.
Availability Ratio**	The proportion of the Available Capacity to the Obligated Capacity, calculated for a CMU per 15 minutes.
Availability Test**	The tests based on which CMUs have to demonstrate their availability by actually delivering energy upon request of the transmission system operator. During an Availability Test it is monitored whether the CMU's delivered energy equals at least its Obligated Capacity.
Balance Responsible Party (BRP)***	As defined in Article 2 (7) of the EBGL and listed in the register of Balance Responsible Parties.
Balancing Market*	*According to the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, article 2, 2°, the entirety of institutional, commercial and operational arrangements that establish market-based management of balancing.*
Baseline**	The power, on a quart hourly basis, on which the energy volume that the CMU would have taken off is evaluated in case no demand side response is activated.
Bid	Offer made by a Prequalified CRM Candidate in the Auction.
Bid Cap**	A maximum Bid Price (in EUR/MW/year) that can be made for a Bid in the Auction.
Bid Price	The price expressed (in EUR/MW/year) at which a Prequalified CRM Candidate is offering a Bid in the Auction.
BRP Source***	The Balance Responsible Party of the Access Point of the Grid User
Buyer of an Obligation**	A Prequalified CRM Candidate or a Capacity Provider taking over the obligations resulting from the Service under the CRM of a Seller of an Obligation via a Transaction on the Secondary Market.
Calibrated Strike Price	The value of the Strike Price applicable at a certain moment as determined as a result of the yearly calibration process as referred

	to in article 7undecies § 2, 2° of the Electricity Act.
Capacity**	Power associated to a Delivery Point.
Capacity Category*	*According to the Electricity Act, article 2, 84°, the category including capacities that are distinguished by the eligible total Investment Thresholds to which different Capacity Contract Durations are linked, during which the Capacity Provider is entitled to a Capacity Remuneration.* As referred to in article 7undecies § 7 of the Electricity Act, the Capacity Contract Durations 1-year, 3-years, 8-years and 15-years, depending on the category.
Capacity Contract**	The contract signed between a Capacity Provider and the Contractual Counterparty as referred to in article 7undecies § 7 of the Electricity Act.
Capacity Contract Duration**	The number of consecutive Delivery Period(s) that the Capacity Contract covers as stipulated in the Capacity Contract.
Capacity Contract Framework**	The contract signed as part of the Prequalification Process between a CRM Candidate and the Contractual Counterparty that determines the rights and obligations for both parties and under which a Capacity Holder becomes bound by the Market Rules.
Capacity Holder*	*According to the Electricity Act, article 2, 74°, every natural person or legal entity that can offer capacity, either on an individual or aggregated basis.*
Capacity Market Unit (CMU)***	A Capacity (« individual CMU ») or several associated Capacities (« aggregated CMU») with the objective to ~~deliver the Service in the~~pass through the consecutive phases of the Capacity Remuneration Mechanism, being the Prequalification Process, followed by the Auction, with the aim to be selected and to deliver the Service. ~~In the context of Unproven Capacities, it is also called «virtual Capacity Market Unit».~~
Capacity Provider*	*According to the Electricity Act, article 2, 75°, every Capacity Holder selected after closing of the Auction and that will keep available a capacity during the Delivery Period in return for a Capacity Remuneration.*
Capacity Remuneration*	*According to the Electricity Act, article 2, 76°, the periodically assigned remuneration to the Capacity Provider in return for keeping available their capacity.*
Capacity Remuneration Mechanism* (CRM)	*According to the Electricity Act, article 2, 71°, the market mechanism based on a system of Reliability Options allowing to ensure the country's required level of security of supply and to guarantee that the evolution of the different forms of capacities meets the development of the electricity demand in the medium to long term, taking into account the electricity import possibilities.*

CDS Operator (CDSO)**	A natural or legal person appointed by the relevant authority as the operator of the CDS.
CIPU Contract**	The contract for the Coordination of Injection of Production Units concluded with Elia, or any other regulated contract(s) that will replace the CIPU Contract, in accordance with the dispositions in article 377 of the Federal Grid Code.
Closed Distribution System (CDS)**	As defined in article 2, §1, 3° of the Federal Grid Code;
Contracted Capacity***	The c~~C~~apacity of a CMU subject to a Transaction in the Primary Market or in the Secondary Market.
Contractual Counterparty	The legal entity that signs the Capacity Contract with the Capacity Providers that are selected in the Auction as referred to in article 7quaterdecies § 1 of the Electricity Act.
CRM Candidate***	A Capacity Holder ~~that has initiated the Prequalification Process~~ whose application form has been accepted by Elia.
CRM Act**	The Act of 22/04/2019 amending the Electricity Act: « *Wet tot wijziging van de wet van 29 april 1999 betreffende de organisatie van de elektriciteitsmarkt, teneinde een capaciteitsvergoedingsmechanisme in de stellen » / « Loi modifiant la loi du 29 avril 1999 relative à l'organisation du marché de l'électricité portant la mise en place d'un mécanisme de rémunération de capacité »*.
CRM Required Volume	Volume that should be contracted by an Auction for a certain Delivery Period.
Cross-border Contribution	Contribution to the Belgian electricity market from electrically directly connected market zones during near-scarcity moments.
Daily Schedule**	The program of production of a CMU (in MW), given on a quarter hourly basis, provided to Elia in Day-Ahead Market and updated in accordance with the rules of the CIPU Contract.
Day-Ahead Market (DAM)*	*The single day-ahead coupling, as defined in article 2.26° of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.*
Day-Ahead Market Price**	As published on Elia's website (https://www.ELIA.be/en/grid-data/transmission/day-ahead-reference-price), the Belgian reference price as calculated by Elia as the volume weighted average price of the prices of the NEMO hubs in the Belgian bidding zone, as defined in the Belgian MNA.

Declared Day-Ahead Price**	The Day-Ahead Market price declared by the Capacity Provider equal to or above which a CMU would deliver energy in the energy market by dispatching at least its Obligated Capacity.
Declared Market Price (DMP)**	The price declared by the Capacity Provider that is equal to or surpassed on its respective market associated with the highest volume of energy the CMU would deliver by dispatching that volume, as established in section 9.3.1 of the Market Rules.
Delivery Period*	*According to the Electricity Act, article 2, 77°, the period starting from the 1st of November and ending on (but including) the 31st of October of the next year, during which the Capacity Providers are remunerated for making available their capacity.*
Delivery Point***	A (future) point on an electricity grid or within electrical installations of a Grid User where the Service is or will be delivered. This point is or will be associated with one or several metering device(s) in conformity with standards set by Elia.
Demand Curve*	*According to the Electricity Act, article 2, 78°, a curve that reflects the variation of the capacity volume to be procured, in function of the price level of the capacity.*
Demand Side Response* (DSR)	*According to the Electricity Act, article 2, 66°, the capacity of end users to change their electricity demand upwards or downwards on a voluntary basis, reacting upon an external signal.*
Derating Factor*	*According to the Electricity Act, article 2, 83°, a factor that is applied to a certain capacity, determining its contribution to the security of supply and used to calculate the Eligible Volume that is qualified to participate in the Auction.*
Direct Cross-Border Participation*	*According to the Electricity Act, article 2, 86°, capacity outside the Belgian territory, but connected through a specific cable to only the Belgian control zone, after entry into force of the CRM Law, subject to the same rights and obligations as similar capacity inside the Belgian territory.*
DSO-CRM Candidate Agreement***	Agreement between the CRM Candidate and the concerned DSO(s) confirming the technical possibility for specific Delivery Points connected to the ~~distribution grid~~DSO Grid to participate to the Service.
Electricity Act**	Federal Electricity Act of 29 April 1999 on the organization of the Belgian electricity market: "*Wet van 29 april 1999 betreffende de organisatie van de elektriciteitsmarkt*" / "*Loi du 29 avril 1999 relative à l'organisation du marché de l'électricité*".
Elia Grid**	The electricity grid to which Elia holds the property right or at least the right of using and operating it, and for which Elia has been appointed as system operator.
Eligible Volume**	The Reference Power of a CMU multiplied by the Derating Factor as determined in the Capacity Contract Framework during the Prequalification Process., or in case of Unproven Capacity the volume associated to a Virtual CMU as declared 100% available by

	the CRM Candidate.
Energy Constrained CMU**	A CMU that has limited availability because it can only provide energy for a limited number of hours per day.
Energy Not Served (ENS)	Amount of energy that cannot be supplied, expressed in GWh per year.
Existing Capacity***	Capacity that, at the moment of submission of the Prequalification File, could already inject electricity or reduce its consumption in the market or behind the meter.~~Capacity for which, at the time of prequalification file submission, the Nominal Reference Power can be calculated based on 15 minutes measurements.~~
Forced Outage**	An unplanned removal (full or partial) of a CMU providing the Service for any urgent reason that is not under the operational control of the Capacity Provider.
Global Auction Price Cap	The Price Cap applicable in an Auction to all Bids.
Grid User**	As defined in article 2 §1 (57) of the Federal Grid Code for a Grid User connected to the Elia Grid or to Public Distribution Grid; or as defined in article 2 §1 (58) of the Federal Grid Code for a Grid User connected to a CDS.
Grid User Declaration**	The official declaration of the Grid User provided to Elia in the Capacity Contract Framework, containing among other things proof of the agreement between the CRM Candidate and the Grid User to provide the Service with one (or more) specific Delivery Point(s) for which he is responsible of.
Headmeter***	A (group of) meter(s), as defined in Art. 2 §1 (5) of the Federal Grid Code, associated with the Access Point as determined by Elia, or the DSO (for the Public Distribution Grid), installed by Elia for the Elia Grid and the DSO for the Public Distribution Grid.
Indirect Cross-Border Participation*	*According to the Electricity Act, article 2, 85°, capacity outside the Belgian control zone that is contributing to the security of supply of Belgium via interconnectors.*
Intraday Market*	*The single intraday coupling, as defined in article 2, 27° of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.*
Last Published Derating Factor**	The latest published value for a category of Derating Factor as a result of the yearly calibration process as referred to in article 7undecies § 2, 2° of the Electricity Act.

Market Rules**	The rules referred to in article 7undecies § 8 of the Electricity Act.
Measured Power**	The power read by Elia from the meter installed at the Delivery Point averaged over every hour corresponding to a Day-Ahead market segment.
Missing Capacity**	The positive difference between the Obligated Capacity and the Available Capacity.
Near Scarcity Hours (NSH)***	Hours ~~in which there is simulated Energy Not Served and~~ where no more margin is left in Belgium, meaning that any additional load would not be served by making available the full generation capacities to the Belgian electricity grid, taking into account the import capabilities and the energy available on the market.
Nominal Reference Power**	Maximal capacity of a Capacity that could be offered in the Capacity Remuneration Market.
Nominated Electricity Market Operator (NEMO)***	An entity designated by the competent authority to perform tasks related to single day-ahead or single intraday coupling as defined in article 2.23° of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.
Non-Energy Constrained CMU**	A CMU that is not subject to limited availability, because it is not subject to the constraint of only providing energy for a limited number of hours per day.
Non-SLA Hours**	All hours of an Energy Constrained CMU that are not SLA Hours.
Obligated Capacity**	The Capacity for a CMU that a Capacity Provider is obliged to make available in the form of Available Capacity during pre-delivery monitoring, Availability Tests and Availability Monitoring, in line with the availability requirement, as referred to in Article 7undecies §7 of the Electricity Act.
Opt-Out Volume	(Part of) the Nominal Reference Power of a CMU for which the CRM Candidate formally indicates it is not willing to offer it in the Auction, by the end of the Prequalification Process at the latest as referred to in article 7undecies § 6 of the Electricity Act.
Opt-Out Notification**	The notification based on which a CRM Candidate notifies Elia that it has decided not to offer the Op-Out Volume into an Auction for a Delivery Period, in line with Article 7undecies §7 of the Electricity Act.
Payback Capacity***	The total of capacity (in MW) on which the Payback Obligation will be applied.
Payback Obligation**	A Capacity Provider's obligation to pay back an amount to the Contractual Counterparty in function of the Contracted Capacity as referred to in Article 7undecies § 7 of the Electricity Act.

Peak Hours***	Hours starting from 08.00 (CET) until 20.00 (CET) of every day, excluding weekend and Belgian public holidays.
Pmax available (Pmax)**	The maximum power (in MW) that the Delivery Point can inject into (or take off) the Elia Grid for a certain quarter-hour, taking into account all technical, operational, meteorological or other restrictions known at the time of notification to Elia with the Daily Schedule, without taking into account any participation in the provision of Balancing Services.
Prequalification File***	All documents and data prepared, updated (when required) and issued by the CRM Candidate to Elia and which are necessary for the proper and complete performance of the Prequalification Process.
Prequalification Platform**	The set of information systems within the control of Elia used to perform their functions under the Prequalification Process.
Prequalification Process*	*According to the Electricity Act, article 2, 82°, the procedure aiming to determine the possibility for Capacity Holders to participate in the Auction.*
Prequalified CRM Candidate***	The CRM Candidate that is allowed to participate in ~~an Auction~~the Primary Market or the Secondary Market thanks to the prequalification of one or several Capacity Market Unit(s).
Price Cap**	The maximum bid price and the maximum Capacity Remuneration that can be received for a Bid.
Primary Market**	The market where the obligations resulting from the Service are created as a result of an Auction and the signing of a Capacity Contract.
Proven Availability**	The situation in which (i) a CMU without Daily Schedule is available during AMT Hours where the Declared Market Price is exceeded by its respective market price, that at least equals the Obligated Capacity or (ii) a CMU with Daily Schedule is available in the energy market for at least its Obligated Capacity or (iii) a CMU reserving its Obligated Capacity in an Ancillary Services made up only of Delivery Points associated to the CMU or (iv) a CMU physically delivering its Obligated Capacity output as a result of Ancillary Services activations.
Public Distribution Grid or “DSO Grid”**	As defined in article 2, 49° of the Federal Grid Code.
Public Distribution System Operator or “DSO”**	A natural personal or legal entity appointed by the designated regional regulator or regional authority, who is responsible for the exploitation, the maintenance and, if necessary, the development of the Public Distribution Grid in a certain zone and, where applicable, for its interconnectors with other systems and who is responsible of guaranteeing the long-term ability of the Public Distribution Grid to meet reasonable demands for electricity distribution.

Reference Power**	Capacity that must be considered in the CRM according to the CRM Candidate, before application of relevant Derating Factors, but after deducting the Opt-Out Volume (if applicable).
Reference Price*	*According to the Electricity Act, article 2, 81°, the price that is reflecting the price that is presumed to be received by the Capacity Providers on the energy markets.*
Reliability Options*	*According to the Electricity Act, article 2, 72°, the CRM based on which Capacity Providers will repay the positive difference between the Reference Price and the Strike Price.*
Remaining Eligible Volume***	The maximum Contracted Capacity for a Prequalified CRM Candidate's Transaction on the Primary Market.
RIME (Regulation EU n° 2019/943)	Regulation (EU) n° 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity.
Royal Decree on eligibility criteria related to cumulative support and minimal participation threshold**	Royal Decree established in accordance with article 7 undecies §4 of the Electricity Act which defines eligibility criteria: 1) the possibility for Capacity Holders, already benefitting from state support, to benefit from cumulative support for the CRM, 2) the minimal threshold, in MW, after application of the Derating Factors, below which Capacity Holders may not participate to the Prequalification Process.
Royal Decree Methodology**	Royal Decree for calculation of volume and parameters needed for the auctions of the CRM established in accordance with article 7undecies, § 2 of the Electricity Act.
Scarcity Hours (SH)	Hours with Energy Not Served.
Secondary Market**	The market in which the obligations resulting from the Service are subject to a Transaction between a Seller of an Obligation and Buyer of Obligation.
Secondary Market Capacity**	The capacity that is subject to a Transaction on the Secondary Market.
Secondary Market Remaining Eligible Volume***	The maximum Contracted Capacity for a Buyer of Obligation's Transaction on the Secondary Market.

Seller of an Obligation**	A Capacity Provider that transfers the obligations resulting from the Service under the CRM to a Buyer of an Obligation via a Transaction on the Secondary Market.
Service***	The contractual rights and obligations of a Capacity as stipulated in the Capacity Contract.
Service Level Agreement *** **(SLA)**	The level of service per calendar year the Capacity Provider selects for Energy Constrained CMUs during the Prequalification Process in function of their duration constraints and as determined in the Capacity Contract.
Simulated Scarcity Situation***	A situation, based on a simulation, in which the load cannot be covered or in which the load could not be covered in case of an additional load of 1 MW, by making available the full generation capacities to the Belgian electricity grid, taking into account the import capabilities and the energy available on the market.
SLA Hours**	Up to N AMT Hours with the highest Proven Availability for the CMU over one day, where N corresponds to the number of hours in the CMU's SLA, as defined in section 9.4 of the Market Rules.
Stop Loss**	Mechanism that caps the amount that a Capacity Provider has to pay as stipulated in the Capacity Contract.
Strike Price*	*According to the Electricity Act, article 2, 80°, a pre-defined price that determines the threshold above which the Capacity Provider has to pay-back difference with the Reference Price.*
Submeter***	Either a meter, as defined in Art.2 §1 (5) of the Federal Grid Code, situated downstream of the Headmeter; or, an equation between one or more meter(s) situated downstream of the Headmeter and/or the Headmeter.
Title Transfer Facility	The mechanism that allows the notification of the transfer of obligation between the Buyer of the Obligation and the Seller of the Obligation on the Secondary Market.
Total Load	The total load includes all the electrical loads on the TSO grid and on the distribution systems connected to it. It also takes into account the estimated power losses.
Total Contracted Capacity**	The sum of all Contracted Capacities for a CMU for a certain period.
Transaction***	An agreement about the obligations resulting from the Service in the Primary Market or the Secondary Market in the form of a Capacity Contract between a Capacity Provider and the Contractual Counterparty at a Transaction Date, identified by a transaction identification number and for a determined volume covering a Transaction Period.

Transaction Date**	The date and time a Transaction is made.
Transaction Period**	The period defined by a start date/start time and end date/end time, during which the Service is delivered resulting from a Transaction.
Unproven Availability**	The situation when a CMU without Daily Schedule is assumed to be available during AMT Hours where the Day-Ahead Market price is below the Declared Market Price, without actual proof of delivery of energy.
Unproven Capacity**	A Capacity which, at the start of the Y-4 Prequalification Process, cannot be associated to one or several CMUs and therefore cannot respect Delivery Point prequalification requirements.
Unsheddable Margin	Minimal amount of net active power offtake (in kW/MW) that cannot be curtailed (inflexible or unsheddable power) at the Delivery Point(s) concerned.
Virtual Capacity Market Unit (VCMU)***	Capacity Market Unit whose capacity is unproven in accordance with article 5.2.2 of the Market Rules.
Winter Period * / *	*According to the Electricity Act, article 2, 51°, the period from 1 November to 31 March*.
Working Day**	A week day which is not a public holiday or a bank holiday in Belgium.

3 List of Abbreviations

AMT	Availability Monitoring Trigger
BRP	Balancing Responsible Party
CDS**	Closed Distribution System
CDSO**	Closed Distribution System Operator
CEP	Clean Energy Package
CET**	Central European Time Zone
CIPU	Contract for the Injection of Production Units
CMU	Capacity Market Unit
CRM	Capacity Remuneration Mechanism
DAM	Day-Ahead Market
DMP	Declared Market Price
DSR	Demand Side Response
DSO	Distribution System Operator

DSO Grid**	Public Distribution Grid
FO***	Forced Outage
GCT**	Gate Closure Time
GOT**	Gate Open Time
ENS	Energy Not Served
IDM	IntraDay Market
NEMO	Nominated Electricity Market Operator
NSH	Near Scarcity Hours
NTC***	Net Transfer Capacities
RES	Renewable Energy Sources
SH	Scarcity Hours
SLA	Service Level Agreement
SOGL**	Commission Regulation (EU) 2017/1485 establishing a guideline on electricity transmission system operation.
SR***	Strategic Reserves
TSO	Transmission System Operator
OTC	Over The Counter

VCMU* **	Virtual Capacity Market Unit
Y-1**	1 year before the start of the Delivery Period
Y-4**	4 years before the start of the Delivery Period

Updated CRM Design Note:

Derating factors

March 2020

Table of contents

Introduction

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means is a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

This design note ~~will serve~~serves as ~~basis~~support for Elia's proposal regarding the methodology, as referenced in Article 7undecies, §2 of the CRM Law[5]. ~~In particular, the principles included at~~At the end of each chapter of this note, ~~will serve as guidance for Elia when preparing its~~the related articles from the Royal Decree Methodology are mentioned. These articles come from the latest draft proposal ~~of~~for the Royal Decree Methodology setting out the methodology for calculating capacity and parameters for auctions under the capacity remuneration mechanism[6].

In accordance with Article 7undecies, §2 of the CRM Law, a yearly calibration for the parameters will take place. At the end, a yearly Ministerial Decision is taken in order to instruct the TSO to organize the auction and according to which parameters.

The purpose of this document is to present the methodology and the process that will be

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn1_crm-design-note---derating-factors.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf
[5] http://www.ejustice.just.fgov.be/doc/rech_n.htm
[6] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf

followed to determine the derating factors associated with every capacity, hence reflecting its expected contribution to adequacy. ~~In addition, it will also provide the maximum cross-border contribution per border.~~ The multiplication of the associated derating factor and the reference power of each capacity market unit (CMU) upon prequalification results in the ~~derated capacity~~eligible volume, i.e. the maximum capacity that could take part in the auction. In addition, this document also presents the maximum entry capacity for cross-border contribution per border.

An overview of the whole process is illustrated on ~~Figure 1~~Figure 1.

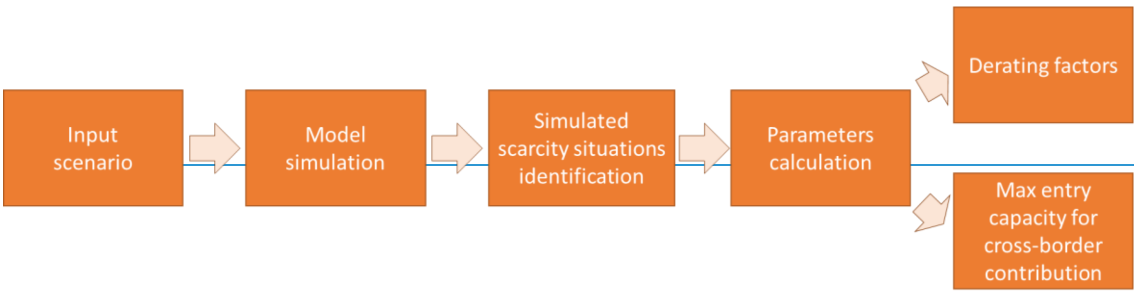

Figure 1: Methodology overview

The first step of the methodology is to select an input scenario on which the derating factors will be calculated. Such scenario must contain at least information about the expected hourly consumption profiles, thermal generation facilities, RES capacities, storage capacities, market response and cross-border market capacities between considered countries. In addition associated weather profiles, energy limitations and technology characteristics are also required.

The second step consists in performing a 'Monte-Carlo' probabilistic simulation to dispatch the different facilities to meet the electricity demand following a cost optimization approach. The output of the model will first provide all the data needed to calibrate the input scenario installed capacities to comply with the legal adequacy criteria, as referenced in Article 7undecies, §3 of the CRM Law. The model will ~~also~~then provide dispatch indicators necessary to calculate the contribution of each technology and interconnection, like countries net position or the hourly generated energy per technology.

The third step consists of determining the ~~near-~~simulated scarcity ~~hours~~situations. These hours represent the time periods which are critical for the Belgian electricity adequacy.

Once this set of hours is known, **the fourth step** is to calculate model-based derating factors for all technologies. A derating factor is calculated as the ratio between the ~~average~~ contribution of a technology during ~~near-~~simulated scarcity ~~hours~~situations (the contribution to security of supply) and ~~the~~its nominal reference power ~~of every technology~~.

Following the same methodology, the maximum entry capacity for cross-border participation for each border is calculated in **the last step**.

All these steps, and if applicable any other relevant input, will be provided for the determination of the capacity to be procured.

0 Legal framework

This design note is based on the CRM Law from 22nd of April 2019 that modifies the Electricity Law of 29th April 1999 on the organization of the electricity market.

The main articles concerning the derating factors are the following:

22 April 2019 **Wet tot wijziging van de wet** **van 29 april 1999 betreffende de organisatie** **van de elektriciteitsmarkt, teneinde** **een capaciteitsvergoedingsmechanisme** **in te stellen**	**22 avril 2019** **Loi modifiant la loi** **du 29 avril 1999 relative à l'organisation** **du marché de l'électricité portant** **la mise en place d'un mécanisme** **de rémunération de capacité**
~~**Ch.2, Art 2, §78**~~	
~~**"vraagcurve": de curve die de variatie weergeeft van het te contracteren capaciteitsvolume in functie van het prijsniveau van de capaciteit**~~	~~"courbe de demande": la courbe représentant la variation du volume de capacité à contracter en fonction du niveau de prix de la capacité~~
~~**Ch.2, Art 2, §83**~~	
~~**"reductiefactor": de wegingsfactor van een bepaalde capaciteit, die diens bijdrage aan de bevoorradingszekerheid bepaalt, teneinde het volume vast te leggen dat in aanmerking komt om deel te nemen aan de veiling**~~	~~"facteur de réduction": le facteur de pondération d'une capacité considérée, déterminant sa contribution à la sécurité d'approvisionnement afin de fixer le volume éligible à participer à la mise aux enchères~~
~~Ch.2,~~ Art ~~6~~7undecies, §2	
Op basis van een methode die wordt vastgesteld door de Koning, op voorstel van de netbeheerder, opgesteld na raadpleging van de marktspelers en na advies van de commissie, stelt de netbeheerder, na raadpleging van de marktspelers over met name de basishypotheses, de twee volgende verslagen op: **1° een eerste verslag […] dat de berekeningen bevat van het noodzakelijke capaciteitsvolume en het aantal uren tijdens dewelke deze capaciteit gebruikt zal worden ten behoeve van de toereikendheid, met het oog op het verzekeren van het vereiste niveau aan bevoorradingszekerheid zoals bepaald in paragraaf 3, voor de veilingen van één jaar en van vier jaar vóór de periode van capaciteitslevering. Dit verslag omvat eveneens een voorstel voor een minimaal te reserveren volume voor de veiling die één jaar voor de periode van capaciteitslevering plaatsvindt. Dit minimaal te reserveren volume is minstens gelijk aan de capaciteit die gemiddeld minder dan 200 draaiuren heeft per jaar teneinde de totale piekcapaciteit af te dekken; en** **2° een tweede verslag dat een voorstel bevat van parameters, berekend op basis van het volume bedoeld in het 1°, die noodzakelijk zijn voor de organisatie van de veiling van vier jaar vóór de periode van capaciteitslevering, met name de vraagcurve, de prijslimiet(en), de referentieprijs, de uitoefenprijs en de reductiefactoren. Dit verslag bevat eveneens de noodzakelijke aanpassingen voor de veiling van één jaar vóór de periode van capaciteitslevering.** Voorafgaand aan de opmaak van het verslag bedoeld in het	Sur la base d'une méthode fixée par le Roi, sur proposition du gestionnaire du réseau, formulée après consultation des acteurs du marché et après avis de la commission, le gestionnaire du réseau établit, après consultation des acteurs du marché notamment sur les hypothèses de base, les deux rapports suivants: 1° un premier rapport contenant un calcul du volume de capacité nécessaire et du nombre d'heures pendant lesquelles cette capacité sera utilisée à des fins d'adéquation, en vue d'assurer le niveau de sécurité d'approvisionnement requis conformément au paragraphe 3, pour les mises aux enchères quatre ans et un an avant la période de fourniture de capacité. Ce rapport contient également une proposition de volume minimal à réserver pour la mise aux enchères se déroulant un an avant la période de fourniture de capacité. Ce volume minimal à réserver est au moins égal à la capacité nécessaire, en moyenne, pour couvrir la capacité de pointe totale pendant moins de 200 heures de fonctionnement par an; et 2° un second rapport contenant une proposition des paramètres, calculés sur la base du volume visé au 1°, nécessaires à l'organisation de la mise aux enchères quatre ans avant la période de fourniture de capacité, notamment, la courbe de demande, le ou les plafond(s) de prix, le prix de référence, le prix d'exercice et les facteurs de réduction. Ce rapport contient également les ajustements nécessaires pour la mise aux enchères un an avant la période de fourniture de capacité. Préalablement à l'établissement du rapport visé à

eerste lid, 1°, stelt de Algemene Directie Energie alle informatie die nuttig is voor die analyse en waarover het beschikt, ter beschikking van de netbeheerder.

Uiterlijk op 15 december van elk jaar worden de in het eerste lid bedoelde verslagen voor advies bezorgd aan de commissie en aan de Algemene Directie Energie.

De Algemene Directie Energie en de commissie maken uiterlijk op 15 februari hun respectieve adviezen met betrekking tot deze verslagen over aan de minister.

Uiterlijk op 31 maart van elk jaar, op basis van de verslagen en de adviezen bedoeld in het eerste en het vierde lid, met het oog op het verzekeren van het vereiste niveau aan bevoorradingszekerheid zoals bepaald in paragraaf 3, na overleg in de Ministerraad, geeft de minister instructie aan de netbeheerder om de veilingen te organiseren voor de onderzochte perioden van capaciteitslevering, stelt de parameters vast die nodig zijn voor hun organisatie en bepaalt het minimaal te reserveren volume voor de veiling die één jaar voor de periode van capaciteitslevering georganiseerd wordt. Dit minimaal te reserveren volume is minstens gelijk aan de capaciteit die gemiddeld minder dan 200 draaiuren heeft per jaar teneinde de totale piekcapaciteit af te dekken, vermeerderd met de onzekerheidsmarge vervat in de initiële volumeberekening uitgevoerd door de netbeheerder in het verslag bedoeld in het eerste lid, 1°.

l'alinéa 1er, 1°, la Direction générale de l'Énergie met à disposition du gestionnaire du réseau toute information utile pour cette analyse et dont elle dispose.

Au plus tard le 15 décembre de chaque année, les rapports visés à l'alinéa 1er sont transmis pour avis à la commission et à la Direction générale de l'Energie.

La Direction générale de l'Énergie et la commission transmettent leurs avis respectifs relatifs à ces rapports au ministre au plus tard le 15 février.

Au plus tard le 31 mars de chaque année, sur la base des rapports et des avis visés aux alinéas 1er et 4, afin d'assurer le niveau de sécurité d'approvisionnement requis conformément au paragraphe 3, après concertation en Conseil des ministres, le ministre donne instruction au gestionnaire du réseau d'organiser les mises aux enchères pour les périodes de fourniture de capacité considérées, fixe les paramètres nécessaires à leur organisation et détermine le volume minimal à réserver pour la mise aux enchères organisée un an avant la période de fourniture de capacité. Ce volume minimal à réserver est au moins égal à la capacité nécessaire, en moyenne, pour couvrir la capacité de pointe totale pendant moins de 200 heures de fonctionnement par an, augmentée de la marge d'incertitude prévue dans le calcul du volume initial effectué par le gestionnaire du réseau dans le rapport visé au 1° de l'alinéa 1er.

~~Ch.2,~~ Art ~~6~~7undecies, §3

Het te bereiken niveau van bevoorradingszekerheid dat wordt vooropgesteld voor het capaciteitsvergoedingsmechanisme, komt overeen met de vraagcurve, die gekalibreerd wordt met als referentie:

1° desgevallend, de geharmoniseerde normen vastgesteld door de in deze aangelegenheid bevoegde Europese instellingen;

2° bij het ontbreken van geharmoniseerde normen op Europees niveau, desgevallend de geharmoniseerde normen vastgesteld op regionaal niveau, inzonderheid op het niveau van de Centraal-West-Europese elektriciteitsmarkt;

3° bij het ontbreken van zulke normen, een berekening van een LOLE van minder dan 3 uur en van een LOLE95 van minder dan 20 uur.

Le niveau de sécurité d'approvisionnement à atteindre visé par le mécanisme de rémunération de capacité correspond à la courbe de demande calibrée avec comme référence:

1° le cas échéant, des normes harmonisées établies par les institutions européennes compétentes en la matière;

2° en l'absence de normes harmonisées au niveau européen, les normes harmonisées fixées le cas échéant au niveau régional, en particulier au niveau du marché de l'électricité du Centre Ouest de l'Europe;

3° en l'absence de telles normes, un calcul de LOLE inférieur à 3 heures et de LOLE95 inférieur à 20 heures.

~~**Disclaimer:**~~

~~The above-mentioned legal framework is subject to evolution, in particular to align it with the European 'Clean Energy Package-legislation'. This could impact the process of the determination of the reliability standard for Belgium and the competences in the volume determination process. This design note already anticipates the possible future changes, to the best of knowledge of Elia, following discussion in a working group consisting of representatives of CREG, FPS Economy and Elia.~~

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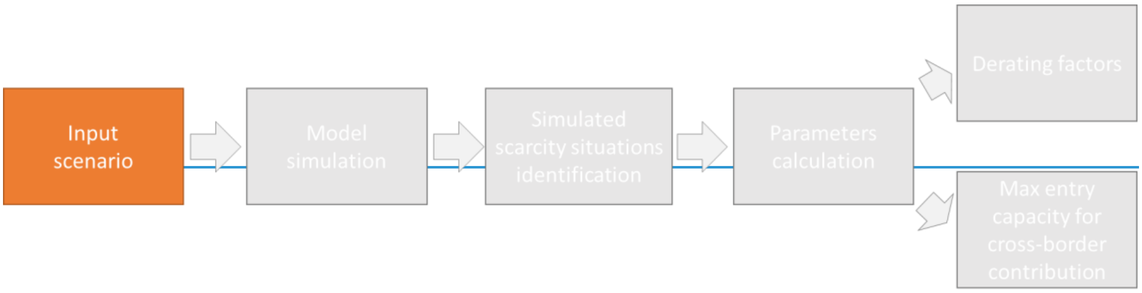
1 Input scenario



The derating factors shall always be calculated based on a given input scenario. To develop a coherent scenario, some information must be provided regarding on the one hand the national consumption and on the other hand the different capacity sources and their characteristics (volume, energy limitations…). These data should be available for Belgium but also for at least the electrically directly connected market zones included in the simulation perimeter. Moreover, the interconnection capacity between the different considered market zones must also be determined.

An example of input scenario to calculate the derating factors for Belgium could ~~be~~come from the latest ~~available 'central scenario'~~published study from the European Resource Adequacy Assessment (ERAA) defined at ENTSO-E level.

The input parameters that are required to determine derating factors are [I]:

- The consumption (growth) and hourly normalized consumption profiles;
- The installed capacity of thermal generation facilities with their associated availability parameters for per-unit modeled generators and hourly generation profiles for distributed thermal capacities;
- The installed solar, wind and hydroelectric capacity;
- The installed storage facilities with their associated efficiency and reservoir constraints;
- The installed demand flexibility/market response capacity with their associated energy or activation limits;
- The interconnection capacity between market zones (e.g. 'flow-based' domains, 'NTC' capacities).

A public consultation is foreseen regarding input data, as referenced in Article 7undecies, §2, 1° of the CRM Law. This public consultation will last at least one month and will involve FPS Economy, CREG and all relevant stakeholders. This public consultation will include at least[7]:

- The parameters of the Belgian market zone:

[7] The public consultation will be performed in order to provide as much transparency as possible as long as the data do not come from a confidential source.

  - Yearly consumption growth & normalized profile (as in SR);
  - Installed capacity in generation facilities, storage and market response;
  - Interconnection parameters (flow-based and NTC);
  - Technical parameters (efficiency, reservoir level, …);
  - Fuel prices, CO_2 prices, …;
- Any relevant update from the ERAA ‘central’ scenario for other market zones (given the time between data collection and publication of the report);
- The preselected capacity types needed to make the scenario adequate.

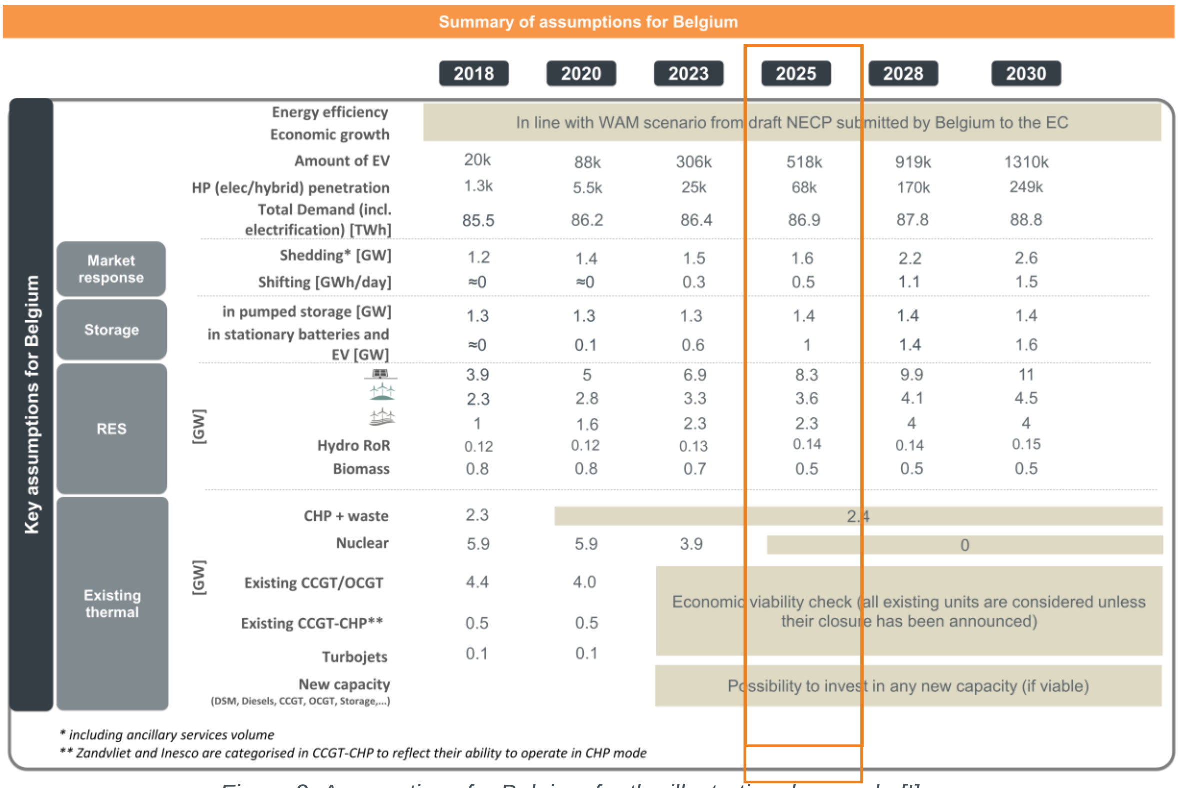
To correctly calibrate the derating factors and given that the CRM is designed to procure the needed capacity to be adequate, the input scenario has to be made adequate following the ~~adequacy~~ criteria defined for Belgium (cf. section on model simulation). It means that the defined ~~reliability standard has to be respected~~security of supply criteria, as referenced in Article 7undecies, §3 of the CRM Law, has to be respected.

Example: Case study from the Adequacy & Flexibility study [I]

Throughout this note, an example is used to illustrate the different concepts and the process to be followed when calculating derating factors.

For this example a scenario is used from the latest 10 year Adequacy & Flexibility study [I]. The input scenario used is the 'CENTRAL/EU-BASE' scenario for 2025, which also takes into account the 'flow-based' model implemented for CWE countries (including the CEP min 70% rule) and the adequacy patch.

The main assumptions for Belgium of this example scenario are summarized on Figure 2.



Summary of assumptions for Belgium

Key assumptions for Belgium		2018	2020	2023	2025	2028	2030
	Energy efficiency Economic growth	In line with WAM scenario from draft NECP submitted by Belgium to the EC					
	Amount of EV	20k	88k	306k	518k	919k	1310k
	HP (elec/hybrid) penetration	1.3k	5.5k	25k	68k	170k	249k
	Total Demand (incl. electrification) [TWh]	85.5	86.2	86.4	86.9	87.8	88.8
Market response	Shedding* [GW]	1.2	1.4	1.5	1.6	2.2	2.6
Market response	Shifting [GWh/day]	≈0	≈0	0.3	0.5	1.1	1.5
Storage	in pumped storage [GW]	1.3	1.3	1.3	1.4	1.4	1.4
Storage	in stationary batteries and EV [GW]	≈0	0.1	0.6	1	1.4	1.6
RES [GW]		3.9	5	6.9	8.3	9.9	11
RES [GW]		2.3	2.8	3.3	3.6	4.1	4.5
RES [GW]		1	1.6	2.3	2.3	4	4
RES [GW]	Hydro RoR	0.12	0.12	0.13	0.14	0.14	0.15
RES [GW]	Biomass	0.8	0.8	0.7	0.5	0.5	0.5
Existing thermal [GW]	CHP + waste	2.3	2.4				
Existing thermal [GW]	Nuclear	5.9	5.9	3.9	0		
Existing thermal [GW]	Existing CCGT/OCGT	4.4	4.0	Economic viability check (all existing units are considered unless their closure has been announced)			
Existing thermal [GW]	Existing CCGT-CHP**	0.5	0.5				
Existing thermal [GW]	Turbojets	0.1	0.1				
Existing thermal [GW]	New capacity (DSM, Diesels, CCGT, OCGT, Storage,...)			Possibility to invest in any new capacity (if viable)			

** including ancillary services volume*
*** Zandvliet and Inesco are categorised in CCGT-CHP to reflect their ability to operate in CHP mode*

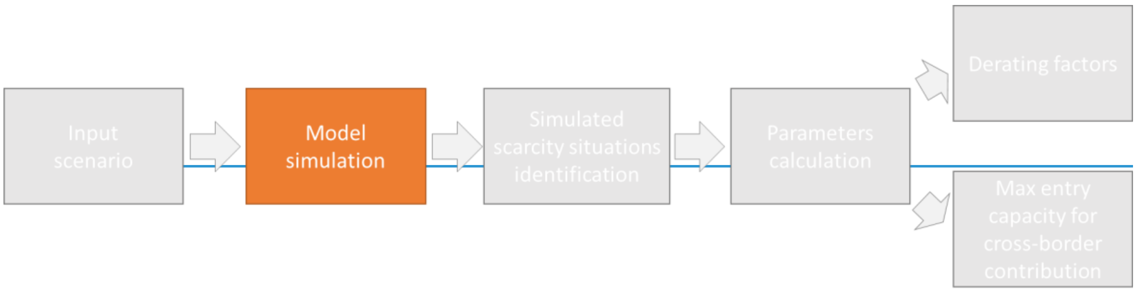
Figure 2: Assumptions for Belgium for the illustrational example [I]

References in the Royal Decree Methodology proposal

Art. 3. § 1er. Le gestionnaire du réseau établit les rapports visés à l'article 7undecies, § 2 de la loi du 29 avril 1999 sur la base d'un scénario de référence.	**Art. 3.** § 1. De netbeheerder bepaalt de verslagen bedoeld in artikel 7undecies, § 2, van de wet van 29 april 1999 op basis van een referentiescenario.
Art. 4. § 1er. Le scénario de référence est composé des paramètres relatifs à la consommation d'électricité, à la production d'électricité, au stockage, à la participation active de la demande et à la capacité d'interconnexion pour au minimum la zone de réglage belge et les zones de réglage qui lui sont directement reliées électriquement.	**Art. 4.** § 1. Het referentiescenario bestaat uit parameters met betrekking tot het elektriciteitsverbruik, de elektriciteitsproductie, de opslag, de actieve deelname van de vraagzijde en de interconnectiecapaciteit voor ten minste de Belgische regelzone en de regelzones die er rechtstreeks elektrisch mee verbonden zijn.
Art. 4. § 5. Le gestionnaire du réseau s'assure que le scénario (…) réponde aux critères de sécurité d'approvisionnement requis conformément à l'article 7undecies, § 3 de la loi du 29 avril 1999 en ajoutant de la capacité supplémentaire à la zone de réglage belge : 1° provenant de types de capacité présélectionnés proposés par le gestionnaire de réseau dans la consultation publique visée à l'article 5 et déterminé sur base de celle-ci ; 2° de manière itérative sur base d'une boucle d'optimisation économique dont l'incrément est de 100 MW.	§ 5. De netbeheerder verzekert zich ervan dat het scenario (…) beantwoordt aan de criteria voor de bevoorradingszekerheid die worden geëist door artikel 7undecies, § 3, van de wet van 29 april 1999 door aan de Belgische regelzone bijkomende capaciteit toe te voegen: 1° afkomstig van voorgeselecteerde types van capaciteit die voorgesteld worden door de netbeheerder ter openbare raadpleging bedoeld in artikel 5 en op basis daarvan bepaald worden; 2° op een iteratieve manier op basis van een economische optimalisatielus in incrementele stappen van 100 MW.
Art. 5. § 1er. La consultation publique sur les hypothèses de base est organisée par le gestionnaire du réseau conformément à l'article 7undecies, § 2, alinéa 1er de la loi du 29 avril 1999 durant une période de minimum un mois. Le gestionnaire du réseau informe notamment la Direction générale de l'Energie, la Commission et les acteurs de marché de la tenue de cette consultation.	**Art. 5.** § 1. De openbare raadpleging over de basishypothesen wordt door de netbeheerder georganiseerd in overeenstemming met artikel 7undecies, § 2, lid 1, van de wet van 29 april 1999 gedurende een periode van ten minste één maand. De netbeheerder informeert met name de Algemene Directie Energie, de Commissie en de marktdeelnemers over het houden van deze raapleging.

§ 2. La consultation publique porte au moins sur : 1° les paramètres visés à l'article 4, § 1er pour la zone de réglage belge ainsi que sur les adaptations de ces paramètres (...) pour les autres zones de réglage simulées ; (...) 3° le type de capacité supplémentaire visé à l'article 4, § 5, 1° (...).	§ 2. De openbare raadpleging heeft ten minste betrekking op: 1° de parameters bedoeld in artikel 4, § 1 voor de Belgische regelzone en de aanpassingen van deze parameters (...) voor de andere gesimuleerde regelzones; (...) 3° het type bijkomende capaciteit bedoeld in artikel 4, § 5, 1° (...).

2 Model simulation



Once the input scenario has been defined, a 'Monte-Carlo' simulation is performed with a unit commitment tool for the given year. The purpose of this tool is to optimally dispatch the different technologies on the market to meet the hourly consumption for each considered market zone. The simulation methodology that will be applied shall be in line with the relevant sections of the 'European Resource Adequacy Assessment' methodology, as referenced in Article 23 of the EU Regulation 2019/943 of the European Parliament and of the council of 5 June 2019 on the internal market for electricity, provided that such an approved methodology exists at the time of performing the calculations. The simulation shall apply the requirements described in this methodology, insofar they are implemented in the most recently published ENTSO-E ERAA report at the time of performing the calculations on derating factors. For the latter, the most recently published 'ENTSO-E Mid-Term Adequacy Forecast' report at the time of performing the calculations on derating factors is used as a benchmark.

A 'Monte-Carlo' method is used to perform simulation of the electricity market. This requires the construction of a large number of future states (called 'Monte-Carlo' years~~).~~, see Figure 3). The different variables which are needed to perform the simulations can be subdivided into two categories: weather variables and the availability of generation or interconnection facilities (more information can be found in Annex 1: Correlation of climatic conditions).

First, periodic values for wind energy generation, solar generation, hydro inflows and temperature-dependent electricity consumption are mutually correlated. These climatic variables are modelled on the basis of a representative number of historical years. The forecasts of installed capacity for each simulated market zone are combined with this historical data to obtain production time series for onshore wind, offshore wind, photovoltaic production and hydroelectric 'run-of-river' production. The temperatures of the historical years have an impact on the electricity consumption.

Second, parameters related to the availability of thermal generation or HDVC links (in a non-meshed grid) are assumed to be independent from climatic data and therefore not correlated to the others. Thermal generation can be subdivided in two categories. On the one hand, large thermal generation units, independent of their generation types, are modelled individually, with their specific technical characteristics. Their individual availability is determined by a probabilistic draw for each 'Monte Carlo' year based on historical availability rates. This way, a sequence of availabilities can be drawn for each unit to be used in the simulations. On the other hand, small thermal generation units are modelled in an aggregated way by using a fixed generation profile based on historical metering data. The availability of these smaller units is directly taken into account in the generation profile, and is therefore the same for all 'Monte Carlo' years.

The generation output of climate independent technologies is optimized by the simulator. This category also contains flexible technologies such as storage or market response. Storage capacity is economically optimized, storing electricity in some form when prices are low and releasing electricity when those are higher. Market response is also introduced in the model with a certain number of constraints. The model optimizes their dispatch, taking their specific characteristics and limitations into account.

The above variables are combined into a number of 'Monte-Carlo' years so that the correlation between the various renewable energy sources (wind, solar, hydroelectric) and the temperature remains intact. Both geographical and time correlations are present. Consequently, the climatic data relating to a given variable for a specific year shall always be combined with data from the same climatic year for all other variables, with this applying to all market zones involved. In contrast, for power plant and HVDC link availability, random samples are taken by the model, by considering the parameters of probability and length of unavailability (in accordance with the 'Monte Carlo' method). Availability thus differs for each future state. Since each 'Monte Carlo' year carries the same weight in the assessment, the different availability samples have equal probability of occurrence.

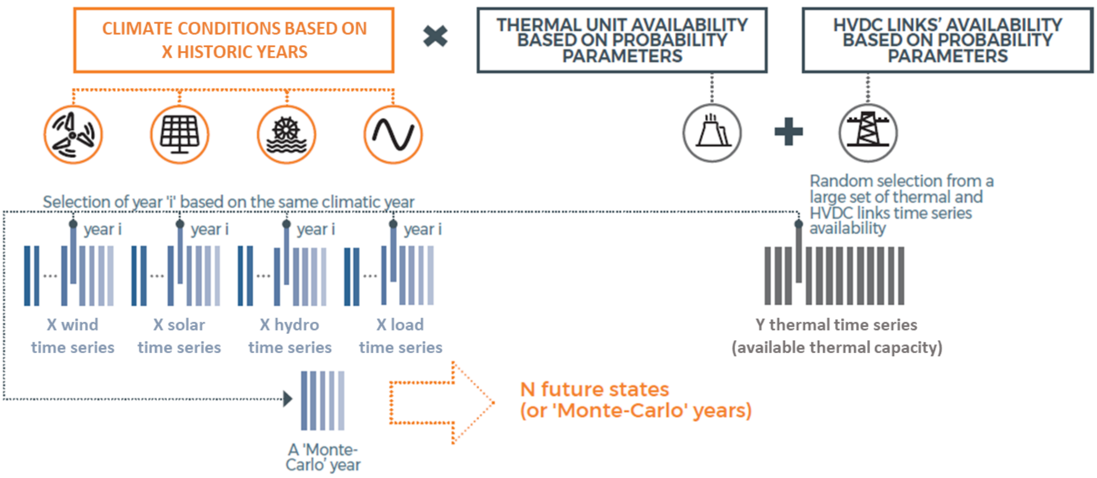


Figure 3: Generation of a 'Monte-Carlo' year

Based on the defined inputs and parameters, the optimization problems are solved with an hourly time step and a weekly timeframe, making the assumption of perfect information at this weekly time horizon but assuming that the evolution of load and RES is not known beyond this weekly horizon. Fifty-two weekly optimization problems are therefore solved in a row for each 'Monte-Carlo' year. The simulation ends when it reaches a convergence criterion by combining the results of all these future states.

The optimal dispatch, minimizing overall ENS, is based on market bids reflecting the marginal costs of each unit (be it generation, storage or demand/market response)

[€/MWh]. When this optimum is found, the following output can be analysed in order to derive the derating factors and cross-border contribution:

- Hourly dispatch by technology (generation, storage or demand/market response);
- Hourly net position for all market zones within the ‘flow-based’ zone (only Belgium and electrically directly connected market zones data will be used);
- Hourly cross-border exchanges on links modelled with ‘net transfer capacities’ (links between market zones inside the ‘flow-based’ zone and outside of this zone).

Following the simulations, the output data provided by the model enables a large range of indicators to be determined. In the framework of this design note, the main parameters of interest will be dispatch indicators:

- market exchanges between market zones;
- generated energy per fuel/technology.

Figure 4 summarizes the global process.

Input and output data for the model

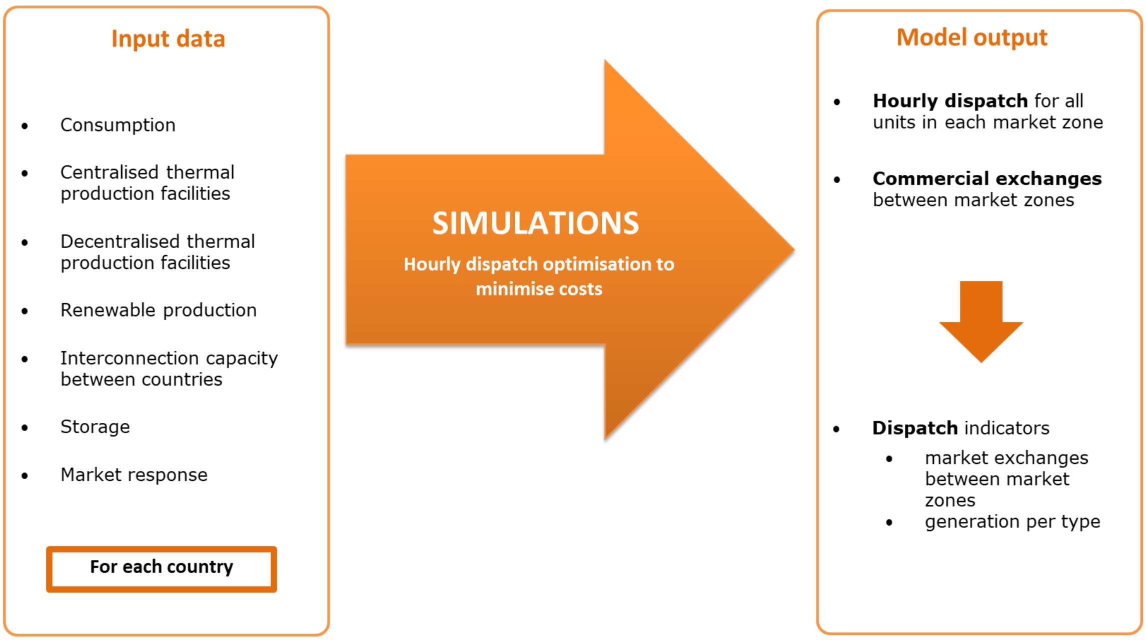


Figure 4: Hourly electricity market model [I]

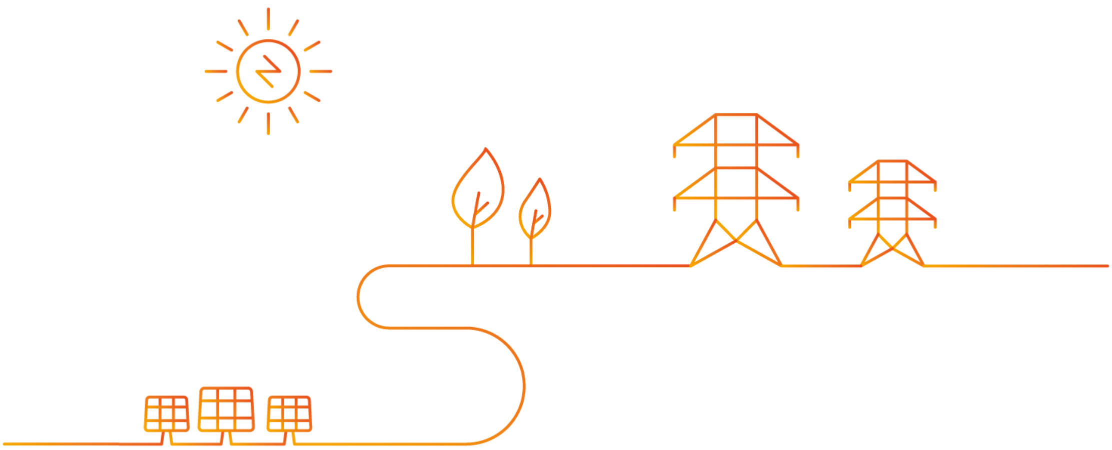
The hourly generated energy per technology and the hourly imports/exports are furthermore required to calculate the derating factors and the maximum entry capacity for cross-border participation for each border.

As mentioned before, the applicable adequacy criteria of Article 7undecies, §3 of the CRM Law needs to respected. If the input scenario already complies with the criterion, then it is assumed to be adequate and the analysis can continue. In contrast, if the criterion is not reached, ~~a virtual~~ capacity ~~(100% available~~has to be added. The needed gap will be filled in an iterative way, based on an economic loop adding new capacity~~)~~ ~~will be added, or vice-versa, if~~ by steps of 100MW from pre-selected types. These preselected types will be proposed by the TSO and submitted to public consultation. If the scenario is ‘over-adequate’, a volume of assumed new capacity will be removed to the point where any additional removal would lead to a non-compliance with the criteria.

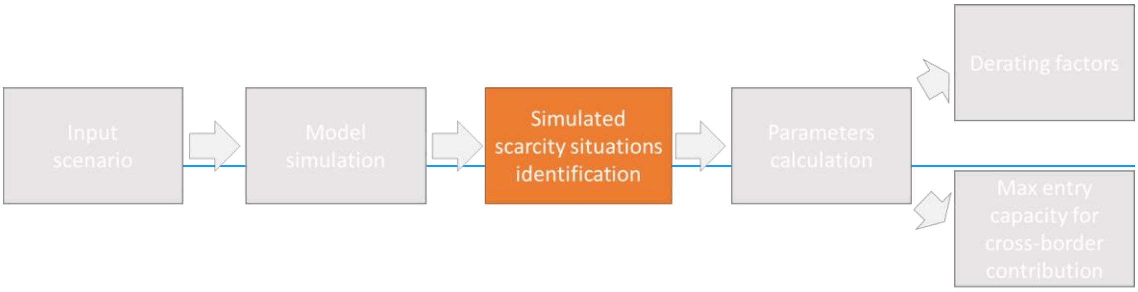
References in the Royal Decree Methodology proposal

Art. 4. § 5. Le gestionnaire du réseau s'assure que le scénario (...) réponde aux critères de sécurité d'approvisionnement requis conformément à l'article 7undecies, § 3 de la loi du 29 avril 1999 en ajoutant de la capacité supplémentaire à la zone de réglage belge : 1° provenant de types de capacité présélectionnés proposés par le gestionnaire de réseau dans la consultation publique visée à l'article 5 et déterminé sur base de celle-ci ; 2° de manière itérative sur base d'une boucle d'optimisation économique dont l'incrément est de 100 MW.	**Art 4.** § 5. De netbeheerder verzekert zich ervan dat het scenario (...) beantwoordt aan de criteria voor de bevoorradingszekerheid die worden geëist door artikel 7undecies, § 3, van de wet van 29 april 1999 door aan de Belgische regelzone bijkomende capaciteit toe te voegen: 1° afkomstig van voorgeselecteerde types van capaciteit die voorgesteld worden door de netbeheerder ter openbare raadpleging bedoeld in artikel 5 en op basis daarvan bepaald worden; 2° op een iteratieve manier op basis van een economische optimalisatielus in incrementele stappen van 100 MW.
Art. 6. § 1er. Le gestionnaire du réseau réalise une simulation du marché de l'électricité, afin de déterminer les paramètres visés à l'article 4 (...) ainsi que l'ajout de la capacité supplémentaire, visé à l'article 4, §5. § 2. La simulation se base sur les sections pertinentes de la méthodologie d'évaluation de l'adéquation des ressources européennes référencée à l'article 23 du Règlement (UE) 2019/943, sous réserve que cette méthodologie ait été adoptée au moment de la simulation. § 3. La simulation applique les exigences décrites dans la méthodologie visée au §2, dans la mesure où elles sont implémentées dans le rapport d'évaluation de l'adéquation des ressources européennes le plus récent publié par REGRT au moment de réaliser le calcul des facteurs de réduction.	**Art. 6.** § 1. De netbeheerder voert een simulatie van de elektriciteitsmarkt uit om de paramaters te bepalen bedoeld in artikel 4 (...) evenals de toevoeging van bijkomende capaciteit bedoeld in artikel 4, § 5. § 2. De simulatie is gebaseerd op de relevante delen van de methodologie voor de Europese beoordeling van de toereikendheid van de elektriciteitsvoorziening bedoeld in artikel 23 van Verordening (EU) 2019/943, op voorwaarde dat deze methodologie op het ogenblik van de simulatie werd aangenomen. § 3. De simulatie past de eisen toe die worden beschreven in de methodologie bedoeld in § 2, voor zover ze geïmplementeerd zijn in het meest recente verslag van de Europese beoordeling van de toereikendheid van de elektriciteitsvoorziening, zoals gepubliceerd door ENTSB op het ogenblik van de berekening van de reductiefactoren.

§ 4. La simulation fournit la répartition horaire de la production par technologie ainsi que la position nette de la zone de réglage belge et, a minima, de l’ensemble des zones de réglage qui lui sont directement reliées électriquement.	§ 4. De simulatie geeft de verdeling per uur weer van de productie per technologie evenals de netto positie van de Belgische regelzone en, ten minste, van het geheel van de regelzones die rechtstreeks elektrisch met de Belgische regelzone verbonden zijn.



3 Identification of ~~near-~~simulated scarcity ~~hours~~situations



The purpose of this step is to select from the simulation output the critical hours for the Belgian adequacy. These hours correspond to situations where the sum of the available capacity on the market and the imports from electrically directly connected market zones is insufficient to meet the domestic consumption or close to the limit.

In the remainder of this note, the term '~~near-~~simulated scarcity ~~hours'~~situations' refers to both those hours from the simulation output with ENS (scarcity) and those hours that are close to a situation of scarcity (near-scarcity). Near-scarcity refers to situations where any additional increase of the load will lead to energy not served. Figure 5 illustrates this concept.

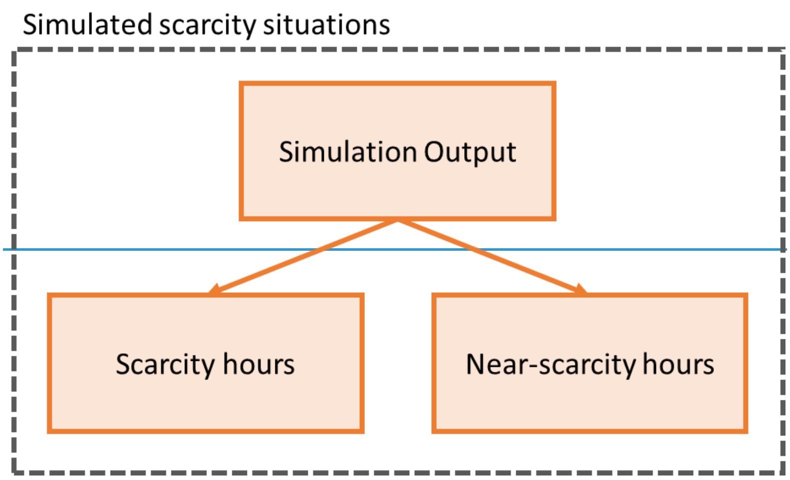


Figure 5: Simulated scarcity situations concept

3.1 Choice of a criterion

The criterion used for the determination of the ~~near-~~simulated scarcity ~~hours~~situations is a situation ~~where~~from the simulation output in which there is simulated ENS or in which any additional load in Belgium would not be served and would therefore lead to ENS. This criterion leads to an identification of hours where a scarcity situation with ENS exists, as well as hours with a ~~near-~~simulated scarcity situation where no margin is left.

3.2 Justification

The consideration of ~~near-~~simulated scarcity ~~hours~~situations while calculating the derating factors is deemed necessary as relying only on the hours with ENS would not take into account situations where the system is close to its limits. As these situations are also critical for the adequacy of Belgium, the contribution of each technology to system adequacy should also account for such ~~near-~~simulated scarcity ~~hours~~situations.

Basing the criterion on a given threshold (in [€]) for the marginal price introduces the difficulty of fixing this threshold value. It is very difficult to objectively select such a threshold, also given that simulated prices will depend on assumptions taken in the scenario regarding generation mix in Belgium and abroad, economic parameters, etc.

Therefore, an approach is proposed where the identification of ~~near-~~simulated scarcity situations is based on the appearance of ENS when for the given hour any additional consumption would be introduced in Belgium. This approach does not require setting a specific threshold value on simulated prices while allowing to capture the critical time periods from different 'Monte-Carlo' years.

Example: Near-scarcity hours for derating factors calculation

In order to illustrate the importance of near-scarcity hours from the simulation output in the simulated scarcity situations in order to determine the derating factors, let's take an example.

Assumptions:

- situation with 6h and 600MW of unsupplied load
- 1 remaining DSM CMU available with the following technical constraints:
  - 600MW of capacity
  - 2 consecutive hours of availability
  - 1 activation/day

This last CMU will be used to fill the remaining gap but it won't be enough to cover all the unsupplied load (see Figure 6).

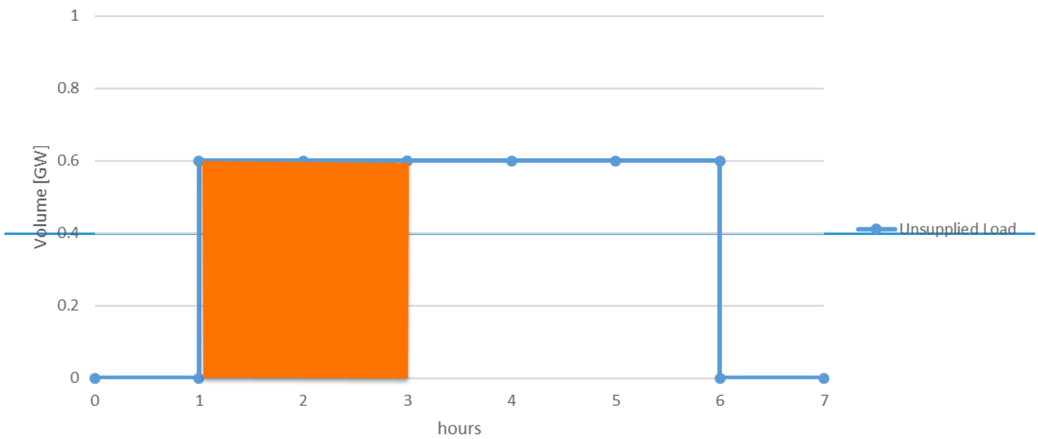


Figure 6: Example of the near-scarcity hours' importance (Part 1)

There are two ways to determine the derating factor of the DSM CMU. The first one is based only on the scarcity hours and the second one is based on the simulated scarcity situations as defined in this chapter.

If only the scarcity hours are considered, then the derating factor of the DSM CMU will be equal to 0% as its contribution during scarcity hours is equal to 0. If the definition of simulated scarcity situations including both scarcity and near-scarcity hours is considered, then the derating factor of the DSM CMU will be equal to 40%. This value is more in line with the real contribution of the CMU as it avoids having more scarcity hours. This is illustrated on Figure 7.

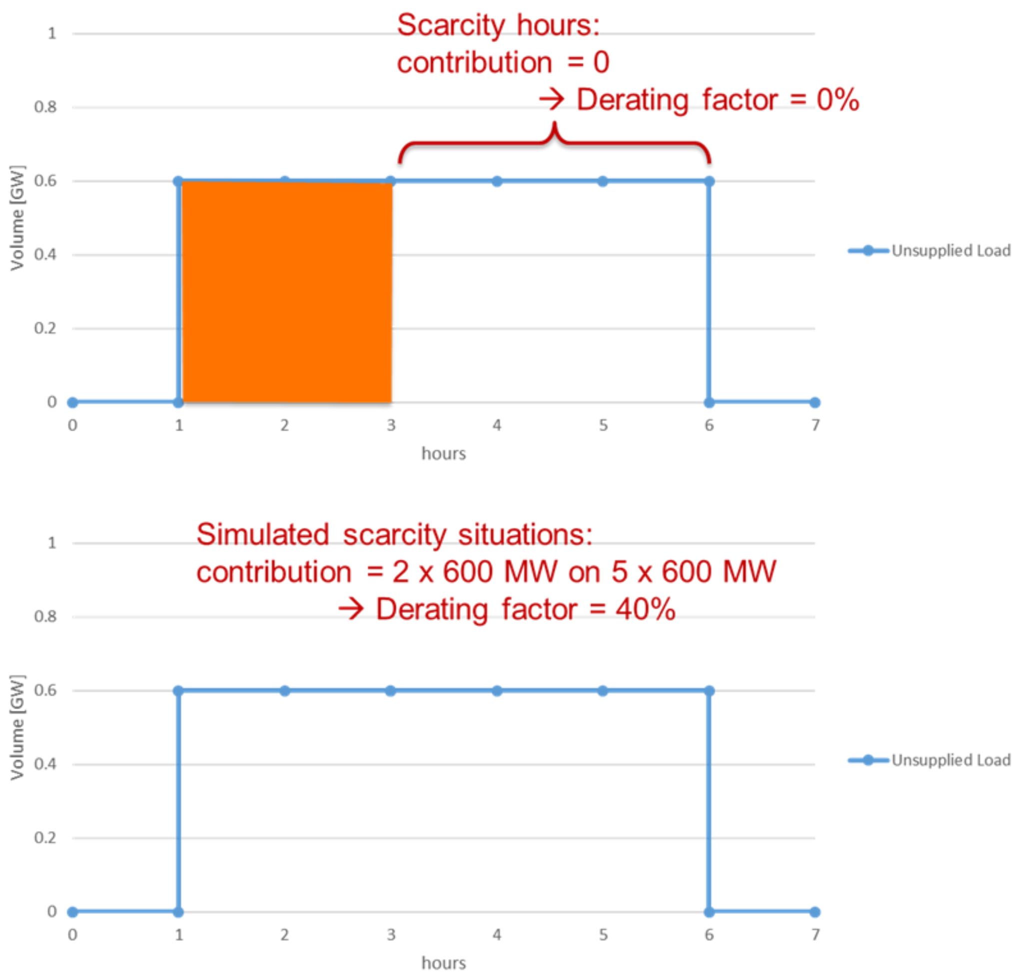
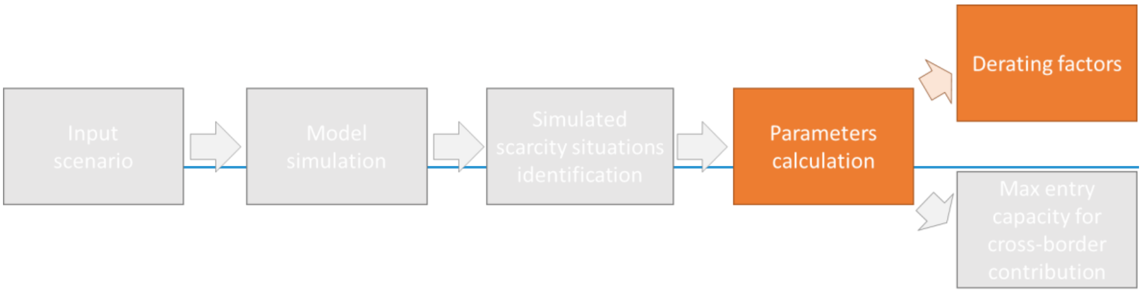


Figure 7: Example of the near-scarcity hours' importance (Part 2)

References in the Royal Decree Methodology proposal

Art. 2. 18° « situation de pénurie simulée » : Une situation, basé sur une simulation, durant laquelle la charge ne pourra pas être couverte ou durant laquelle la charge ne pourrait pas être couverte en cas de charge additionnelle de 1MW, par l'ensemble des moyens de production à disposition du réseau électrique belge, tenant compte des possibilités d'importation et de l'énergie disponible sur le marché.	**Art 2.** 18° "gesimuleerde tekortsituatie": een situatie, gebaseerd op een simulatie, waarin de lading niet kan worden gedekt of waarbij de lading niet zou kunnen worden gedekt in geval van een bijkomende lading van 1MW, door het geheel van de productiemiddelen ter beschikking van het Belgische elektriciteitsnet, rekening houdend met de invoermogelijkheden en de energie beschikbaar op de markt.

4 Calculation of derating factors



The purpose of derating factors is to evaluate the contribution of different technologies (generation/demand flexibility/storage facilities) to the Belgian adequacy for a particular input scenario. In the framework of the CRM, this contribution is evaluated in situations where Belgium is facing ~~near-~~simulated scarcity situations, as defined in §~~3~~3. In such situations, the total generation combined with imports are insufficient to cover either the actual load (scarcity) or any additional load (near-scarcity).

The derating factors are technology specific and expressed as the percentage of the nominal reference power that contributes to adequacy. It represents the fact that technologies are not assumed to be available to generate 100% of the time at 100% of their nominal reference power during ~~near-~~simulated scarcity ~~hours~~situations, due to breakdowns, maintenance cycles, economical constraints, technical constraints or weather conditions. In order to determine the contribution to adequacy of each ~~unit~~CMU, the capacity within each technology category is derated. The multiplication of the reference power of the CMU and the associated derating factor is defined as the eligible volume[8], i.e. the maximum capacity that could take part in the auction.

In the framework of the CRM, ~~4~~5 main categories of contribution to adequacy are considered (Figure 8). The different technologies taken into account for the derating factors are divided into these ~~4~~5 categories. They are based on the currently available technologies and could evolve in the future. The maximum entry capacity for cross-border participation for each border forms a particular case since their contribution is expressed in [MW] rather than in [%]. Cross-border ~~contribution~~participation is therefore not represented in this figure and is presented in chapter 5.

[8] To be noted that a CRM Candidate also can opt-out for part of its Nominal Reference Power (i.e. the Opt-Out Volume which will not be offered in the Auction). In this case, the Eligible Volume equals the Reference Power (= Nominal Reference Power – Opt-Out Volume) multiplied by the Derating Factor.

Figure 8: Derating factors categories

4.1 Thermal ~~TSO-connected~~with daily schedule technologies

Thermal with daily schedule technologies | Energy constrained with daily schedule technologies | Weather dependent technologies | Thermal DSO- or CDS-connected technologies | SLA Service Level Agreement

4.1.1 Concept

The first category takes into consideration thermal technologies with daily schedule that contribute to adequacy independently from the weather conditions and without energy limitations. ~~In~~A daily schedule is defined as the ~~framework~~program of ~~the CRM, this category mostly refers~~production of a CMU, given on a quarter-hourly basis, provided to ~~thermal units.~~

~~Thermal units consist~~ELIA in ~~fossil fuel generation including TSO-connected combined heat~~day-ahead and ~~power (CHP), biomass and waste units, CCGT and OCGT. Turbojets, gas engines~~updated in accordance with the rules of the CIPU Contract[9] or ~~diesel generators~~any similar program of production for cross-border capacities in accordance with their local rules. This category only takes into account thermal CMUs with daily schedule, regardless of whether these CMUs are ~~also considered~~connected to the TSO or DSO/CDS network. Every thermal with daily schedule CMU is then obligated to choose the appropriate derating factor for its technology in this category.

Thermal with daily schedule technologies are individually modelled and can be dispatched at their maximum power during simulated scarcity situations unless they are in forced outage. These forced outages are assumed to be independent from the climatic conditions. Moreover, it is assumed that no planned outages occur during the winter period. Therefore, in a probabilistic approach with a large number of Monte-Carlo years simulated, the average contribution during simulated scarcity situations will be equal to the availability rate (forced outage) of those technologies.

Thermal with daily schedule technologies are individually modelled and can be dispatched at their maximum power during simulated scarcity situations unless they are in outage. The main parameters impacting these ~~units~~CMUs are thus their planned and unplanned unavailabilities (Figure 9). On the one hand, for planned outages, it is assumed that no maintenance is applied during winter months (or more specifically when ~~near-~~simulated scarcity situations occur). Therefore, planned outages will have no impact on the derating factors since no planned outage are assumed during ~~near-~~

[9] Or any other regulated contract(s) that will replace the CIPU Contract, in accordance with the dispositions in article 377 of the Federal Grid Code.

simulated scarcity periods[10]. On the other hand, forced outage events are, within the probabilistic approach, assumed independent from the specific climate conditions occurring within the set of ~~near-~~simulated scarcity ~~hours~~situations identified.

Regarding, the age of the CMUs, the methodology could be updated in the future if a relevant correlation can be demonstrated between the age of a unit and its forced outage rate. In this framework, Elia refers to the study (F)1958 of the CREG[11]. On §2.2, pp.13-17, it can be noted that:

- decreased availability can be observed for older units, mainly linked to planned unavailabilities
- no increased forced outage rate can clearly be detected for CCGTs

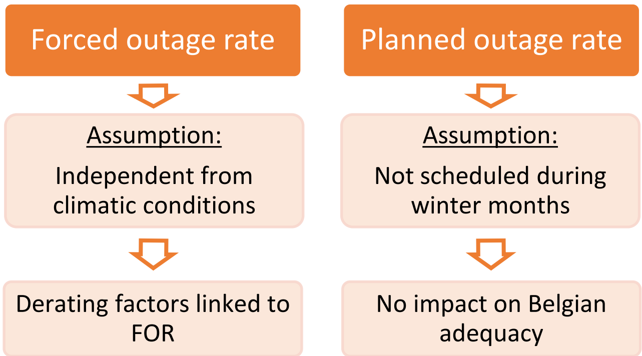


Figure 9: Thermal ~~units~~'CMUs' parameters

For the thermal ~~generation~~with daily schedule technologies, the assumed yearly average forced-outage rates (FORs) are provided as input to the model (combined with an average duration of such FORs). Given their independence from climatic variables and that these technologies are not constrained by activation limitations, the probabilistic model-based approach (with a large number of Monte-Carlo years simulated) will lead to the result that the average contribution of each ~~thermal~~ technology during the ~~near-~~simulated scarcity ~~hours~~situations is equal to its ~~reference power reduced by the given FOR percentage.~~availability rate (100% - forced outage rate [%]). The associated derating factors of these technologies can therefore simple be inferred from the input parameters provided to the model (i.e. historical FO data).

The thermal derating factors are thus computed from forced outage rates through the following formula:

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[10] Regarding the questions raised during the public consultation, the assumption of planned outage during the winter period will be further analyzed in the future based on the available documentation. The methodology could then be updated if necessary.

[11] "Study on the functioning and price evolution of the Belgian wholesale electricity market – monitoring report 2018", https://www.creg.be/sites/default/files/assets/Publications/Studies/F1958EN.pdf

$$\cancel{\text{DRF [\%]} = \frac{\text{Average contribution during near} - \text{scarcity hours [MW]}}{\text{Reference power [MW]}}}$$

$$\text{DRF [\%]} = \frac{\text{Average contribution during simulated scarcity situations [MW]}}{\text{Nominal reference power [MW]}}$$

which is equivalent to:

[1] DRF [%] = 100 [%] - Forced Outage Rate [%]

4.1.2 Categories

This methodology is applied for the technologies for which the historical FO data are sufficient, trustworthy and assumed independent from the weather/seasonal conditions.

In the framework of the CRM, it will therefore be applied for the technologies defined on Figure 10~~.~~. Thermal with daily schedule CMUs consist in fossil fuel generation including CCGT, OCGT, turbojets, gas engines and stand-alone diesel generators. It also includes combined heat and power (CHP), biomass and waste CMUs. Moreover, technologies available in other countries but eligible to participate in the CRM are also considered. That is why nuclear and coal are also part of this category.

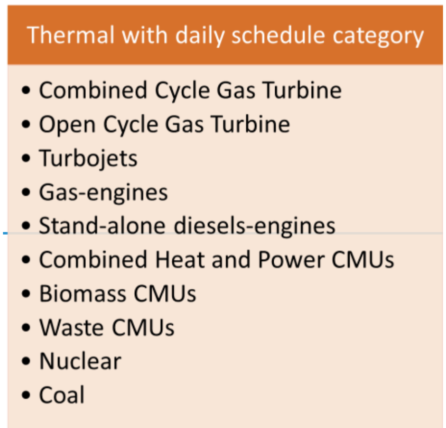


Figure 10: Thermal ~~TSO-connected categories~~with daily schedule technologies

Example: Derating factors for thermal ~~TSO-connected technologies~~with daily schedule category

As an illustration, the input data from the Adequacy and Flexibility report [I] can be used. The different forced outage rates are determined and formula [1] is applied. The results are presented in Table 1.

Technologies	Forced outage rate [%]	Derating factors [%]
CCGT	~~8,~~9	91~~,1~~
OCGT	12~~,3~~	~~87,7~~88

TJ	4~~,3~~	~~95,7~~96
TSO-connected CHP	6~~,4~~	~~93,6~~94
TSO-connected Biomass	6~~,4~~	~~93,6~~94
TSO-connected Waste	~~1,5~~2	98~~,5~~

Table 1: Example of historical-based derating factors

4.2 Energy constrained with daily schedule technologies

4.2.1 Concept

~~4.20.1~~ For energy constrained CMU with daily schedule~~Weather dependent technologies~~

~~4.2.10.1.1 Concept~~

~~For weather dependent~~ technologies, the derating factors are calculated after analysis of the results of the model-based approach ~~(Figure 7).~~ . For these technologies, the model optimizes their use so that they can maximally contribute to adequacy in simulated scarcity situations when the price is the highest (and as such lead to the lowest overall ENS). Energy constrained CMUs are cost-optimized so that the pumping/loading cost is lower than the turbining/unloading revenue. Therefore, the optimization considers that pumping/loading can be interesting because there is a possibility to turbine/unload later at a higher price.

Their contribution cannot be easily inferred from the input provided to the model. In this case, the contribution comes from the output of an associated 'Monte-Carlo' simulation including all technologies as input data. In the context of the CRM, the derating factors for these technologies are calculated on their contribution (from the simulation output) on ~~near-~~simulated scarcity ~~hours~~situations, as defined in §3.

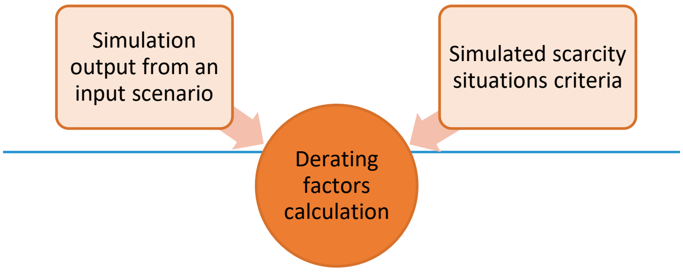


Figure 11: Derating factors calculation – required data

The derating factors are determined by dividing the average contribution of a particular technology during ~~near-~~simulated scarcity ~~hours~~situations by its nominal reference power.

The derating factors for ~~weather independent~~energy constrained with daily schedule technologies are computed through the following formula:

~~[2] DRF [%] = $\frac{\text{Average contribution during near–scarcity hours [MW]}}{\text{Reference power [MW]}}$~~

[2] $$\text{DRF [\%]} = \frac{\text{Average contribution during simulated scarcity situations [MW]}}{\text{Nominal reference power [MW]}}$$

4.2.2 Categories

In the framework of the CRM, this approach shall be applied for ~~the~~pumped storage plant (PSP) and large-scale batteries. These technologies ~~presented~~are part of the energy constrained category as their contribution depend on ~~Figure 8.~~their duration of activation.

For PSP, the duration of activation is linked to the size of the reservoir and to the turbining capacity. Its derating factor is limited by two main parameters:

- a round trip efficiency of around 75% (value for Coo power plant in Belgium);
- a forced outage rate in the same logic as for thermal CMUs.

For batteries, the duration of activation is linked to its capacity and its unloading power. Its derating factor is only limited by its round trip efficiency (around 90%).

4.3 Weather dependent technologies

4.3.1 Concept

~~4.3 Energy-limited technologies~~

~~4.3.10.1.1 Concept~~

~~For energy-limited~~For weather dependent technologies, the derating factors are calculated by applying the same approach as for weather dependent technologies. Their derating factors are determined by dividing the average contribution of a particular technology during ~~near-~~simulated scarcity ~~hours~~situations by its total nominal reference power [2].

4.3.2 Categories

In the framework of the CRM, this approach shall be applied for ~~categories defined on Figure 9.~~

~~Figure 9: Energy-limited~~the technologies ~~categories~~presented on Figure 12.

~~For flexible technologies (pumped-storage plants (PSP), market response, batteries or any other storage technology), the model optimizes their use so that they can maximally contribute to adequacy in near-scarcity hours when the price is the highest (and as such lead to the lowest overall ENS). Flexible sources are cost-optimized so that the pumping/loading cost is lower than the turbining/unloading revenue.~~ ~~*Therefore, the optimization considers that pumping/loading can be interesting because there is a possibility to turbine/unload later at a higher price.*~~

~~The contribution of market response and storage with high round trip efficiency (above 90%) subject to activation or reservoir constraints can be considered as equal as long as their availability duration is similar.~~

~~From the latest '10 year adequacy and flexibility study' performed by Elia [I], it can be shown that both a Market Response (MR) and a battery category with the same duration constraint have the same energy-constrained derating factor. Any aggregation of x% of MR and y% of battery (x% MR + y% battery) will qualify in principle under the same aggregation category.~~

~~A list of 'SLA categories' is therefore defined. Categories can be composed of any mix of MR (= DSR + generation +…), batteries or any other storage technology subject to~~

~~similar activation constraints. For each 'aggregation category' a given activation limit is defined (Table 2). The derating factors for 'aggregation categories' can be therefore presented as so-called different 'service level agreements' (SLAs) based on hourly activation constraints (as most constraining limits). Moreover, every aggregation category is assumed to be available once a day.~~

~~In order for the aggregator or individual demand/market response provider to select the SLA category that best fits its portfolio/profile, the choice of SLA is left open and left to the aggregator/individual demand/market response provider.~~

~~'SLA category'~~	~~Duration~~	~~Limits~~
~~SLA #1~~	~~1h~~	~~1 activation / day~~
~~SLA #2~~	~~2h~~	
~~SLA #3~~	~~3h~~	
~~SLA #4~~	~~4h~~	
~~SLA #5~~	~~8h~~	
~~SLA #6~~	~~No Limit~~	~~NA~~

~~Table 2: MR categories~~

~~The derating factors associated with each aggregation category is to be considered as a maximum threshold. Its value is associated with the contribution of the SLA category to the Belgian adequacy.~~

Weather-dependent technologies
• Onshore wind
• Offshore wind • Solar • Hydro Run-of-River

Figure 12: Weather dependent technologies categories

~~Furthermore, it is up to the aggregator to define the level of the reference power of each aggregated CMU, according to the principles set up in the prequalification and availability monitoring parts of the design.~~

~~Pumped-storage cannot be associated to a SLA category, even if both energy-limited technologies can be in principle activated with the same duration[12] because the derating factors are different. This is explained by two main parameters:~~

- ~~a pumping/turbining efficiency ratio of around 75% (value for Coo power plant in Belgium);~~
- ~~a forced outage rate in the same logic as for thermal units.~~

~~These parameters lead to the definition of a specific derating factor for pumped-storage units.~~

[12] ~~For PSP, the duration of activation is linked to the size of the reservoir and to the turbining capacity.~~

4.4 Thermal DSO- or CDS-connected technologies

Thermal with daily schedule technologies | Energy constrained with daily schedule technologies | Weather dependent technologies | Thermal DSO- or CDS-connected technologies | SLA Service Level Agreement

4.4.1 Concept

~~For DSO~~ The calculation of the derating factor of thermal CMUs without daily schedule and connected ~~units,~~ to the Distribution System Operator (DSO) network or to the Closed Distribution System (CDS) is also based on the output of the 'Monte-Carlo' simulation but is still slightly different because these CMUs usually have other constraints (heat, industrial process, etc.). Some of them might be driven by other signals than only electricity wholesale prices. It is therefore not feasible to model the exact behaviour of such CMUs.

Thermal DSO- or CDS-connected without daily schedule are therefore modelled through historical aggregated time-series. The historical time-series take into account historical outages, climatic conditions or industrial processes and are therefore representative of the real contribution of these technologies. These available historical metering datasets are used as input in the simulation. ~~Due to a lack of information[13], it is not feasible to model the exact behaviour of such units. One of the main characteristics of these technologies is that their generation is not always linked to the electricity price only because it has frequently other purposes as well (e.g. the production of heat or steam). Nevertheless, it is assumed that these units will~~

As the contribution determined on the output of the simulation depends on the input data quality[14] and since it is assumed that those CMUs will nevertheless maximize their electricity generation ~~in case of high electricity prices. The derating factors are consequently obtained by dividing the maximum contribution of a particular technology during near-scarcity hours by its total installed capacity.~~

~~Since it is assumed that those units are able to maximally produce electricity~~ in case of high electricity prices, their derating factors shall be computed by taking the maximum contribution of the technology during ~~near-~~simulated scarcity ~~hours~~situations from the simulation output through the following formula:

$$\cancel{[3] \quad DRF\,[\%] = \frac{\text{Maximum contribution during near-scarcity hours [MW]}}{\text{Total installed capacity [MW]}}}$$

~~[13] E.g. all DSO-connected are not metered, the TSO does not have access to the metering data … Only relevant available metering are used but it only represent a part of the capacity.~~

[14] E.g. all DSO-connected are not metered, the TSO does not have access to the metering data … Only relevant available metering are used but it only represent a part of the capacity.

$$[3]\quad \mathrm{DRF}\ [\%] = \frac{\text{Maximum contribution during simulated scarcity situations [MW]}}{\text{Nominal reference power [MW]}}$$

Nevertheless, if relevant and sufficient metering data are available in the future, the calculation of derating factors for thermal DSO- or CDS-connected ~~units~~CMUs could evolve to be closer to reality. These derating factors will then be determined by the ratio of their average contribution during ~~near-~~simulated scarcity ~~hours~~situations to the nominal reference power [2].

In addition to their specific derating factor, these technologies are also eligible the SLA categories, presented on §4.5[15].

4.4.2 Categories

For the DSO-connected ~~units~~CMUs, a detailed analysis has been performed to compare the contribution to adequacy of different categories. On the one hand, the ~~units~~CMUs can be divided by fuel type:

- waste,
- biomass, and
- gas-fired.

From applying the first categorization it could be concluded that the data ~~for waste~~ were not ~~representative due~~quantitative enough to ~~a too small number of units in this category~~make sub-categories.

[15] More flexibility is given to this category as it can provide a way to aggregate different technologies and to benefit from some technological advantages to balance other technological disadvantages (and vice versa) which can motivate an aggregator to choose a SLA category with a better derating factor.

On the other hand, they can be divided by the contract type that has been awarded:

- Gtrad[16]
- Gflex[17]
- Gint[18]

When applying the second categorization, most ~~units~~CMUs have a Gtrad contract. The number of ~~units~~CMUs with Gflex and Gint contracts is not large enough and the available data are not sufficient to be representative[19].

Therefore, ~~two main categories of~~a single aggregate derating ~~factors have been~~factor is taken into account for thermal DSO- or CDS-connected technologies ~~(that are not weather dependent): RES and non-RES (Figure 10). These categories~~ . Some sub-categories could be ~~subject to evolution~~considered in case of additional available information or data in the future.

[16] Possibility to produce without any grid constraint.
[17] Possibility to produce subject to grid constraints. In case of planned or unplanned constraints on the grid, there can be a necessity to reduce the production.
[18] Interruptible production. The unit is connected through only one grid element to the transmission system (non-redundant connection). An interruptible unit can have either a Flex or a Trad contract.
[19] TSO-connected also have that kind of contract but the categorization does not apply since derating factors are determined based on forced outage rates.

4.5 SLA Categories

4.5.1 Concept

SLA categories represent aggregated CMUs with different availability duration (Table 2). The derating factors are calculated by applying the same approach as for energy constrained with daily schedule technologies. Their derating factors are determined by dividing the average contribution of a particular technology during simulated scarcity situations by its total nominal reference power [2].

'SLA category'	Duration	Limits
SLA #1	1h	
SLA #2	2h	
SLA #3	3h	1 activation / day
SLA #4	4h	
SLA #5	8h	
SLA #6	No Limit	NA

Table 2: MR categories

For each 'aggregation category' a given activation limit is defined. The derating factors for 'aggregation categories' can be therefore presented as so-called different 'service level agreements' (SLAs) based on hourly activation constraints (as most constraining limits). Moreover, every aggregation category is assumed to be available once a day.

The derating factors associated with each aggregation category is to be considered as a maximum threshold. Its value is associated with the contribution of the SLA category to the Belgian adequacy.

4.5.2 Categories

SLA Categories are available:

- by obligation to energy constrained without daily schedule, including small-scale batteries, market response or emergency diesels;
- by obligation to a CMU with multiple delivery points associated with different technologies;
- by choice for every other technology without daily schedule.

In order for the aggregator or individual provider to select the SLA category that best fits its portfolio/profile, the choice of SLA is left open and left to the aggregator/individual provider. The SLA categories also offer the possibility to introduce in the CRM any mix of delivery points into 1 CMU as long as these delivery points do not have daily schedule.

Furthermore, it is up to the aggregator to define the level of the nominal reference power of each aggregated CMU, according to the principles set up in the prequalification process and availability monitoring parts of the design.

4.5.3 Remarks

During the public consultation, the one activation per day has been commented. However, the current design of the SLA categories will remain with only one activation by day because the whole SLA design has been done based on this limit.

As the current mechanism allows for all technologies that can react to a day-ahead signal, multiple activations per day would require to introduce ramping restrictions as well. The problem would become three-dimensional: number of hours, number of activations and time between activations. The derating factors are dependent on the share of every 3D SLA in the system. Elia is of the opinion that no representative information on this is available to perform such an exercise for the Belgian market and this would needlessly complexify the derating factors (also for market parties), as multiple activations do not influence derating drastically (contrary to number of hours). On the other hand, imposing to cover every AMT moment is a very strict technical capability for many energy constrained technologies and would negatively impact competition in the CRM. In any case, any volumes available beyond a single AMT moment can be valorized through the secondary market.

Elia also believes that the secondary market offers enough possibilities for the capacity providers to participate in the CRM and to optimize the contribution of their asset.

This limit does not also prevent the asset to participate in the energy market.

4.6 Selection of a category

The first criterion to choose a category is related to the daily schedule constraint. As mentioned, a daily schedule is defined as the program of production of a CMU, given on a quarter-hourly basis, provided to ELIA in day-ahead and updated in accordance with the rules of the CIPU Contract or any other regulated contract(s) that will replace the CIPU Contract, in accordance with the dispositions in article 377 of the Federal Grid Code[20].

Every technology with daily schedule is associated with the derating factor of its technology. This could be weather-dependent technologies, energy constrained with daily schedule technologies or thermal with daily schedule technologies, depending on the technology's constraints.

Every technology without daily schedule is eligible for a SLA category. There are two particular cases. The selection of a SLA category is obligated for energy constrained CMUs without daily schedule and for a CMU with multiple delivery points associated with different technologies as long as neither of them has a daily schedule. It is available by choice for the others. It means that weather-dependent technologies without daily schedule and thermal DSO- or CDS-connected technologies without daily schedule can therefore choose to take part in a SLA category and to have a derating factor associated with an availability duration constraint or to select the derating factor associated with its technology.

This selection process is presented on Figure 13.

[20] or any similar program of production for cross-border capacities in accordance with their local rules

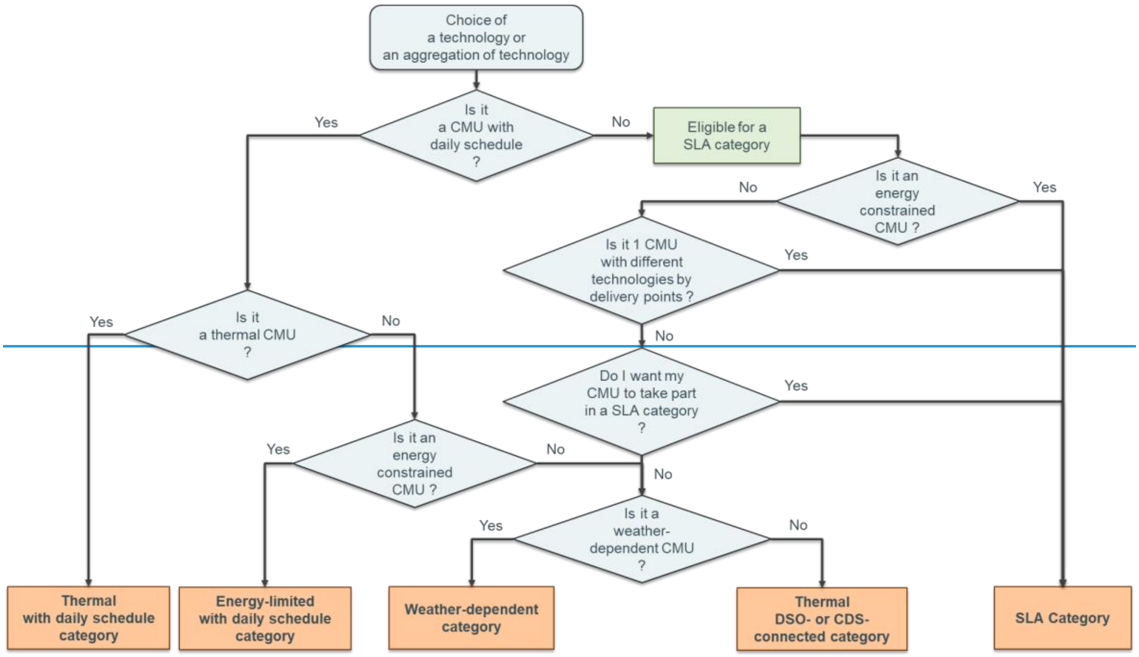


Figure 13: Derating factor categories selection

~~4.5~~4.7 Synthesis

Table 3 presents a synthesis of each category of derating factors including all the associated technologies and the formula used to determine those. ~~Every technology taking part to the CRM has to be classified into one of these categories and the appropriate derating factor shall be applied to its reference power. These categories are~~This table is based on the current available technologies and could evolve in the future.

Categories	~~Formulation~~Formula	~~Sub-category~~Technologies
Thermal with daily schedule	100 - FOR [%]	Combined Cycle Gas Turbine Open Cycle Gas Turbine Turbojets Gas-engines Diesels-engines Combined Heat and Power CMUs Biomass CMUs Waste CMUs Nuclear Coal
~~Weather-dependent technologies~~Energy-limited with daily schedule	Average contribution during ~~near-~~simulated scarcity / ~~Maximum capacity~~Nominal Reference Power [%]	~~RES~~Pump-Storage Plant Large-scale batteries
Weather-dependent		Offshore wind Onshore wind Solar Hydro run-of-river
Service Level Agreement (SLA)		1h 2h 3h 4h 6h 8h No Limit
Thermal DSO- or CDS-connected ~~technologies~~	Maximum contribution during ~~near-~~simulated scarcity ~~/~~ ~~Maximum capacity~~ /	~~RES~~Aggregation of all technologies

	Nominal Reference Power [%]

Table 3: Synthesis of derating factors categories

Example: Derating factors calculation

The Adequacy and Flexibility study [I] presents (Figure 14) some global results of derating factors that would be obtained by applying the explained methodology to each technology (note that the derating factors depend on the scenario applied, and will therefore vary depending on the chosen scenario).

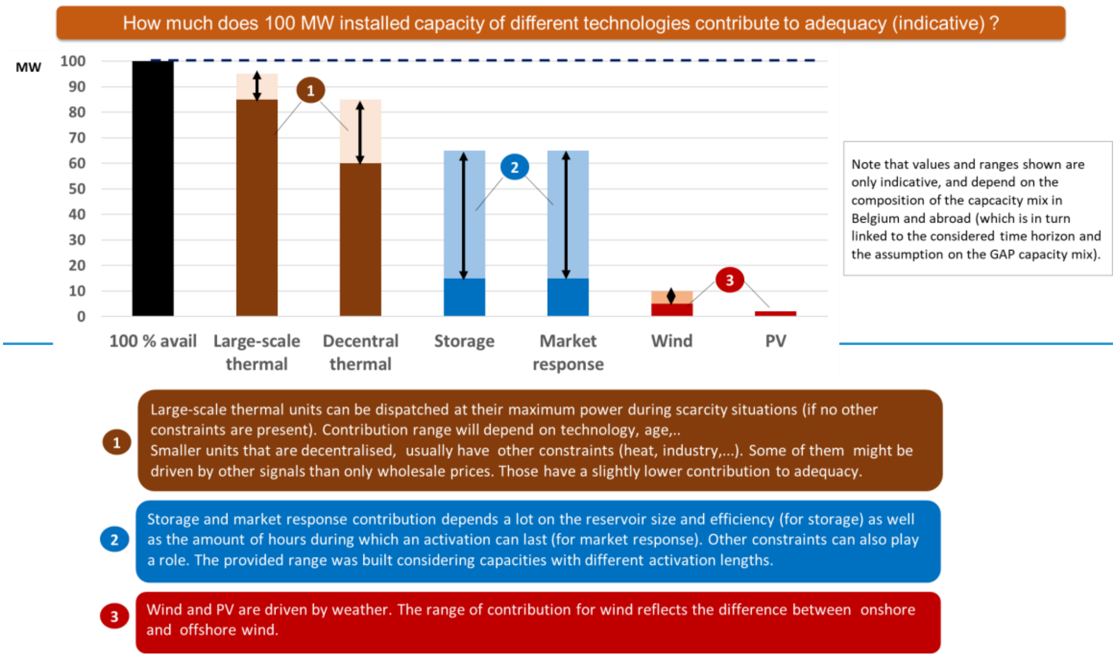


Figure 14: Results from the Adequacy and Flexibility report [I]

"Large scale thermal" can be linked to the daily schedule thermal technologies category. The derating factors of daily schedule thermal CMUs are around 85 and 95%. These values reflect mainly the historical forced outage of these CMUs. The impact of planned outage is not considered due to a production optimization to avoid winter periods. These technologies are not constrained by other technical parameters.

"Decentral thermal" can be linked to the thermal DSO- or CDS- connected aggregated category. The derating factor of thermal DSO- or CDS- connected is comprised around 60 and 85%. This derating factor range is significantly lower than the one of daily schedule thermal CMUs because these smaller units that are decentralized usually have other constraints (heat supply, industry processes, etc.). Some of them might be driven by other signals than only electricity wholesale prices. Those have hence a slightly lower contribution to adequacy. They are implemented in the model through aggregated time-series based on historical data, taking into account outages, climatic conditions, industrial processes, etc. As these technologies are typically not submitted to a daily schedule obligation, they can also choose to participate in a SLA category (and have the choice to some extent to choose their own derating).

"Storage" and "Market Response" can be linked to the daily schedule energy-limited

category and to the SLA category. The value of the associated derating factors should be around 15 and 65%. The derating factors of SLA categories mainly depend on the technical limitation of the technology.

On the one hand, the derating factors of storage technologies depend on the reservoir size and the round-trip efficiency. Derating factors will be higher if the reservoir is bigger, leading to more energy available to cover simulated scarcity situations. The model optimizes the use of storage devices so that it can maximally contribute to adequacy in simulated scarcity situations when the price is the highest (and as such lead to the lowest overall ENS). Storage is cost-optimized so that the pumping/loading cost is lower than the turbining/unloading revenue. Therefore, the optimization considers that pumping/loading can be interesting because there is a possibility to turbine/unload later at a higher price.

~~Cross~~

On the other hand, SLA categories derating factors depend on the number of hours during which an activation can last. The higher the availability duration, the higher the derating factor as the technology shall be available to cover more simulated scarcity situations. A one-hour activation duration CMU shall have a derating factor that is between 15 and 20%. If a SLA category does not have any availability duration constraint, it can be represented by the 100% available category from Figure 14. This trend is presented in Table 4, determined based on the numbers of Elia's Adequacy and Flexibility Study [I].

SLA Category	Range [%]	
	Min	Max
1h availability	10	20
2h availability	20	40
4h availability	30	50
8h availability	40	70
100% available	100	

Table 4: SLA Categories Derating Factors Range

"Wind" and "PV" categories can be associated with the weather-dependent category. The derating factor for wind is comprised around 5 and 15% with a higher contribution for offshore than onshore due to better technical characteristics. The derating factor for solar would be around 2 and 5%.

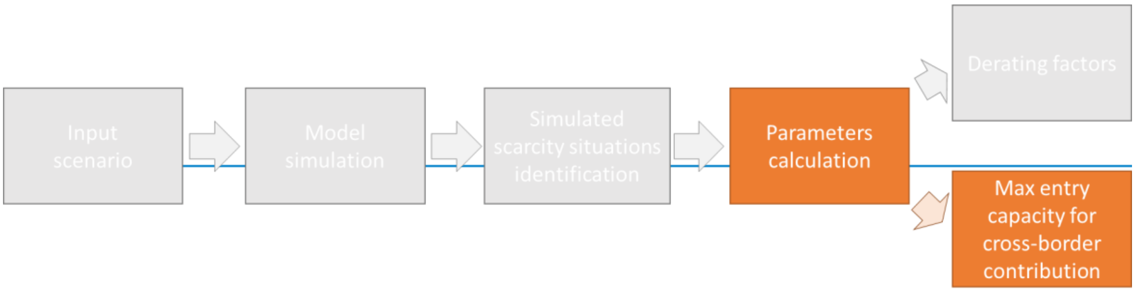
References in the Royal Decree Methodology proposal

Art. 7. § 1er. Pour la détermination des facteurs de réduction, les technologies (connectées à la zone de réglage belge et sur l'ensemble des zones directement reliées électriquement à la zone de réglage belge) susceptibles de participer au mécanisme de rémunération de capacité sont classées dans l'une des catégories suivantes:	**Art. 7.** § 1. Voor de bepaling van de reductiefactoren worden de technologieën (in de Belgische regelzone en het geheel van de regelzones die rechtstreeks elektrisch met de Belgische regelzone verbonden zijn) die aan het capaciteitsvergoedingsmechanisme kunnen deelnemen in een van de volgende categorieën ingedeeld:
1° les catégories d'accords de niveau de service : cette catégorie inclut la réponse du marché y compris la participation active de la demande, les technologies de stockage à petite échelle et les groupes de secours permettant l'îlotage, de manière individuelle ou agrégée ; elle est également accessible par choix à toutes les technologies sans programme journalier ;	1° de categorieën met overeenkomsten inzake dienstverleningsniveau: deze categorie omvat de marktrespons, met inbegrip van de actieve deelname van de vraagzijde, de kleinschalige opslagtechnologieën en de noodstroomgroepen die in eilandbedrijf kunnen opereren, individueel of geaggregeerd; ze is ook naar keuze toegankelijk voor alle technologieën zonder dagelijks programma;
2° les technologies thermiques avec programme journalier : cette catégorie inclut les turbines gaz-vapeur, les turbines à gaz, les turbojets, les moteurs au gaz autonomes, les moteurs diesel autonomes, les centrales de cogénération, les centrales à biomasse et les installations d'incinération des déchets ainsi que les centrales nucléaires et les centrales à charbon;	2° de thermische technologieën met dagelijks programma: deze categorie omvat de stoom- en gasturbines, de gasturbines, de turbojets, de autonome gasmotoren, de autonome dieselmotoren, de centrales met warmtekrachtkoppeling, de biomassacentrales en de afvalverbrandingsinstallaties alsook de kerncentrales en de steenkoolcentrales;
3° les technologies à énergie limitée avec programme journalier : cette catégorie inclut les technologies de stockage à grande échelle ainsi que les installations de pompage-turbinage ;	3° de technologieën met beperkte energie met dagelijks programma: deze categorie omvat de grootschalige opslagtechnologieën en de pomp-opslaginstallaties;
4° les technologies dépendantes des conditions climatiques : cette catégorie inclut les éoliennes terrestre, les éoliennes en mer, les installations à l'énergie solaire et les centrales hydraulique au fil de l'eau, avec programme journalier ainsi que celles sans programme journalier qui ont fait le choix de ne pas participer à une catégorie d'agrégation visée à l'article 7, § 1, 1° ;	4° de van de weersomstandigheden afhankelijke technologieën: deze categorie omvat de windturbines op het land, de windturbines op zee, de zonne-energie installaties en de waterkrachtcentrales op waterlopen met dagelijks programma, en evenals de technologieën zonder dagelijks programma die ervoor hebben gekozen om niet deel te nemen aan een aggregatiecategorie bedoeld in artikel 7, § 1, 1°;
5° les technologies thermiques sans programme journalier connectées au réseau de distribution ou à un réseau fermé de distribution: cette	5° de thermische technologieën zonder dagelijks programma die aangesloten zijn op het distributienet of op een gesloten distributienet: deze categorie omvat de centrales met

catégorie inclut les centrales de cogénération utilisant de la biomasse, les centrales à biomasse, les installations d'incinération des déchets et les centrales de cogénération au gaz, pour autant que le choix ait été fait de ne pas participer à une catégorie d'agrégation visée à l'article 7, § 1, 1°.	warmtekrachtkoppeling die biomassa gebruiken, de biomassacentrales, de afvalverbrandingsinstallaties en de centrales met warmtekrachtkoppeling op basis van gas die ervoor hebben gekozen om niet deel te nemen aan een aggregatiecategorie bedoeld in artikel 7, § 1, 1°.
§ 2. Pour les catégories d'accords de niveau de service, les données d'entrée de la simulation sont d'abord divisées en sous-catégories, représentées par différents accords de niveau de service, sur la base de la contrainte de durée d'activation ou de toute autre contrainte technique définie dans le rapport visé à l'article 7undecies, § 2, 2° de la loi du 29 avril 1999. Les facteurs de réduction de chaque accord de niveau de service sont déterminés en divisant la contribution moyenne attendue de chaque accord de niveau de service pendant les situations de pénurie simulées par la puissance de référence nominale agrégée associée à chaque accord de niveau de service. La contribution moyenne est déterminée sur la base de la simulation visée à l'article 6.	§ 2. Voor de categorieën met overeenkomsten inzake dienstverleningsniveau worden de invoergegevens van de simulatie eerst verdeeld in subcategorieën, vertegenwoordigd door verschillende overeenkomsten inzake dienstverleningsniveau op basis van beperkingen met betrekking tot de activeringsduur of van elke andere technische beperking die wordt gedefinieerd in het verslag bedoeld in artikel 7undecies, § 2, 2°, van de wet van 29 april 1999. De reductiefactoren van elke overeenkomst inzake dienstverleningsniveau worden bepaald door de verwachte gemiddelde bijdrage van elke overeenkomst inzake dienstverleningsniveau tijdens gesimuleerde tekortsituaties te delen door het geaggregeerde nominale referentievermogen van elke overeenkomst inzake dienstverleningsniveau. De gemiddelde bijdrage wordt bepaald op basis van de simulatie bedoeld in artikel 6.
§ 3. Les facteurs de réduction des technologies thermiques avec programme journalier sont déterminés, pour chaque technologie, en soustrayant le taux d'arrêt fortuit, basé sur des données historiques et exprimé en pourcentage, de cent pourcent.	§ 3. De reductiefactoren van de thermische technologieën met dagelijks programma worden voor elke technologie bepaald door de verhouding onverwachte stilstanden, gebaseerd op historische gegevens en uitgedrukt in procent, af te trekken van 100 procent.
§ 4. Les facteurs de réduction des technologies à énergie limitée avec programme journalier sont déterminés en divisant la contribution moyenne attendue de ces technologies pendant les situations de pénurie simulées par la puissance de référence nominale agrégée de la technologie applicable. La contribution moyenne est déterminée sur la base de la simulation visée à l'article 6.	§ 4. De reductiefactoren van de technologieën met beperkte energie met dagelijks programma worden bepaald door de verwachte gemiddelde bijdrage van deze technologieën tijdens de gesimuleerde tekortsituaties te delen door het geaggregeerde nominale referentievermogen van de toepasselijke technologie. De gemiddelde bijdrage wordt bepaald op basis van de simulatie bedoeld in artikel 6.
§ 5. Les facteurs de réduction des technologies dépendantes des conditions climatiques sont déterminés en divisant la contribution moyenne	§ 5. De reductiefactoren van de technologieën die afhankelijk zijn van de weersomstandigheden worden bepaald door de

attendue de ces technologies pendant les situations de pénurie simulées par la puissance de référence nominale agrégée de la technologie applicable. La contribution moyenne est déterminée sur la base de la simulation visée à l'article 6.	verwachte gemiddelde bijdrage van deze technologieën tijdens de gesimuleerde tekortsituaties te delen door het geaggregeerde nominale referentievermogen van de toepasselijke technologie. De gemiddelde bijdrage wordt bepaald op basis van de simulatie bedoeld in artikel 6.
§ 6. Les facteurs de réduction des technologies thermiques sans programme journalier connectées au réseau de distribution ou à un réseau fermé de distribution sont déterminés en divisant la contribution moyenne attendue de ces technologies pendant les situations de pénurie simulées par la puissance de référence nominale agrégée. La contribution moyenne est déterminée sur la base de la simulation visée à l'article 6. Les facteurs de réduction des technologies thermiques sans programme journalier connectées au réseau de distribution ou à un réseau fermé de distribution sont déterminés sur la base des données de mesure disponibles. Si ces données de mesure nécessaires sont jugées insuffisantes par le gestionnaire du réseau, les facteurs de réduction sont déterminés en divisant la contribution maximale des technologies thermiques sans programme journalier connectées au réseau de distribution ou à un réseau fermé de distribution pendant les situations de pénurie simulées sur la base des données disponibles par la puissance de référence nominale agrégée. La contribution maximale est déterminée sur la base de la simulation visée à l'article 6.	§ 6. De reductiefactoren van de thermische technologieën zonder dagelijks programma die aangesloten zijn op het distributienet of op een gesloten distributienet worden bepaald door de verwachte gemiddelde bijdrage van deze technologieën tijdens de gesimuleerde tekortsituaties te delen door het geaggregeerde nominale referentievermogen. De gemiddelde bijdrage wordt bepaald op basis van de simulatie bedoeld in artikel 6. De reductiefactoren van de thermische technologieën zonder dagelijks programma die aangesloten zijn op het distributienet of op een gesloten distributienet worden bepaald op basis van de beschikbare meetgegevens. Indien de netbeheerder deze vereiste meetgegevens ontoereikend acht, worden de reductiefactoren bepaald door de maximale bijdrage van de thermische technologieën zonder dagelijks programma die aangesloten zijn op het distributienet of op een gesloten distributienet tijdens de gesimuleerde tekortsituaties op basis van de beschikbare gegevens te delen door het geaggregeerde nominale referentievermogen. De maximale bijdrage wordt bepaald op basis van de simulatie bedoeld in artikel 6.

5 Max entry capacity for cross-border contribution



Belgium is very dependent on imports to ensure its adequacy. Additionally, when scarcity situations occur in Belgium, they are mostly linked to scarcity in at least one electrically directly connected market zone. In the future, this interaction of scarcity situations between countries will further increase (see [I], Figure 4-12).

The maximum entry capacity for cross-border participation will be defined by the European Regulation 2019/943, Article 26. As long as this methodology is not available, the following methodology will be used.

The contribution of interconnections is based on the simulation output. A post-processing methodology is implemented to determine the maximum entry capacity for cross-border participation in the context of adequacy, as the most relevant parameter for estimating the contribution to adequacy via interconnections with electrically directly connected market zones is the amount of energy that can be imported rather than the available interconnection capacity. Therefore, the contribution of other market zones to the Belgian adequacy shall be expressed in [MW].

The net position of Belgium during ~~near~~ simulated scarcity ~~hours~~situations will be determined and the capability of electrically directly connected market zones (France, Germany[21], Netherlands and United Kingdom)[22] to export energy during those moments will be used to determine the average contribution of each electrically directly connected market zone to Belgian adequacy.

For interconnections, the different categories shall therefore be related to the contribution of these market zones, as presented on Figure 15.

[21] Through the Allegro connection that will be available for the first delivery year.
[22] Luxemburg is not considered because it is part of the same market zone as Germany.

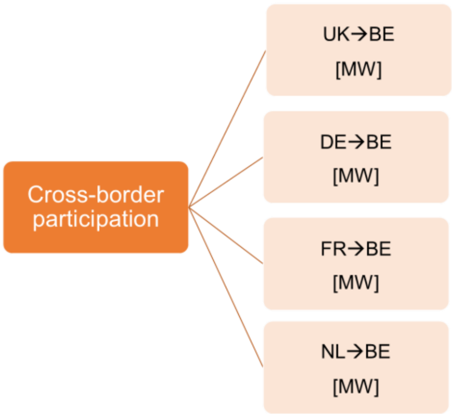


Figure 15: Interconnections categories

The approach to determine cross-border contributions for the input scenario is presented on Figure 16.

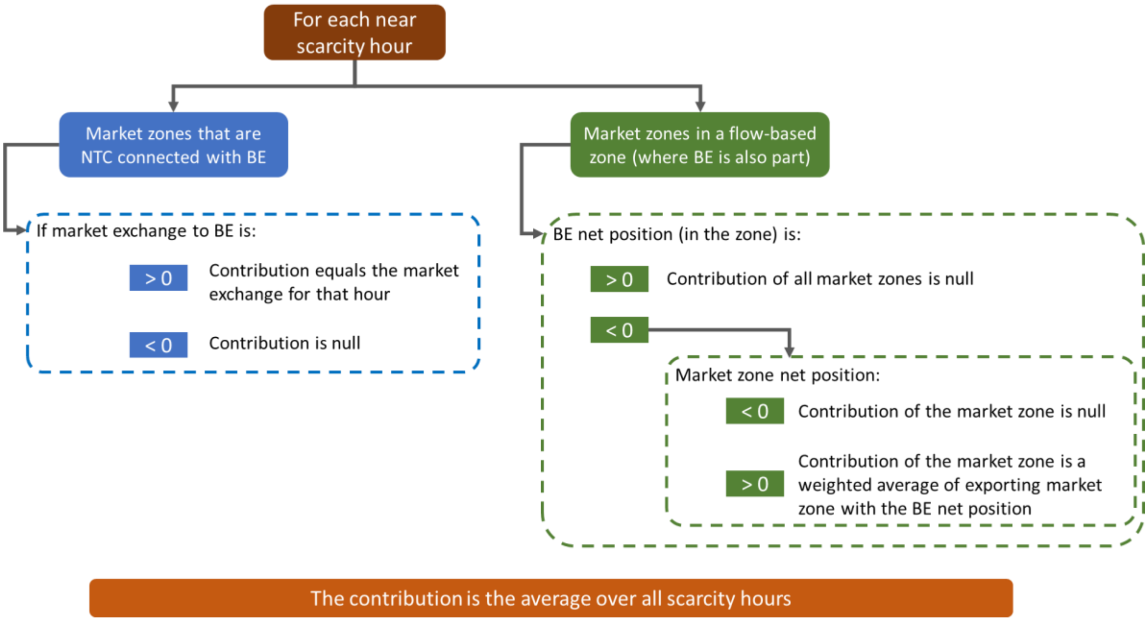


Figure 16: Interconnection contribution calculation

This methodology could further evolve when the methodology for the determination of the maximum entry capacity following the Regulation Internal Market for Electricity (RIME) Art. 26.11 (a) becomes available. Note that according to Art. 26.7 of RIME in the future also the RSC (Regional Security Coordinator center) (Coreso) will have to provide a recommendation.

The principles of ‘the maximum entry capacity for cross-border participation’ that Elia is proposing in the CRM design are already well aligned with the high level principles under consideration by ENTSO-E regarding Art 26.11.a methodology.

Example of interconnection contribution calculation

Let's assume a situation where Belgium is in scarcity and is importing 1 GW of available energy in electrically directly connected market zones.

On this particular hour, other market zones can also be in scarcity situations and have no capacity to export electricity abroad. The electrically directly connected market zones net position (for 'flow-based' domain, in red) and market exchange to Belgium (for 'NTC-connected' market zone, in blue) are presented on the figure to the side. In this case, only Germany and Netherlands are exporting whereas France and United Kingdom are importing. Therefore, the contribution of these countries can be calculated:

- $FR \rightarrow BE = 0$
- $UK \rightarrow BE = 0$
- $NL \rightarrow BE = BE_{import} \cdot \frac{NL_{export}}{NL_{export}+DE_{export}} = 1 . \cancel{\frac{3}{3+2}} \frac{3}{3+1} = 0.\cancel{6}75\ GW$
- $DE \rightarrow BE = BE_{import} \cdot \frac{DE_{export}}{NL_{export}+DE_{export}} = 1 . \cancel{\frac{2}{3+2}} \frac{1}{3+1} = 0.\cancel{4}25\ GW$

On average, the latest Adequacy and Flexibility report of Elia [I] gives some insights of the capability of other countries to export energy during Belgian scarcity moments (Figure 17)

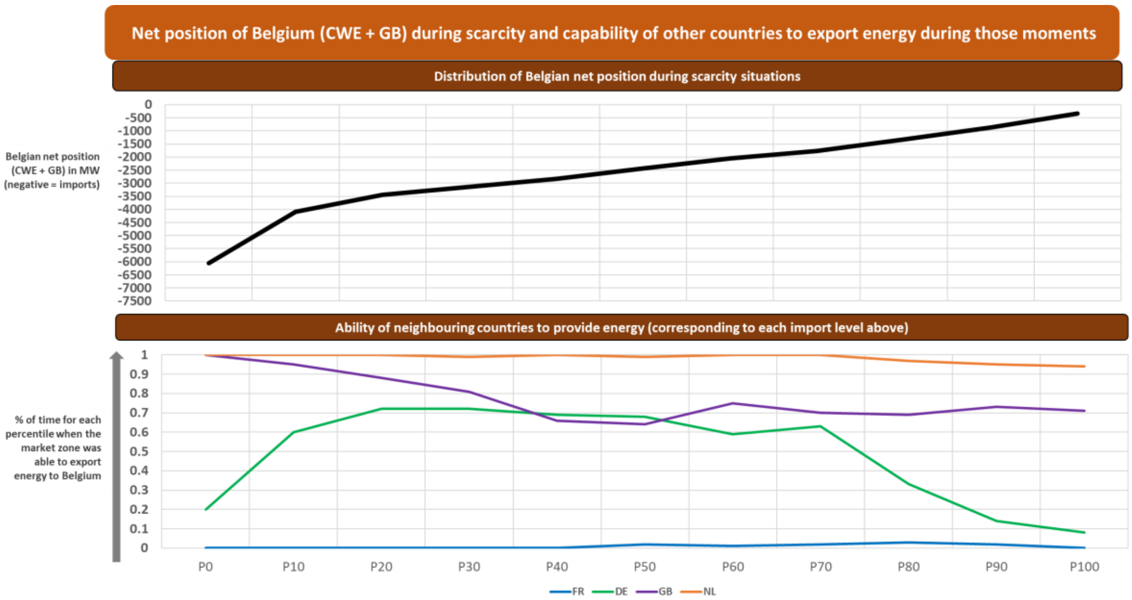


Figure 17: Example of electrically directly connected market zones contribution to Belgian adequacy from the Adequacy and Flexibility report [I]

References in the Royal Decree Methodology proposal

Art. 8. § 1er. La capacité d'entrée maximale disponible pour la participation de capacités étrangères indirectes d'une zone de réglage est défini par le gestionnaire du réseau, pour chaque zone de réglage directement reliée électriquement à la zone de réglage belge, en conformité avec l'article 26 du Règlement UE 2019/943.	**Art. 8.** § 1. De maximale beschikbare invoercapaciteit voor de deelname van de indirecte buitenlandse capaciteiten in een regelzone wordt door de netbeheerder bepaald voor elke regelzone die rechtstreeks elektrisch met de Belgische regelzone verbonden is, in overeenstemming met artikel 26 van Verordening (EU) 2019/943.
§ 2. Dans l'attente de l'adoption des méthodologies, propositions ou décisions pertinentes permettant l'application de l'article 26 du Règlement UE 2019/943, la contribution de chaque zone de réglage directement reliée électriquement à la Belgique est déterminée par la contribution de ces zones pendant les situations de pénurie simulées sur la base des résultats de la simulation visée à l'article 6.	§ 2. In afwachting van de aanname van de relevante methodologieën, voorstellen of besluiten die de toepassing mogelijk maken van artikel 26 van Verordening (EU) 2019/943, wordt de bijdrage van elke regelzone die rechtstreeks elektrisch met België verbonden is, bepaald door de bijdrage van deze zones tijdens de gesimuleerde tekortsituaties, op basis van de resultaten van de simulatie bedoeld in artikel 6.
§ 3. La capacité d'entrée maximale disponible pour la participation de capacités étrangères indirectes est exprimé en puissance [MW].	§ 3. De maximale beschikbare invoercapaciteit voor de deelname van de indirecte buitenlandse capaciteiten wordt uitgedrukt in vermogen [MW].
§ 4. La capacité d'entrée maximale disponible pour la participation de capacités étrangères indirectes d'une zone de réglage tient compte de la manière dont les échanges transfrontaliers sont modélisés sur le marché. Il est soit basé sur les flux, soit basé sur la capacité nette de transfert avec la zone de réglage belge.	§ 4. De maximale beschikbare invoercapaciteit voor de deelname van de indirecte buitenlandse capaciteiten van een regelzone houdt rekening met de manier waarop de grensoverschrijdende uitwisselingen op de markt worden gemodelleerd. Hij is gebaseerd op ofwel de stromen, ofwel de netto transfercapaciteit met de Belgische regelzone.
§ 5. La contribution d'une zone de réglage dans une approche fondée sur les flux incluant la zone de réglage belge et pour une heure spécifique :	§ 5. De bijdrage van een regelzone in een stroomgebaseerde aanpak die de Belgische regelzone omvat en voor een specifiek uur:
1° pour les zones de réglage en situation d'exportation, est déterminée par la position nette de la zone de réglage belge multipliée par le rapport entre la position nette de la zone de réglage en situation d'exportation et la somme des positions nettes de l'ensemble des zones de réglage en situation d'exportation ; et	1° wordt voor de regelzones in een exportsituatie bepaald door de netto positie van de Belgische regelzone, vermenigvuldigd met de verhouding tussen de netto positie van de regelzone in een exportsituatie en de som van de netto posities van het geheel van de regelzones in een exportsituatie; en

2° pour les zones de réglage en situation d'importation, est nulle. § 6. La contribution d'une zone de réglage dans une approche fondée sur la capacité nette de transfert avec la zone de réglage belge et pour une heure spécifique : 1° est déterminée par l'échange commercial si cet échange commercial est dirigé de la zone de réglage étrangère vers la zone de réglage belge ; 2° est nulle dans le cas contraire.	2° is nul voor de regelzones in een importsituatie. § 6. De bijdrage van een regelzone in een nettransmissiecapaciteitsbenadering met de Belgische regelzone en voor een specifiek uur: 1° wordt bepaald door de commerciële uitwisseling als die commerciële uitwisseling van de buitenlandse regelzone naar de Belgische regelzone gaat; 2° is in het andere geval nul.

References

[I] Elia (2019). Adequacy and flexibility study for Belgium 2020-2030. http://www.elia.be/~/media/files/Elia/publications-2/studies/20190628_ELIA_Adequacy_and_flexibility_study_EN.pdf

Annex 1: Correlation of climatic conditions

The various meteorological conditions having an impact on renewable generation and electricity consumption are not independent of each other. Wind, solar radiation, temperature and precipitation are correlated for a given region. In general, high-pressure areas are characterized by clear skies and little wind, while low-pressure areas have cloud cover and more wind or rain. Given the very wide range of meteorological conditions that countries in Europe can experience, it is very hard to find clear trends between meteorological variables for a given country. Figure 18 attempts to show the non-explicit correlation between wind production, solar generation and temperature for Belgium. The graph presents the seven-day average for these three variables for Belgium based on 34 climatic years. The hourly or daily trends cannot be seen as the variables were averaged by week but various seasonal and high-level trends can be observed:

- The higher the temperature, the lower the level of wind energy production. During the winter there is more wind than in the summer;
- The higher the temperature, the higher the level of PV generation. This is a logical result from the fact that more solar generation goes on during the summer and inter-season months;
- When the level of wind energy production is very high, the level of PV generation tends to fall;
- In extremely cold periods, wind energy production falls while there is a slight increase in PV generation. This is a key finding that will affect adequacy during very cold weather.

The various meteorological data are also geographically correlated as countries are close enough to each other to be affected by the same meteorological effects. A typical example of this is the occurrence of a tight situation due to a cold spell which first spreads over western France, then over Belgium and after that over Germany. It is essential to maintain this geographical correlation between countries in terms of climate variables.

Given the high amount of renewable energy from variable sources that is installed each year in Europe and the high sensitivity to temperature of some countries' electricity demand, it is essential to maintain the various geographically and time-correlated weather conditions in the assessment.

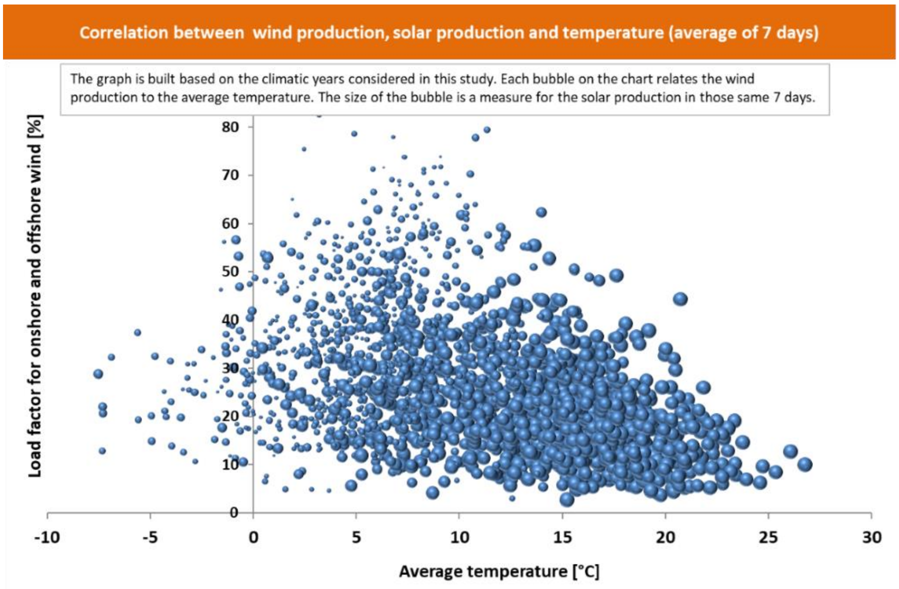


Figure 18: Correlation between wind production, solar production and temperature

Updated CRM Design Note: Intermediate Price Cap

~~September 2019~~

March 2020

Table of contents

Introduction and context

The purpose of the present design note is to provide all stakeholders with a clear view concerning on the one hand the rationale for having an intermediate price cap in the auctions and on the other hand, the scope and the methodology for calibration of this intermediate price cap.

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 options, a centralized approach via a single list is opted for.

About the ~~public consultation~~status of this document

~~This design note is put for formal public consultation and any remark, comment or suggestion is welcomed. 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 **Friday 11 October 2019 at 6 pm**.~~

~~Early October also a second set of design notes will be launched by Elia for public consultation.~~

~~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.~~

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019.

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn2_crm-design-note---intermediate-price-cap.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf

Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

Legal Framework

The Law setting up a Capacity Remuneration Mechanism, adopted on April 4th 2019[5] (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 a price limit (“prijslimiet/plafond de prix”) as “the maximum price of bids permitted in the auctions and/or the maximum capacity remuneration received by capacity providers after auction closure.”

The Electricity Law Art. 7undecies §2 foresees the introduction of one or more such price limits, which are to be interpreted as comprising both the global auction price cap and an intermediate price cap. This design note only focuses on the intermediate price cap, the global auction price cap is out of scope.

The CRM law further foresees the governance framework of the intermediate price cap parameter~~, foreseeing~~. On the one hand, the methodology proposal for the yearly calibration of this parameter (scope of this design note), has been subject to a vast consultation procedure of market actors, the FPS Economy and the regulator~~, prior to determining on the one hand the methodology for the calculation of the proposal of this parameter (scope of this design note) and on~~. On the other hand~~ the yearly calibration (~~, a public consultation is also foreseen in yearly calibration process , after which the Minister decides on the intermediate price cap parameter based on ~~the methodology in this design note, translated~~Elia’s proposal, taking into ~~a Royal Decree) and decision of this parameter~~account the advices from the regulator and the FPS Economy.

Bid caps or price caps?

For the sake of clarity and building further on the legal definition of a price limit, in this design note, an explicit distinction is made between a bid cap and a price cap. **While a bid cap only determines the maximum bid price for a bid in the auction, a price cap additionally also limits the maximum remuneration that capacity providers can receive from the auction for this bid to the level of this cap.** These principles are illustrated in Figure 1~~Figure 1~~ below, in which also a distinction is made between a pay-as-bid and pay-as-cleared pricing rule.

[5] https://www.dekamer.be/FLWB/PDF/54/3584/54K3584001.pdf

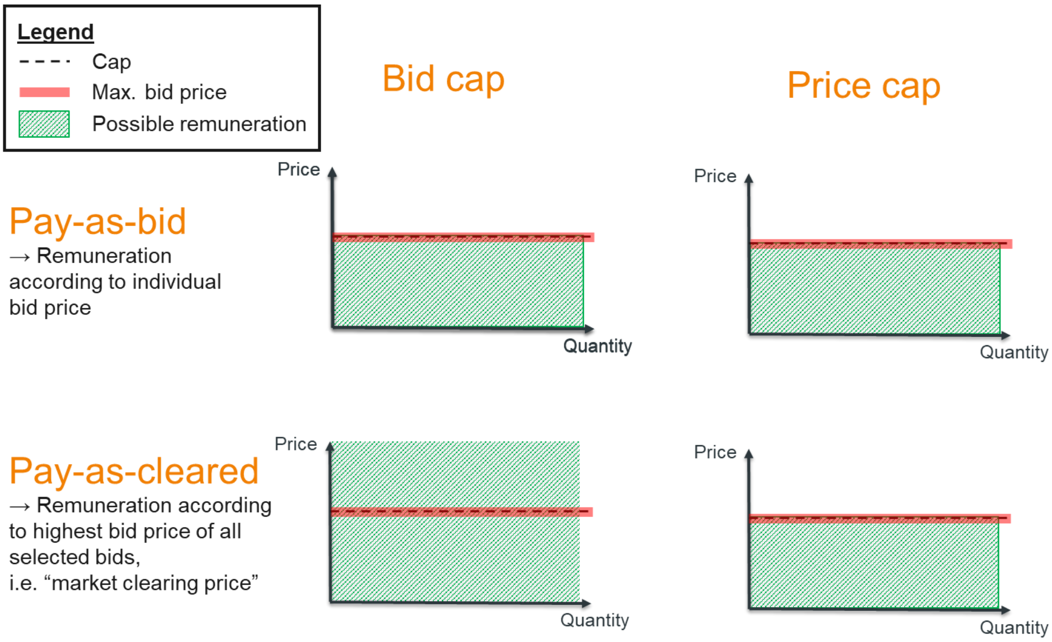


Figure 1: Implications for bids subject to a bid/price cap under a pay-as-bid/pay-as-cleared pricing rule in terms of maximum bid price and possible remuneration

From Figure 1~~Figure 1~~, it can be derived that in case a pay-as-cleared pricing rule applies (cf. discussed in *CRM Design Note: Auction ~~Algorithm~~Process*[6]), a bid cap (down, left on the figure) limits the bid price for a bid but not the possible remuneration that can be received for this bid. Indeed, in case the market clearing price is higher than the bid cap (because of an accepted high price bid not subject to the bid cap), and since under pay-as-cleared this market clearing price applies to all bids, bids that are subject to the bid cap would receive a remuneration that is higher than this bid cap. This contrasts with the case of a price cap (below, right on the figure), whereby not only the bid price but also the possible remuneration for a bid is limited to the level of this price cap.

Also illustrated in Figure 1~~Figure 1~~ (up on the figure), in case a pay-as-bid pricing rules applies (cf. discussed in *CRM Design Note: Auction ~~Algorithm~~Process*), there is no additional impact of a price cap compared to a bid cap, as capacity providers are remunerated according to their individual bid price anyway.

Note that both the intermediate price cap (scope of this design note) and the global auction price cap (out of scope for this design note) fall into the category of price caps

[6] This design note ~~will be~~was launched for public consultation together with the second set of design notes early October. Note that also an update of the *CRM Design note: Auction Process* shall be published.

and not bid caps. The intermediate price cap will apply regardless of the implemented pricing rule, i.e. in both a pay-as-bid and pay-as-cleared mechanism.

Structure of the design note

In what follows, firstly the rationale for applying an intermediate price cap in the auctions is provided. Secondly, the scope of the proposed intermediate price cap is discussed, specifying which bids shall be subject to the intermediate price cap and explaining its enduring character. Finally, the calibration methodology of the intermediate price cap is outlined.

~~In annex, an overview is given of the~~The complete set of proposed principles of this design note~~, which shall form~~ is the basis ~~for drafting the~~of Elia's proposal of Royal Decree articles with respect to the methodology for setting the intermediate price cap.

1 Rationale for intermediate price cap

In general, the introduction of an intermediate price cap serves two purposes.

Firstly, as further explained in section 1.1, by means of an intermediate price cap, windfall profits that may otherwise arise from disproportionate capacity remuneration can – at least partly – be avoided. As such, an intermediate price cap contributes to the overall objective as defined in the CRM law to keep the cost of the CRM as low as possible while at the same time ensuring a proportionate and appropriate remuneration for capacity providers.

The windfall profit avoidance reasoning, i.e. avoiding that capacity providers obtain a higher than necessary remuneration as a consequence of the auction design, is valid under both a pay-as-cleared and pay-as-bid pricing rule.

Secondly, as further explained in section 1.2, ~~but only in case a pay-as-cleared pricing rule applies,~~ an intermediate price cap also acts as a market power mitigation measure, discouraging and in some ways even preventing improper strategic behavior from prequalified CRM candidates in the auction. In particular, an intermediate price cap avoids so-called ‘economic withholding’ of capacity and discourages prequalified CRM candidates from engaging into strategic mothballing/closure behavior.

1.1 Limiting the CRM cost by avoiding inframarginal CRM rents

A CRM as being deployed in Belgium is conceived as a remuneration mechanism complementary to the energy market (incl. ~~ancillary~~balancing 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 the CRM is complementary to the energy market and residual as revenue stream, there is no economic rationale behind an inframarginal rent resulting from the CRM auctioning mechanism. Indeed, in the CRM auction, competitive bids should correspond with the missing-money levels for the respective Capacity Market Units (CMUs). The missing-money of a CMU can be interpreted as already consisting of the share of investment/refurbishment and fixed O&M costs that cannot be recovered through anticipated revenues from the energy~~,~~ market and market for balancing ~~and ancillary service markets~~services, plus a certain mark-up to secure a fair and sufficient return on investment. Hence, there is no economic rationale for allocating an additional surplus inframarginal rent on top of the bid price of the capacity providers. The bid price of the capacity provider should be driven by its level of missing money. Such surplus inframarginal rent could be considered as a windfall profit and should be avoided in order to limit the overall cost of the CRM.[7]

Inframarginal rent in CRM auctions can arise when the CMUs that compete are characterized by diverging levels of missing-money. It is reasonable to expect that new capacity CMUs requiring substantial capex investments are associated with significantly higher levels of missing-money than existing capacity CMUs currently already operating in the market. As such, especially when new capacity is expected to be selected in the auction given a significant adequacy concern, an important potential for inframarginal rent – and hence windfall profits – arises for existing capacity when no intermediate price cap applies.

This reasoning is valid for both the pay-as-cleared and pay-as-bid pricing rule. Under a pure pay-as-cleared mechanism, where all winning bids receive the same (clearing) price, the higher market clearing price would automatically apply to all accepted bids. In a pay-as-bid mechanism, where each winning bid receives its own bid price, rational bidding behavior implies to bid in close to the anticipated market clearing price thereby directly incorporating an expected inframarginal rent in the price of the bid.

Through the introduction of an intermediate price cap, it is possible to significantly limit the share of the inframarginal rents, as conceptually illustrated in Figure 2~~Figure 2~~ below, and thereby reduce the cost of the CRM. For illustrative purposes and sake of simplicity only, a sloped demand curve and pay-as-cleared pricing rule are assumed.

The intermediate price cap – in line with the proposal explained further in this design note – applies only to bids related to CMUs ~~applying~~who are not eligible to apply for a ~~1~~multi-year capacity contract. Although the intermediate price cap as such does not eliminate all inframarginal rents as there could remain differences within the ~~1~~group of CMUs that is not eligible to apply for multi-year capacity ~~contract category~~contracts and/or within the group of CMUs that is eligible to apply for multi-year ~~category, it may manage~~capacity contracts, the proposed intermediate price cap is believed to avoid a significant part of the otherwise disproportionately allocated inframarginal rents (avoided windfall profits are illustrated by a green rectangle in Figure 2~~Figure 2~~ below).

Note that no additional intermediate price caps are foreseen to differentiate between multi-year ~~contracts~~capacity categories of different lengths as - unlike the clear difference between existing and new or refurbished CMUs – there is no ~~necessary~~clear correlation between the level of investment and the level of anticipated missing money (see also section 2.1).

[7] Note that unlike in a CRM, inframarginal rents earned via the energy market constitute a crucial part of the revenues of a capacity provider and particularly serve at covering fixed costs, etc.

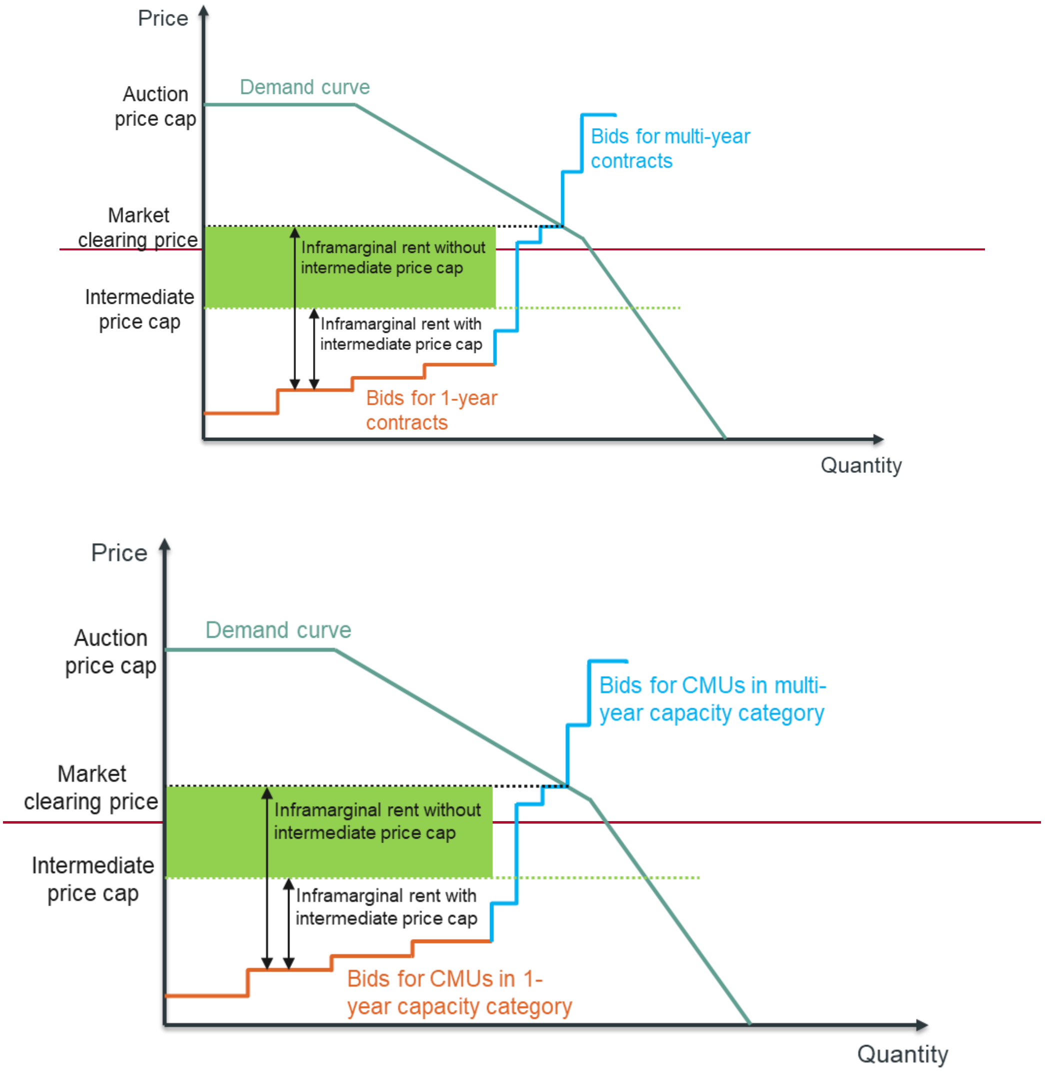


Figure 2: Conceptual illustration on the windfall profit avoidance through intermediate price cap. The green area indicates the gain for society by introducing the intermediate price cap

1.2 Market power mitigation

~~In case a pay-as-cleared pricing rule applies, an~~An intermediate price cap acts as a market power mitigation measure, defining both the maximum bid price allowed to bid into the auction and additionally also the maximum capacity remuneration that can be received by capacity providers after closure of the auction.

The determination of a maximum bid price is useful as market power mitigation measure, since it limits the potential for improper strategic behavior of prequalified CRM candidates in the form of so-called ‘economic withholding’ of capacity. Economic withholding occurs when prequalified CRM candidates would set the bid price for a certain CMU at such high level that it is effectively priced out of the market. By means of economic withholding, prequalified CRM candidates could exploit a pivotal position in the auction, leading to a higher market clearing price that would then benefit other accepted CMUs in their portfolio.

Economic withholding is an alternative to physical withholding, whereby prequalified CRM candidates refrain from even offering their CMU into the auction. Physical withholding of existing capacity is neutralized in the CRM design by means of an obligated notification to the grid operator when prequalified capacity – and all eligible production capacity within the Belgian control zone is obligated to prequalify according to Art. 7undecies §4, third paragraph of the Electricity Law – will not (or only partly) be offered into the auction. In line with Art. 7undecies §6, final paragraph of the Electricity Law, this allows the grid operator to take the necessary measures to correct for this so-called opt-out capacity, thereby also preventing capacity holders to behave strategically through physical withholding so as to influence the market clearing price. The treatment of opt-out capacity will be discussed in detail in *CRM Design Note: Auction ~~Algorithm~~Process*.

An intermediate price cap is additionally useful as market power mitigation measure, to discourage market parties from even more aggressive strategic behavior to influence the market clearing price. By strategically mothballing or closing existing capacity, thereby effectively taking capacity out of the market (hence no contribution to adequacy), market parties could create capacity scarcity, influencing the market clearing price. The intermediate price cap, by determining the maximum capacity remuneration that ~~existing~~ CMUs subject to this price cap can receive, discourages market parties from engaging into strategic mothballing or closing existing capacity as the potential benefit (i.e. via the capacity remuneration for capacity that remains in the market) from doing so is restricted. Also timings foreseen for the notification obligation on definitive or temporary closure following Art. 4bis of the Electricity Law~~ of 1999~~ contribute to limiting such behavior.

2 Scope of intermediate price cap

Firstly, this chapter clarifies the choice for a single intermediate price cap applicable to all CMUs ~~applying for~~in the one-year capacity ~~contracts~~category, and no intermediate price cap for CMUs ~~applying for~~within any of the multi-year capacity ~~contracts~~categories. Secondly, the enduring character of the proposed intermediate price cap is argued. Finally, it is explained why it is appropriate to apply the intermediate price cap in both Y-4 and Y-1 auctions.

2.1 The intermediate price cap is applicable to CMUs ~~applying for~~within the one-year ~~contracts~~capacity category

A single intermediate price cap shall be applicable to all CMUs ~~applying for a~~ within the one-year capacity ~~contract, including CMUs voluntarily applying for a one-year contract despite being~~ category, and therefore non-eligible to apply for a multi-year capacity ~~category (cf. infra).~~contract. There will be no intermediate price cap for CMUs ~~applying for a multi-year~~ within any of the multi-year capacity categories, also not when these CMUs voluntarily apply for only a one-year capacity contract~~, which are thus only subject to the global auction price cap~~ in the end.

In line with the rules that will be set out by the regulator on investment thresholds, before the auction and in parallel with the prequalification process, a CRM candidate can ~~apply for a multi-year capacity contract~~submit an investment file to the regulator for each CMU that requires significant investments, based on which the regulator will determine whether this CMU is eligible to apply for a multi-year capacity contract. In alternative CRM terminology, this process is defined as the application for another capacity category (max. 3, 8 or 15 years) than the one-year capacity category to which each CMU is assigned by default. ~~By~~During the ~~end of~~auction, the ~~prequalification process, the~~prequalified CRM candidate has to indicate in its bids – for each CMU – the contract duration for which it wants to apply, which can of course not be longer than the capacity category to which it has been assigned. Multi-year contracts facilitate participation to the ~~auction~~CRM of projects with high capital expenditure, in a way that it provides a level playing field for them compared to projects not requiring substantial investments.

As such, by design, CMUs within the one-year capacity category are confronted with no or minimal investments to cover for and hence also a lower expected level of missing-money. Therefore, to avoid windfall profits for CMUs within the one-year capacity category, it makes sense to apply an intermediate price cap to the one-year capacity category. Indeed, awarding them a capacity remuneration equal to the missing-money level of capacity projects requiring substantial investments would be disproportionate (cf. supra).

Regarding the CMUs ~~applying~~eligible to apply for multi-year capacity contracts, which all require substantial investments, it is not straightforward to separate projects or capacity categories in terms of missing-money levels. Although, for instance, the investment cost per MW for a new OCGT unit is expected to be lower compared to the required investments per MW to build a new CCGT unit, the missing-money for both units might be similar due to higher anticipated energy market revenues for the CCGT unit, for instance linked to a higher amount of running hours during which it can collect inframarginal rents in the energy market. It is therefore not considered appropriate to differentiate further intermediate price caps to CMUs ~~applying for~~within the multi-year ~~contracts~~capacity categories, let alone apply a different intermediate price cap to each multi-year capacity category. Note, however, that ~~also~~ CMUs ~~applying~~eligible to apply for a multi-year contract are in any case subject to the global auction price cap, thereby also putting a cap at their potential revenue from the CRM.

2.2 Intermediate price caps are an enduring measure

The intermediate price cap applicable to CMUs within the one-year capacity category is proposed as an enduring measure in the CRM design, meaning that such intermediate price cap shall be defined for each auction that will be organized. The argument concerning the fact that there is no economic rationale behind inframarginal rent in a CRM context as explained above as well as the advantages linked to market power mitigation, remain valid over time.

Assuming a pay-as-cleared pricing rule, the selection of even a limited investment capacity project with high missing-money, would result in disproportionate inframarginal rent allocation to all existing capacity in case no intermediate price cap would be applied.

2.3 Intermediate price caps apply in both Y-4 and Y-1 auction

Following the above drivers for an intermediate price cap, there is no reason to differentiate with respect to the application of an intermediate price cap between Y-4 and Y-1 auctions. The appropriate level of the intermediate price cap could however vary per delivery period and per auction (Y-1, Y-4). Indeed, the potential for inframarginal rents can arise in both Y-4 and Y-1 auctions, as CMUs with high levels of missing-money (and possibly applying for multi-year contracts in case substantial investments are required) can participate and be selected in both. Also the potential for market power abuse and hence the need for an intermediate price cap as market power mitigation measure are valid irrespective of the timing of the capacity auction.

Summary of the proposed principles following from Chapter 2 Scope of the intermediate price cap

(1) An intermediate price cap is a price cap that applies to all bids related to CMUs ~~applying for a~~within the one-year capacity ~~contract~~category.

(2) A single intermediate price cap shall be determined for each Y-1 and Y-4 capacity auction organized.

3 Calibration methodology of intermediate price cap

A good calibration of the intermediate price cap is key. On the one hand, the intermediate price cap should be sufficiently low to be effective and to ensure that disproportionate inframarginal rents are avoided to a maximum extent possible. On the other hand, the intermediate price cap should also not be too low, as this could obstruct some CMUs – subject to the intermediate price cap and confronted with a higher level of missing-money than the level of this cap – from participating in the CRM~~ and~~, thereby ~~be~~being confronted with a potentially unnecessary market exit signal.

3.1 Worst performer analysis among existing technologies

It is considered the most accurate approach to align the intermediate price cap applicable to ~~all~~ CMUs ~~applying for a~~within the one-year capacity ~~contract~~category with the missing-money level of the worst performing technology class currently in the market, i.e. the technology class with the highest missing-money.

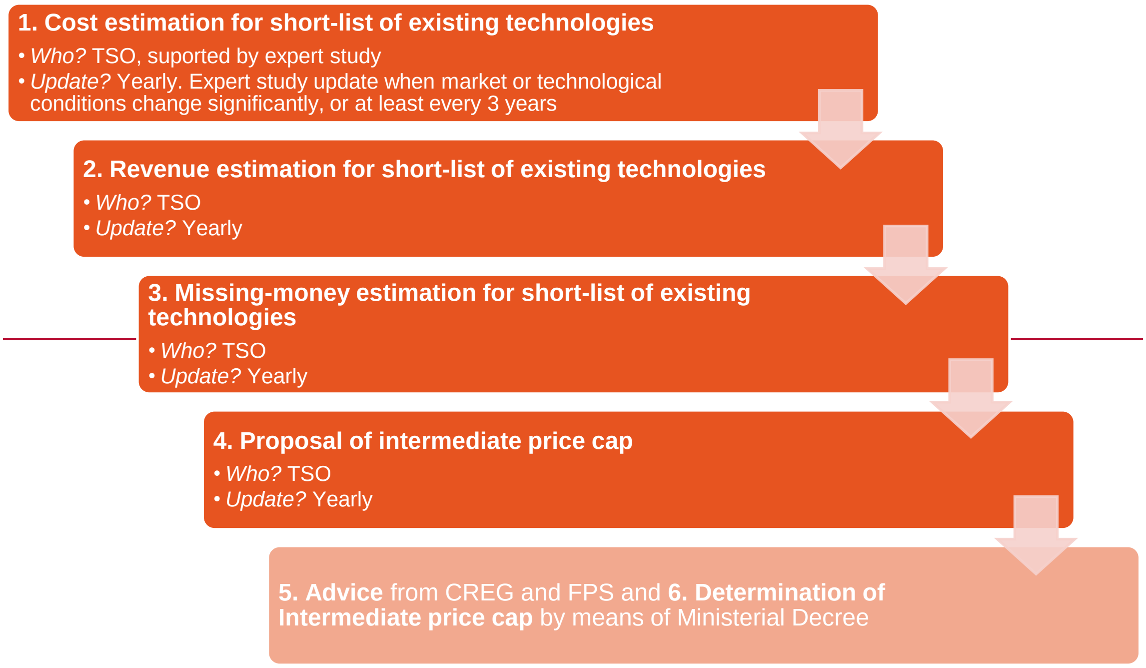
Although the set of CMUs ~~applying for a~~within the one-year capacity ~~contract~~category does not necessarily exclusively correspond with existing capacities, a worst performer analysis among existing technology classes is deemed an appropriate benchmark for missing-money of CMU's requiring minimal investments. Besides, it is neither possible nor desirable from a cost-efficiency point of view to consider all possible technologies with limited investments – hence also new and currently unknown – to calibrate the intermediate price cap.

By looking at both costs and revenues, the proposed calibration methodology results in a decreasing intermediate price cap when market conditions improve and levels of anticipated missing money drop, thereby ensuring that the intermediate price cap remains proportionate. Furthermore, by looking at existing technologies currently in the market, there is a strong correlation between the calibration methodology and the target group of the intermediate price cap – being CMUs requiring minimal investments and thereby largely corresponding with existing capacities.

3.2 Different steps of the calibration methodology

In general, on a yearly basis an intermediate price cap will be determined for all auctions that will be organized. The intermediate price cap will be calibrated to the delivery period to which ~~this~~these auctions ~~relates~~relate.

In Figure 3~~Figure 3~~ hereunder, the sequential steps of the calibration methodology towards the construction of an intermediate price cap are outlined, also indicating who is responsible for each step and the intended frequency of updating each component. A detailed explanation of each step can be found below.



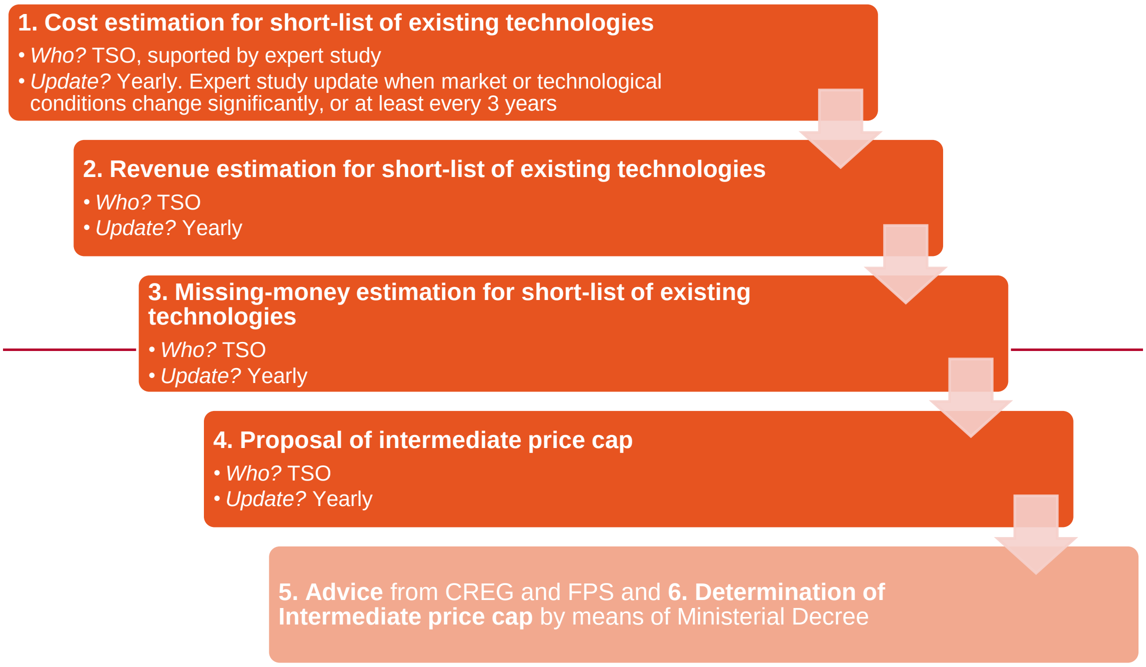


Figure 3: Steps in calibration process towards intermediate price cap

3.2.1 Step 1: Cost estimation for short-list of existing technologies (see principles (3~~)~~ ~~(~~) and (4~~)~~ ~~(5~~))

~~A~~A cost estimation for a short-list of existing technology classes to be considered in the calibration ~~methodology~~ of the intermediate price cap shall be determined ~~via~~by the TSO, in concertation with the regulator, based on a substantiated study performed by an independent expert ~~study on behalf of and in collaboration with the TSO and the regulator.~~ .

This ~~expert~~ study shall include~~, for each technology on the short-list,~~ the following cost components~~ with respect to a reference delivery period (e.g. 1 November 2025 – 31 October 2026):~~:

- Annualized routine investments not directly linked to a life-time extension or capacity augmentation~~;~~ (in €/MW/year);
- Yearly fixed O&M costs~~;~~ (in €/MW/year);
- ~~Short run marginal costs (possibly including but not limited to: primary fuel costs, CO2 costs, variable O&M costs, efficiency rates, etc.).~~
- ~~In addition, the expert study shall determine a methodology to translate each cost component to a delivery period~~ Variable O&M costs, other than fuel and CO2 costs (in €/MWh, to be used as input to estimate market revenues);

and shall be updated when market or technological conditions have ~~not~~ changed ~~considerably and hence a full update of the study is not required, e.g. by means of an indexation parameter.~~

~~This step will be performed~~ significantly, or at ~~the beginning of the CRM process and updated only when deemed appropriate, e.g.~~least every ~~few~~3 years. ~~In case of an update, the cost components will be estimated related to a new reference delivery period and also the methodology to translate each cost component to a delivery period shall be reviewed.~~

The cost estimation of the TSO, subject to public consultation, shall include – for each technology included in the short-list of existing technologies – the following cost components:

- Annualized routine investments not directly linked to a life-time extension or capacity augmentation (in €/MW/year);
- Yearly fixed O&M costs (in €/MW/year);
- Variable O&M costs, other than fuel and CO2 costs (in €/MWh, to be used as input to estimate market revenues);
- Fuel costs (in €/MWh);
- CO2 costs (in €/tCO2);
- Activation costs for availability tests, as described in the market rules (in €/MW/test).

Activation costs for availability tests are particularly relevant for technologies with high short-run marginal costs (SRMC), as they are not likely to be activated in the market and therefore prone to availability testing.

This step will be performed during the yearly process defining the auction parameters to be proposed. The expert study will be updated only when market or technological conditions have changed significantly, or at least every 3 years.

3.2.2 Step 2: Revenue estimation for short-list of existing technologies (see principle (~~6~~5))

For each technology listed in step 1, a revenue estimation shall be performed by the

TSO with respect to the applicable delivery period. For each technology, the following revenue components shall be estimated:

- Yearly inframarginal rents earned on the energy market
  - determined based on a probabilistic market modeling tool;
  - taking into account a reference scenario that reflects expected circumstances[8];
  - ~~taking into account the short run marginal costs as determined by the expert study in step 1;~~
  - considering P50 revenues ~~and~~, taking into account the applicable strike price level, as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law, reduced by the variable costs as determined in the cost estimation in step 1.
- Yearly net revenues from the provision of balancing ~~and ancillary service market revenues~~ services
  - determined based on total historical procurement ~~cost~~costs for balancing ~~and ancillary~~ services~~.~~ over the last 36 months;
  - taking into account the costs associated with the delivery of balancing services, such as must-run costs of the installation and opportunity costs related to the reservation of capacity to provide balancing service that is therefore unable to be used to deliver energy services.

This step will be performed during the yearly process defining the auction parameters to be proposed.

3.2.3 Step 3: Missing-money estimation for short-list of existing technologies (see principle (~~7~~6))

Based on the results of steps 1 and 2, a missing-money estimation shall be performed by the TSO with respect to the relevant delivery period. For each considered technology, the missing-money shall be estimated as follows:

Missing-money =

(annualized routine investments

+ yearly fixed O&M costs

+ activation cost for one availability test [only for high SRMC technologies]

– yearly inframarginal rents earned on the energy market ~~revenues~~

– yearly net revenues from the provision of balancing ~~and ancillary~~

[8] The scenario used here shall be consistent with the one(s) determined to calibrate the volume to be procured through the CRM as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law.

~~service~~services) * 1,05

A 5% uncertainty margin shall be added to the missing-money estimation. In the first place, an uncertainty margin is introduced because of the general uncertainty related to the estimation of the intermediate price cap. Indeed, it is not straightforward to estimate a project's missing-money, let alone do this a couple of years in advance as is the case since the intermediate price cap is an auction parameter that is calibrated several years before the actual delivery period takes place. Moreover, taking into account an uncertainty margin also reduces the risk of excluding projects due to an intermediate price cap that is too restrictive, which would confront them with an unnecessary market ~~revenues~~exit signal.

This step will be performed during the yearly process defining the auction parameters to be proposed.

3.2.4 Step 4: Proposal of intermediate price cap (see principles (1)-(2))

In this ~~final~~fourth step, a proposal for the intermediate price cap shall be put forward by the TSO. The proposed intermediate price cap shall be equal to the highest missing-money of the technologies considered for the relevant delivery period. Note that one intermediate price cap shall be proposed per auction. Therefore, several intermediate price caps will be proposed when more than one auction will be organized (e.g. two when one Y-4 and one Y-1 auction will be organized).

This step will be performed during the yearly process defining the auction parameters to be proposed.

3.2.5 Steps 5 and 6: Advice from CREG and FPS & Determination of the intermediate price cap

To conclude the yearly cycle determining the intermediate price cap a final 5th and 6th step are required – which are already described in the Electricity Law Art. 7undecies, §2 and therefore not part of the calibration methodology to be included in the Royal Decree articles with respect to the methodology for setting the intermediate price cap.

In step 5, CREG and the FPS will provide an advice on the proposal of the intermediate price cap submitted by the TSO. These advices shall be transferred to the Minister.

The final 6th step determines the intermediate price cap. Based on the proposal by the TSO (Step 4), taking into account the advices of CREG and the FPS (Step 5), the intermediate price cap will be fixed by means of Ministerial Decree.

Summary of the proposed principles following from Chapter 3 Calibration methodology of intermediate price cap
When? How many?
(1) On a yearly basis, an intermediate price cap will be proposed for each auction that will be organized, related to the relevant delivery period to which this auction relates.

How?

(2) The intermediate price cap shall be equal to the missing-money of the technology with the highest missing-money~~ among the technologies listed in (3). ~~.

The missing-money shall be estimated for each considered technology ~~listed in (3) shall be estimated ~~according to the formula provided in (~~7~~6), taking into account the cost estimation as referred to in (~~4) (5~~3) and revenue estimation as referred to in (~~6~~5).

● **~~technologies~~costs**

(3) ~~A ~~For a short-list of existing technologies~~ to be considered for the calibration of the intermediate price cap shall be based on an independent expert study on behalf of and in collaboration with the TSO and the regulator. This list of technologies shall be updated only when deemed appropriate, i.e. when market or technological conditions have changed considerably.~~

~~**● costs**~~

~~(4) For each technology listed in (3),~~, the following cost components shall be estimated by the TSO in concertation with the regulator, based on a substantiated study by an independent expert~~ study on behalf of and in collaboration with the TSO and the regulator, with respect to a reference CRM delivery period~~:

(a) annualized routine investments not directly linked to a life-time extension or capacity augmentation (in €/MW/year),

(b) yearly fixed O&M costs (in €/MW/year),

(c) ~~short run marginal~~variable O&M costs, excluding fuel and CO2 costs (in €/MWh~~). ~~),

(d) fuel costs (in €/MWh),

(e) CO2 costs (in €/tCO2)

(f) activation cost for availability tests as described in the CRM market rules (in €/MW/test).

The cost component estimation shall be updated ~~only when deemed appropriate, i.e. ~~on a yearly basis.

(4) The independent expert study shall include the following cost components:

(a) annualized routine investments not directly linked to a life-time extension or capacity augmentation (in €/MW/year),

(b) yearly fixed O&M costs (in €/MW/year),

(c) variable O&M costs, excluding fuel and CO2 costs (in €/MWh)

This study shall be updated when market or technological conditions have changed ~~considerably~~significantly, or at least every three years.

~~(5) A methodology shall be determined by an independent expert study on behalf of and in collaboration with the TSO and the regulator to translate each cost component as~~

~~determined in (4) to another delivery period.~~

~~This methodology shall be updated together with, and hence when deemed appropriate for, the cost estimation as referred to in (4).~~

● **revenues**

(~~6~~5) For each technology listed in (3), the following revenue components shall be estimated by the TSO:

(a) yearly inframarginal rents earned on the energy market (in €/MW/year)

i) determined based on a probabilistic market modelling tool

ii) taking into account a reference scenario consistent with the one(s) determined to calibrate the volume to be procured through the CRM as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law base case scenario

iii) ~~taking into account the short run marginal costs as determined in the cost component estimation as referred to in (4) (c)~~

~~iv)~~ considering P50 revenues~~ and~~, taking into account the applicable strike price level, as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law and considering P50 revenues~~.~~, reduced by the variable costs as referred to in (3) (c), (d) and (e).

(b) yearly net revenues from the provision of balancing ~~and ancillary service market revenues (in €/year~~services

i) determined based on total historical procurement ~~cost~~costs for balancing~~/ancillary~~ services ~~based on historical data.~~ over the last 36 months

ii) taking into account the costs associated with the delivery of balancing services, such as must-run costs of the installation and opportunity costs related to the reservation of capacity to provide balancing service that is therefore unable to be used to deliver energy services

The revenue component estimation shall be updated on a yearly basis.

● **missing-money**

(~~7~~6) For each technology listed in (3), a missing-money estimation shall be performed by the TSO, according to the following formula:

Missing-money =

~~Annualized routine investments not directly linked to a life-time extension or capacity augmentation, as referred to in (4) (a), if necessary translated to the relevant delivery period according to the methodology as referred to in (5)~~

~~+ Yearly fixed O&M, as referred to in (4) (b), if necessary translated to the relevant delivery period according to the methodology as referred to in (5)~~

~~- Yearly inframarginal rents earned on the energy market, as referred to~~

~~in (6) (a)~~

~~- Yearly balancing and ancillary service market revenues, as referred to in (6) (b)~~

~~The missing-money estimation shall be updated on a yearly basis.~~

~~Annex: Summary of the proposed principles as a basis towards the intermediate price cap articles in the Royal Decree Methodology~~

~~Scope of the intermediate price cap:~~

~~(1) An intermediate price cap is a price cap that applies to all bids related to CMUs applying for a one-year capacity contract~~

~~(2) A single intermediate price cap shall be determined for each Y-1 and Y-4 capacity auction organized.~~

~~Calibration methodology of intermediate price cap:~~

~~When? How many?~~

~~(1) On a yearly basis, an intermediate price cap will be proposed for each auction that will be organized, related to the relevant delivery period to which this auction relates.~~

~~How?~~

~~(2) The intermediate price cap shall be equal to the missing-money of the technology with the highest missing-money among the technologies listed in (3).~~

~~The missing-money for each technology listed in (3) shall be estimated according to the formula provided in (7), taking into account the cost estimation as referred to in (4)-(5) and revenue estimation as referred to in (6).~~

- **~~technologies~~**

~~(3) A list of existing technologies to be considered for the calibration of the intermediate price cap shall be based on an independent expert study on behalf of and in collaboration with the TSO and the regulator. This list of technologies shall be updated only when deemed appropriate, i.e. when market or technological conditions have changed considerably.~~

- **~~costs~~**

~~(4) For each technology listed in (3), the following cost components shall be estimated based on an independent expert study on behalf of and in collaboration with the TSO and the regulator, with respect to a reference CRM delivery period:~~

> ~~(a) annualized routine investments not directly linked to a life-time extension or capacity augmentation (in €/year),~~
>
> ~~(b) yearly fixed O&M costs (in €/year),~~
>
> ~~(c) short run marginal costs (in €/MWh).~~

~~The cost component estimation shall be updated only when deemed appropriate, i.e. when market or technological conditions have changed considerably.~~

~~(5) A methodology shall be determined by an independent expert study on behalf of and in collaboration with the TSO and the regulator to translate each cost component as determined in (4) to another delivery period.~~

~~This methodology shall be updated together with, and hence when deemed appropriate for, the cost estimation as referred to in (4).~~

~~● revenues~~

~~(6) For each technology listed in (3), the following revenue components shall be estimated by the TSO:~~

~~(a) yearly inframarginal rents earned on the energy market (in €/year)~~

~~i) determined based on a probabilistic market modelling tool~~

~~ii) taking into account a reference scenario consistent with the one(s) determined to calibrate the volume to be procured through the CRM as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law base case scenario~~

~~iii) taking into account the short run marginal costs as determined in the cost component estimation as referred to in (4) (c)~~

~~iv) considering P50 revenues and taking into account the applicable strike price level, as defined in the Royal Decree methodology meant in Art. 7undecies §2 of the Electricity Law and considering P50 revenues.~~

~~(b) yearly balancing and ancillary service market revenues (in €/year) determined based on total historical procurement cost for balancing/ancillary services based on historical data.~~

~~The revenue component estimation will be performed during the yearly process defining the auction parameters.~~

~~● missing-money~~

~~(7) For each technology listed in (3), a missing-money estimation shall be performed by the TSO, according to the following formula:~~

~~Missing-money =~~

[Annualized routine investments not directly linked to a life-time extension or capacity augmentation, as referred to in (~~4) (a), if necessary translated to the relevant delivery period according to the methodology as referred to in (5~~3) (a)

+ Yearly fixed O&M, as referred to in (~~4~~3) (b~~), if necessary translated to the relevant delivery period according to the methodology~~)

+ For technologies with high SRMC, activation cost for availability tests, as referred to in (~~5~~3) (f)

- Yearly inframarginal rents earned on the energy market, as referred to in (~~6~~5) (a)

- Yearly balancing and ancillary service market revenues, as referred to in (~~6~~5) (b~~)~~)]

* 1, 05

The missing-money estimation ~~will~~shall be ~~performed during the~~updated on a yearly ~~process defining the auction parameters.~~basis.

Updated CRM design note: Prequalification and Pre-delivery Monitoring

March 2020

Table of contents

Purpose of this document

The goal of this present note is to clarify and summarize the CRM design requirements related to the prequalification and the pre-delivery monitoring processes.

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by ELIA in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by ELIA in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means is a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

[1] https://www.ELIA.be/-/media/project/ELIA/ELIA-site/ug/crm/dn3_crm-design-note---prequalification-and-pre-delivery-monitoring.pdf
[2] https://www.ELIA.be/-/media/project/ELIA/ELIA-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.ELIA.be/-/media/project/ELIA/ELIA-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.ELIA.be/-/media/project/ELIA/ELIA-site/ug/crm/20191220_updated-kb-ELIA_volumeparameters_frnl_clean.pdf

Structure of this document

This design note is organized in two specific parts.

The first part focuses on the **Prequalification Processes** which are an absolute pre-requisite for any CRM Candidate willing to prequalify:

- A Capacity Market Unit (CMU) to submit an offer in an Auction (Y-4 or Y-1, also called "Primary Market") or for a possible participation to the Secondary Market – this is the **Standard Prequalification Process**;
- A Virtual Capacity Market Unit (VCMU) to submit an offer in an Auction Y-4 – this is the **Specific Prequalification Process**;

In this way, ELIA details the Prequalification Processes applicable to any CRM Candidate. To provide the reader with the necessary context, it starts with an explanation of the most important "CRM related" terminology and a reminder of the legal framework. It continues then with an overview (including a timeline) of ELIA's expected interactions with third parties (DSOs, CREG, FOD…) and goes on with a detailed description of administrative and technical requirements collected or verified by ELIA during this Prequalification Process. These prequalification related requirements are organized in **6 steps**. Finally, ELIA clarifies the three possible methodologies to calculate the Nominal Reference Power that is used as input to the CMU Eligible Volume determination and presents the rules around possible CMU evolution in time (from one Auction cycle and/or Secondary Market Transactions to the other).

The second part of the document presents the monitoring process applicable to the pre-delivery period (hereafter "**pre-delivery monitoring process**"). This process is applicable from the moment a capacity is contracted (consecutive to an Auction or to a validated Transaction on the Secondary Market) and ends with the start of the Delivery Period. The objectives of the pre-delivery period for ELIA is to ensure compliancy, all along the related period, between what has been contracted and what is effectively measured (for Existing Capacities) or realized (for Additional & Unproven Capacities). To ensure such compliancy, specific financial penalties are applicable.

Out of scope

With this document, ELIA wants to summarize the principles and key requirements applicable to both the prequalification and pre-delivery monitoring processes. The related tools, interfaces and operational organization are not discussed yet with market parties. It will be the case in a later stage of the process, scheduled to start mid 2020 once the design consultation phase is over.

Terminology

Prior to the description of the prequalification requirements (part 1) and pre-delivery monitoring process (part 2) and to facilitate the reading of this document, ELIA wants to clarify in this section essential CRM–specific terminology used all along the document. This is to be read in complement to the “list of definitions” document that is proposed to market parties as support to this consultation.

The present section is divided in three categories: roles, units and volume. To conclude it, an overview is presented in a table below.

Roles related terminology

Specific roles are needed because rights and obligations will differ depending on the stage of the CRM process. Furthermore, some terms are fixed by the CRM Law. Those terms are therefore not subject to consultation. In this way, ELIA identifies the need to have the following 4 roles:

Capacity Holder: According to the CRM Law, article 2, 74°, every natural person or legal entity that can offer **Capacity**, either on an individual or aggregated basis.

From the moment a **Capacity Holder** wishes to participate to the CRM, he shall request an access to the Prequalification Platform and this request is done by submitting an application form which must be approved by ELIA. As soon as this application form has been approved, the Capacity Holder becomes a **CRM Candidate**.

CRM Candidate: Capacity Holder whose application form has been accepted by Elia.

Prequalified CRM Candidate: The CRM Candidate that is allowed to participate in the Primary Market or the Secondary Market thanks to the prequalification of one or several Capacity Market Unit(s). A CRM Candidate thus becomes a prequalified CRM Candidate from the moment at least one of his Capacity Market Unit or one of his Virtual Capacity Market Unit is successfully prequalified.

Capacity Provider: According to the CRM Law, article 2, 75°, every Capacity Holder selected after closing of the Auction and that will keep available a capacity during a Delivery Period in return for a Capacity Remuneration.

Unit-related terminology

As soon as the Capacity Holder becomes a CRM Candidate, he is allowed to introduce a Prequalification File on ELIA’s Prequalification Platform. One Prequalification File concerns one **Capacity Market Unit** (hereafter “CMU”) or one **Virtual Capacity Market Unit** (hereafter “VCMU”).

Terminology related to Capacity Market Unit (CMU)

A CMU consists of at least one Delivery Point (also called "Capacity"). Two possible status can be associated to a Delivery Point, and by extension to its related CMU: **existing** and **additional**.

A Capacity is considered as "Existing" from the moment the Nominal Reference Power can be calculated by ELIA or the relevant DSO as per one of the three possible methodologies (as detailed in section 3.1.4) and as long as it respects the metering requirements defined by ELIA.

On the contrary, a Capacity is considered as "**Additional**" if it is not yet connected to the grid or not equipped yet with metering devices at the moment of Prequalification File submission date. The Nominal Reference Power thus corresponds to a value as declared by the CRM Candidate.

In addition to the two possible status associated to its Delivery Point(s) (Existing or Additional); a Capacity Market Unit can either be "individual" or "aggregated". **An individual CMU** contains only one Delivery Point, while in opposition **an aggregated Capacity Market Unit** contains more than one Delivery Point. A CRM Candidate cannot aggregate into one CMU Delivery Points subject to a Daily Schedule obligation. These Capacities **must** be prequalified individually.

Furthermore, from the moment one Capacity part of an aggregated CMU is considered as "Additional", the whole CMU gets the "Additional" status and is subject to the requirements listed in section 3.1.3.3.

Finally, a Delivery Point can either corresponds to a metering point behind an Access Point (i.e: a "Submeter") or to the Access Point (i.e.: "Headmeter"). Two examples are provided below to illustrate it.

In a first example, 2 Capacities (one of 300 MW and one of 350 MW) are connected behind the same Access Point. Both are equipped with a valid metering device (DP1 and DP2) and fall under the obligation to participate individually (the Capacity is subject to a Daily Schedule Obligation).

During the CRM Prequalification Process, the CRM Candidate will therefore introduce a Prequalification File for CMU 1 (related to the Capacity of 300 MW) and a second one for CMU 2 (related to the Capacity of 350 MW).

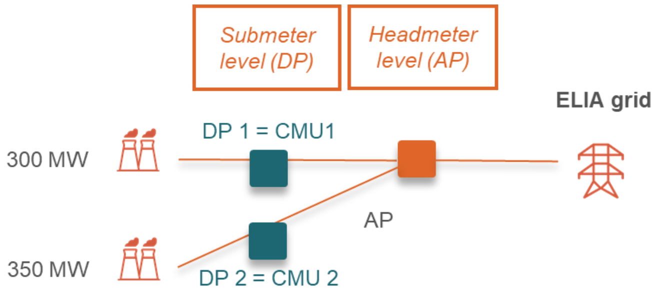


Figure 1 – Example of configuration with two CMU

In the second example, three Capacities (20 MW, 10 MW and 5 MW) are connected behind the same Access Point. As each individual Capacity has a Nominal Reference Power lower than the threshold from which an individual participation in the CRM mechanism is required, the CRM

Candidate has **the possibility to** choose between two configurations:

1) Propose a Capacity Market Unit using the metering device of the Access Point in the CRM prequalification. The Capacity Market Unit is then the aggregation of these 3 Capacities (total of 35 MW). It is called an Aggregated CMU and it will be considered as only one entity in the CRM mechanism (illustration below).

2) Propose one Capacity Market Unit for each individual Capacity, provided that they are equipped with a valid metering device. In such configuration, the CRM Candidate prequalifies 3 independent CMUs (following same illustration than in Figure 1).

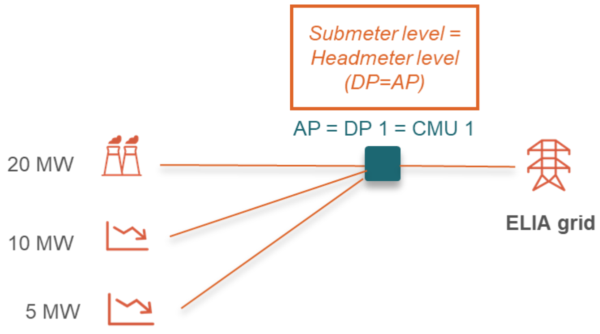


Figure 2 – Example of configuration with one CMU

Terminology related to Virtual Capacity Market Unit

A Virtual Capacity Market Unit cannot be associated – at the moment of Prequalification File submission date – to one or more Delivery Point(s).

It is associated to the status of "**Unproven**". Furthermore, a specific prequalification process applies as detailed in section 3.2.

Volume-related terminology

ELIA identifies the need to define with specific terms the volume related to a unit. Indeed, these terms are used all along the CRM mechanism and are related to specific obligations. In this way, the following 4 terms are proposed. It is important to highlight that those 4 terms are not the only ones related to the volume, but only the most relevant for the Prequalification Process (subject of this design note).

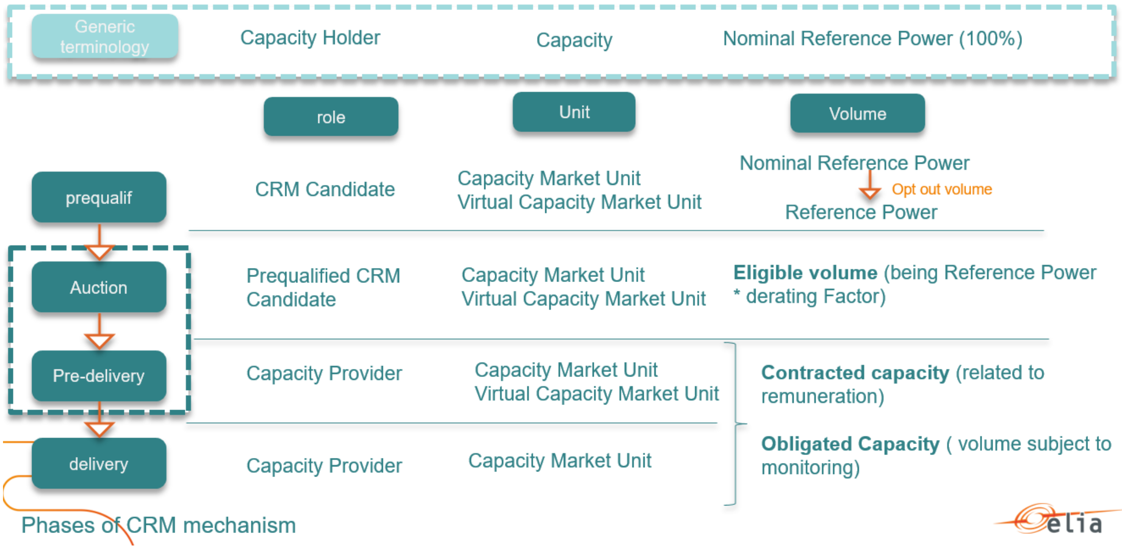
Nominal Reference Power: it corresponds to the maximal capacity (expressed in MW) that **could** be offered in the CRM mechanism (so before application of relevant Derating Factor and Opt-Out Volumes).

Reference Power: this volume corresponds to the capacity that **must** – according to the CRM Candidate – be considered in the CRM mechanism, before application of the relevant Derating Factor but after deducing the Out-Out Volume (if applicable).

Eligible Volume: this volume corresponds to the Reference Power (expressed in MW) of a CMU multiplied by the Derating Factor, as determined in the Capacity Contract Framework during the Prequalification Process or in case of Unproven Capacity the volume associated to a Virtual CMU as declared 100% available by the CRM Candidate.

Contracted Capacity: The capacity of a CMU subject to a Transaction in the Primary Market or in the Secondary Market.

To conclude this section, ELIA provides the executive summary in the table below.



Part I – Prequalification Process

0 Overview of legal framework

On 4 April 2019, the Belgian parliament approved the proposed modifications of the 29 April 1999 electricity law about the organization of electricity market (through the adoption of the CRM Act on 22 April 2019). These modifications concern the set-up of a Capacity Remuneration Mechanism. Main articles related to the Prequalification Process are the following:

82° "prekwalificatieprocedure": de procedure die ertoe strekt de mogelijkheid vast te stellen voor de capaciteitshouders om deel te nemen aan de veiling;	82° "procédure de préqualification": la procédure visant à déterminer la possibilité des détenteurs de capacité de participer à la mise aux enchères;
§ 4. De Koning bepaalt, bij besluit vastgesteld na overleg in de Ministerraad, de criteria en/of nadere regels voor het in aanmerking komen voor de prekwalificatieprocedure. Deze criteria en/of nadere regels beogen:	§ 4. Le Roi définit, par arrêté délibéré en Conseil des ministres, les critères et/ou modalités d'éligibilité à la procédure de préqualification. Ces critères et/ou modalités visent:
1° de mogelijkheid voor de capaciteitshouders die genieten of genoten hebben van steunmaatregelen om deel te nemen aan de prekwalificatieprocedure;	1° la possibilité pour les détenteurs de capacité bénéficiant ou ayant bénéficié de mesures de soutien de participer à la procédure de préqualification;
2° de minimumdrempel in MW, na toepassing van de reductiefactoren, waaronder de capaciteitshouders niet kunnen deelnemen aan de prekwalificatieprocedure;	2° le seuil minimal, en MW, après application des facteurs de réduction, en-dessous duquel les détenteurs de capacité ne peuvent participer à la procédure de préqualification;
3° de voorwaarden waaronder de houders van rechtstreekse en onrechtstreekse buitenlandse capaciteit kunnen deelnemen aan de prekwalificatieprocedure. Deze voorwaarden worden vastgesteld voor het eerste leveringsjaar, na advies van de commissie en van de netbeheerder; zij houden rekening met de verwachte effectieve bijdrage van deze capaciteit tot de bevoorradingszekerheid van België en met het afsluiten van akkoorden onder de betrokken netbeheerders.	3° les conditions auxquelles les détenteurs de capacité étrangère directe et indirecte peuvent participer à la procédure de préqualification. Ces conditions sont fixées, après avis de la commission et du gestionnaire du réseau, pour la première année de livraison de capacité; elles tiennent compte de la contribution effective attendue de cette capacité à la sécurité d'approvisionnement en Belgique et de la conclusion d'accords entre les gestionnaires de réseau concernés.
De netbeheerder start het prekwalificatieproces uiterlijk op 1 juni op en deelt het resultaat uiterlijk vijftien dagen voor de start van de veilingen aan de capaciteitshouders mee.	Le gestionnaire du réseau lance la procédure de préqualification au plus tard le 1er juin et notifie le résultat aux détenteurs de capacité au plus tard quinze jours avant le début de la mise aux enchères.

Iedere in aanmerking komende houder van productiecapaciteit gelokaliseerd in de Belgische regelzone moet een prekwalificatiedossier indienen. Elke andere in aanmerking komende capaciteitshouder gelokaliseerd

Tout détenteur de capacité de production éligible localisé dans la zone de réglage belge est tenu d'introduire un dossier de préqualification. Tout autre détenteur de capacité éligible localisé dans la zone de réglage

KAMER • 6e ZITTING VAN DE 54e ZITTINGSPERIODE 2018 2019 CHAMBRE • 6e SESSION DE LA 54e LÉGISLATURE

8 DOC 54 3584/005

in de Belgische regelzone en, onder de voorwaarden bepaald door de Koning krachtens het eerste lid, elke houder van buitenlandse capaciteit is toegestaan om een prekwalificatiedossier in te dienen.

belge et, aux conditions définies par le Roi en vertu de l'alinéa 1er, tout détenteur de capacité étrangère est autorisé à introduire un dossier de préqualification.

In het geval dat een houder van productiecapaciteit bij indiening van zijn prekwalificatiedossier niet beschikt over de individuele vergunning, zoals bedoeld in artikel 4, bevat het prekwalificatiedossier alle noodzakelijke informatie voor het verkrijgen van deze individuele vergunning, die vereist is krachtens artikel 4 en diens uitvoeringsbesluiten.

Dans le cas où un détenteur de capacité de production ne dispose pas, au moment de l'introduction de son dossier de préqualification, de l'autorisation individuelle visée à l'article 4, le dossier de préqualification contient toutes les informations nécessaires à l'obtention de cette autorisation individuelle, requises en vertu de l'article 4 et de ses arrêtés d'exécution.

§ 5. Gelijktijdig met de indiening van het prekwalificatiedossier, dient de capaciteitshouder, die een capaciteitscontract wenst te verkrijgen voor meer dan één periode van capaciteitslevering, een ten opzichte van de criteria bepaald krachtens het vierde lid gemotiveerd en gedetailleerd investeringsdossier in bij de commissie.

§ 5. Concomitamment à l'introduction du dossier de préqualification, le détenteur de capacité qui souhaite obtenir un contrat de capacité pour plus d'une période de fourniture de capacité introduit auprès de la commission un dossier d'investissement détaillé et motivé au regard des critères d'éligibilité déterminés en vertu de l'alinéa 4.

Na onderzoek van het investeringsdossier bepaalt de commissie de klassering van de capaciteit in een capaciteitscategorie. De beslissing van de commissie betreft enkel de investeringsdossiers van capaciteiten die de netbeheerder heeft geprekwalificeerd. Deze laatste verstrekt de commissie, met al de nodige zorgvuldigheid, alle informatie die hiervoor nodig is.

Après examen du dossier d'investissement, la commission détermine le classement de la capacité dans une catégorie de capacité. La décision de la commission ne porte que sur les dossiers d'investissement des capacités que le gestionnaire du réseau a préqualifiés. Ce dernier transmet à la commission, avec toute la diligence requise, toutes les informations nécessaires à cet égard.

De commissie deelt haar beslissing uiterlijk vijftien dagen voor de start van de veiling aan de capaciteitshouder mee.

La commission notifie sa décision au détenteur de capacité au plus tard quinze jours avant le début de la mise aux enchères.

Elke capaciteitshouder die na het doorlopen van de prekwalificatieprocedure in aanmerking komt en geselecteerd is, mag deelnemen aan de veiling. Een capaciteitshouder kan beslissen om geen bieding in te dienen in het kader van de veiling voor het geheel of een deel van zijn capaciteit, op voorwaarde dat hij de netbeheerder er voorafgaand aan de veiling van op de hoogte brengt. De netbeheerder houdt rekening met deze niet-aangeboden capaciteit voor de veiling overeenkomstig de werkingsregels van het capaciteitsvergoedingsmechanisme bedoeld in paragraaf 8.

De werkingsregels van het capaciteitsvergoedingsmechanisme omvatten in het bijzonder:

1° de criteria en modaliteiten inzake prekwalificatie;

Tout détenteur de capacité éligible et sélectionné au terme de la procédure de préqualification peut participer à la mise aux enchères. Un détenteur de capacité peut décider de ne pas remettre offre lors de la mise aux enchères, pour la totalité ou une partie de sa capacité à condition de le notifier au gestionnaire du réseau préalablement au début de la mise aux enchères. Le gestionnaire de réseau tient compte de cette capacité non offerte pour la mise aux enchères conformément aux règles de fonctionnement du mécanisme de rémunération de capacité visées au paragraphe 8.

Les règles de fonctionnement du mécanisme de rémunération de capacité contiennent notamment:

1° les critères et modalités de préqualification;

1 Interactions with third parties

As foreseen in the CRM Act and as best practice from similar processes set up in balancing markets, the CRM Prequalification Process is not solely ELIA's responsibility. Indeed, third parties (FOD, regulator, DSOs…) have their role to play and will contribute all along the procedure.

Before further detailing the steps of this Prequalification Process and the requirements applicable to any Capacity Market Unit or Virtual Capacity Market Unit, ELIA highlights these identified interactions in the figure below and in this section.

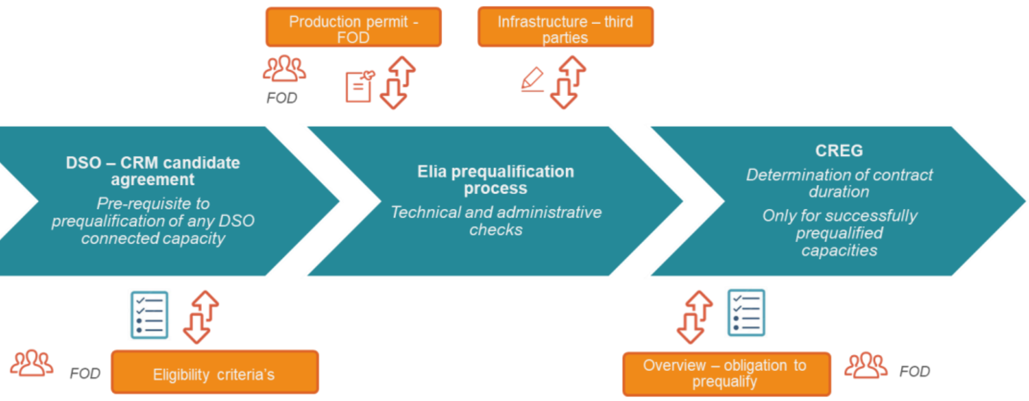


Figure 3 – Prequalification Process and interactions with third parties

1.1 Prequalification of DSO-connected capacities

DSO-connected capacities will more than probably participate to the Capacity Remuneration Mechanism, either as individual CMU or via an aggregated one.

The participation of DSO-connected Delivery Points to market services is not a novelty as such. Indeed, Demand Side Response has contributed to deliver successfully balancing services such as FCR and mFRR. In those markets, the related prequalification processes and the collaboration with the DSOs have proven their efficiency. Furthermore, each product design evolution included further operational improvement.

For these reasons, ELIA proposes to use the current operational procedures of balancing services as starting point for the CRM Prequalification Process for DSO-connected capacities. Concretely, **a pre-condition to start the CRM Prequalification Process will be** – similar to the FCR and mFRR process – **to have a signed "DSO-CRM Candidate Agreement" between the CRM Candidate and the concerned DSO(s)**. Of course, this pre-condition only concerns DSO-connected Delivery Points.

Obviously, ELIA will follow the upcoming balancing design improvements (e.g: mFRR 2020) to guarantee consistency between energy and capacity market processes and requirements.

Furthermore, ELIA reminds that the exact DSO related requirements within this specific agreement are not part of this design document and will be subject to further clarification by the DSOs.

1.2 Interactions foreseen in the CRM Law

1.2.1 Obligation to prequalify

The CRM Law specifically foresees (art. 6 §4) an obligation from any Capacity Holder with production excessing the minimal threshold[5] to submit a Prequalification File. Even though the entity responsible for the monitoring of this obligation as well as the determination and application of possible penalties in case of non-compliance is still to be determined, it is clear that both ELIA and the DSOs will have a role to play at least as provider of the overview of which Capacity Holder has introduced a Prequalification File.

Furthermore and to facilitate the respect of this legal obligation, ELIA foresees a "**Fast Track Prequalification Process**" (see section **Error! Reference source not found.**). In this specific process, ELIA lists the minimal quantity of information required from the Capacity Holder to be compliant with the law.

There are two consequences of this "Fast Track Prequalification Process":

1) It gives no right to the Capacity Holder to introduce a bid in the Auction nor to participate to the Secondary Market (as only part of the Prequalification Process has been respected) and;
2) The related (de-rated) volume is considered by default as "Opt-Out-Out Volume" and taken into consideration accordingly in the volume determination, as a correction volume of the demand.

However, such process is not definitive and the Capacity Holder may resume the Prequalification Process anytime, provided it complies with time schedule and requirements as detailed below.

1.2.2 Production permit

In case a Capacity Holder has the obligation to possess a valid production permit for its Capacity[6] and provided that this permit has not been given when submitting the related Prequalification File, the CRM Law (art.6 introducing an art. 7undecies §4 in the Electricity Law) requires the Capacity Holder to provide in the Prequalification File all information required on how to get such a permit. As part of the Prequalification Process, ELIA will verify – based on a checklist provided by FPS Economy - that the CRM Candidate shares all the required information. Once this verification is performed, ELIA will send the Prequalification File to the FPS (responsible for the production permit delivery) to get their formal confirmation on that specific aspect.

[5] The minimal threshold will be fixed – along with the Eligibility Criteria's in a Royal Decree
[6] The criteria's to determine which capacities are subject to this obligation along with the process to respect are detailed on the CREG website (https://www.creg.be/fr/professionnels/production/comment-devenir-producteur)

1.2.3 Capacity Contract Duration

In parallel to the submission of its Prequalification File, a CRM Candidate willing to get a Capacity Contract for more than one Delivery Period (contract duration longer than one year) introduces a detailed investment file to the CREG and makes sure it contains the information required (cf. Art.7undecies, §5 of the Electricity Law introduced by art. 6 of the CRM Law). The CREG only looks at investment files related to capacities successfully prequalified by ELIA. In this way, the CRM Candidate will notify its will to apply for a longer Capacity Contract Duration at the beginning of ELIA's Prequalification Process (as part of its prequalification file) so:

a. A unique Project ID can be generated by ELIA to be used by the CRM Candidate as reference in its investment file to CREG and;
b. The related Nominal Reference Power calculated by ELIA can be shared with the CREG – once the Prequalification File successfully passes the prequalification – within the timing foreseen by the CRM Law.

One investment file can include more than one CMU.

1.2.4 Eligibility Criteria

The set-up of the Eligibility Criteria is not ELIA's responsibility and is therefore not discussed in this document. A royal decree, as meant in Art. 7undecies § 4 of the Electricity Law introduced by art. 6 of the CRM Law will further specify these rules.

However – due to the obvious link with the CRM Prequalification Process, ELIA will require from any CRM Candidate willing to prequalify its **official commitment with requirements as detailed in Royal Decree related to eligibility criteria**. Of course, this commitment may be subject to an audit from the relevant authorities. More details can be found on this in section 3.1.2.2.

1.3 Technical possibility to connect the proposed capacity

As some projects are also dependent on (network) **infrastructure work** from third parties other than ELIA (e.g. Fluxys), ELIA must make sure that the related Delivery Point(s) can effectively be connected in time and prior to the start of the concerned Delivery Period. In this way, and only for related additional capacity(ies), ELIA also requires a written confirmation from that third party of the project's feasibility within the timeframe imposed by the CRM calendar from these parties. The nature of this written confirmation (e.g. comfort letter, connection study…) will be determined in collaboration with those third parties taking into account their procedures.

2 Timing

In this section, ELIA specifies the number of Working Days that are to be considered for each step of the Prequalification Processes. The timing presented below applies to both Standard and Specific Prequalification Processes and **starts from the Prequalification File submission date.** The time needed for a Capacity Holder to register himself via the application form (pre-requisite to the possible submission of a Prequalification File) is therefore not included. This application form will be accepted by ELIA within maximum 5 Working Days.

One Prequalification File is required per Capacity Market Unit.

a. From the Prequalification File submission date, ELIA has up to 20 Working Days to verify the Prequalification File's completeness. In case of missing elements, ELIA will notify the CRM Candidate accordingly;

b. In case additional elements are required to complete a Prequalification File, the CRM Candidate shall have up to 10 Working Days to communicate them to ELIA, starting from ELIA's notification date.

c. From the moment the additional elements are submitted to ELIA, ELIA has 5 Working Days to validate or reject the Prequalification File. In case of rejection; a new Prequalification File shall be introduced by the CRM Candidate. In consequence, it shall respect the process as from step "a" above.

d. Once a Prequalification File is validated by ELIA (hence considered as complete), ELIA calculates the Nominal Reference Power within the next 10 Working Days. By the end of these 10 Working Days, the resulting Nominal Reference Power (also called "Provisional Nominal Reference Power" or "Provisional NRP") is communicated to the CRM Candidate.

e. From the provisional NRP notification date, a CRM Candidate has 5 Working Days to contest the result of ELIA's calculation.

f. In case a contestation is introduced to ELIA within that period of time, an additional period of 5 Working Days is foreseen to leave the possibility to the CRM Candidate to organize its own test, following the 3rd method described in section 3.1.4.1.1.3 of this document. ELIA will consider the highest Nominal Reference Power, between its results and CRM Candidate's one, as final.

g. Once the final NRP is known and notified to the CRM Candidate (within a period of 5 Working Days from the day of the prequalification test), ELIA shall calculate the related Eligible Volume within a period of 10 Working Days. Consecutive to the calculation of a CMU's Eligible Volume, ELIA will notify the prequalification results to the CRM Candidate.

Taking into account the milestones set by CRM Law and in case a CRM Candidate **wants to participate to a forthcoming auction**, prequalification results shall be communicated to the CRM Candidate no later than the 15/09 of the year of that Auction. Based on the timing specified above, such Prequalification File must be introduced to **ELIA no later than 15/06.**

Finally, ELIA reminds that, from the moment the Prequalification Platform is implemented and operational, the Prequalification Process is continuous. The timing detailed above is applicable in any case, from a Prequalification File submission date or from a submission of a change to the Prequalification File (see section 0).

The illustration below summarizes the Prequalification Process described above.

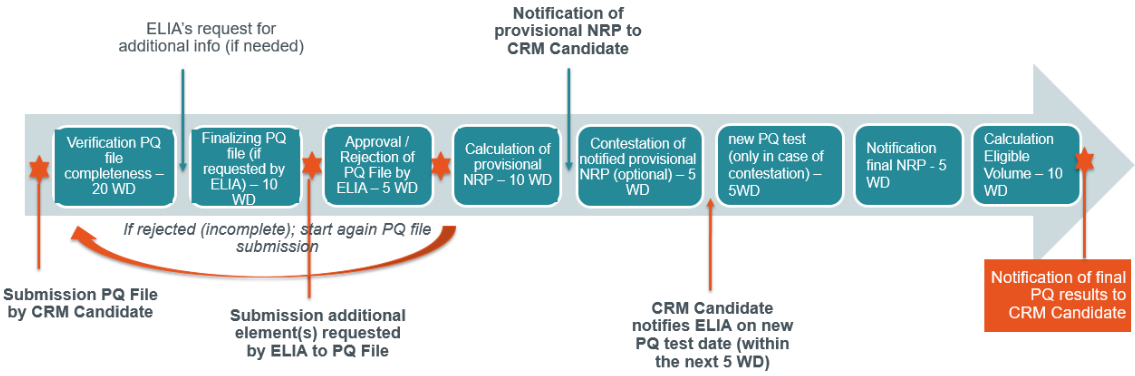


Figure 4 – Timing applicable to each step of the prequalification process

<u>Important remarks:</u>

1) While ELIA confirms its intention to propose a continuous pre-qualification process to facilitate the participation to the Secondary Market, a start date has to be determined for the first prequalification round (summer 2021).

   Considering the need to have the earliest start date possible to smoothen the expected workload on both ELIA and third parties side on one hand and the ambitious implementation trajectory which the set-up of such mechanism supposes (automated tools to support the prequalification operators) on the other hand, ELIA proposes as start date the **May 15, 2021.**

3 Prequalification Processes

In this section, ELIA details the three possible Prequalification Processes and reminds for each one of them the applicable requirements. The first section focuses on the Standard Prequalification Process. Then, the second section details the Specific Prequalification Process, applicable to the Virtual Capacity Market Unit. Finally, the last section explains the Fast-Track Prequalification Process.

3.1 Standard Prequalification Process

Here, ELIA determines the technical and administrative requirements applicable to any CRM Candidate willing to provide the service with an individual or an aggregated CMU which obtains the status of Existing or Additional Capacity. In addition, the three possible methodologies to calculate the Nominal Reference Power and the related Eligible Volume are described. Finally and whenever relevant, ELIA makes the distinction between generic requirements (applicable to both Delivery Points and Capacity Market Units labelled as "Additional" or "Existing") and specific requirements (only related to Delivery Points and Capacity Market Units categorized as "Additional")

ELIA's full CRM Prequalification Process consists in six steps, as illustrated in Figure 5 below:

1. The **Capacity Holder registration**, which consists in registering the Capacity Holder in ELIA's database following usual procurement processes. The data are to be filled-in in the application form.
2. The CRM Candidate**'s commitment with the CRM set of rules and its endorsement to the Capacity Contract**, in order to confirm his agreement with the whole set of requirements.
3. **The CMU acceptance process**. It starts from the submission of the Prequalification File**.** At such stage, ELIA verifies the technical and administrative requirements related to the Delivery Point(s) that compose(s) each CMU (e.g: Grid User Declaration; aggregation rules ;…) and those specific to the Capacity Market Unit itself.
4. **The Nominal Reference Power and Reference Power determination.** In this step, ELIA calculates (for Existing Delivery Points) the maximum volume of capacity (in MW) for each Delivery Point part of a CMU, and reduce it (if required by the CRM Candidate) by the Opt-Out Volume to get to the Reference Power.
   For Additional Delivery Points, the Nominal Reference Power and Reference Power are declared by the CRM Candidate as it cannot – by definition – be calculated by ELIA at the moment of Prequalification File Submission date.
5. **The application of Derating Factor**. Based on a specific methodology determined in a separate design document, ELIA will apply the Derating Factor corresponding to the characteristics of the CMU to the sum of the Reference Powers calculated on step 4. The result of this calculation will provide the Eligible Volume on the CMU level that can be offered in an Auction by the Prequalified CRM Candidate and/or on the Secondary Market.
6. **Communication of the Prequalification results** to involved parties (CRM Candidate, CREG, FOD, etc.).

In addition to the requirements listed above, ELIA reminds that the principles detailed in section 0 on bank guarantee apply to any Capacity Market Unit following the Standard Prequalification Process.

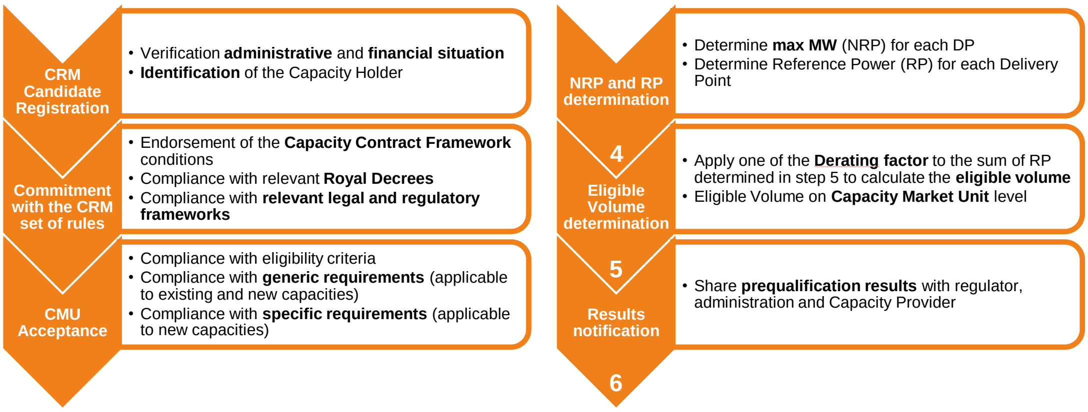
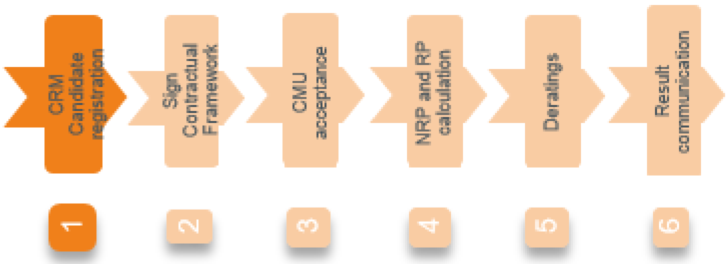


Figure 5 – The six steps of the ELIA side of the CRM Prequalification Process

3.1.1 Step 1 – CRM Candidate registration



3.1.1.1 From Capacity Holder to CRM Candidate

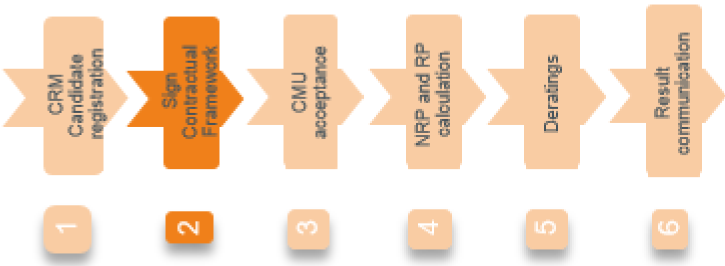
As first Prequalification step it is common practice for ELIA to verify the administrative situation of each Capacity Holder.

In order to become a CRM Candidate, a Capacity Holder shall request an access to the Prequalification Platform. This request must be done by submitting an application form via the ELIA website. This application form will require information like the one listed below. A template will be proposed as part of the Capacity Contract Framework.

- Company Name
- Address of the Head Office
- Telephone
- Fax
- Registration Number (VAT)
- Energy Identification Code (EIC)
- Etc.

The submitted application form must be verified by ELIA. However, Capacity Holder remains fully responsible for the data and others information as provided. Once approved, it remains valid for an unlimited period of time as long as the information listed in it does not evolve over time.

3.1.2 Step 2 – Commitment with the CRM set of rules



3.1.2.1 Endorsement of the Capacity Contract Framework

From the moment a CRM Candidate has submitted an application form and it has been approved by ELIA, this CRM Candidate must confirm its agreement with the whole set of requirements. It is a precondition for being prequalified.

Note that the Capacity Contract will be a regulated contract, approved by CREG.

3.1.2.2 Compliancy with Eligibility Criteria

A Royal Decree (cf. Art. 7undecies §4 of the Electricity Law introduced by art. 6 of the CRM Law) will determine the Eligibility Criteria related to having benefitted from past or ongoing *other* support mechanisms. These rules will determine whether a CMU can prequalify or not and focuses on the acceptable interferences with other subsidy mechanisms.

As first verification to determine the possible participation of a CMU to the Prequalification Process, ELIA requires from the CRM Candidate a **firm commitment** of **its compliancy with the related set of rules**. In other words, the CRM Candidate is responsible to determine and confirm to ELIA – based on the Eligibility Criteria's set by such Royal Decree – whether a CMU can participate to the Capacity Remuneration Mechanism.

This commitment is of course auditable by the relevant authorities anytime during or after the Prequalification Process and may trigger specific penalties (not described in this document).

3.1.2.3 CO_2 emission thresholds

In addition, the CRM Candidate confirms at this step the compliancy of each Delivery Point part of a Prequalification File with the applicable CO_2 emission thresholds set in Regulation (EU) 2019/943.

3.1.2.4 Compliancy with the relevant legal and regulatory frameworks

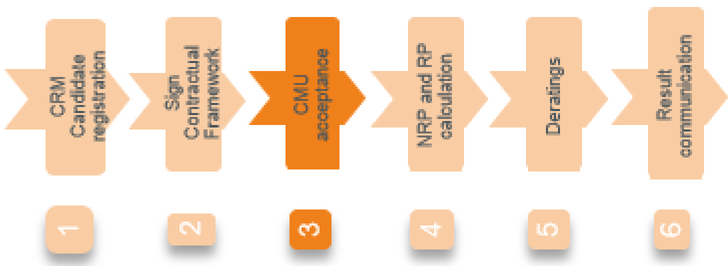
Any Delivery Point composing a Capacity Market Unit shall comply and remain compliant with the relevant legal and regulatory framework (related royal decrees, Electricity Law, Market rules, etc.).

3.1.2.5 Conditional bank guarantee

As per detailed in section 4, prior to any possible Bid submission and as part of its Prequalification File, a CRM Candidate shall provide a conditional bank guarantee issued by a recognized financial institution.

This is a way for ELIA to verify the financial situation of each CRM Candidate.

3.1.3 Step 3 – CMU acceptance



At this stage, the CRM Candidate identifies in the Prequalification Platform the CMU(s) that he intends to prequalify by **submitting one or more Prequalification File(s).** One Prequalification File contains one Capacity Market Unit only. By doing so, the CRM Candidate will deliver the required technical and administrative information detailed in the sections hereunder.

Once the Prequalification File is approved by ELIA, the process to determine the related Eligible Volume starts.

ELIA organizes the requirements to be met by the CRM Candidate in three distinct sections:

a. Prequalification requirements on Delivery Point level;
b. Prequalification requirements on Capacity Market Unit level;
c. Specific Prequalification requirements only applicable to Additional Capacity(ies).

Unless explicitly mentioned, the requirements listed below apply to TSO, DSO and CDS connected Delivery Points.

3.1.3.1 Prequalification requirements on Delivery Point level

3.1.3.1.1 Technical information

Whatever the status of the Delivery Point, the CRM Candidate shall provide ELIA with the following list of information for each Delivery Point submitted in a Prequalification File:

- **The Expected Nominal Reference Power**

This volume is declared by the CRM Candidate for the Delivery Point and represents the volume expected by the CRM Candidate for a participation to an Auction (before application of the related Derating Factor and Opt-Out Volume). For Additional Capacities, this value will be used as the final Nominal Reference Power. However, for Existing Capacities, it can be subject to adaptation following the notification of the Nominal Reference Power by ELIA (see section 3.1.4.3).

- **The Technology**

The technology of the Delivery Point shall be supplied according to the list provided into the Royal Decree Methodology.

- **The type of Delivery Point**

The CRM Candidate needs to tell to ELIA if the Delivery Point is connected to the TSO, the DSO or the CDS Grid. In case of CDS Grid, the CRM Candidate also needs to tell to ELIA if the Delivery Point is connected to the TSO or the DSO Grid.

- **The intention of the CRM Candidate to introduce an investment file to CREG**

The CRM Candidate must notify to ELIA if he intends to introduce an investment file to CREG in parallel to the CRM Prequalification Process. This is relevant for ELIA as the final Nominal Reference Power needs to be communicated by ELIA to CREG in such cases.

Furthermore, to guarantee that CREG and ELIA talk about the same Capacity on both financial and volume related aspects, ELIA will generate a unique project ID for capacities identified by the CRM Candidate as subject to an investment file. A project ID can concern more than one Prequalification File and will be communicated by ELIA via the Prequalification Platform.

- **A single line diagram**

A Single Line Diagram is a diagram with specific identification of the exact location of the Delivery Point. A Single Line Diagram can includes more than one Delivery Points. The single line diagram allows ELIA to verify the combinability rules described in section 3.1.3.1.3.

- **The link with other CMU(s) located on same geographical site (if relevant)**

The CRM Candidate needs to identify the other Delivery Point(s) and corresponding CMU(s) located on the same geographical site, and which have technical dependency. The notion of geographical site and technical dependency is defined by CREG in its royal decree proposal on investment thresholds.

In addition to the above information, the CRM Candidate must provide to ELIA the following information when he wants to prequalify an Existing Delivery Point in one of his CMU:

- **The Baseline methodology (if relevant)**

The CRM Candidate must select the Baseline methodology that suits him the best among the possibilities offered by ELIA. This will be used by ELIA for the monitoring during the pre-delivery and the Delivery Period.

- **The Unsheddable Margin (if relevant)**

The Unsheddable Margin is the minimal amount of net active power offtake (in kW/MW) that cannot be curtailed (inflexible or unsheddable power) at the Delivery Point(s) concerned. It can be equal to 0. The sign of the Unsheddable Margin is positive in case of a minimum offtake and negative in case of a maximum injection.

- **The full technical injection capacity (if relevant)**

This is the injection of active power as measured at the Delivery Point.

- **The full technical offtake capacity (if relevant)**

This is the value indicating the offtake of active power at a Delivery Point.

- **The preferred NRP methodology**

This preferred methodology (amongst the three possible options, as described in section 3.1.4) will be used by ELIA to determine the Nominal Reference Power.

- **The EAN code and the name of the Delivery Point**

The EAN code corresponds to the identification code of the certified metering device(s) to be used by ELIA as input to the pre-delivery and delivery monitoring processes. If the Delivery Point has a status of Existing, the CRM Candidate shall communicate a Delivery Point's name. There is no requirement for the choice of this name. It is up to the CRM Candidate.

- **The EAN code of the Access Point**

The EAN code of the Access Point corresponds to the identification code of the certified metering device(s) of the Access Point.

- **The Opt-Out Volume**

For the CRM Candidate which wants to decrease the Nominal Reference Power of a Delivery Point, an Out-Out Volume needs to be communicated, as per detailed in section **Error! Reference source not found.**.

- **The CO_2 emission**

The CRM Candidate must provide an attestation delivered by a competent national body in order to prove that the CO_2 emission of his Delivery Point respect the thresholds as defined in Regulation (EU) 2019/943.

- **The letter for renouncing the operating aid**

In the situation where the Capacity Holder benefits from an operating aid during the Delivery Period, a letter in which it states it is renouncing the operating aid in case it signs a Capacity Contract Framework shall be provided (see related Royal Decree) to ELIA.

- **Grid User Declaration**

Similar to the verification done by ELIA in the balancing services prequalification procedures, a signed declaration from a Grid User is necessary in each case where Grid User differs from the CRM Candidate. It gives the permission to the CRM Candidate to offer the related Capacity as a Service to ELIA. A specific template adapted to the capacity Service will be proposed in the CRM Capacity Contract in a later stage. Of course, a capacity can only be related to one Grid User Declaration.

- **CDS Operator declaration**

For CDS Delivery Points, the CRM Candidate shall obtain the agreement from the CDS Operator by submitting – as part of its Prequalification File for the related Capacity – a signed CDS Operator Declaration. Such declaration formalizes – as currently implemented in mFRR service – the needed data exchanges related to the CRM processes with the CDS Operator.

- **DSO – CRM Candidate Agreement**

A DSO – CRM Candidate Agreement is an agreement between the CRM Candidate and the DSO allowing him to provide the Service to ELIA with Delivery Points connected to its grid.
Prior to the Prequalification Process with ELIA, the CRM Candidate will deliver the required technical information to the concerned DSO(s) so the specific verifications detailed in this contract can be performed. ELIA will not consider as valid a Delivery Point connected to a DSO grid that has not been verified and confirmed by this DSO. The details about the technical and administrative requirements gathered in this DSO – CRM Candidate Agreement will be elaborated by the DSOs and are therefore not reminded in this document.

3.1.3.1.2 Metering / Submetering requirements

The authenticity of metering data used for settlement purposes is a major concern in each service procured by ELIA. There are currently two processes implemented in balancing services; depending on the kind of metering data exchanged: telemeasures (each 4 seconds) and 15-minutes metering data.

<u>4-second data</u>

As of today and for technical reasons related to the services procured (FCR and aFRR), tele measures are sent in real time from the Capacity Provider central dispatch to ELIA via a specific secured communication channel . ELIA identifies the following disadvantages that justify not duplicating this requirement to the CRM Service:

a. It **takes time** (around 2 months) to proceed to the installation of this specific communication channel;
b. The **related costs are not insignificant**;
c. It **is not future proof** (physical limitation on number of new channels that can be connected);
d. Such granularity level (4 second) is not required for a proper CRM availability monitoring.

<u>15-minutes data</u>

The second existing process is related to the mFRR service and organizes the data exchange of 15-minute measurements between the Capacity Provider and ELIA. This process was implemented in cooperation with the DSOs and concerned market parties, via a common data exchange platform. Furthermore, specific metering requirements have been established at that time to guarantee the metering data authenticity.

Given the similar metering granularity required for the monitoring of CRM Service, the existing common procedure (and platform) with DSOs and the number of metering devices already compliant with these technical requirements, ELIA **proposes to start from the mFRR data exchange requirements for the CRM Service**[7]**.**

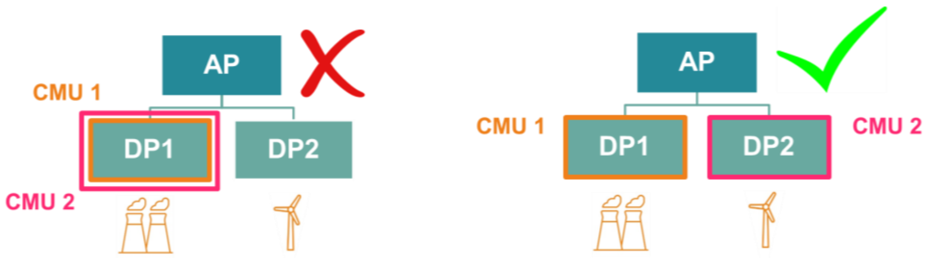
Obviously, the CRM metering requirement will evolve in parallel to the adaptations foreseen in future evolutions of mFRR product design.

3.1.3.1.3 Combination with other Capacity Providers

Here again, ELIA proposes to follow the three key principles introduced in balancing services to determine the possible competition between CRM Candidates behind an Access Point.

In this way:

1) **There can only be one CRM Candidate per Delivery Point** (an Access Point may be equal to a Delivery Point). The example below gives a practical illustration of that principle, with an Access Point behind which there are two specific capacities: a small production unit (DP2) and an industrial consumption site (DP 1). In the example, the CRM Candidate proposes the Access Point for the prequalification. He is allowed to do so as the Nominal Reference Power of each Delivery Point is lower than the threshold to participate as individual CMU (Capacities subject to a **Daily Schedule obligation**; (currently 25 MW)).

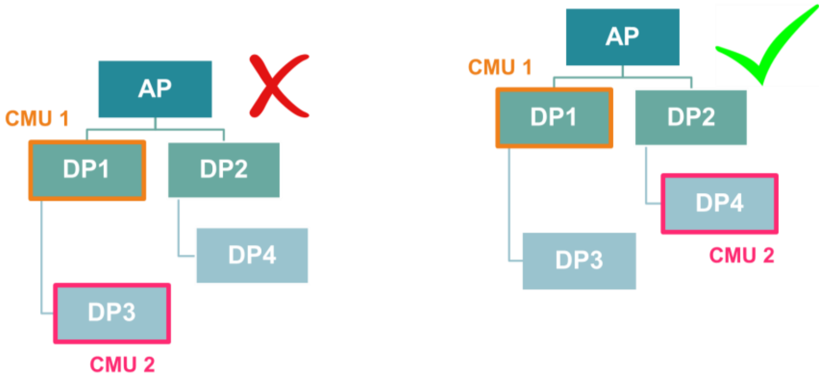


2) **One Delivery Point cannot influence another one**. In other words, no combination possible between a Service delivery on the Headmeter and a Submeter behind or with two Submeters with hierarchy (one Delivery Point above another one). Indeed, in such

[7] The exact metering device requirements are described in a specific technical appendix available on ELIA's website and will be verified by the corresponding DSO (in case of DSO-connected Delivery Point) or by ELIA (in case of TSO-connected Delivery Point). This document will also be part of the Capacity Contract Framework for the convenience of the Capacity Holders.

configuration the Delivery Point downstream (Delivery Point 1 in the example below) influences the one upstream (Access Point in the example below) and might negatively influence the control of the Service delivery.

3) **More than one CRM Candidate can deliver a Service behind an Access Point as long as these Delivery Points are not influencing each other.**
   In the example below, 2 different CRM Candidates can offer the Service as the concerned Delivery Points (DP1 and DP2) are not influencing each other and as no CRM Candidate offers the Service on the Access Point.



In case two Delivery Points are influencing each other, ELIA will apply the “first-come, first-served” principle and communicate the decision to the candidate. Then, the CRM Candidate can adapt his file by changing his Delivery Point. If it does not do it, the Delivery Point will not be prequalified.

3.1.3.2 Prequalification requirements on Capacity Market Unit level

3.1.3.2.1 Individual or aggregated Capacity Market Unit

The CRM Candidate informs ELIA about the Delivery Points that composes each CMU. Indeed, several possibilities are offered to the Capacity Provider and ELIA must make sure that the following conditions are respected:

1. Any Delivery Point with an Nominal Reference Power lower than the threshold determined by Royal Decree cannot be considered as an individual CMU but may be part of an aggregated one;

2. Any Delivery Point subject to the obligation to introduce to ELIA an individual MW schedule (obligation coming from the System Operation Guidelines and already being

respected in the energy market) is prohibited to be part of an aggregated CMU (currently, the threshold is 25 MW).

3. A Delivery point with a Nominal reference Power higher than the threshold defined by Royal Decreed and not subject to a Daily Schedule obligation may chose if its Delivery Point will be part of an aggregated CMU or not.

It is also important to remind that there are **no technology related constraints** in the set-up of an aggregated CMU (several technologies can be gathered together as long as the above-mentioned conditions are respected) and that one Delivery Point can only be part of one CMU, in the portfolio of one CRM Candidate.

3.1.3.2.2 Energy Constrained Assets and Derating Factors

As detailed in the specific design note describing derating methodology and principles, several categories are identified depending on – among other things – the technology or the energy constraint. For each category, specific Derating Factors are calculated.

At this stage of the Prequalification Process, the CRM Candidate identifies which category applies to each of his CMU. Based on this information, ELIA will calculate the Eligible Volume (as described in section 3.1.5 below).

It is important to highlight that the Prequalification Process does not aim at verifying the exactitude of the CRM Candidate derating related declaration as it will be monitored by ELIA thanks to the availability controls. In other words, a CRM Candidate proposing an Energy Constrained Asset (e.g: aggregated CMU) will not be asked to perform a prequalification test for the entire duration of this energy constraint. However, ELIA has the right to verify this requirement during the Delivery Period via the availability monitoring.

3.1.3.2.3 Declared Market Price

For each Capacity Market Unit consisting of Delivery Point(s) not subject to a Daily Schedule obligation, the CRM Candidate shall indicate at least one **Declared Market Price**. The notion of Declared Market Price is explained in a dedicated design note and therefore not further explained here.

If applicable (not a strict requirement from ELIA), the CRM Candidate may also indicate a partial Day-ahead, Intraday or Balancing price. These information are to be used during the availability monitoring process that is subject of another design note.

ELIA will foresee the possibility for any Capacity Provider to update – closer to real time – these values. The most recent data communicated via the dedicated IT interface shall prevail.

3.1.3.2.4 NEMO

For each Capacity Market Unit, the CRM Candidate indicates the NEMO in which the Reference Price is observed in the Day-ahead Market prices. The notion of Reference price is explained in a dedicated design note and therefore not further explained here.

3.1.3.3 Specific requirements applicable to Additional Capacities

On top of the generic requirements listed above, ELIA identifies in this section the need for information specifically related to CMU with an Additional status. A CMU with an Additional status is a CMU that includes at least one Delivery Point which is still in project stage and for which no energy can effectively be measured at moment of the Prequalification Process.

However, ELIA reminds that such Capacity is expected to get the Existing status at start of Delivery Period.

3.1.3.3.1 Grid connection

Prior to any possible Transaction, capacities not connected yet to the grid must comply with the grid connection process as foreseen in the Federal Grid Code. This procedure gives the confirmation to ELIA that the proposed Delivery Points (in the CRM Prequalification Process) can effectively be connected to the grid before the start of the Delivery Period. A possible connection is formalized by a signed positive technical agreement. Such agreement details both financial and technical elements related to the connection requested.

Having a signed technical agreement is a pre-requisite verified during this stage of Prequalification Process. As part of its Prequalification File, the CRM Candidate will indicate the exact reference of such technical agreement. One reference can be used for more than one Prequalification File as a project may concern more than one Capacity Market Unit.

Such technical agreement must at least remain valid until the communication of the Auction results (at the latest on 31/10 according to CRM law).

The information gathered in this technical agreement will be used by ELIA in the Auction clearing algorithm as input for the determination of grid constraints (as detailed in the specific design note on Auction algorithm).

3.1.3.3.2 Production permit

According to the CRM law, a Capacity Holder (for generation) must either deliver a valid production permit for its CMU or provide in his Prequalification File every information required for its attribution. ELIA will hence verify the completeness of the Prequalification File based on a checklist delivered from the federal administration who is responsible for the production permit delivery. ELIA will therefore timely share this information with the federal administration which will either approve the content or not.

The verification of the information related to the process for the attribution of the production permit at this stage of the Prequalification Process is of course not a guarantee for the CRM Candidate that he will obtain such permit in the end.

3.1.3.3.3 Network constraints (Fluxys, DSO)

In parallel to the verification of the possible connection of an Additional Capacity on ELIA’s grid (via the connection process described in the Federal Grid Code), ELIA must have the written confirmation that the network infrastructure (electricity and – where relevant – related to primary fuel) needed for the proper functioning of that capacity is effectively foreseen by the CRM

Candidate. In this way, ELIA requires signed commitment from the relevant network operator attesting of the possible connection before start of Delivery Period (conditional offer subject to selection of the related capacity in the Auction algorithm is accepted).

This commitment only concerns the guarantee that Delivery Points part of a Capacity Market Unit will effectively be connected to the required combustible (e.g.: gas for a gas turbine) before the start of the Delivery Period. A valid energy (primary fuel) contract is not required by ELIA as prequalification prerequisite.

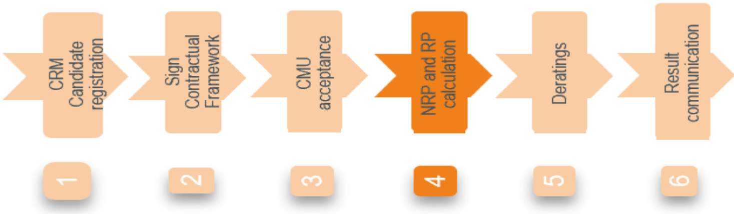
3.1.3.3.4 Project execution plan

In addition to the requirements listed above, ELIA requires to deliver a project execution plan. A project execution plan is a document that will establish the means and timeline to execute the project. It serves as the main communication vehicle to ensure to ELIA that the CRM Candidate is aware and knowledgeable of the project objectives and how they will be accomplished. This document contains at least the following elements:

a. A short description of the project;
b. The list of the main equipment(s);
c. The list of the tests to be performed;
d. The list of the permits already obtained and/or the milestones to get the required permits
e. A clear identification of the work which will be performed by third parties other than ELIA (e.g: DSOs, Fluxys) and a detailed planning for these works with yearly, quarterly and monthly milestones. Indeed, the Capacity Provider is responsible to collect the required information from these third parties so that ELIA can perform the required monitoring.
f. A clear identification of milestones, running from the moment the Auction results are communicated and until the first day of the Delivery Period. In this planning, at least the following milestones must be provided:
    - The reception date of the required permits;
    - The commencement date of the construction work;
    - The purchase date of the last main equipment(s);
    - The final completion date.

   For each step, the Capacity Provider identifies the last possible moment to finalize it without jeopardizing the project's global schedule. The milestones must be timely provided along with the relevant strategy to achieve them;
g. The details of **construction work** in itself (foundations; order of main component ;…)

3.1.4 Step 4 – Nominal Reference Power and Reference Power calculation



In this step, ELIA determines the provisional Nominal Reference Power, the final Nominal Reference Power and the Reference Power of each Delivery Point.

The **provisional Nominal Reference Power** corresponds to the maximal capacity that can be delivered by a Delivery Point. It is the outcome of the application by ELIA of one of the three methods described below. Unless contested by the CRM Candidate within a period of 5 working days starting from ELIA's notification (see section 3.1.4.1.4), it becomes automatically the **final Nominal Reference Power** that is used to determine the CMU's Eligible volume.

It is to be reminded that the determination of the final Nominal Reference Power following one of the three methods described in this section is only relevant for "Existing" Delivery Points. For "Additional" ones, ELIA uses the declared Nominal Reference Power as final Nominal Reference Power.

The **Reference Power** of a Delivery Point corresponds to the difference between the Final Nominal Reference Power and the Opt-Out Volume.

Even though the Opt-Out Volume is indicated on the Delivery Point level at the Prequalification File submission date, the CRM Candidate will have the possibility to adapt it based on the notified provisional Nominal Reference Power, within the same period of time foreseen for its contestation (5 working days, see section **Error! Reference source not found.**).

3.1.4.1 Provisional NRP calculation for Existing Delivery Points

3.1.4.1.1 For TSO-connected Delivery Points

3.1.4.1.1.1 1st method to determine the provisional NRP – use of historical data

This method only applies to Existing Capacities already connected to the Grid and which respect the metering requirements set below (see section 3.1.3.1.2). In this approach, ELIA analyzes the historical 15-minutes measurement data of each moment to determine the provisional Nominal Reference Power over a period defined below:

- Starts with the first injection or offtake into the ELIA Grid if the Delivery Point is connected to the Grid since less than 12 months;
- Starts 12 months before the Prequalification File submission Gate Closure Time if the Delivery Point is connected to the Grid since more than 12 months;
- Ends from the Prequalification File submission Gate Closure Time;

A moment starts at 12:00 and ends at 23:45 the following day (36 hours in total). The provisional

Nominal Reference Power corresponds to the highest difference observed between each of these moments. As there are no specific activation time per product definition, the difference must not necessarily correspond to a power deviation between two consecutive quarter hour.

The graph below illustrates this methodology and makes the distinction between generation and consumption. Indeed, the Nominal Reference Power of a generation unit will often correspond to the difference between the highest injection observed ("P_{max}") and 0 (when the unit does not produce) while the Nominal Reference Power of a consumption site will correspond to the difference between the highest consumption (max offtake) and the minimal consumption (Unsheddable Margin) within the considered time window.

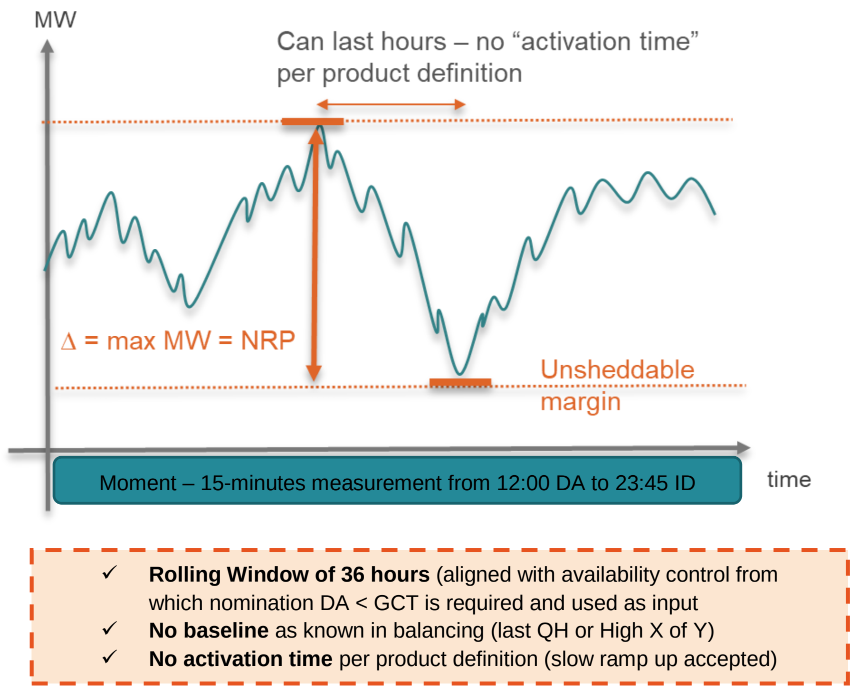


Figure 6 – Example of method 1 (Use of historical data)

3.1.4.1.1.2 2nd method to determine the provisional NRP – use of historical balancing results

An alternative methodology to determine the provisional Nominal Reference Power of a CMU is the consideration of historical balancing results. Indeed, as the requirements (a.o: the activation time) of balancing services are stricter than those set for the capacity product in the CRM, any volume certified and/or proven to be available in those services can "de facto" be used as reference for the determination of a provisional NRP.

ELIA considers the following balancing results (**over the last 12 months**) as valid:

- FCR / aFRR / mFRR prequalification tests;
- FCR availability tests;
- mFRR effective activations;

As opposed to the 1st and the 3rd methods, the balancing results will provide the provisional Nominal Reference Power on the level of the CMU and not on the level of the Delivery Point. In case of aggregated CMU the list of Delivery Points gathered in this CMU shall therefore correspond exactly to the list of Delivery Points used in the corresponding balancing service.

3.1.4.1.1.3 3rd method to determine the provisional NRP – Organization of a prequalification test

Finally, a third possibility to determine the provisional Nominal Reference Power is via the organization of a specific CRM prequalification test.

The CRM prequalification test is scheduled in advance (not a surprise test). In this way, the CRM Candidate informs ELIA about its realization 5 working days in advance. In such communication, he shall indicate the following information:

- Which Delivery Point(s) are being tested;
- The Expected Nominal Reference Power (MW);
- The test date,

There is no specific requirement set by ELIA on the minimal activation duration except that it needs to be visualized in the 15-minutes measurements (and therefore lasts **at least a full quarter-hour**).

The logic followed by ELIA to determine the provisional Nominal Reference Power from a prequalification test is the same than the one described in the 1st method above. Indeed, ELIA will look at the 15-minutes measurement over the entire test period (which can last maximum 36 hours) and determine the highest power variation. Note that ELIA does not test on particular constraints that will be taken into account via the Derating Factor (e.g. energy limitation limited to *some* hours).

The costs related to the organization of a CRM prequalification test are at the CRM Candidate's charge. No remuneration is foreseen by ELIA. Furthermore, no energy compensation (nor BRP source perimeter correction) is expected from ELIA (in opposite direction to compensate possible imbalance) as the test is foreseen by the CRM Candidate in advance and can be compensated accordingly.

3.1.4.1.2 For DSO-connected Delivery Points

For DSO-connected Delivery Points, the Nominal Reference Power will be made available by the DSO, through adequate platform. Such will be therefore extracted to be used by ELIA to calculate the Eligible Volume.

In such case, the contestation scheme described below (Section 3.1.4.1.4) is to be followed by the CRM Candidate and the DSO prior to the communication of the Nominal Reference Power to ELIA. The submitted value is deemed final and shall be used by ELIA in the determination of the Eligible Volume.

3.1.4.1.3 For CDS-connected Delivery Points

CDS-connected Delivery Points are either part of the TSO Grid or the DSO Grid and shall therefore respect same conditions as respectively described in Sections 3.1.4.1.1 (TSO-connected point) or 3.1.4.1.2 (DSO-connected Point).

3.1.4.1.4 Contestation of provisional Nominal Reference Power

A CRM Candidate has the opportunity to timely contest the provisional Nominal Reference Power calculated by ELIA in case he does not agree with the determined volume as received as part of the notification. To do so, he shall respect the following procedure:

a. Starting from the provisional NRP notification, a CRM Candidate shall **notify a contestation** to ELIA (for TSO connected Delivery Points) or the concerned DSO (for DSO connected Delivery Points) within a period of 5 working days. Such notification shall be organized via the Prequalification Platform.

b. A prequalification test, following the process and the rules defined in section 3.1.4.1.1.3 is organized in order to determine a new provisional Nominal Reference Power. In addition to the information on the provisional NRP being contested, the CRM Candidate shall therefore also indicate the date he wants to schedule this prequalification test. Such prequalification test must be realized within a period of 5 working days, starting from the notification of the provisional NRP by ELIA.

c. As a result of the prequalification test, a second provisional NRP is calculated by ELIA. To determine the final NRP, ELIA selects the highest provisional NRP obtained. There can only be one contestation of a provisional NRP.

3.1.4.1.5 Adaptation of Opt Out Volume[8]

As foreseen by the CRM Law, 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. This related volume is called the “Opt-Out Volume”, and is given to ELIA when submitting the Prequalification File.

For Existing Capacities, CRM Candidate may decide to adapt their initial Opt-Out Volume (communicated to ELIA when submitting the Prequalification File) based on ELIA’s determination and notification of provisional Nominal Reference Power. It is possible to do so within the 5 Working Days starting from the notification of such provisional Nominal Reference Power.

In absence of reaction from the CRM candidate, the initial Opt-Out Volume is considered valid and used by ELIA as input to determine the related Eligible Volume.

3.1.4.2 NRP calculation for Additional Delivery Points

At the moment of the Prequalification Process, some capacities cannot be physically measured yet (Additional Capacities) as investments and modifications are required. For these Delivery

[8] Opt-Out related requirements are specifically detailed in another design note and therefore not reminded here

Points, the CRM Candidate will declare the **expected Nominal Reference Power as** part of their Prequalification File. This declared volume will be used by ELIA as input to determine the Eligible Volume. Furthermore, ELIA reminds that – prior to the start of the Delivery Period for which the Delivery Point has been contracted – the Capacity Provider has the obligation to finalize the Prequalification Process and his additional Delivery Point(s) has/have the obligation to become "Existing" (hence finalize the prequalification procedure, including the calculation of the final NRP based on one of the three methodologies). This is specifically monitored in the pre-delivery monitoring process as described in the second part of this document.

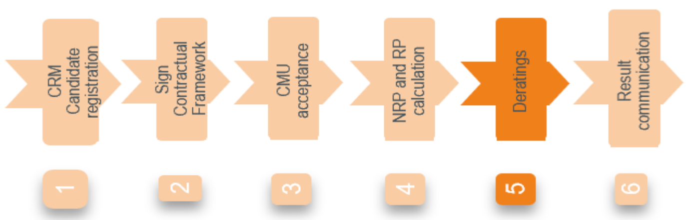
3.1.4.3 Determination of the Reference Power of a Delivery Point

The Reference Power of a Delivery Point, corresponds to the difference between the Final Nominal Reference Power and the notified Out-Out Volume.

$$Reference\ Power = Final\ Nominal\ Reference\ Power - Opt{\sim}out\ Volume$$

In the event that the Opt-Out Volume is different than zero, the CRM Candidate will have to provide some additional information like the treatment of the type of Opt-Out (see dedicated design note on Opt-Out). These information will be submitted to ELIA when submitting the Prequalification File.

3.1.5 Step 5 –Eligible Volume of the Capacity Market Unit



The objective of this step is to determine an Eligible Volume at the Capacity Market Unit level. To do so, ELIA starts by determining the Reference Power on the Capacity Market Unit level by summing Reference Power of each Delivery Point part of this Capacity Market Unit.

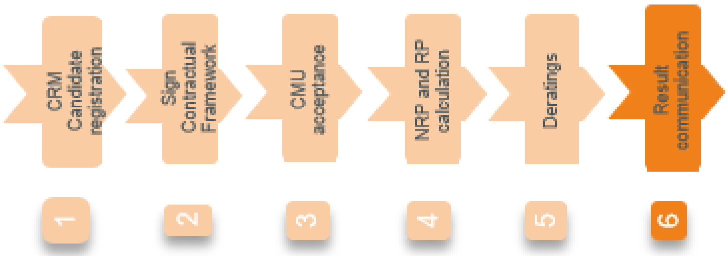
Once the Reference Power of the CMU is obtained, ELIA applies the adequate Derating Factor. The Derating Factor is chosen by the CRM Candidate depending on the technology of the related Delivery Point(s) (or the energy constraints) and is provided as part of the Prequalification File.

The outcome of this calculation corresponds to the Eligible Volume and is equal to the maximal capacity that a CRM Candidate is authorized to offer in the Auction for that CMU, and for a contract duration

$$Eligible\ Volume = Derating\ Factor * Reference\ Power\ of\ the\ CMU$$

An Eligible Volume has a granularity of 0.01 MW, after application of mathematical rounding.

3.1.6 Step 6 – Result communication



As final step of ELIA's Prequalification Process, ELIA notifies the Prequalification results related to a submitted Prequalification File to the CRM Candidate.

Such notification is organized via the prequalification platform and contains at least the following parameters, per Capacity Market Unit:

- The corresponding Eligible Volume along with the parameters used to calculate it (Nominal Reference Power, Reference Power and Opt-Out Volume of each Delivery Point part of that CMU);
- The status corresponding to that CMU (Existing or Additional);
- The date of the first expected quarterly report in case the CMU is labelled as Additional;
- The justification in case of a Prequalification File rejection.

<u>Remark</u>

In addition to the Eligible Volume of a CMU, which corresponds to the maximal capacity a Prequalified CRM Candidate is authorized to offer in an Auction, ELIA will also calculate a **Secondary Market Eligible Volume** and communicate the results along with the Prequalification result notification process described above. More detail about the secondary market eligible volume can be found in the dedicated design note on the Secondary Market and is therefore not discussed here.

3.2 Specific Prequalification Process

The Specific Prequalification Process is the Prequalification Process that must be followed by Unproven Capacities. An Unproven capacity is a capacity which, at the moment of the Prequalification Process for the Y-4 Auction, cannot be associated to one or several Delivery Point(s). Therefore, the determination of an Eligible Volume according to the methodology detailed in section 3.1.5 is not possible.

When a CMU has the status of Unproven, it is called a virtual Capacity Market Unit.

The specific Prequalification Process purpose is to determine the Eligible Volume of the virtual Capacity Market Unit. It follows the same logic than the standard Prequalification Process presented above, including the timing as presented in section 2.

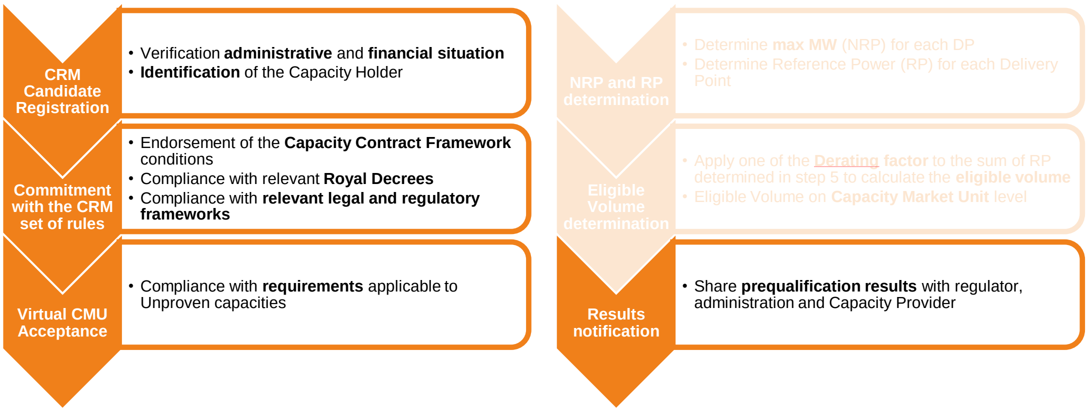


Figure 7 – The six steps of the ELIA side of the CRM Prequalification Process

To facilitate the understanding of the Unproven capacity concept, ELIA also reminds important requirements applicable when considering a virtual Capacity Market Unit:

a. A Virtual Capacity Market Unit can **only participate to Y-4 Auctions** and is excluded from Secondary Market (as Buyer);
b. A **specific monitoring process** is described in the second part of this document and applies to Virtual Capacity Market Units awarded with a Contracted Capacity;
c. A Virtual Capacity Market Unit **cannot apply for a Contract Category higher than one year**;
d. A constraint on the Eligible volume to be selected will be implemented in the Auction clearing algorithm. To start with, this **maximal volume is set to 400 MW**.
e. Unproven Capacities are **not subject to grid constraints** that are used by ELIA in the Auction algorithm;
f. To guarantee a level playing field with other Contracted Capacities, ELIA will use the **Derating Factors as known at the moment of the Y-4 Auction** as input parameter for the future Prequalification Process (as Existing Capacities and following the Standard Prequalification Process) of the Delivery Point(s) related to that Virtual Capacity Market Unit.

In addition to the requirement listed above, ELIA reminds that the principles detailed in section 0 on bank guarantee apply to any Virtual Capacity Market Unit following the specific Prequalification Process.

3.2.1 Step 1 – CRM Candidate Registration

A Capacity Holder who wants to participate to the CRM Service with an Unproven capacity must register himself in the same way as a Capacity Holder who intends to prequalify an Existing or an Additional Capacity (see section 3.1.1).

3.2.2 Step 2 – Commitment with the CRM set of rules

A CRM Candidate who wants to participate to the CRM Service with an Unproven capacity must comply with the same requirements as the ones defined in section 3.1.2.

3.2.3 Step 3 – Virtual CMU acceptance

To prequalify a Virtual Capacity Market Unit, a CRM Candidate shall introduce a Prequalification File that respects the following requirements:

- The CRM Candidate is responsible to declare an Eligible Volume for that Virtual CMU. Such volume is considered 100 % available, as a final commitment and is not associated yet with Delivery Point(s) or Derating Factors.

  Aligned with the cap set by ELIA on the maximal capacity of the category "Unproven" that can be selected in a Y-4 auction (currently 400 MW), a CRM Candidate can only declare an Eligible volume equal or lower than 400 MW.

- There can only be one Virtual Capacity Market Unit (hence one related Prequalification File) per CRM Candidate;

- No Existing or Additional Delivery Point(s) can be part of a Virtual CMU at the moment of the Prequalification File submission;

  In a manner similar to what is required for the CMU with an Additional status (see section **Error! Reference source not found.**), the CRM Candidate will have to provide to ELIA a project execution plan during the Prequalification Process. This plan must respect the format and the list of milestones and key milestones as determined in the Market Rules.

3.2.4 Step 4 – Result communication

Once ELIA validates the Prequalification File related to a Virtual Capacity Market Unit, ELIA informs the CRM Candidate and confirms the Eligible Volume.

3.3 Fast track Prequalification Process

As introduced earlier in this document, some Capacity Holders have the legal obligation to submit a Prequalification File to ELIA from the moment its production unit exceeds a minimal threshold. This obligation is independent from the effective possibility for the Capacity Holder to participate to the CRM mechanism. Indeed, some production units subject to this legal obligation might not respect the Eligibility Criteria's.

To facilitate the obligation for Capacity Holders to respect the law and considering the costs of the full Prequalification Process (in time and euros), ELIA proposes a “**fast track”**, in which a minimal number of information is filled in by the Capacity Holder.

In the context of a Fast track Prequalification Process, a Capacity Holder with DSO-connected capacities does not need to sign a DSO – CRM Candidate Agreement.

The figure below illustrates the required steps of this fast track, compared to the six detailed steps of the full Prequalification Process.

ELIA reminds that – consecutive to the fast track – it is **not possible to participate to an Auction nor to the Secondary Market and the corresponding volume (after application of derating) is considered by ELIA as a “per-default” Opt-Out.**

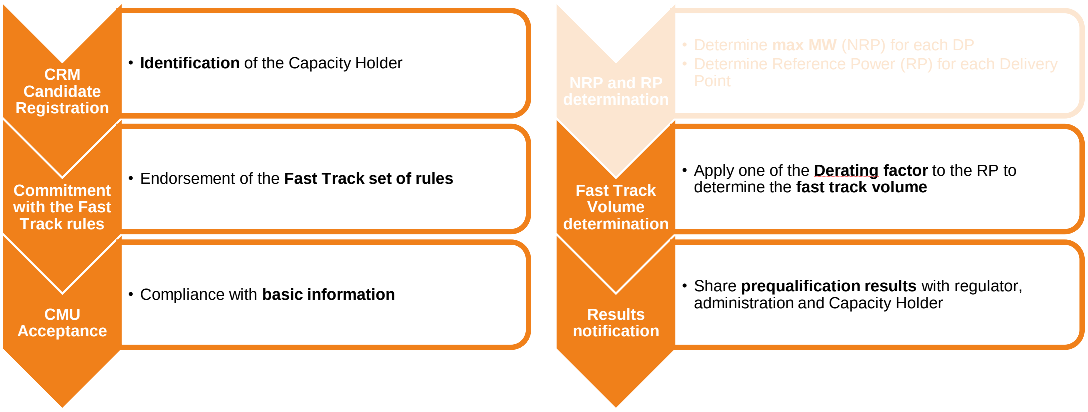


Figure 8 – The five steps of the Fast track Prequalification Process

3.3.1 Step 1 – CRM Candidate registration

Unlike the Standard and the Specific Prequalification Processes where ELIA verifies both the administrative and financial status of each CRM Candidate, the CRM Candidate registration in the fast track process is limited to the **identification of the Capacity Holder**. In this way, the requirements to follow are the one listed in section **Error! Reference source not found.**.

Processing such fast track Prequalification Process does not entail the Capacity Holder to participate, at a later stage, to the Standard or the Specific Prequalification Process.

3.3.2 Step 2 – Commitment with the fast track set of rules

From the moment a CRM Candidate has submitted an application form and it has been approved by ELIA, the CRM Candidate has the possibility to initiate a fast track Prequalification Process. To do so, he must confirm its agreement with the whole set of requirements related to a fast track Prequalification Process.

3.3.3 Step 3 – CMU acceptance

In this step, ELIA only requires the Capacity Holder to **identify its Capacity Market Unit** and to declare the corresponding Reference Power and Derating Factor. Indeed, ELIA will not calculate the Nominal Reference Power following the three methods described in section 3.1.4 nor verify the entire list of generic requirements set in the full Prequalification Process as the CRM Candidate has no intention (nor rights) to propose this CMU to the forthcoming Auction.

These information are the only elements required from the CRM Candidate to respect its legal obligation to prequalify. Based on these declared information, ELIA will perform the actions described in step 3 and 4 below.

In the event of a fast track Prequalification Process, the CMU can only correspond to one Delivery Point as **the possibility to have an aggregated CMU makes no sense in the context of a fast track and is therefore forbidden by ELIA.**

Moreover, it makes sense that a CRM Candidate cannot register into the fast track Prequalification Process with a Delivery Point which has the status of an Additional Capacity.

3.3.4 Step 4 – Fast-track Volume determination

Similar to the Standard Prequalification Process, ELIA determines the fast track volume corresponding to the CMU by multiplying the declared Reference Power with the related Derating Factor. This volume is called the "Fast-track volume" and cannot be confused with the Eligible Volume resulting from a successful Standard Prequalification Process.

3.3.5 Step 5 – Communication reporting to parties

To conclude the fast track Prequalification Process, ELIA communicates the information received from the Capacity Holder to the FPS (FOD) who will be responsible for the follow-up of the legal obligation to prequalify. From that moment on, ELIA considers the Fast Track volume as per default a full Opt-Out.

It makes sense to add that, if the CRM Candidate fills in correctly the Reference Power and the Derating Factor corresponding to its CMU, it is not possible to fail a fast track Prequalification Process because no requirements must be met by the CMU.

The results of the fast track Prequalification Process will only determine the following parameters for each CMU proposed in the fast track Prequalification Process:

- The Fast Track Volume calculated for that CMU;
- The identification of the CMU (via the EAN code of the Delivery Point)

3.4 Access to platforms, tools and related operational processes

3.4.1 In support to the Prequalification Process

From the moment a Capacity Holder becomes a CRM Candidate, he shall receive access to the Prequalification platform. This Platform will be used to submit Prequalification Files, along with the required data and documents.

3.4.2 In support to the Auction process

From the moment a Capacity Holder becomes a CRM Candidate, he is granted access to the test version of the Auction platform. **Prior to becoming a Prequalified CRM Candidate, the CRM Candidate shall demonstrate its ability to submit fictive bids** which respect the bidding requirements detailed in a specific design note.

Provided that at least one Capacity Market Unit has been successfully prequalified and once the auction test (via the demo platform) has been correctly passed, the Prequalified CRM Candidate gets the possibility to introduce bid(s) as of forthcoming Auction start date.

3.4.3 Prior to the start of Delivery Period

Prior the start of a Delivery Period, a Capacity Provider shall ensure that it complies with the IT requirements (including security) pursuant to IT specifications timely shared with market parties. In this way, the following processes are identified as potentially subject to IT developments:

a. The exchange of an availability test signal with ELIA, including the electronic confirmation of acknowledgement;
b. The possibility to nominate declared Market Prices closer to real time.

The requirements described in this section are not a pre-requisite to a participation to an auction and therefore do not influence the determination of a Capacity Market Unit or Delivery Point status (additional or unproven).

ELIA also reminds that – in the context of a participation to a Secondary Market Transaction – the exact same requirements are to be finalized for the Buyer prior the start date of the Transaction.

4 Bank guarantee

ELIA's best practice is to verify systematically the **financial situation** of each CRM Candidate. One possibility currently used in the balancing processes is the "Graydon score". However, ELIA observes the limits of the Graydon score when looking at the CRM specificities. Indeed, the CRM consists in two Auction rounds for each Delivery Period: in Y-4 and in Y-1. This configuration introduces a **significant gaming risk**. Especially in the first round of Auction in Y-4 where a volume offered at low price (with no intention to effectively be there at start of Delivery Period) in Y-4 could lead to the rejection of competitors from the Y-4 selection.

Moreover, the penalties[9] for service's non-delivery are capped to the contractual value and no remuneration is due before the start of Delivery Period (up to 4 years later).

Given these specificities, ELIA is looking for a way to have a different financial incentive (than the Graydon score) applicable from the moment of Y-4 and Y-1 selection while keeping in mind the need to limit at its maximum the entry barriers to this market.

As preferred solution, ELIA proposes the setup of **a bank guarantee for each selected CMU**, **proportional to the Contracted Capacity** (MW). For the sake of clarity, this concerns the three possible statuses: Existing, Additional and Unproven Capacities. ELIA also observes that this requirement is common in other Capacity Remuneration Mechanisms (FR, UK, I, Poland).

In this way and prior to any possible Bid submission and as part of its Prequalification File, a CRM Candidate shall provide a **conditional bank guarantee** issued by a recognized financial institution. Such bank guarantee shall be irrevocable, unconditional, non-transferable and **on first demand**. The amount of the bank guarantee corresponds to 20.000,00 € multiplied by the related Eligible Volume. As such Eligible volume is no yet known at the time of the submission phase of the Prequalification File, the system (Prequalification Platform) will allow the CRM Candidate to simulate the required amount for its conditional bank guarantee. The amount is based on the expected Nominal Reference Power for CMUs with the status of Existing and Additional and based on the declared Eligible Volume for virtual Capacity Market Units.

The bank guarantee will automatically become effective provided that the Prequalified CRM Candidate is selected in the Auction, for an amount of 20 000 € per contracted capacity (MW). The definition of a recognized financial institution, along with the minimal rating it shall correspond to, will be fixed in the Capacity Contract Framework.

[9] The details on availability controls and related penalties are presented in a specific design note and are therefore not reminded here.

4.1 Modalities

An alternative (e.g. parent company guarantee) may be accepted by ELIA provided it comes from an entity with the same (or better) rating than the one accepted for the recognized financial institution and set in the Capacity Contract Framework and that it respects the exact same conditions (a.o: callable on first demand).

Furthermore, the bank guarantee applies as long as the following two conditions are not respected:

a. The Capacity it is related to becomes “Existing” (if it was not already the case); **and**

b. The Delivery Period related to the Contracted Capacity covered by such bank guarantee has started.

Once these two conditions are met, ELIA will release the bank guarantee and notify the Capacity Provider accordingly within a period of 60 Working Days.

Finally, a **partial release** based on the information given by the Capacity Provider in his quarterly reports (for Additional and Unproven Capacities) might be applicable by ELIA. The key milestones and exact release criteria’s shall be fixed in the Capacity Contract Framework.

The modalities according to which the bank guarantee may be partially or totally called will be described in the Capacity Contract Framework.

4.2 Determination of bank guarantee for capacities subject to a similar obligation in connection contract

In parallel to the elaboration of the prequalification and monitoring rules relevant for the Capacity Remuneration Mechanism, market parties (incl. federal administration, CREG and ELIA) are investigating the possibility to adapt the capacity reservation process currently proposed in the Federal Grid Code[10] in order to maximize the competition in a CRM context.

Among the possible improvements, ELIA investigates how to reinforce its connection contract to incentivize the effective project realization and avoid “sleeping capacities[11]”. To do so, ELIA identifies two possible incentives: the right to **suspend the allocated capacity** (incl. the termination of the connection contract) as well as **possible financial consequences**.

Concerning the possible financial consequences to include in the connection contract, market parties proposed to also use the concept of **a bank guarantee** and put forward the following principles:

[10] A specific design document has been consulted with market parties and is available on ELIA’s website ( )

[11] A Sleeping capacity is a capacity allocated via the signature of the connection contract to a market party but which has never led to its effective connection (no physical injection / consumption)

- 3 to 5 % of the project's total cost;
- Partial reimbursement in function of the project's advancement (if everything goes according to schedule);
- Total reimbursement as of capacity commissioning (in case the initial planning is respected) or in case of "force majeure".

ELIA favors the introduction of the bank guarantee obligation and will include the principle in its next contractual review (subject to a specific public consultation). Its order of magnitude (being a percentage of project total cost as proposed by market parties or a fixed value / MW) will be consistent with the one proposed in the context of CRM mechanism and described further below.

Obviously, ELIA will not ask Capacity Providers subject to the obligation (broader than the CRM) to give a bank guarantee via the connection contract (if approved) to deposit a second one as part of the CRM Contracted Capacity. In such situation, the bank guarantee of the Capacity Contract is sufficient.

5 Evolution of a CMU in time

In this section, ELIA proposes additional clarifications to determine how a Prequalification File (both administrative and technical aspects) is influenced over time. A distinction is made between automatic update which does not require a validation from the Capacity Provider or the Prequalified CRM Candidate and manual update, which supposes an intervention from the Capacity Provider or the Prequalified CRM Candidate.

It is important to remind that – regardless of the changes – a Contracted Capacity remains valid all along the Capacity Contract Duration.

5.1 Automatic update of a Prequalification File

By default, there is no end of validity date to a prequalified Capacity Market Unit. However, due to the yearly cycle of the Capacity Remuneration Mechanism, parameters and/or relevant legal framework are due to evolve in time.

5.1.1 Evolution of the CRM set of rules (e.g: Market rules)

As detailed in section 3.1.2, several documents and legislation (Clean Energy Package, Royal Decrees, Electricity Law…) rule the Capacity Remuneration Mechanism. As soon as one of these document evolves in time, ELIA shall notify the Capacity Providers and the Prequalified CRM Candidates via the Prequalification Platform.

This notification generates two consequences:

1) It does not influence the obligations linked to an on-going contract (neither the volume, nor the Capacity Contract Duration);
2) It suspends the prequalified CMU from a participation to any future Transaction (via the Primary or / and the Secondary Market) as long as the Prequalified CRM Candidate or the Capacity Provider has not accepted the new CRM set of rules on the Prequalification Platform.

5.1.2 Evolution of the CRM parameters (e.g: Derating Factor)

In addition to a possible evolution in time of the CRM set of rule, CRM parameters will evolve in time. Parameters on which the Prequalified CRM Candidate or the Capacity Provider does not have an influence upon (e.g: derating factor) shall lead to an automatic re-calculation of the CMU's Eligible Volume.

Such re-calculation shall be made by ELIA within 20 Working Days, starting from the moment the updated parameter is officially published. The updated prequalification results will be notified by ELIA to Prequalified CRM Candidate (or Capacity Provider) via the Prequalification Platform with immediate effect. From notification, these updated results apply to future Transactions only.

5.1.3 Consideration of monitoring results

The results of the pre-delivery monitoring process described in Part 2 of this design note (missing volume) and the availability monitoring process described in another design note (missing obligation) may lead to the identification of a gap between the initial obligation and the observations made by ELIA.

In such circumstances, ELIA will automatically update (downward) a CMU's parameters (i.o. its Eligible Volume) to reflect the most recent test result.

In a specific situation where the observations deliver higher reference values than the one initially used in the Prequalification File, no automatic update of the Eligible Volume is done by ELIA. Indeed, to do so, it is the Prequalified CRM Candidate's responsibility to introduce manually a change request as per the procedure described in section 5.2.

5.2 Manual update of a Prequalification File

In this section, ELIA focuses on the possible evolution of technical or administrative requirements that must be manually notified to ELIA in order to trigger an update of a Prequalification File.

Indeed, it is the Prequalified CRM Candidate's responsibility to guarantee the compliance and validity of its information submitted to ELIA. This section focuses on the most relevant changes that can happen in the life of a prequalified CMU.

5.2.1 Creation of a new CMU

A Prequalified CRM Candidate or a Capacity Provider has the possibility to create a new CMU any time via the Prequalification Platform. The timing described in section 2 above applies to any Prequalification File (whether for the Standard or for the Specific Prequalification Process).

Once a new CMU is successfully prequalified, it can participate to a future Transaction. As a Contracted Capacity is always linked to a CMU, the only possibility for a Capacity Provider to link a new CMU to an already Contracted Capacity is via a Transaction on the Secondary Market between the initial and the new CMU.

ELIA also reminds that in the context of Secondary Market, CMU(s) prequalified as "Existing" are the only one(s) that can be used as "Buyer" of an obligation (see design note on Secondary Market for more details).

5.2.2 Suppression of a CMU

A Prequalified CRM Candidate or a Capacity Provider has the possibility to delete a CMU any time via the Prequalification Platform. The consequences of this deletion shall be further detailed in the rules regarding the Opt-Out notification and are therefore not further explained here.

However, it is important to remind that the suppression of a CMU that is linked to a Contracted Capacity does not lead to a termination or an adaptation of the related obligation. In such configuration, the Capacity Provider shall face the penalties of the availability monitoring as no Delivery Point will be used to verify the effective availability (hence it will be considered as 100 % unavailable) unless the CRM Candidate uses the Secondary Market to compensate the missing volume or the missing capacity.

5.2.3 Change in CMU life

In this section, ELIA summarizes the possibilities for a Capacity Provider to modify the data or the documents linked to a CMU but also to add, remove or adapt information on one or more Delivery Point(s) part of a prequalified CMU.

In contrast to the cases described above and below this section, these types of change can be validated by ELIA for an on-going Contract. The Prequalified CRM Candidate or the Capacity Provider will therefore have to choose whether the change is immediate or takes effect only for a future date.

In the event that the Prequalified CRM Candidate or the Capacity Provider decides that the change is effective immediately, the following conditions must be respected:

1) The additional Delivery Point(s) respect(s) the aggregation rules and CRM set of rules detailed in sections 3.1.2 and 3.1.3;
2) The energy constraint declared by the CRM Candidate for that already prequalified aggregated CMU is not influenced and remain valid;
3) The Capacity Contract Duration of the additional Delivery Point(s) is/are not lower than the Capacity Contract Duration of the already prequalified aggregated CMU;
4) The CO_2 emission of the new aggregated CMU does not exceed the CO_2 emission calculated for the aggregated CMU following the rules presented in the Auction algorithm design note;
5) The status of the CMU remains the same;

If the Prequalified CRM Candidate or the Capacity Provider notifies the entry into force of the changes so it has no influence on an on-going Contracted Capacity, then the limitations above do not apply.

5.2.4 Change of CMU status

A Capacity Provider with a Capacity Market Unit prequalified as “Additional” or a Virtual Capacity Market Unit has the obligation – during the pre-delivery period – to finalize the standard Prequalification Process and by doing so, become “Existing”. A specific monitoring and penalty process is determined in the second part of this document to illustrate it.

In this way, the Capacity Provider shall respect the following two-stage process:

a. Via the Prequalification platform, the Capacity Provider selects his Contracted Capacity and visualize the already registered parameters of Capacity Market Unit or virtual Capacity Market Unit associated to this contract;

b. Introduce (for Virtual CMU) or complete (for Additional CMU) a Prequalification File for each Capacity Market Unit requiring a prequalification as Existing. In both cases, the timing as defined in the second part of this document (pre-delivery period) applies.

Part II – Pre-delivery monitoring

Introduction

This part of the present design note focuses on another key element of the capacity remuneration mechanism: **the pre-delivery monitoring process**. This specific process starts from the moment a capacity is awarded (Auction result notification or consecutive to a validated Secondary Market Transaction) and ends with the start of the Delivery Period.

The objectives of the pre-delivery monitoring process for ELIA is to ensure compliance, all along the period between what has been provided or determined during the Prequalification Process and what is effectively realized (for Unproven & Additional Capacities) or measured (for Existing Capacities).

Capacity Market Units with the three possible status (Existing, Additional and Unproven) are subject of ELIA's pre-delivery monitoring process and related penalties.

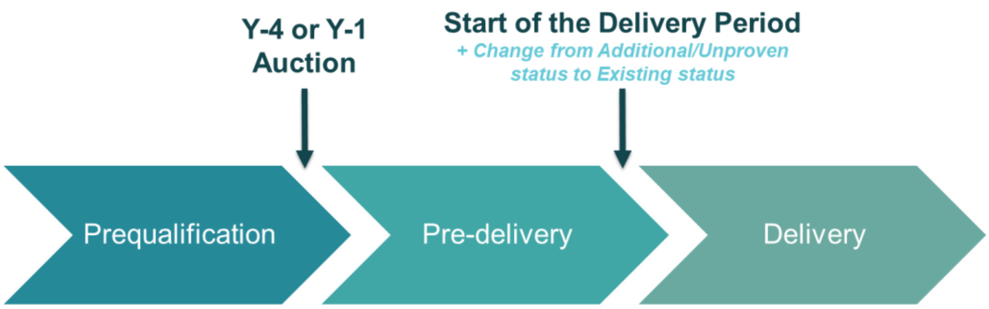


Figure 9 – location of the pre-delivery monitoring period into the CRM process

6 Pre-delivery monitoring processes

In this section, ELIA defines the two phases that applies to the pre-delivery monitoring process before describing the requirements to be respected for respectively an Existing, Additional and Unproven capacity, as well as the penalties incurred in case of non-compliance.

6.1 The two phases of the pre-delivery monitoring process

For each Delivery Period, the Contracted Capacity results from two specific auctions: Y-4 and Y-1 and from validated Secondary Market Transactions. This concretely signifies that ELIA has one single opportunity to compensate a possible difference between the initially Contracted Capacity and the effectively observed capacity with an **increase of the volume to procure in Y-1**. Obviously, the use of this single opportunity is not applicable to each possible situation but justifies the determination of two specific monitoring periods:

- The **pre-delivery monitoring phase 1** which starts after the Y-4 Auction and ends prior to the determination of the volume for the Y-1 Auction;
- The **pre-delivery monitoring phase 2** which starts from the determination of the volume for the Y-1 Auction and ends with the start of the Delivery Period;
-

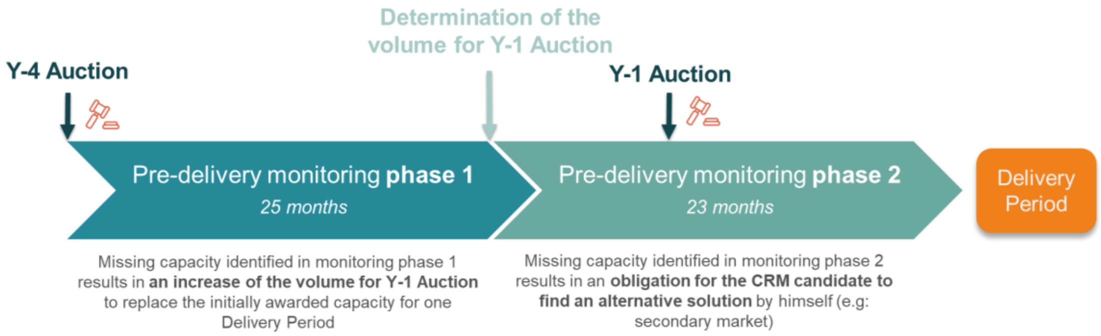


Figure 10 – the two phases of the pre-delivery monitoring period

The consequences incurred by the Capacity Provider in the event of non-compliance with its obligation differ from the period during which the missing volume is observed.

Of course, a Capacity Provider remains responsible in both phases to find by himself an alternative (e.g: use of the Secondary Market) in case of missing volume. By doing so he avoids the penalties detailed hereunder.

According to the above figure, one can also observe that in case of CMU awarded from a Y-1 Auction, only the requirements and the impacts of the phase two (as detailed in the following sections) apply.

6.2 Pre-delivery monitoring process applicable for Existing capacities

As soon as a CMU has or gets the status of Existing, ELIA has the possibility to use the 15-minutes measurements of the Delivery Points part of that CMU to verify that it **effectively equals or excess the Reference Power** calculated during the Prequalification Process. Such verification (also called "Compliance test") will be performed at ELIA's sole discretion, in application of the following principles:

- Only once if the Existing Capacity has been contracted in a Y-1 Auction;
- Only once if an Additional or Unproven Capacity becomes Existing Capacity during pre-delivery monitoring phase 2;
- At least once and at most twice if the Existing Capacity has participated to a Y-4 Auction;
- At least once and at most twice if the Additional or Unproven Capacity becomes an Existing Capacity during the Pre-delivery monitoring phase 1.

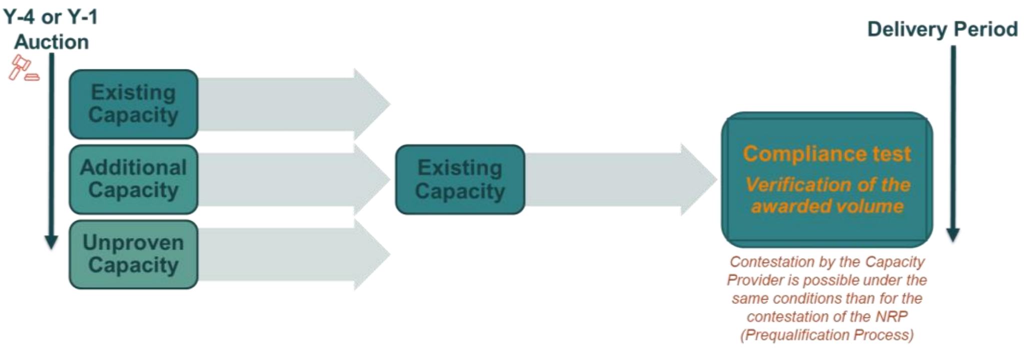


Figure 11 – Compliance test for Existing capacities

In order to check the compliance of a Capacity Provider between what has been contracted and what is effectively measured, ELIA is entitled to use the 15-minutes measurements of each Delivery Point part of a CMU and compare it to the Reference Power determined during the Prequalification Process.

To perform this monitoring, ELIA will use the 1st method (see section 3.1.4.1.1.1 of the first part of this design note) which is used in the Prequalification Process to determine the Nominal Reference Power.

A notification detailing the test result and the potential missing volume, if any, will be provided later on to the Capacity Provider. The missing volume corresponds to the difference between the Reference Power of the CMU evaluated during the Prequalification Process and the result obtained based on 15-minutes measurements of the related CMU during the pre-delivery period.

The Capacity Provider can contest the results of the test performed by ELIA by asking to ELIA for a Prequalification test (respecting the requirements of the 3rd method defined in section 3.1.4.1.1.3) within 20 Working Days from ELIA's notification. If the results obtained after contestation are higher than the initial ones, the latter will be considered as valid. Contrariwise, if the results obtained after contestation are lower than the initial ones, only the result initially evaluated by ELIA will be considered as valid.

In case no contestation is issued by the Capacity Provider within 20 Workig Days from ELIA's notification, the results are considered as valid.

6.3 Pre-delivery monitoring process applicable for Additional capacities

A Capacity Provider with a Contracted Capacity which has a status of Additional has the obligation to finalize the standard Prequalification Process and become "Existing" prior to the start of the Delivery Period it has been contracted for.

Once the status of the CMU passes from Additional to Existing, it shall be subject to the pre-delivery monitoring process described in section 6.2 above.

Meanwhile and, as long as the status of the CMU remains Additional, the following requirements must be respected:

- Based on the project execution plan provided during the Prequalification Process, the Capacity Provider shall provide a quarterly report to ELIA which must include at least the following information:
    - An update of the project's status;
    - An update of the planning presented during the Prequalification Process (with specific information on the related milestones and schedule slippage, if any);
- This quarterly report is sent to ELIA every 3 months, starting from project start date identified by the CRM Candidate during the Prequalification Process.
- From the moment a schedule deviation higher than a month and impacting a volume higher than 1 MW is identified compared to the initial project execution plan provided during the prequalification process, the Capacity Provider must submit a dedicated mitigation plan supported by concrete elements. For the sake of clarity, a validated Transaction on the Secondary Market is one of (but not the only one) the possibilities offered to the Capacity Provider to be included (as part of) in its mitigation plan.
- In case the project requires the intervention of a third party such as Fluxys or a DSO, the quarterly report must explicitly present the evolution of these elements, supported by a written confirmation from the concerned third party at least once a year.

For sake of consistency, such quarterly report and the like (mitigation plan…) shall respect the form and content as provided as part of the Capacity Contract Framework.

Finally, if a delay is observed by ELIA in application of the principles above ELIA shall increase the volume to be procured in Y-1 accordingly and apply the financial penalty described in the section 6.5.2 below.

6.4 Pre-delivery monitoring process applicable for Unproven capacities

A Virtual CMU is – by definition – not associated to Delivery Points at the moment of the Prequalification. Therefore, once it is associated to a Contracted Capacity consecutive to a Y-4 Auction, the Capacity Provider shall respect the following requirements during the pre-delivery monitoring period:

- At least 75 % of the Contracted Capacity associated to that Virtual CMU shall be prequalified following the standard Prequalification Process with Existing Capacities no later than one month prior to the publication of the volume to be procured in Y-1 Auction of the same Delivery Period;

- The remaining 25 % shall be prequalified following the standard Prequalification Process with Existing Capacities prior to the Gate Closure Time of the Prequalification Process for the Y-1 Auction of the same Delivery Period.

ELIA reminds that the timing presented in section 2 is applicable. It is therefore the Capacity Provider's responsibility to include the time needed by ELIA to treat a Prequalification File in order to make sure that the results are notified within the deadlines set above.

Finally, it is important to remind that a Capacity Provider cannot use a Delivery Point already prequalified or an Additional Capacity to fulfill the prequalification obligations related to a Virtual CMU.

6.5 Consequences in case of non-compliance

6.5.1 Impacts for Existing Capacities

As already defined in section 6.2, in order to check the compliance of a Capacity Provider between what has been contracted and what is effectively measured, ELIA is entitled to use the 15-minutes measurements of each CMU and compare it to the Reference Power of the related CMU determined during the Prequalification Process.

From the moment the most recent 15-minutes measurements are lower than the Reference Power determined during the Prequalification Process, the following principles apply regardless of the phase during which the test is carried out:

- The prequalified Reference Power and the prequalified Eligible Volume related to that Capacity Market Unit is reduced to consider the most recent values. In consequence, ELIA notifies the concerned Capacity Provider and the updated value **becomes the reference to any future Transaction from the moment of notification. It does not influence an ongoing Capacity Contract.**

- In the event the updated Reference Power related to the Capacity Market Unit is lower – by 20 % or more – than the initial one (obtained during the Prequalification Process), ELIA applies a financial penalty corresponding to 50 % of the amount covered by the bank guarantee.

- In the specific case where the updated Reference Power is equal to zero, ELIA applies a financial penalty corresponding to 100 % of the amount covered by the bank guarantee. For the sake of clarity, this does not lead to a contract termination and the Capacity Provider remains therefore responsible for its obligations and subject to the availability monitoring process detailed in a specific design note.

6.5.2 Impacts for Additional Capacities

6.5.2.1 Impacts linked to the Capacity Provider and ELIA

A Contracted Capacity which has an Additional status is not subject to penalties if, based on the information provided in the quarterly monitoring report and/or in the related mitigation plans, **no residual delay is declared.** A residual delay corresponds to a delay of at least one month for which no solution has been proposed by the Capacity Provider. It may concern part of or the entire Contracted Capacity.

However, if – based on the information given in the last quarterly monitoring process submitted prior to the determination of Y-1 volume to be procured in the next Y-1 Auction – a residual delay on part of (> than 1 MW) or on the entire Contracted Capacity remains, ELIA shall increase the calculated Y-1 volume accordingly.

So, from the moment part of or an entire initially Contracted Capacity is substituted by an additional volume to be procured in Y-1 Auction, the penalty regime detailed below is applied by ELIA on the Capacity Provider:

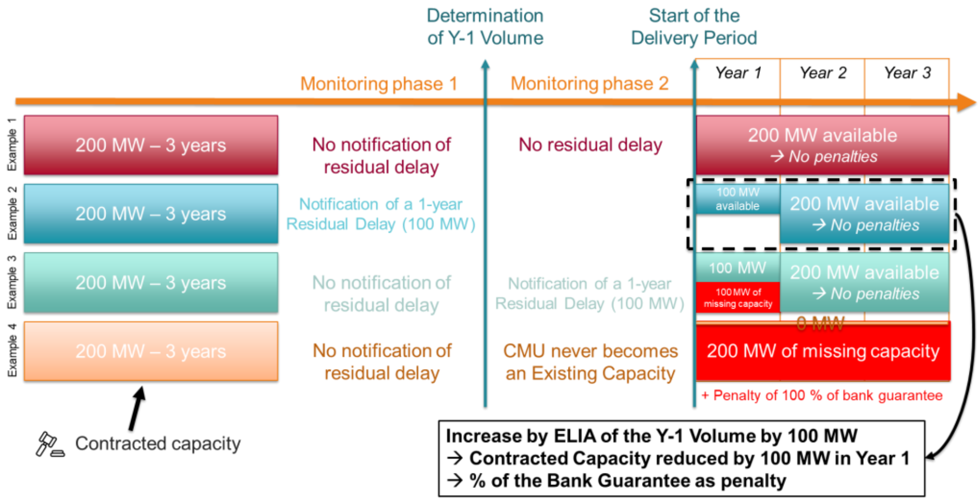
- Its initial Capacity Contract Duration is reduced by one year for the related volume. In case the entire Contracted Capacity is substituted by an additional volume to be procured in Y-1 and provided that the Capacity Contract Duration left is equal to one year, the Capacity Contract shall be terminated;

- A financial penalty applies and corresponds to 33 % of the amount covered by the bank guarantee. The principles ruling the determination of the bank guarantee are described in section 0 of the first part of this document.

In the event that the Capacity Provider notify a residual delay on part of (> than 1 MW) or on the entire Contracted Capacity during the pre-delivery monitoring phase 2 or his related CMU never gets the Existing status, a financial penalty corresponding to the remaining amount covered by the bank guarantee is applied by ELIA.

In addition, the Capacity Provider will be accordingly subject to the Availability Monitoring principles (detailed in a specific design note during the Delivery Period).

The figure below illustrates the principles described above.



Finally, as long as ELIA has not been able to measure (with an appropriate metering device respecting the requirements set in the Capacity Contract Framework) the Contracted Capacity of an Additional Capacity, the bank guarantee remains valid and accessible to ELIA as detailed in section 0 of the first part of this document.

Once the Contracted Capacity has been measured by ELIA, the principles and related penalties described in section 6.5.1 above apply.

6.5.2.2 Impacts linked third parties (ELIA, DSOs or Fluxys)

Because of their own infrastructure works, the following third parties may have an influence on one or several Contracted Capacities during the pre-delivery period: ELIA, DSOs and Fluxys.

An infrastructure work is defined as any construction work that falls under the responsibility of the system operator (being Fluxys, DSO or ELIA). In other words, it cannot be coordinated and realized by another entity selected by a Capacity Provider (no competition possible). A concrete example is the construction of a 380 kV line for ELIA or the installation of a new gas pipeline for Fluxys.

In opposition to infrastructure work, project works are defined as any work needed to effectively realize a project and for which the selection of the related contractors is the Capacity Provider's responsibility. These works are clearly identified in the project execution plan submitted by the CRM Candidate to ELIA as part of the Prequalification Process of an Additional capacity.

A project work can be realized by a system operator (example with the part B of the connection process described in the Federal Grid Code that can be realized by ELIA) if such system operator is effectively selected by the Capacity Provider among the other possible candidates (competition possible).

A delay on infrastructure work identified as influencing an Additional capacity (such identification is formalized in the project execution plan submitted by the CRM Candidate at the moment of the Prequalification Process of an Additional Capacity) is treated in two possible ways:

1) The infrastructure work delay is detected prior to the determination of Y-1 volume to be procured in Y-1 Auction and confirmed in the last quarterly monitoring report received prior to this Y-1 volume determination.

   In such circumstances, ELIA increases the volume to be procured in Y-1 by the volume of Contracted Capacity influenced by such delay. In parallel, ELIA notifies the concerned Capacity Provider. In consequence of this additional volume procured in Y-1 Auction, the start of the Transaction Period impacted by the infrastructure work delay and notified by ELIA is **delayed by one year, without reduction of their entire contract duration**.

   No financial compensation is foreseen by the System Operator responsible for the related infrastructure work.

2) The infrastructure work delay is detected after the determination of Y-1 volume.

   In consequence, **no additional Capacity can be procured in an Auction** to compensate the initially contracted ones which will not be able to deliver their contractual obligation as from Transaction Date. However, their start of Transaction Period is delayed by one year, without reduction of the entire contract duration.

No financial compensation is foreseen by the system operator responsible for the related infrastructure work.

From the moment one infrastructure work causes three consecutive delays of 1 year on a Contracted Capacity, the related contract(s) is (are) terminated following the procedure determined in the Capacity Contract Framework.

In cases the infrastructure work delay is less than a year, the Contracted Capacities for which the start of the Transaction Period have been delayed by a year may participate to the Secondary Market until the effective start of the Transaction Period.

Project works – even if realized upon Capacity Provider's request by a system operator - are subject to the requirements detailed in section 6.5.2.1 above.

6.5.3 Impacts for Unproven Capacities

With respect to the two milestones defined in section 6.4, ELIA can determine a missing volume which corresponds to the difference between the target to prequalify and the effectively prequalified Eligible Volume:

- For the first target of 75 %, the missing volume corresponds to:

$$[0{,}75 * Contracted\ Capacity - prequalified\ Eligible\ Volume]$$

The resulting missing volume is added by ELIA to the Y-1 volume determination to be procured in the Y-1 Auction. The consequences of this missing volumes are described in section 6.5.3 below.

- For the second target on the remaining 25 %; the missing volume corresponds to:

$$[0{,}25 * Contracted\ Capacity - prequalified\ Eligible\ Volume]$$

The penalties in case of non-compliance with the pre-delivery monitoring requirements specified in section 6.4 are proportional to the percentage of missing volume as detailed in the tables hereunder.

Such percentage of missing volume is calculated for each target independently.

For the first target of 75 %, the percentage of missing volume corresponds to:

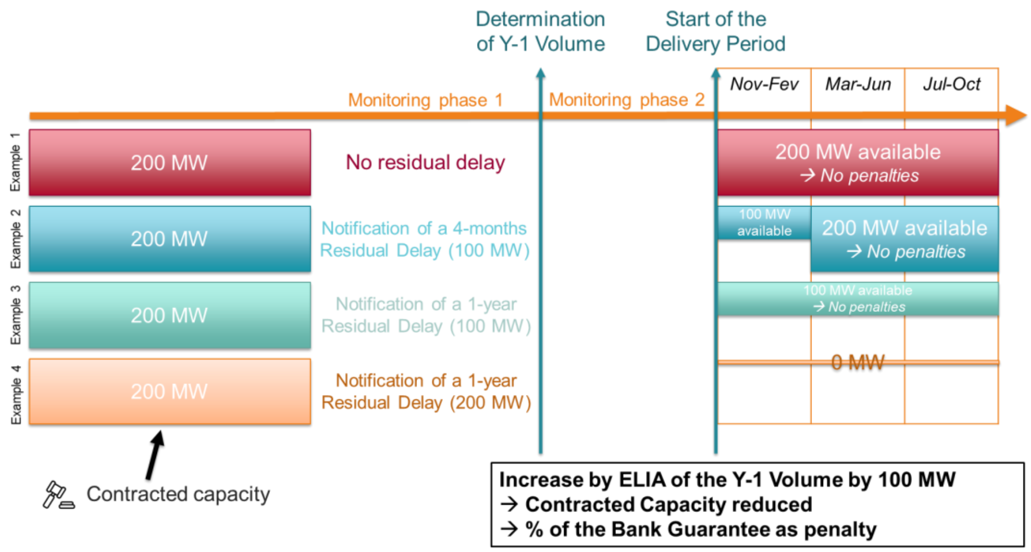
$$\frac{(0{,}75 * Contracted\ Capacity) - prequalified\ Eligible\ Volume}{0{,}75 * Contracted\ Capacity}$$

The corresponding penalties are detailed in the table hereunder:

Percentage of missing volume	Amount of the financial penalty
100%	100% of the amount covered by the bank guarantee
│≥ 66%; < 100%│	50% of the amount covered by the bank guarantee
│≥ 33%; < 66%│	30% of the amount covered by the bank guarantee
│> 0%; < 33%│	15% of the amount covered by the bank guarantee

In addition to the financial penalty, ELIA will terminate the Capacity Contract in case the prequalified Eligible Volume is equal to zero one month prior to the publication of the volume to be procured in Y-1 Auction.

The figure below represents some cases that may occur during the pre-delivery period when a missing volume is observed for the first target.



For the second target on remaining 25 %, the percentage of missing volume corresponds to:

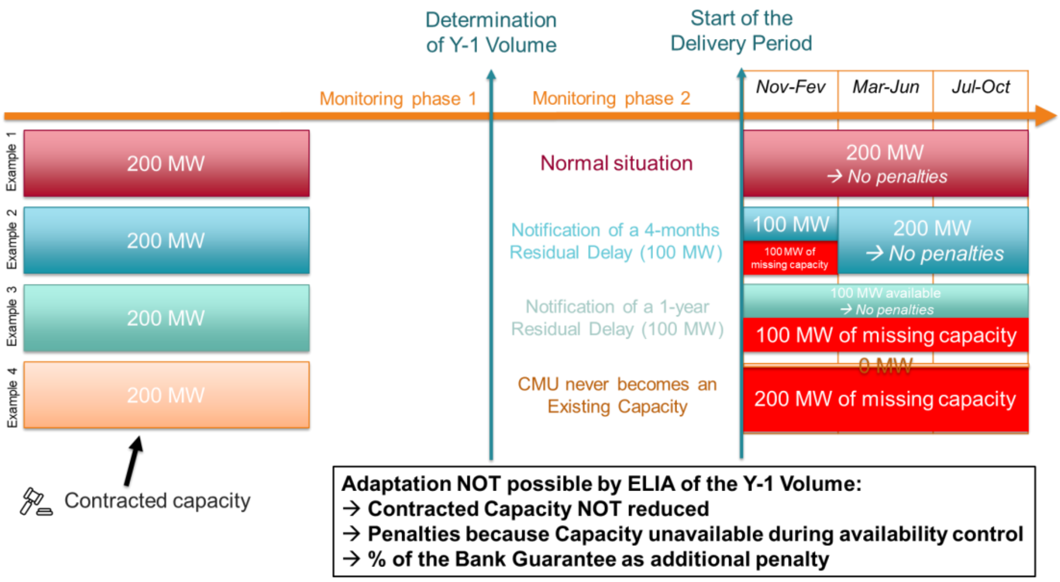
$$\frac{0{,}25 * Contracted\ Capacity - \ prequalified\ Eligible\ Volume}{0{,}25 * \ Contracted\ Capacity}$$

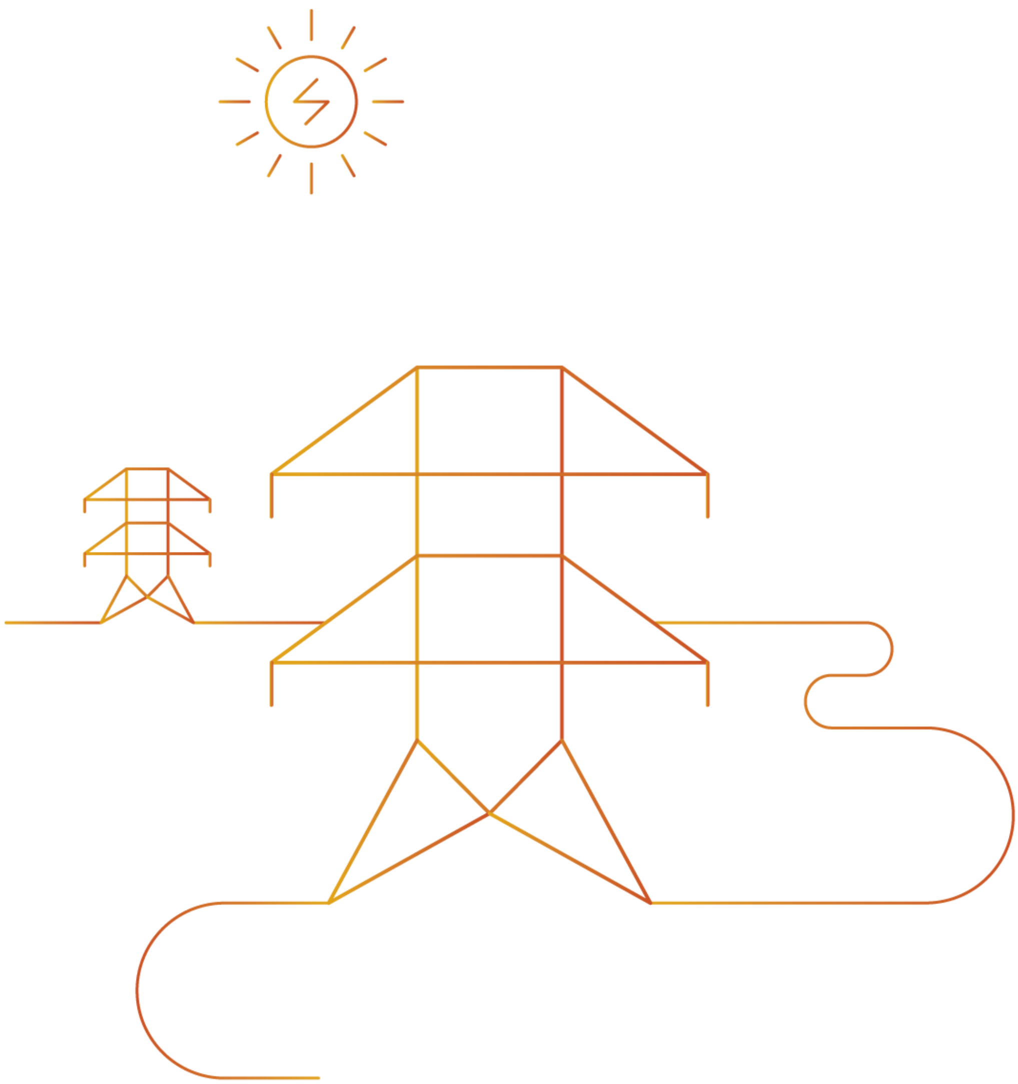
The corresponding penalties are detailed in table hereunder:

Percentage of missing volume	Amount of the financial penalty
100%	30% of the amount covered by the bank guarantee
│≥ 66%; < 100%│	20% of the amount covered by the bank guarantee
│≥ 33%; < 66%│	10% of the amount covered by the bank guarantee

> 0%; < 33%	5% of the amount covered by the bank guarantee

The figure below represents some cases that may occur during the pre-delivery period when a missing volume is observed for the second target.





Updated CRM Design Note: Auction Process

~~2 October 2019~~March 2020

Table of contents

Introduction and context

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

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

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn4_crm-design-note---auction-process.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf

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 Methodology (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~~is 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.~~[5]

~~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[6] (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/

~~5 https://www.elia.be/en/public-consultation/20190913_formal-public-consultation-on-the-crm-design-notes-part-i~~

6 http://www.ejustice.just.fgov.be/eli/wet/2019/04/22/2019012267/staatsblad

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 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.

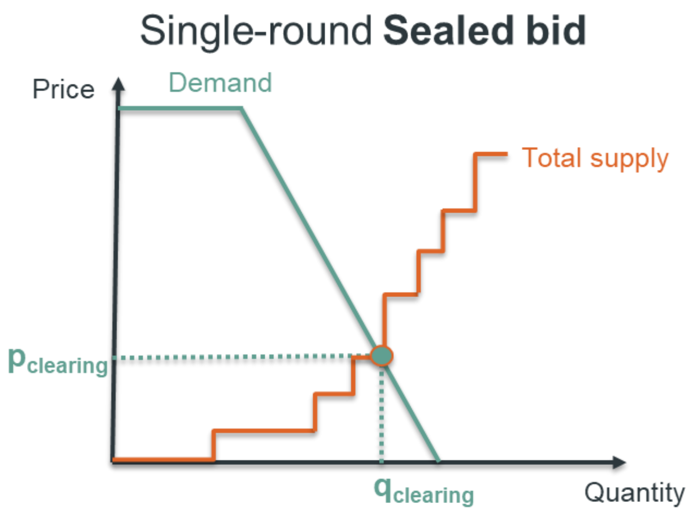


Figure 1: Single-round sealed bid auction format

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.

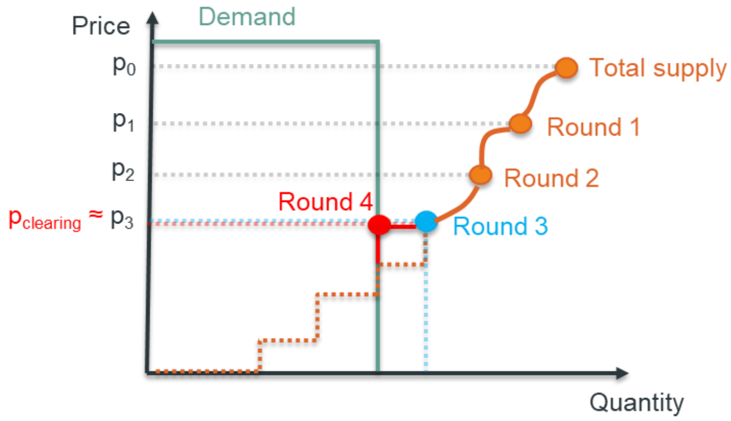


Figure 2: Capacity withholding in multi-round descending clock auction format

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*[7], 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.

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

However, in the FCA, sellers do not receive any information that may be useful in establishing a competitive offer. Instead, the information learned through the auction 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*[8], 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

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

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 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~~ all Auctions that ~~will be organized~~relate to the first two Delivery Periods (i.e. the Y-4 and Y-1 Auctions ~~in 2021 and 2022~~related to Delivery Periods Nov 2025 – Oct 2026 and Nov 2026 – Oct 2027) and apply a pay-as-cleared pricing rule in all ~~subsequent~~other 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 and also part of the set of updated design notes, 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.[9]

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~~eligible to apply 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,

[9] 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)

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.

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 are eligible to 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~~in the Auctions related to the first two ~~Auctions~~ Delivery Periods (i.e. Y-4 Auction and Y-1 Auctions for Delivery Periods starting in November 2025 and November 2026 respectively), ~~after which all following Auctions shall apply~~and a pay-as-cleared pricing rule in all other Auctions.

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 related to the initial two Delivery Periods 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.

Based on feedback received during the public consultation process, in the Market Rules it has been proposed to apply a pay-as-bid pricing rule in all Auctions that relate to the first two Delivery Periods, instead of during the initial two Y-4 Auctions only. The driver for this adaptation is the fact that an expectation to clear new capacity might spill over to a later Auction related to that same Delivery Period, particularly when capacity that has been selected in the Y-4 Auction drops out during the pre-delivery monitoring process and is re-auctioned in the Y-1 Auction related to the same Delivery Period.

Additionally, it avoids any perceived discrimination that may result from applying different pricing rules for the same Delivery Period.

Finally, it allows to mitigate gaming effects that may arise due to the application of different pricing rules for the same Delivery Period.

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~~one single Capacity Contract Duration (expressed in number of years with a precision of 1 year) component;

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

● 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 Methodology meant in Art. 7undecies §2 of the Electricity Law~~.~~;

● The Bid Price of each Bid ~~applying for~~related to a CMU that is assigned to the 1-year Capacity ~~Contract~~Category, shall not be higher than the Intermediate Price Cap defined in accordance with the rules set out in the Royal Decree Methodology 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 Capacity Contract Duration of each Bid related to a CMU shall not be higher than the Capacity Category to which this CMU is assigned, the Capacity Category being assigned in accordance with the rules set out in the Royal Decree Methodology meant in Art. 7undecies §5 of the Electricity Law.

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. Note that aggregation of capacities into a CMU is required for capacities that individually do not reach the minimum participation threshold as defined in the Royal Decree on eligibility criteria related to cumulative support and minimal participation threshold meant in Art. 7undecies §4 of the Electricity Law, and is forbidden for capacities with a Daily Schedule obligation.

However, an exception applies for Bids ~~corresponding~~that are related to CMUs that are ~~covered by~~established on the same geographical site, between which there is a ~~signed~~ link of necessity and technical ~~agreement, for which linked Bids are allowed (cf. infra).~~[10] ~~Still,~~dependence and because they are subject to a Daily Schedule, do not have the possibility of being aggregated in the same CMU. Although 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~~ and the Bids are required to comply with all bidding requirements, ~~cf. especially Design Proposal #5) linked~~such Bids may be linked (cf. infra), meaning that those Bids can only be selected together.

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

~~[10] 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")~~

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.~~

For each prequalified CMU, the Eligible Volume as determined during the Prequalification Process, shall be offered into the Auction, which is a precondition for being able to submit Bids related to this CMU, into the Auction Platform. The Prequalified CRM Candidate shall therefore introduce one or more Bids such that the cumulative quantity offered for this CMU is equal to the Eligible Volume as determined during the Prequalification Process. The cumulative quantity offered is to be interpreted as the maximum capacity volume the auction algorithm can select considering all Bids related to this CMU and whether or not these Bids are mutually exclusive, but regardless of the Bid Price or any potentially relevant grid constraints that may prevent the selection of the Bids.

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 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~~Bids that are related to CMUs that are established on the same geographical site, between which there is a link of necessity and technical ~~agreements,~~dependence and because they are subject to a Daily Schedule, do not have the possibility of being aggregated in the same CMU, may be linked, thereby forming a set of linked Bids.

For CMUs identified as ~~required during the Prequalification Process.~~Additional Capacity, related Bids and/or sets of linked Bids submitted on the Auction Platform shall be consistent with the volume and technical configuration agreed upon in the positive technical agreement delivered by the CRM Candidate as part of its prequalification file. This means that no independent Bid can be made corresponding to a CMU (or a ~~subset~~set of linked Bids corresponding to CMUs) ~~that is covered by a signed technical agreement~~ if there is no ~~signed~~positive technical agreement for this individual CMU (~~subset~~or for this set 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~~identified as Additional Capacity require a ~~signed~~positive 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.~~positive technical agreements for CMUs identified as Additional Capacity. This means that no Bid (or set of linked Bids) can be submitted for a CMU (or set of CMUs) identified as Additional Capacity if there exists no positive technical agreement for this CMU (or set of CMUs).

~~Linked~~ Bids ~~should be interpreted as~~ that are included in a ~~combined Bid across multiple CMUs, which~~set of linked Bids can only be accepted ~~in its entirety~~together or not at all~~,~~. Each of the Bids included in a set of linked Bids shall comply with the bidding requirements defined in design proposal #3. Note however that within a set of linked Bids, each Bid has to be characterized by ~~a single and equal~~an individual Bid Price, volume and ~~a single and equal preferred~~ Capacity Contract ~~duration.~~Duration component.

3.4 Mutual exclusivity of Bids

Design Proposal #6:

Prequalified CRM Candidates may submit one or more sets of mutually exclusive

Bids.[11] From each set of mutually exclusive Bids, maximally one Bid shall be selected by the auction algorithm.

A set of linked Bids ~~within~~may be included in a set of mutually exclusive Bids~~ may include ~~. In this case, the set of linked Bids ~~(~~is considered as ~~defined in Design Proposal #5), which are within a~~one Bid in the set of mutually exclusive Bids ~~interpreted as a single Bid. Different~~, meaning that all or none of the Bids ~~within a~~included in such set of ~~mutually exclusive~~linked 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~~shall be selected.

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~~positive technical agreement for both configurations. Of course, both ~~configuration~~configurations 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

[11] 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.

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~~maximally 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~~select the combination of Bids with the lowest cumulative Capacity Contract Duration, to be calculated as the volume of each selected Bid multiplied by the Capacity Contract Duration

(3) In case of remaining equivalence after rules (1) and (2), preference shall be given to the earliest submitted Bids

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 of the auction algorithm 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~~extra grey Bid would decrease social welfare, as the willingness-to-pay for this ~~additional~~extra 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).

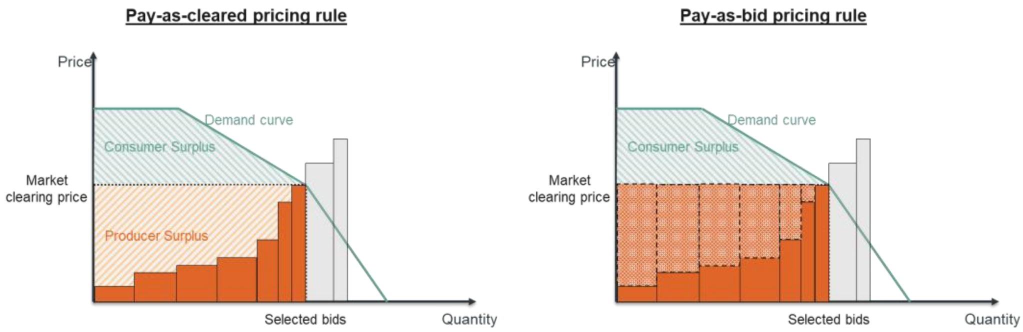


Figure 3: Market clearing under pay-as-cleared (left) and pay-as-bid (right) with perfect information

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~~extra capacity and the cost for ~~additional~~extra 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.

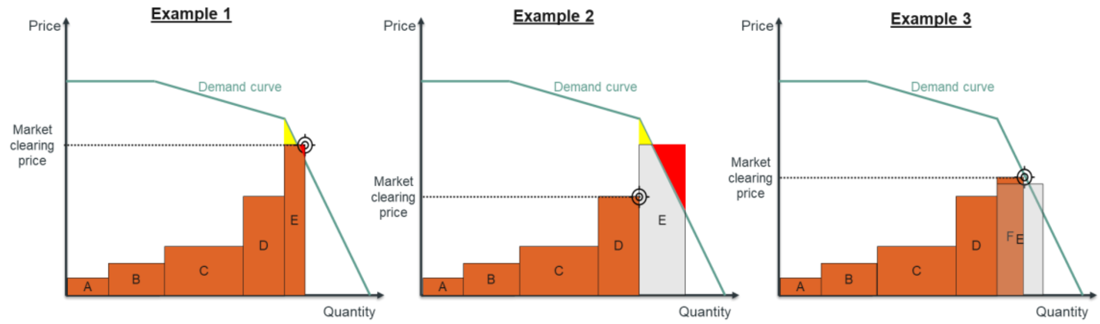


Figure 4: Dealing with indivisible Bids

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.

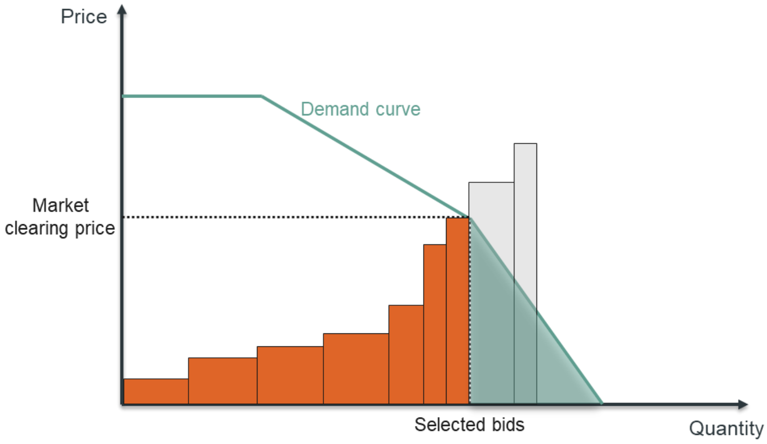


Figure 5: Alternative formulation of the auction clearing objective in terms of total cost

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.

However, the Capacity Contract Duration component is used as one of the tie-breaking rules (cf. infra). Although the impact of the Capacity Contract Duration of the cost efficiency of the Auction is not clear as argued above, it makes sense to go for the overall lowest Capacity Contract Duration solution when two solutions are equal in terms of social welfare (and CO_2 emissions) in order to be more flexible towards the future.

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~~CMU(s) for additional capacity ~~(to be set~~within the CRM framework, based on the ~~target horizon) originating~~expected grid infrastructure for the considered Delivery Period and based on the reference scenario used for the CRM calibration; and it originates 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~~Bids:
  The feasibility of single ~~Bids~~CMUs 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 electrical transmission grid, distribution grid or other; but always on single grid user (project) connection level. Specifically for the public electrical transmission grid, amongst other prequalification criteria the existence and validity of a detailed study (EDS) ~~and~~with 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 current 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~~system security rules and/or ~~geographic~~physical 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 public electrical transmission grid, the choice for the final reference grid will principally be based on the most recent status and anticipation of the planned and approved ~~grid development~~ projects as listed in the Federal development plan & Regional Investment Plans (i.e. for the first Auction in 2021 the latest Federal Development Plan 2020-2030~~)~~), including planned projects resulting from specific client connection requests for which the connection contract has been signed and which have confirmed their intention not to participate to the forthcoming Auction prior to the 1st of June of the same year.

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 connection 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~~Auctions.[12] The discussions ~~are~~have not ~~conclusive~~yet resulted in an adapted FGC at the time of ~~the consultation on~~publication of this updated design note and focus on the necessity to adapt the existing connection process for potential new (additional) connection 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 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 connection 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

[12] 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

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 electrical transmission grid hosting capacity on the target horizon. The proposed technical constraints are objective & transparent in order to facilitate auditable results, ~~and could~~which apply ~~to any type of~~the public electrical grid ~~(transmission, distribution or other).~~. The two drivers for grid constraints considered for the limitation of the available grid hosting capacity are:

(1) ~~Grid~~System 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 public electrical 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 & safe on site 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 (non-exhaustive) 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.

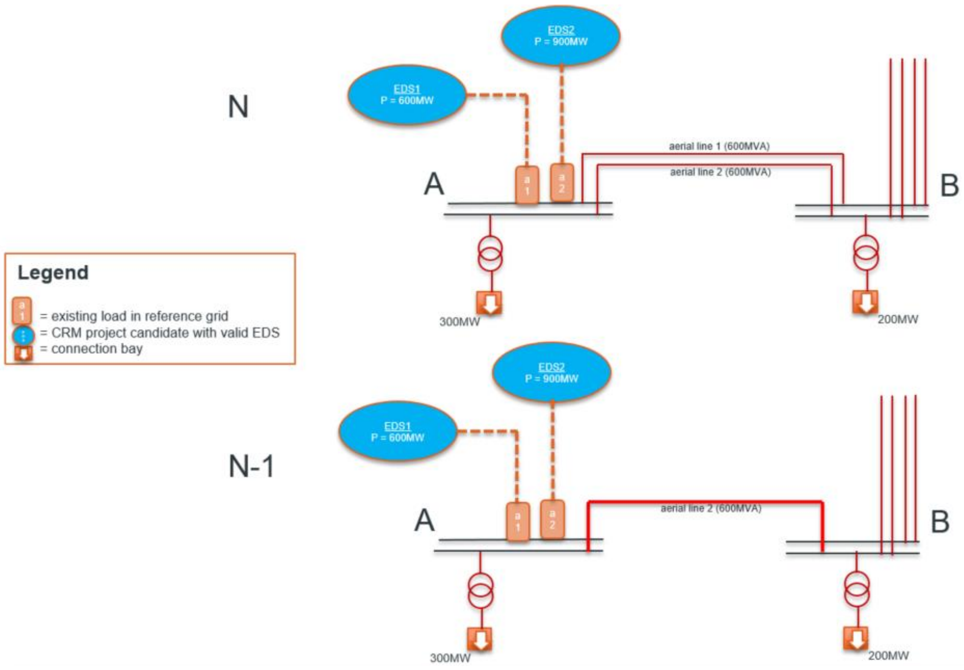


Figure 6: Power flow limitation illustration (substation A)

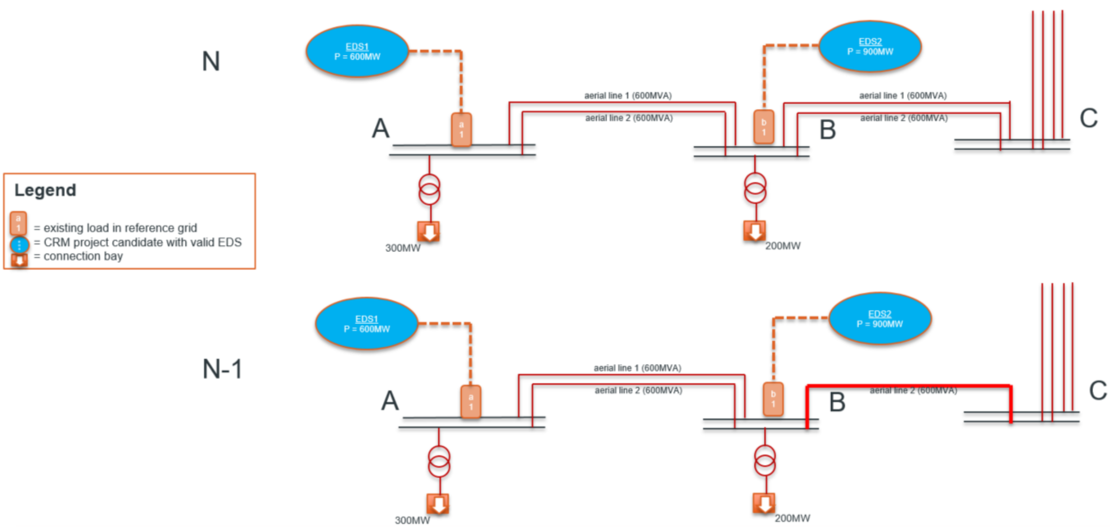


Figure 7: Power flow limitation illustration (substation A + B)

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.

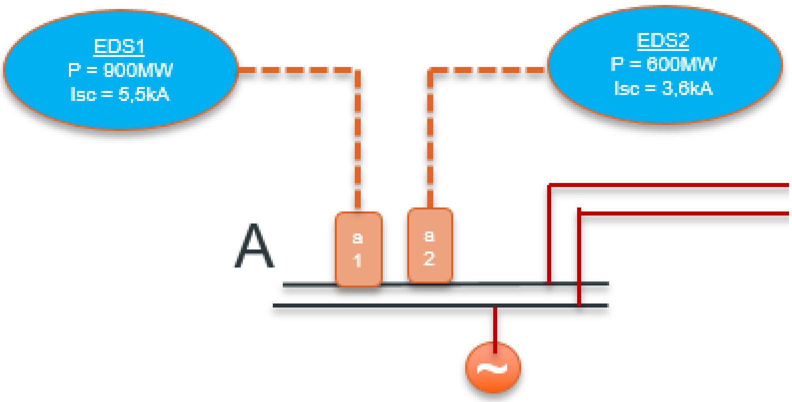


Figure 8: Short-circuit current limitation illustration

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.

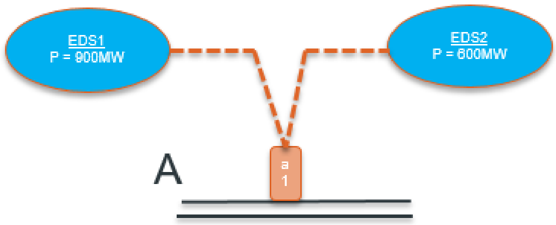


Figure 9: Spacing limitation illustration

External (third party) constraints on EDS combinations

In section 4.2.3 the focus is laid on constraints originating from within the public 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.

Elia shall not calculate itself any external constraints, but shall take them into account during the application phase for a specific Auction, provided they are validated based on the subsequently described validation process.

External constraints are constraints from third parties, for example resulting from within other grids or from primary fuel limitations, which are not related to the public electricity transmission grid. Elia can accommodate in the Auction grid constraints from third parties to the extent they are defined by the third party within the appropriate legal & regulatory framework and they are provided on time & following the format specified in relation to the auction process & rules.

In any case, Elia cannot be held liable for the correctness of these third party constraints. The validation process for external constraints – prior to any application by Elia within the application phase for a specific Auction - can in this respect be separated in two parts:
(1) The third party shall inform Elia in advance whether any distinct external constraint type can be accepted by the 15th of June at the latest. The third party shall provide the written confirmation from the relevant regulatory authority that any such constraints can be applied in the Auction. Elia is not

responsible for the acceptance of the calculation methodology & for the acceptance of a potential application within the auction algorithm during the application phase.
(2) Elia shall verify whether the received external constraints by the 15th of September respect the required formatting. Elia shall notify & inform the relevant regulatory bodies with the received proposals for external constraints as soon as possible after the 15th of September but no later than the 30th of September. Elia shall include in the combination matrix any valid external constraint– in line with the proposed grid constraint format.
In case the need for specified external constraints by third parties would be recurrent, they can be formalized by inclusion into the auction rules.

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 public electrical 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 / Technical Agreement and the individual CRM Bids~~,~~ for certain CMU(s), 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~~for each CMU, during the Prequalification Process, 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 between submitted bids and related EDS Technical Agreement needs to be specified during the bidding process (between GOT and GCT) in addition to having obtained such a valid EDS and having become a Prequalified CRM Candidate 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~~,~~ or relevant CMU(s), 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 principally 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~~15th of June.

● 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~~respect, during the ~~link to~~bidding process, the ~~individual~~ technical configuration in accordance with the EDS ~~& resp. CMU(s) –~~/ Technical Agreement, in order for Elia to be able to apply the determined grid constraints ~~to the proper CRM Bids within the CRM Auction selection algorithm~~

4.2.5 Methodology for ~~calculating~~calculation & application of CRM grid constraints for the transmission grid

The section below will describe the methodology to calculate & apply the CRM grid constraints that Elia will apply for the public transmission grid~~.~~ as well as the format. The section first ~~part will describe~~defines a calculation and application phase, after which the format is defined and finally both the theoretic methodology~~, after which in the second part~~ and 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.~~ is given. .

Calculation & application phase definition

Elia shall apply a step-wise methodology to determine the grid constraints in the calculation phase, the results of which shall be communicated to the CREG at the start of the application phase. The yearly calculation and application phase for grid constraints for the Primary Market is defined as follows.

Calculation phase
During the calculation phase, which starts on 15th of June until 15th of September, Elia shall identify the public electrical transmission grid constraints of the expected grid infrastructure for the Delivery Period for the considered Auction to be taken into account within the CRM auction algorithm. Infeasible combinations of CMU(s) -only for additional connection capacity following the status obtained in the standard Prequalification Process - originating from public electrical transmission grid perspective can occur and shall constitute grid constraints by Elia, if they exert an unacceptable mutual influence or if too many CMU(s) want to connect within the same region. The drivers for such grid constraints are described in section 4.2.3. The individual feasibility of CMU(s) with the need for additional connection capacity, is determined by Elia through the Prequalification Process, whereas the feasibility of combining multiple CMU(s) is verified through the calculation phase of grid constraints.

 Elia does not calculate any external constraints (e.g. from other grids or from primary fuel limitations), but may receive this information from the relevant external supplier, provided all validation conditions for external constraints have been positively verified by Elia (timing & format) and that those constraints have been provided according to the relevant legal and regulatory framework (cfr. end of section 4.2.3).

Application phase
During the application phase, Elia shall provide the calculated grid constraints for public electrical transmission grid to the CREG and any received external constraints to the relevant regulatory bodies for auditability of the CRM Auction (cfr. §4.2.7).
During the application phase, which starts on 15th of September until 30th of September, Elia shall apply the determined grid constraints (incl. validated external constraints) and make mathematical translations for usage in the Auction Algorithm, which effectively sets boundaries on the CRM solution space within which the CRM clearing can take place.

Grid constraints format

In case a grid constraint needs to be imposed within the auction algorithm, it shall take the following form. The table below illustrates the case for 3 CMUs:

CMU 1	CMU 2	CMU 3	Reason for non-acceptable combination
1	1	0	Eg. overload of line X
1	0	1	Eg. no sufficient space at substation X

In case of external constraints, they shall take the same format as specified above and need to be provided to Elia by the relevant third parties.

Methodology Description

Step ~~0~~1)

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;
- Elia shall also use the most recent available information regarding external grid, whenever relevant.
- excluding generation/demand or storage capacity that has given a definitive closure notification prior to the CRM Prequalification Phase (1st of June of the same year) as referred to in Art. 4bis of the Electricity Act prior to the grid constraints calculation phase or if there are any specific

legal requirements for decommissioning of phase-out of existing units.

- 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~~fdefined in the Royal Decree Methodology meant in Art. 7undecies §2 of the Electricity Law – together with some specific sensitivities whenever relevant.

Step 2)

Elia shall apply a combinatory methodology which verifies all relevant combinations of CMU(s) for additional grid connection capacity within the reference grid for the concerned Delivery Period, which have successfully passed the Prequalification Process.

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~~**Step 3)**

A combination matrix will be set up by Elia, that explicitly enumerates at least all ~~possible options – hence 2^n – 1~~infeasible combinations ~~with n = # individual valid EDS.~~

~~**Step 3)** The assessment of~~. For each ~~EDS~~infeasible combination ~~is performed by~~, Elia shall indicate the technical reason for non-acceptance based on the drivers for grid constraints. 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.)~~ shall communicate the combination matrix to CREG 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.~~

– the timing is detailed in §4.2.7.

Step 4)

In the Application Phase, Elia shall apply all valid grid constraints in the auction algorithm through mathematical translation. The validity for public electrical transmission grid constraints and external constraints implies they were available and received on time, in the right format and that on beforehand approval from the respective legal & regulatory framework has been obtained.

~~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 Methodology 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~~relevant regulators.

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 14.

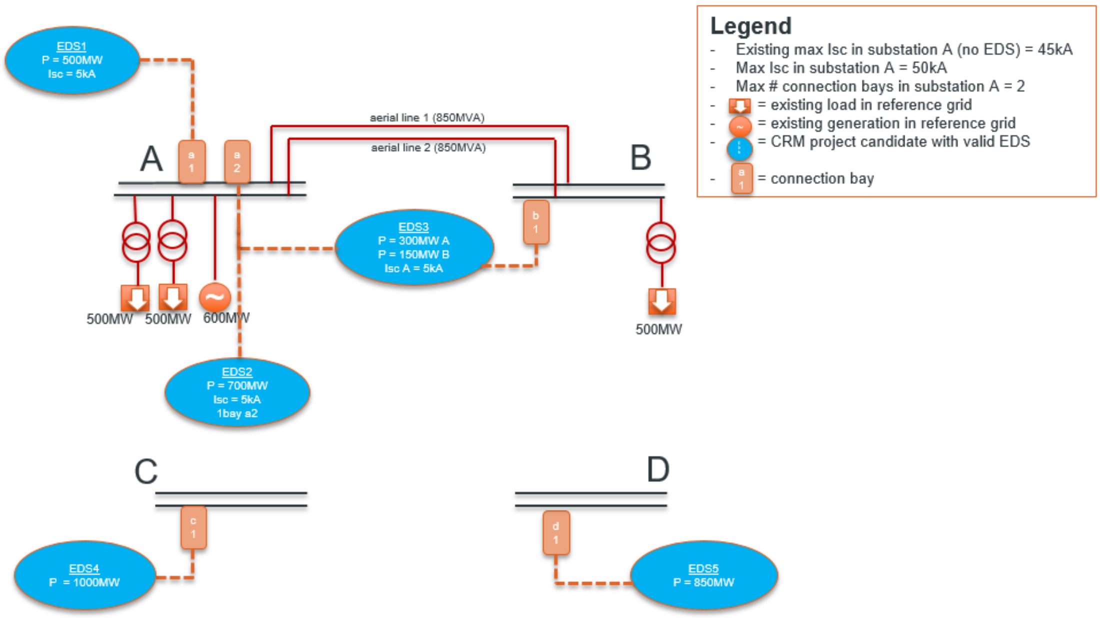


Figure 10: Example grid setup for methodology illustration

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-~~1-2)

► 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~~3)

► 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~~relevant regulators – to serve a potential audit process.

Step 4)

- ~~Elia $_i Z_2 + Z_3 < 1$~~

Elia derives based on the combination matrix outcome the applicable binary grid constraints for not allowed combinations and includes these in the Auction Algorithm. For the illustration, this results in following constraints with z_i a binary selection variable {0,1} which reflects whether a specific EDS "i" has been retained (value 1) or not-retained (value 0) in the Auction Algorithm.

- $Z_2 + Z_3 < 1$
- $Z_1+Z_2+Z_3 < 3$

~~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.~~

These constraints allow for the selection of all 3 EDS individually, but prohibits the combination of sets (EDS 2 + EDS3) and (EDS1 + EDS2 + EDS3).

Summary of the CRM grid constraint calculation methodology

Figure 14 below illustrates a schematic overview of the different steps 1 to ~~5~~4

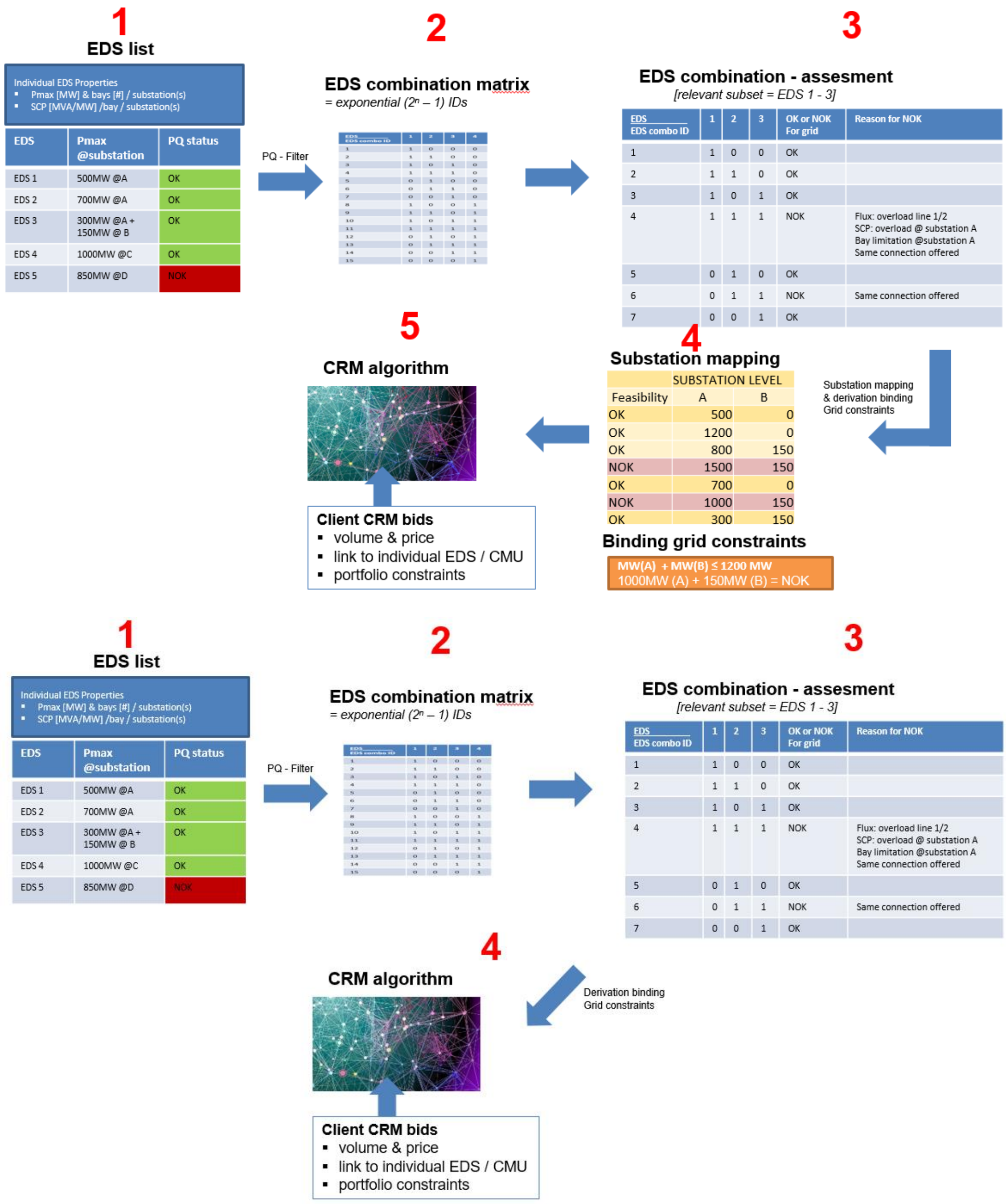


Figure 14: Summary of methodology for CRM grid constraint calculation

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.

CALCULATION PHASE

Third party providers of external constraints shall notify Elia of the acceptance by the relevant regulatory authority that any distinct external constraint type can be accepted by the 15th of June at the latest. Elia is not responsible for the determination of the calculation for any external constraints.

Elia shall determine the public electrical transmission grid constraints (if any) applicable to the respective Auction between the 15th of June and the 15th of September.

All external grid constraints to be taken into account for the Auction shall be communicated to Elia until the 15th of September.

APPLICATION PHASE

As soon as possible after the 15th of September but no later than the 30th of September, Elia shall submit the combination matrix (incl. any external constraints) - to the relevant regulators which ultimately are applied as mathematical constraints in the auction algorithm.

From 15th of September and no later than 15th of October, Elia shall process the information from the calculation phase into mathematical constraints needed within the auction algorithm – based on the combination matrix and received external constraints.

The correct application of the grid constraints, and more generally the Auction, shall be verified following the rules set out in the Royal Decree on the control of the good functioning of the CRM as meant by Art. 7 undecies §9 of the Electricity Act.

FALLBACK SOLUTION

In the extraordinary event of calculation issues in the calculation phase – affecting the ex-ante availability of the necessary & approved grid constraints before the CRM gate closing time as specified above – Elia may exceptionally, after approval by CREG, apply nevertheless grid constraints in the application phase after the gate closing time of the Auction (i.e. 30th of September)

This fallback solution guarantees that the grid feasibility of any Auction is ensured, in case the standard process would fail. In case of failure, Elia & relevant third parties with external constraints take reasonable measures & consult with CREG in order to improve & avoid such events for future Auctions.

The fallback procedure can potentially imply some iterative steps between the gate closing time and the ultimate deadline of the publication of the Auction results – in order to determine the optimal Auction result that respects all valid grid constraints. The fallback process would be as follows: based on the receive Bids & the demand curve applied in the Auction, the auction algorithm shall provide the clearing result without mathematical grid constraints. The obtained solution shall then subsequently be verified by Elia (and if needed third parties to verify their respective external constraints) between 1st of October & 31st of October – following the methodology as defined in the auction rules.

- Step 1: In case the solution respects all constraints, no further steps are needed and the CRM auction result can be considered final.

- Step 2: In case it does not respect all constraints, the next optimal solution with the best objective function value needs to be determined in the auction algorithm, by iteratively performing an Auction clearing with 2 additional constraints (best objective function value step 2 worse than best objective function value step 1 and selection 2 does not equal selection 1).

Step ~~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.~~2 should be repeated until a solution is found that respects all valid grid constraints for the respective Auction.

Design Proposal #13:

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

Elia may exceptionally, after approval by CREG, apply nevertheless grid constraints in the application phase after the gate closing time of the Auction in case of fallback solution.

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~~select the combination of Bids with the lowest Capacity Contract Duration
3. In case of equivalence after rules 1 and 2, give preference to the earliest submitted Bids

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.

For the second tie-breaking rule regarding the lowest Capacity Contract Duration, the cumulative Capacity Contract Duration shall be evaluated, calculated as the sum of the volume of each selected Bid multiplied by the Capacity Contract Duration.

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~~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~~Opt-Out Notification is hereafter referred to as "Opt-Out Volume".

● A CRM Candidate who submits an ~~opt-out notification~~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~~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~~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~~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~~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.[13]

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

[13] 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.

could prove more profitable, etc.

Depending on the reason for opt-out, an ~~opt-out notification~~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~~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 15 below. Note that a volume correction (category 'IN') following an Opt-Out Notification of course only makes sense in case of Existing Capacity. Therefore, an Opt-Out Notification related to an Additional Capacity CMU shall by default be considered as OUT and not follow the scheme provided in Figure 15 below.

The following sections zoom in on this overview and provide examples when deemed useful.

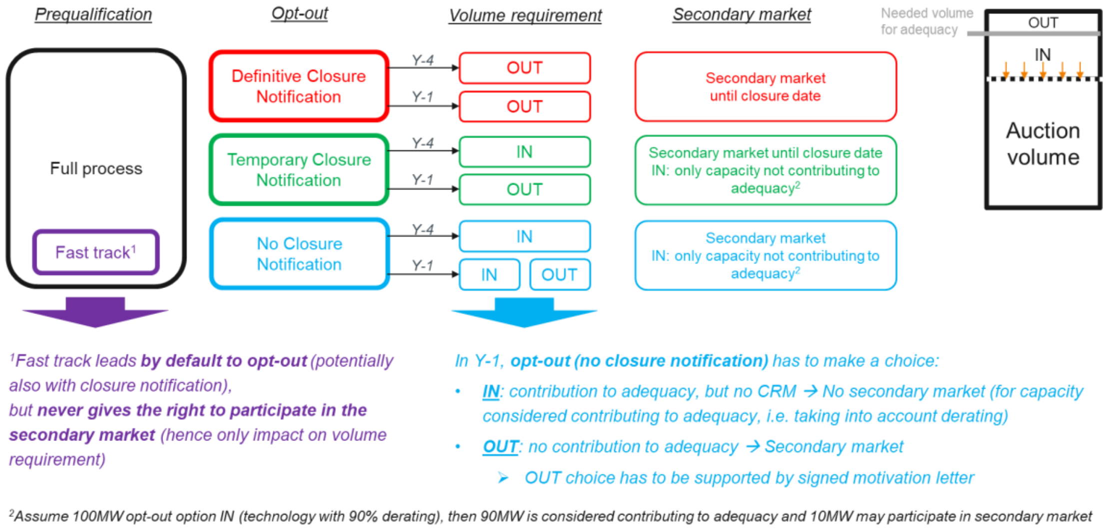


Figure 15: Treatment of Opt-Out Volumes towards Y-4 and Y-1 Auction

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~~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~~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 16 below.

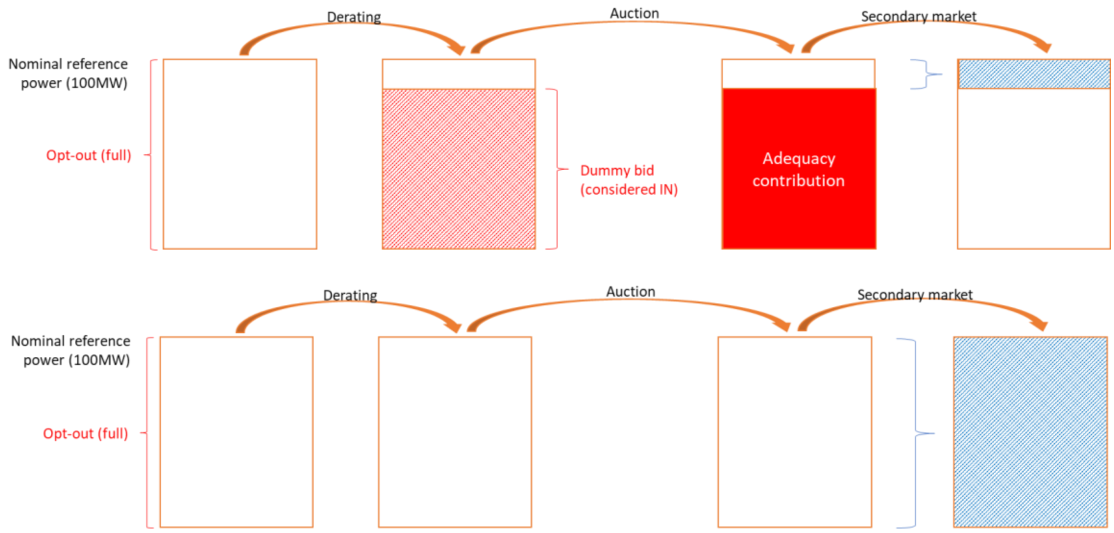


Figure 16: Full opt-out of CMU of 100MW supported by temporary closure notification towards Y-4 Auction (top) and Y-1 Auction (bottom)

As illustrated in Figure 16 (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 16, 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 16 (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~~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 17 below.

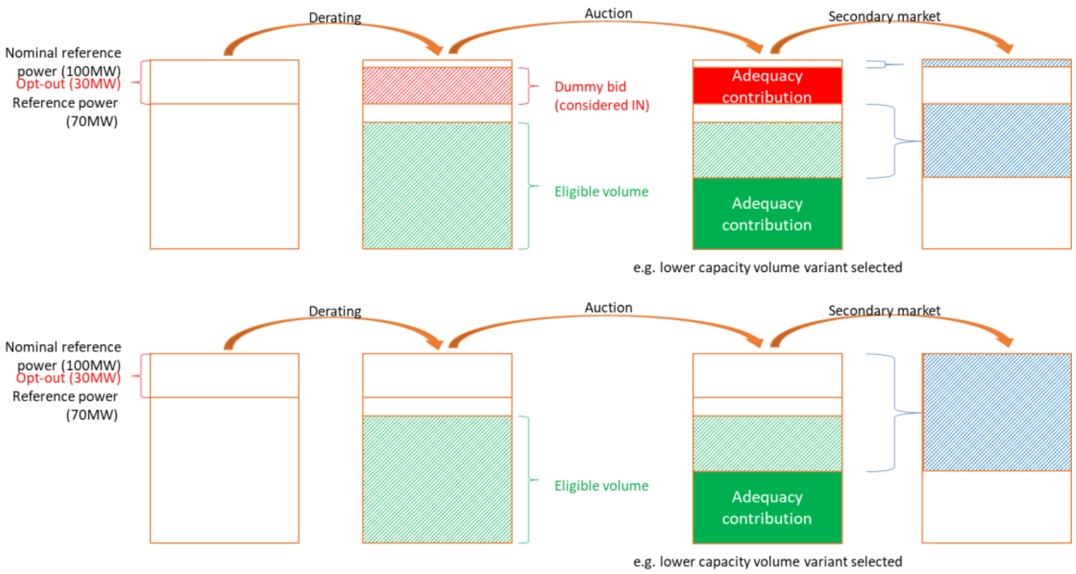


Figure 17: 100MW CMU with 30MW opt-out without notification towards Y-4 Auction (top) and Y-1 Auction with choice OUT (bottom)

As illustrated in Figure 17 (top), a dummy Bid will always be inserted into the Y-4 Auction related to the Opt-Out Volume ~~with~~without a ~~temporary~~ closure notification. ~~The~~Towards the Y-1 Auction, 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 17 (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 17, 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~~Opt-Out Notification and therefore has to comply with all above requirement related to such ~~opt-out notification~~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~~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~~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~~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~~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 18 below.

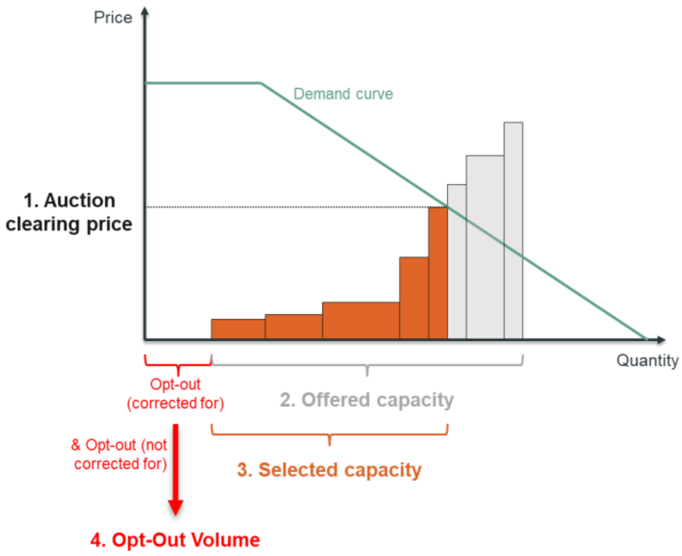


Figure 18: Overview of Auction result information categories

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[14]:

- 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.*

[14] 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.

Updated CRM Design Note:

Payback Obligation

~~2/10~~03/2020~~19~~

Table of contents

1 Introduction & context

1.1 Context and Goal of the Design Note

The purpose of the present design note is to provide all stakeholders with a clear view concerning the methodology for determining the Payback Obligation, the Reference Price and Strike Price in the context of the Reliability Option.

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

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Note that in addition to the versions of the Market Rules and draft Royal decree available at the end of 2019 reflected in this update of the design note, also the indexation of the Strike Price in time is covered in this update. It follows the general principle introduced in the draft royal decree following the public consultation, for which the details will have to be added to a next version of the market rules. For sake of completeness and given that it has already been discussed once in the TF CRM it has been added to this note[5].

Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means is a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn5_crm-design-note---payback-obligation.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf
[5] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/2020/20200206_01-tfcrm10_strike-price-indexation.pdf

~~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.~~[6]

~~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[7] (hereafter "CRM Law"), modifying the Electricity law of 29 April 1999 on the organization of the electricity market (hereafter "Electricity law") introduces the concept of a Reliability Option implying a Payback Obligation when the Reference Price exceeds the Strike Price.

In Art. 2 the following elements are defined:

- The Reliability Option ("Option de fiabilité / betrouwbaarheidsopties") is defined as (own translation): the mechanism for which the Capacity Provider has to re-imburse the positive difference between the Reference Price and the Strike Price
- The Reference Price ("prix de reference / referentie prijs") is defined as (own translation): "the price reflecting the price that should be obtained by the Capacity Providers on the market".
- The Strike Price ("prix d'exercice / uitoefenprijs") is defined as (own translation): "the predefined price that determines the threshold above which the Capacity Provider has to pay-back difference with the Reference Price".

In Art. 7undecies, §2 the CRM law further foresees the governance framework for the determination of the Strike Price and the Reference Price, foreseeing a vast consultation procedure of market actors, the FPS Economy and the regulator, prior to determining on the one hand the methodology for the determination of the proposal of this parameter (scope of this design note) and on the other hand the yearly calibration (based on the methodology in

[6] ~~https://www.elia.be/en/public-consultation/20190913_formal-public-consultation-on-the-crm-design-notes-part-i~~

[7] http://www.ejustice.just.fgov.be/eli/wet/2019/04/22/2019012267/staatsblad

this design note, translated into a Royal Decree) and decision of this parameter.

1.2 Structure of the design note

The purpose of this design note is to address the methodology to define and calibrate the Strike Price & Reference Price in the Payback Obligation in order to reach a clear common understanding of the choices made and to determine the according rules.

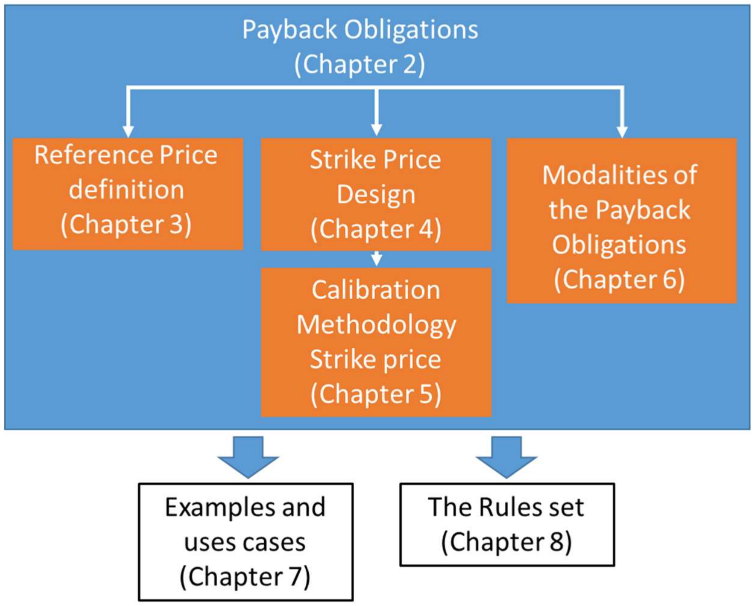


Figure 1: Structure of the Design Note

Chapter 2 will describe the Payback Obligation formula structure and its main ingredients.

Chapter 3, based on the information developed in C~~c~~hapter 2, will explain the proposal for determining the Reference Price.

Chapter 4 will describe the proposal for determining the fundamental design of Strike Price. This is further supported directly in Chapter 5 by the methodology for the Strike Price calibration.

Finally, Chapter 6 aims to discuss other relevant complementary modalities related to the Payback Obligation.

Use Cases and examples that help the comprehension of the Payback Obligation concept are described in Chapter 7.

A summary of the design proposals finalizes the document in Chapter 8.

1.3 Concept of Reliability Option & Payback Obligation

The Reliability Options concept in the CRM can be summarized as:

In a Reliability Option, the Capacity Provider receives a Capacity Remuneration from the CRM mechanism but is obliged to payback money to society (the so-called "Payback Obligation") whenever the reference energy price (e.g. Day-Ahead P~~p~~rice) exceeds a pre-defined Strike Price (i.e. a pre-determined price level expressed in €/MWh).

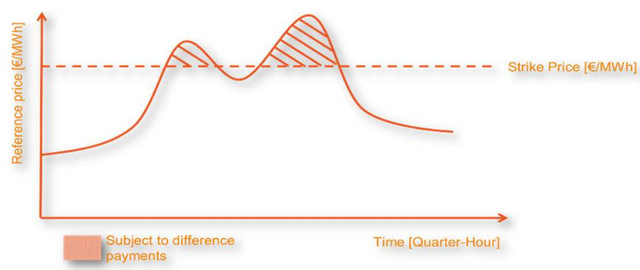


Figure 2: Payback Obligation trigger concept

In principle, such approach has typically two advantages for society.

Firstly, it contributes to the avoidance of windfall profits. As the Capacity Provider already receives a Capacity Remuneration on top of its 'normal' energy market revenues which – together - should cover all its costs, extreme energy prices would provide him with an extra, double remuneration insofar these revenues have not been accounted for when determining his offer price in the CRM. This would constitute a windfall profit.

Secondly, it strengthens the availability incentive. As the Capacity Providers are obliged to payback when the reference energy price exceeds the Strike Price and those moments will be strongly correlated with moments of (near-) scarcity, there is an extra incentive for Capacity Providers to be available for the system at such moments. Indeed, as they would have to payback an amount based on assumed energy market revenues, they have the incentive to actually deliver on energy in the energy market to earn those revenues in the first place.

In the Belgian CRM Framework and under the light of the Clean Energy Package and other European energy guidelines, the definition of the Payback Obligation is considered as a design element where several objectives and important considerations come together, amongst other: technology neutrality and openness, limitation of the overall CRM cost, windfall profit avoidance, respect of the Reliability Option principle, limiting energy market interference, overall complexity avoidance and feasibility.

The strengthening of the availability incentive objective function has been considered as an upside of the Payback Obligation definition. Although in the proposed Belgian CRM design the availability incentive of the Reliability Option is recognized, other availability requirements are foreseen as well to make sure that the whole Contracted Capacity has sufficient incentives to deliver on its obligation and to ensure adequacy at system level.

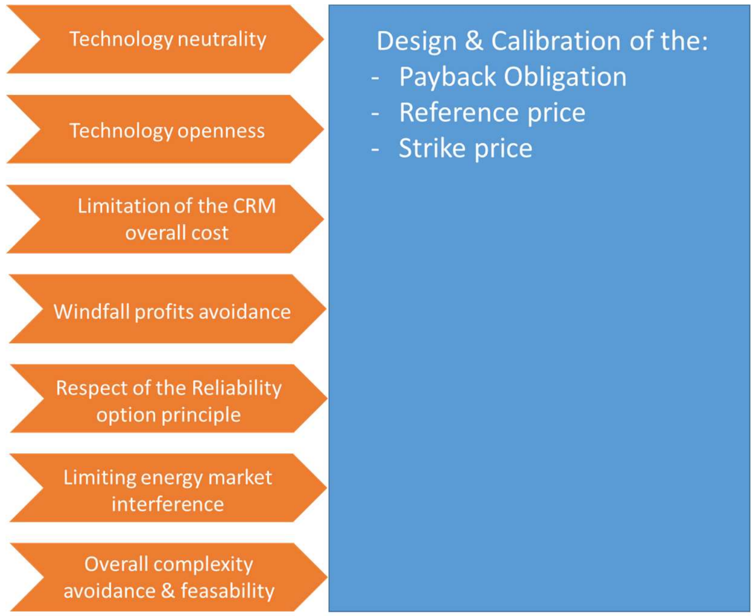


Figure 3: Design & calibration of the Payback Obligation elements deals with several objectives and considerations

It is fundamental to understand that each decision to re-inforce one element of the multi-objectives and considerations may influence on:

- Other objectives and considerations related to the Payback Obligation
- Impact on consistency with other CRM design elements

The design and the calibration therefore inevitably implies a trade-off, a compromise between the objectives and considerations. This element must be kept in mind at all stages of the proposal.

The objectives and considerations mentioned above are further detailed in Paragraph 1.3.

1.3.1 Technology neutrality

In the overall CRM design, the Payback Obligation and the definition of its parameters are driven by the consideration of technology neutrality at all steps. Technology neutrality should ensure a level playing field between technologies and aims at creating a homogeneous CRM design and product requirements. The importance of technology neutrality has also been demonstrated throughout the approval processes of earlier CRMs in Europe.

The rules are to be designed in order to make sure that all realistically potential technologies are able to participate in the CRM while taking into account their actual contribution to the Belgian adequacy (cf. Derating Factor rules presented in the Design Note 1).

One more concrete consequence to bear in mind is that technology neutrality should also imply the facilitation of the participation of aggregators to the CRM. Any differentiating based on technologies should not prevent aggregators from realistically participating (i.e. with a real chance to actually win a contract). As their added value typically lies in combining across multiple technologies, e.g. (smaller scale) generation, storage & DSR units, the rules should keep this in mind from the start.

1.3.2 Technology openness

The Clean Energy Package and other European guidelines consider technology openness as a main requirement for the design of the Market rules & methodologies. For instance, the Clean Energy Package in Art 22 §1 of the Energy Regulation states explicitly that capacity mechanism shall "[...] *be open to participation of all resources that are capable of providing the required technical performance, including energy storage and demand side management* [...]".

As long as a contribution to the Belgian adequacy is ensured, the developed methodologies and rules have to ensure that there is no creation of undue entry barriers to the CRM.

It is to be avoided that the CRM design and also the Payback Obligation would create undue barriers for entry. Especially in the Strike Price design, the level of the Strike Price – if not well calibrated and not well embedded within a larger design – could risk to constitute such a barrier for entry. For instance, too low Strike Price levels not complemented with other design features ~~(e.g. Stop Loss limits, cf. infra)~~ may prevent the participation in the CRM from capacity characterized by higher short run marginal costs. Also the case of an aggregator possibly combining multiple technologies should not be confronted with unnecessary constraints, e.g. the number of different Strike Prices could impact this (cf. infra).

1.3.3 Limitation of the CRM overall cost

The Electricity Law clearly states that an important factor of the CRM is to limit its overall cost (cf. Art.7undecies, §1). In this respect it is crucial to not only address design elements individually, but also considering them within the bigger picture of the entire CRM. It could be that giving in (slightly) at one place in the CRM design could leverage more positively in terms of cost management elsewhere. In this context, allowing more technologies to participate to the CRM, by avoiding undue entry barriers, allows to increase the amount of participants and foster greater competition. Greater competition in the~~-~~ Auction by means of more technologies can only have a downward pressure on the overall CRM cost. In the context of the Payback Obligation, it is important to bear in mind that the impact design choices have on the potential for demand response to participate and create competition for (more conventional) generation technologies. A desired volume and price effect in the primary auction is to be traded off with for instance the impact on potential windfall profits resulting from Strike Price choices (cf. next section 1.3.4).

1.3.4 Windfall profits avoidance

In the energy market, the so-called “infra-marginal rent” of the participating asset is the difference between its market revenue and its marginal cost. Windfall profit (or a double remuneration) would arise when such inframarginal rents would reach levels that are not counted upon initially when investing in the capacity.

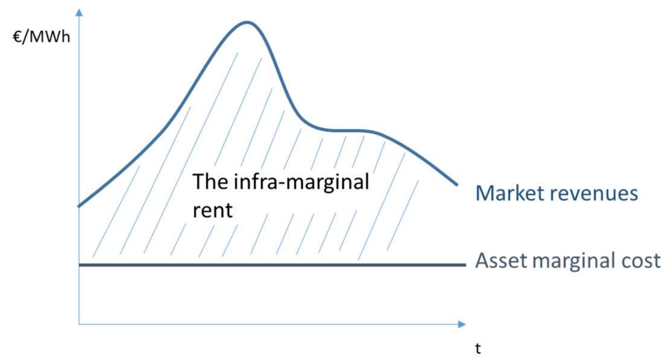


Figure 4: Infra-Marginal rent concept

This risk of windfall profits could exist in the CRM when the Capacity Provider receives a Capacity Remuneration from the CRM to complement its 'normal' energy market revenues. Together it should cover all its costs (incl. a fair remuneration for the investors). However, all extra unusual inframarginal rents originating from higher energy prices, that were not foreseen in the business case and hence not taken into account as market revenues in the CRM Bid Price, would provide an extra, double remuneration. This would constitute a windfall profit.

The windfall profit is thus the difference between the market revenues (or inframarginal rents) and a certain threshold defining the revenues that were taken into account in its Bid Price as revenue. Of course, such thresholds could vary from technology to technology and from investor to investor, for instance depending on his views on the future market outcomes as well as his risk appetite.

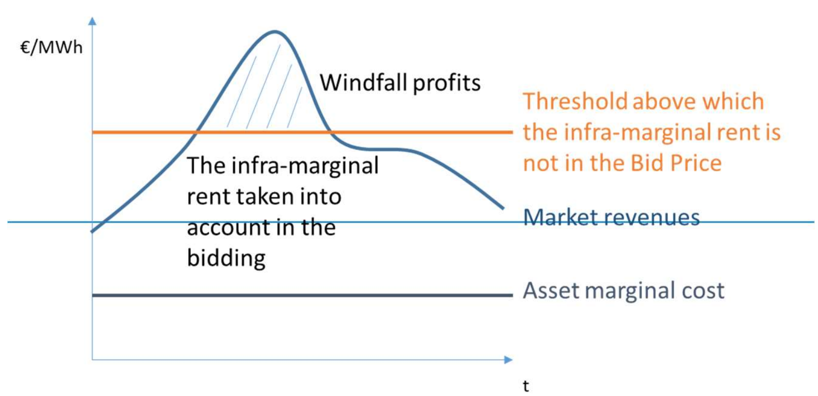


Figure 5: Windfall profit definition

The goal of the Payback Obligation requires thus a Strike Price and a Reference Price defined in order to limit as much as possible such windfall profits, not the least in case of 'extreme' energy market revenues.

1.3.5 Respect of the Reliability Option principle

The CRM Law made the choice of a centralized Capacity Remuneration mechanism with a Reliability Option principle. This means that it should be sufficiently realistic that the Payback Obligation could occur. Otherwise, the principle put forward by the legislator remains hollow and without effect. Obviously, it is crucial to calibrate this prudently, in order not to overthrow the overall mechanism. This principle could easily be interpreted too strictly as well, particularly when taken together with the windfall profit avoidance, in such a way that a Payback Obligation would apply frequently, e.g. several times a year. Lower Strike Prices could achieve this. However, if the idea had been to capture *all* windfall profit perfectly and to have frequent paybacks, other mechanisms could have been more promising in the first place (e.g. based on contracts for differences). A more sensitive interpretation to the Payback Obligation in the context of this mechanism could lie in the avoidance of extremes, for instance the Payback Obligation should kick-in particularly at more extraordinary moments, e.g. when higher energy price levels (which could still be (far) below the price cap) occur. In this way the Payback Obligation provides a real protection to society and respects the overall principle.

1.3.6 Limiting energy market interference

The design of the CRM rules (including the Payback Obligation aspects) should not hamper the good functioning of the energy market. A particular element is allowing a good assessment of energy market participants of the impact of Payback Obligation (and particularly Strike Price choices) on the price formation in the energy market. The more complex the Strike Price design would be, the more difficult the dynamics towards the energy market functioning could be, eventually even hampering its good functioning. From this perspective simplicity is to be preferred.

1.3.7 Overall complexity & feasibility

Feasible methodologies based on accurate logics that could be managed by all is key for the CRM. A manageable complexity of the CRM system is desirable in order to increase competition and limit the cost of the CRM, both in the development phase and in the risk aversion to uncertainty modelling within the CRM Bid Prices by the participants. Overly complex mechanisms, particularly in Strike Price design and calibration, risk in going beyond the effects. The more assumptions and choices needed, the more likely it is to make wrong choices. Also, the more complex the mechanism becomes, the less manageable it is. In this respect, feasibility also links to the overall market design in place. The Belgian energy market design is for instance characterized by portfolio bidding and comes with a specific degree of information sharing. Choices in, for instance, Strike Price design should bear in mind the available information on the Belgian market when for instance pursuing a calibration. For instance, by lack of a unit-based approach in the energy market (like for instance the case in more pool-based market organizations) there is also less information available on actual earnings and profits for individual assets, technologies and/or market players.

2 Overall Payback Obligation design

In this chapter, the proposed overall Payback Obligation formula is defined and its constituting elements are briefly introduced in order to provide already a high-level view. In the upcoming chapters, each of these constituting elements is further explained and detailed.

2.1 Reliability Option & Payback Obligation

The Payback Obligation formula is representing the Reliability Option principle according to which energy market revenues earned above a pre-defined threshold, the Strike Price, that will be applied to all CMUs of the CRM at all moments of their delivery period, will be reimbursed to society.

This calculation will occur for all participating technology types without distinction assuming that they all have access to the energy market respecting therefore the principles of technology neutrality and openness within the CRM design.

Finally, this Payback Obligation calculation will apply to all participating CMU's of a Capacity Provider for a defined operational period & Total Contracted Capacity. As presented in 1.3., a **positive** delta between the Reference Price and the Strike Price has to be applied on a CMU's Total Contracted Capacity, at each moment of the Delivery Period, under pre-defined modalities. The modalities and possible exemptions related to the volume used for the calculation will be further detailed in Chapter 6. The amount that should be reimbursed is calculated **ex-post** in euro (€) by use of those modalities and when comparing the relevant Reference Strike & Strike Price.

The objectives and considerations of the Payback Obligation described in Paragraph 1.3 will be assessed carefully when developing the proposals for each constituting element, in particular: the Reference Price (chapter 3), Strike Price (chapter 4 & 5) and modalities of application (chapter 6).

2.2 The Payback Obligation formula

Obviously the application of the concept of Reliability Option on the ~~Obligated~~ Total Contracted Capacity becomes trickier when considering other elements of the CRM such as the various A~~a~~uctions and the S~~s~~econdary M~~m~~arket.

The Payback Obligation formula is applicable for each individual participating CMU of a Capacity Provider.

However, within a CMU, a distinction has to be made between its different ~~obligations~~Transactions. Indeed, a CMU could provide, during the same delivery period "t", ~~obligations~~ Transactions coming from one or more A~~a~~uctions and/or Transactions~~obligations~~ coming from one or more S~~s~~econdary M~~m~~arket transactions as well.

Of course, each of these auctions or ~~transactions'~~ Secondary Market' Transactions~~obligations~~ is likely to have a different *~~Payback Obligated Capacity~~Payback Capacity* *(CMU, t, Transaction Id)*. This will be described in Chapter 6.

~~Finally~~On top, these different CMU ~~Obligations~~ Transactions may also have been contracted at different moments in time potentially corresponding to different Strike Prices: *Strike Price (CMU, t,~~at~~ Transaction Id ~~Date~~)*. Finally, considering the status of a CMU with or without Daily Schedule, the Strike Price formula will be different. The~~i~~se aspects will be covered in Chapter 4.

As a conclusion, the overall generic formula for a CMU Payback Obligation can be described as the sum of its Payback Obligations (being the positive delta between the common Reference Price and its Strike Price linked to each CMU ~~Obligation transaction~~Transaction ~~date~~) multiplied by a function of the Contracted Capacity ~~the Obligated Capacity~~ linked to the same T~~t~~ransaction ~~obligations~~.

Note: The Payback Obligation formula is a generic formula as it embeds:

- a generic Strike Price in the price difference, the Strike Price (CMU, t, Transaction Id), that will be described in Chapter 4 in details and

- a generic volume on which the price difference is applied, the Payback Capacity (CMU, t, Transaction Id), that will be described in Chapter 6 in details.

Indeed, depending on the CMU features those parameters are themselves considered as formulas so that the Payback Obligation applied to a CMU is the combination of them so that the formula will therefore be refined along the Chapters.

Design Proposal #1: The Payback Obligation Formula

The Payback Obligation generic formula for a given CMU ~~obligation~~ is:

For all t hours where the CMU is under a Transaction ~~Capacity~~,

Payback Obligations (CMU, t) =

Sum on all Transactions of the CMU:

*max[0; Reference Price (t) – Strike price (CMU, t, ~~at~~ Transaction Id~~Date~~)] * ~~Payback Obligated Capacity~~Payback Capacity(CMU, t, Transaction Id) [in €]*

The Reference Price formula is defined in Chapter 3 whereas Chapter 4 describes in detail the Strike Price (CMU, t, ~~at~~ Transaction Id~~Date~~). Strike Price c~~C~~alibration modalities are covered in Chapter 5.

The *~~Payback Obligated Capacity~~Payback Capacity (CMU, t, Transaction Id)* is further defined in Chapter 6.

3 Reference Price design

The Reference Price should represent the most relevant energy market price signal (€/MWh) of the overall Belgian energy market revenue capturing relevant moments for adequacy, while sufficiently distinguishing with moments that are *not* relevant for adequacy.

It is one of the key parameters of the Payback Obligation formula as it will be compared to the Strike Price level in order to define the amount of the payback.

In this chapter, the rationale behind the choice of the Reference Price will be presented in details.

3.1 Reference market choice

Several aspects are described below in order to assess and finally propose the most suitable Reference Price in the Belgian CRM design:

3.1.1 A standardized, market-wide Reference Price is preferred in the Belgian context

In the Italian and Irish Reliability Options mechanisms, an individualization of the Reference Price by each contractor has been settled based on Day-Ahead Market (DAM), Intraday Market (IDM) and Balancing Market.

It is very unlikely to reach such individualized Reference Price per Unit in the current functioning of the 'Self-dispatching' on the DAM/IDM on a portfolio basis in Belgium as the level of information available in Belgium is not as high as in the above-mentioned countries. Indeed, there are no individualized offer curves in both DAM and IDM markets and a lot of trading happens within portfolios or over the counter, and it is hard to change it without affecting the good functioning of the energy market.

In this context, the complexity of the calibration of such individualized Reference Prices per CMU or even per technology would have led to arbitrary definitions of parameters creating niches for some technologies & assets compared to others. It would have then made the technology openness & neutrality criteria impossible to fulfill, next to impacting very significantly the functioning of the energy market itself.

Therefore, a standardized, market wide reference appears to be the simplest, most transparent, equal and "energy market"-compatible solution given the current Belgian Self-dispatching on the DAM/IDM markets.

3.1.2 The Day-Ahead Market is considered as most suitable standardized, market-wide reference in the Belgian context

To determine which market is deemed most suitable for observing the Reference Price, different market segments have been considered: Forward market, Day-Ahead Market, Intraday Market and the Balancing Market.

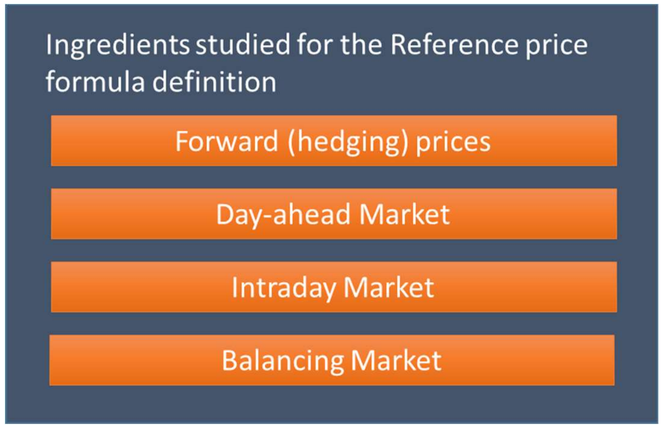


Figure 6: Considered market segments for the Reference Price definition

Forward (hedging) prices

The main issue with the forward prices inclusion in the Reference Price calculation to be used in a CRM lies in its granularity. F~~f~~orward prices are not closely enough linked to adequacy issues, there is for instance no hourly granularity on a day per day basis. Clearly, it also does not represent a sufficiently close signal to potential 'near scarcity' moments in the energy market (which is rather a matter of a few hours on a few days), even the shorter term available forward products still are not capable to actually distinguish between specific moments that are suffering from adequacy concerns from others.

Indeed, forward prices are driven by averages for certain delivery periods: the inclusion of these prices in a Reference Price formula might drastically lower the Reference Price. The dilution effect of these 'near-scarcity' events due to the 'average' of the forward price delivery period is too extreme to truly consider the inclusion of forward prices as (part of) the Reference Price.

Also, the f~~F~~orward market in Belgium is much less transparent and its liquidity is rather limited, compared to other market segments. Its accessibility, the bid-ask spreads identified and the quasi non-existence of peak prices indicate its limited potential as true reference market for the purpose of the Payback Obligation.

Nevertheless, one could wonder whether the hedging on Forward markets of the Capacity Providers would justify an exemption to the Payback Obligation. The question raised would be whether Capacity Providers run the risk of a Payback Obligation despite a potential absence of revenues earned in case of (near) scarcity (due to an absence on the market during these moments). In other words, should Capacity Providers payback when triggered by high spot prices whereas they had not captured high revenues in the first place (because of the hedging/forward volumes already sold at typically lower price levels than a Strike Price based on spot price levels)?

Whereas hedging on f~~F~~orward markets is an inherent part of the functioning of the overall energy market, the choice to hedge (or not) in the end boils down to an individual market actor's choice driven by a risk management internal policy and for which no standard procedure applicable to all Capacity Providers exists. It is, for instance, very likely that some technologies such as demand response are far less active on f~~F~~orward markets than others.

Uniformly applying exemptions would not be correct and applying it at individual level, i.e. at CMU-level, is not compatible with functioning and available transparency on the f~~F~~orward market, which is not organized at CMU-level.

The question on whether such exemption on forward hedged volumes should apply raises a more fundamental question on forward price formation and whether particularly the "f~~F~~orward backwardation principle" applies in this market in Belgium. As far as Elia can tell, the literature on the e~~E~~nergy markets was inconclusive on this topic and remains open whether forward prices do or do not include a sufficient and correctly calibrated premium to reflect (expected) high spot prices. For example, (Bessembinder and Lemmon, 2002) takes several assumptions on the functioning of the electricity market and states that the forward price is a linear formula of e~~E~~xpectancy, v~~V~~ariance and s~~S~~kewness of spot prices. In practice, the model is insufficient as it relies on its own assumptions to assess the relation between both spot and forward prices. Other literature articles like (Boterrud 2009), (Lucia and Torro 2008) and others contributed to show that 'the Bessembinder and Lemmon realization' was not persistently observed. 'The Bessembinder and Lemmon realization' has been tested and is therefore not sufficiently validated by the empirical literature to be proven to be applied in the Belgian energy market context.

In conclusion, for the above reasons such exemption related to forward hedged volumes is not deemed appropriate in the context of the Payback Obligation in the Belgian CRM.

Day-Ahead Market (DAM)

The daily published hourly DAM prices provide a very interesting option to be considered as Reference Price in the case of a CRM. Indeed, the Day-Ahead Market encompasses relevant drivers for adequacy. The main advantages for considering the Day-Ahead Market as Reference Price market are:

- The DAM represents the most relevant market signal related to adequacy issues given that most of the drivers of the market actors' positions are incorporated in the production planning and forecasts at the moment of DAM-clearing. All program changes after the daily matching are rather considered as adjustments and managed via the market and ancillary services. Any structural, i.e. adequacy issues, to be expected are already identified at that time or should ultimately be revealed through the DAM.
- The previous element is further reinforced as after the Day-ahead matching, in the Belgian system, all BRPs have to present balanced portfolios (nomination DA at 3 PM) and at that unique moment, the entire market is considered as settled. This is a unique opportunity in the product timeline and it shows that the market is accessible to all desirable market parties.
- The DAM has a strong price signaling function and represents the strongest, most liquid spot market in Belgium. It is by far considered as the most accurate, liquid and transparent market in the Belgian electricity landscape with a traded volume estimated at 25-30% of the Total Load in Belgium. This figure must be considered as high given that the Belgian transactions in the Day-Ahead Market are portfolio based, meaning that only position nettings of the market actors appear. Indeed, it is not mandatory to trade the gross production and gross consumption positions apart. Most of the Belgian contracts nowadays

refer to this price signal as a reference for transaction settlements. Due to its fair and liquid price, almost all other products available in the Market are benchmarking their revenue expectations with the DAM for their asset volume allocation in their operational strategy.

- The Day-Ahead Market, due to its timing position in the spot markets, allows all technologies (e.g. also ‘slow capacity’) to react upon. Indeed, the adequacy goal is not a matter of speed or quick ramping like for flexibility. The use of the Day-Ahead Market as Reference Price ensures that some ‘slower’ technologies that are nevertheless reliable and useful assets for adequacy (e.g. slower generation units requiring a few hours to start-up or industrial demand processes requiring sufficient notification time to react) can also participate to the CRM. This contributes to the technology openness of the CRM.

Also in Elia’s recent Adequacy & flexibility study for Belgium 2020-2030 study of June 2019, it is mentioned in page 7 that *“An electricity system is ‘adequate’ if there is sufficient capacity to meet the relevant needs (via generation, imports, storage, demand-side management and so on). Flexibility relates to the ability to cope with fluctuations between production and consumption due to the increasing volatility of generation”*. In the CRM design phase, it has been considered that all DAM relatively high prices are reflecting adequacy issues as it provides for the best summary of all system conditions (available generation portfolio, import contribution, impact of temperature on load, etc.). In contrast, short-term balancing prices reflect in the first place flexibility need. Not every flexibility problem is also an adequacy problem (e.g. high balancing prices on a summer day are possible, but are not likely to be the consequence of an adequacy issue).

For all the above reasons, the DAM is considered an appropriate reference market for the Payback Obligation in the Belgian CRM.

Intraday Market (IDM)

The possible inclusion of IDM has been considered. Its lack of liquidity undermines however the reference value of the market. Also the continuous pricing method ~~(~~clearly limits the reference value as it is not straightforward to determine what precisely would be the Reference Price that could be used in a standardized manner. It currently doesn’t represent or add an extra signal of adequacy compared to the Day-Ahead Market.

Rather acting as an adjustment market, adequacy issues ought already to be identified in the day-ahead stage.

Also, the technology neutrality and level-playing field principle could suffer from the shorter lead times in Intraday compared to for instance d~~D~~ay-a~~A~~head, e.g; up to only few hours in advance of their expected adequacy participation. Indeed, it is not possible for all technologies (e.g. slower generation capacity as well as industrial demand response with slower lead times) to react upon. In conclusion, it thus creates a bias towards a subset of faster assets and technologies while the adequacy need does not require it.

Balancing market

In the Belgian landscape, the balancing prices are representing in the first place a flexibility signal rather than an adequacy signal. Indeed, most of the peak prices appearing in the balancing timeframe are related to the need to cover for a flexibility issue at moments where there is as such no ~~any~~ adequacy concern. Basing the Reference Price in an adequacy-oriented CRM on the balancing price could result in many ‘false positive’ signals.

As argued on Intraday Market, a fortiori it is also impossible for all technologies to react upon balancing prices within the same time frame and therefore it creates a competitive advantage for a subset of assets while the adequacy need does not require such short lead-time. This clearly could also affect the overall cost of the mechanism, as limiting to flexible technologies only may come at higher costs than allowing a larger set of (also slower) technologies to participate.

3.1.3 Other Reference Price aspects

A number of other dimensions related to the Reference Price have been considered.

- **Ex-ante or ex-post Reference Price**

In the case of an ex-ante Reference Price, the coefficients of a Reference Price formula and its corresponding values are disclosed before the delivery period. This decreases the market parties’ risks and would have, a priori, a virtuous impact on the CRM Cost.

In the case of an ex-post Reference Price, the coefficients of a Reference Price formula and its corresponding values are only revealed after the delivery period. This increases the market parties’ uncertainty and ends up priced in the Auction bid price as it creates an extra possible exposure for market parties.

An ex-ante approach is favored as this would be facilitating the market parties’ participation because of its simplicity and the lower risk exposure attached to it. Lowering risks in such way also contributes to lowering the overall cost of the mechanism.

Opting for the Day-ahead Market as (single) reference market follows this preference for an ex-ante solution.

- **Single or multiple Reference Price**

Multiple Strike Prices definition is the existence of a categorization of the Strike Price. This means that a Strike Price will be inherent to a feature of a participating CMU. The most common Multiple Strike Price differentiation element is the technology. In that case, it requires to assign a technology to each CMU. Being assimilated to a technology will automatically defines the Strike Price that will be applied to the CMU for its Payback Obligation calculation.

The question related to a single or multiple Reference Price is a key question when considering technology neutrality and complexity. Having multiple Reference Prices drawn on the different technologies present in the market would have led to a non-technology neutral situation as no unique solution would have been applicable to all technologies.

Besides, the calibration of these multiple Reference Prices would have an influence on the various technologies targeted by these prices. Any inaccuracy on the calibration could create a potential distortion of the capacity market by advantaging/dis-advantaging a technology in respect to the others. Furthermore, it would have potentially had an influence on Payback Obligation as well as it is calculated by differentiating the Reference and the Strike Prices.

3.1.4 Conclusion

For all reasons explained above, the proposal is to work with a strong, accessible, reliable and liquid market, ex ante Standardized Reference Price i.e. **the Day-Ahead Market Price.**

Design Proposal #2: Reference Price definition

The Reference Price must be observed for each hour of the Payback Obligation in the Belgian Day-Ahead Market segment.

3.2 Choice of the specific Day Ahead NEMO

The Belgian Day-Ahead energy market allows for more than one power exchange (NEMO) to operate and provide a Day-Ahead Market price. Already today this multiple NEMO setting is a reality with both EPEX and Nordpoolspot being active.

For the CRM design and particularly the determination of the Reference Price, this is to be taken into account.

Given that in the energy market, all market actors are free to choose their NEMO Reference Price this should be followed in the Reference Price as well, i.e. leaving the choice to the Capacity Provider or Prequalified CRM Participant to select for each CMU the NEMO best fitting its own functioning on the energy market reference.

- EPEX Day-Ahead spot Belgium[8]

It is the most liquid exchange market related to the Day-Ahead transactions. Its gate closes at 11.30 am and its matching occurs daily around 12pm for delivery products of the day after. The current granularity is hourly.

- NordPool Day-Ahead spot Belgium[9]

It has been recently launched in Belgium and a matching occurring at 2.30 pm UK time. Its granularity is by half hour.

- Reference Price Day-Ahead Belgium (publication by ELIA)

It represents a publication of the Belgian zone Day-Ahead prices

The CMU chosen Belgian Day-Ahead market Reference Price will be used as CRM Reference Price in the Payback Obligation calculation: Reference Price (t)

[8] https://www.belpex.be/market-results/the-market-today/dashboard/

[9] https://www.nordpoolgroup.com/

Design Proposal #3: CMU choice of NEMO for its Reference Price

A CRM participating Capacity Provider or Prequalified CRM Candidates shall choose for each of its CMUs in the Prequalification Process, a NEMO operating in Belgium in the Day-Ahead time frame for setting his Reference Price.

The CMU chosen Belgian Day-Ahead Market Price reference will be used as CRM Reference Price in the Payback Obligation calculation: Reference Price (t)

Any contracted CMU can during the Delivery Period notify a modification of the NEMO choice for the Reference Price to Elia (and the Contractual Counterparty) ~~up to 5~~that will be applicable 10 working days ~~prior to a new calendar month of delivery, with the change being effective as from the 1st day of the next month~~after notification reception date without retroactive effect.

In case of missing or conflicting data on its NEMO choice related to a specific CMU, the Reference Price Day-Ahead Belgium (publication by ELIA) will be used as fallback value.

For example, if no matching occurred on a set of hours of the Delivery Period dd/mm/20xx hh:mm on the EPEX spot Day-Ahead, then the ELIA Reference Price Day-Ahead published for the same hours of the Delivery Period ~~will~~ shall be applied.

Design Proposal #4: modification of the Day-Ahead Reference Price & missing data

The Capacity Provider has the possibility for each CMU to notify a modification of its earlier NEMO choice for the Belgian Day-Ahead Market Reference Price of a CMU. Once a change is notified to ELIA and the Contractual Counterparty, it becomes applicable in the Payback Obligation calculation 10 ~~up to 5~~ working days after the notification reception date without retroactive effect.~~prior to a new month of delivery.~~

~~The change will be effective as from the 1st calendar day of the next month.~~ In case of missing or conflicting data related to a specific CMU' NEMO choice, the Reference Price Day-Ahead Belgium (publication by ELIA) will be used as fall-back value. The Reference Price Day-Ahead Belgium is determined as the 'Belgian Bidding Zone Day-Ahead Reference Price'. The valid and binding price for the Belgian bidding zone is the single Day-Ahead coupling price ("Belgian SDAC Price") which is calculated by the Market Coupling Operator (MCO) function jointly performed by all Nominated Electricity Market Operators (NEMOs), and is published on the ENTSO-E Transparency Platform and on the websites of the Belgian NEMOs. (https://www.elia.be/fr/donnees-de-reseau/transport/prix-de-reference-day-ahead)

4 Strike Price design

4.1 Decision & Choice: storyline

As the Reference Price, the Strike Price definition is fundamental for the Payback Obligation and has a crucial impact on the assessment of the different objectives and considerations.

The design of the Strike Price encompasses several dimensions which together should bring an adequate trade-off related to the objectives and considerations.

○ **A single Strike Price is preferred over a multiple Strike Price(s)**

The number of Strike Prices applied for the Payback Obligation is obviously a crucial design element. Different options exist and have been studied and discussed with the stakeholders in the Task Force CRM ~~preceding the launch of the public consultation on this note~~. In addition, two short surveys were organized among the stakeholders to gather early feedback allowing to better develop the current proposal.

A public consultation has been launched on the previous version of the Design Notes published on 02/10/2019 and had led to answers from ELIA and some Design changes resulting in the present version.

Next to the existing practice in other European countries with Reliability Options, the use of a single Strike Price brings a number of advantages:

- In terms of level playing field and technology neutrality, it ensures a more homogeneous product with similar requirements laid upon every contracted capacity in the CRM.
- A single Strike Price is inherently less complex, both in assessing and appreciating the overall CRM design as well as for its (annual) calibration.
- The impact of a Single Strike Price towards the proper functioning of the energy market is more limited. This is even more limited when the activation costs of the participating assets higher than the Single Strike Price are somehow taken into consideration in the Strike Price formula so that the Payback Obligation reimbursement is limited to the revenue received from the energy market. The possibility is offered in the design choice and will be explained further (for the CMU without Daily Schedule and having a Declared Market Price cf. infra). On top, f~~F~~or the energy market, it is relevant to understand how capacities active in the market are impacted by Payback Obligations and at which price levels those obligations become active.

Especially the first advantage related to the level playing field and homogenous product requirement is fundamental. Multiple Strike Prices (i.e. two or more) would typically rely on a differentiation based on technology ~~starting from the hypothesis that different technologies have different cost structures and revenue expectations~~. For instance, a differentiation based on the short-run marginal costs of arbitrary generation technologies ~~are typically deemed lower~~could create difference of treatment even within the same type of technologies. ~~than~~The same applies for demand response technologies for which an arbitrary allocation of the category shall be in total discrepancy with their intrinsic activation costs, creating difference of treatment. ~~and the energy price level as from which inframarginal rents in the energy market would no longer serve as necessary revenue but rather be considered as a so-called windfall profit could differ greatly.~~

Notwithstanding that it looks appealing at first glance to differentiate between Strike Price levels on a technology basis, particularly when dealing with the objective to avoid windfall profits and keeping costs low, a closer analysis reveals that this is not straightforward and that the perceived advantages are not necessarily correct:

- There exist many technologies, each with its own cost structures. This is true for various generation technologies (peakers versus based load, different fuel types, varying efficiency levels, varying ages of installations, etc). This is applicable for Demand Side Response and Storage as well. The activation price for demand response is typically distributed over a very large price range (going from a few hundred euros up to – theoretically – the Value of Lost Load). In order to correctly differentiate between technologies, a large set of (sub)-technologies should be distinguished. This raises at least questions on the complexity and feasibility of such approach. A reduction to for instance two groups (e.g. generation versus demand response) would be oversimplifying reality and overthrowing the goal of differentiating in the first place.
- If the Strike Price level was differentiated across technologies, this would clearly be with the intention to "manage" the revenues of such technologies. If the choice was to differentiate, in the CRM design, the product in such way to "correct" between technologies, wouldn't it be crucial to apply this principle more generally? In other words, shouldn't we have also considered differentiating the allowed revenue in the Auction of the CRM (e.g. via technology differentiated price caps), as capex levels and missing money levels are also not similar across technologies? This clearly goes beyond the purpose of the CRM and Reliability Option concepts as it would imply a full revenue regulation of the whole capacity participating in the CRM, rather than considering the CRM as a technology-neutral complement to the energy market.
- Finally, differentiating between Strike Price levels would create difficulties for aggregated portfolios to participate. As aggregators create added value by bringing together different technologies (e.g. complement small-scale generation with demand response and/or Storage), it would require either very arbitrary rules on how to assess the Strike Price of such aggregated, differentiated portfolio or it would result in obliging aggregators to compose portfolios within the same (sub)technology (e.g. aggregate Storage with Storage, metallurgy demand response with metallurgy demand response, small-scale CHP with small-scale CHP, etc.). This would hamper the added value and participation of aggregated portfolios in the CRM.

For the above reasons, a single Strike Price is preferred over multiple (two or more) Strike Prices.

- **The level of the Strike Price requires a careful trade-off**

The level of the single Strike Price is essential to respect a number of objectives and considerations of the Payback Obligation, but like with other design aspects, it unfortunately also implies a trade-off to be made.

Firstly, having a relatively low Strike Price compared to Spot Reference Price expectations better ensures that windfall profits could be avoided, particularly by technologies with lower short-run marginal costs. This argument of course only holds to the extent that inframarginal rents above the Strike Price would not normally be accounted for when determining the offer price in the CRM auction. If put too low, a low Strike Price could even risk in augmenting the cost of the Auction.

Secondly, a relatively high Strike Price scores well in terms of making the mechanism sufficiently technology open, particularly towards technologies with higher short-run marginal costs. They otherwise bear the risk of having a Payback Obligation while not being dispatched by the energy market in the first place. Although a higher Strike Price may avoid such effects to some extent, other measures ~~(such as a Stop-Loss limit on the Payback Obligation)~~ help mitigating this risk such as the correction of the Strike Price for activations costs proved higher than it (cf. infra with the consideration of the Declared Market Price for the CMU without Daily Schedule). This mechanism is proposed in order to maintain a Strike Price level reasonable so that it doesn't imply the creation of undue Windfall profits for the participating assets lower short run marginal costs.

The trade-off between lower and higher Strike Prices is more subtle than~~t~~ simply preventing from windfall profits versus being more open towards some technologies. An important indirect effect is that thanks to a higher Strike Price, more technologies can be facilitated, this has the chance to create more competitive pressure in the Auction and thereby impact the capacity mix obtained and lower the overall cost of the CRM. Notwithstanding its relevance, a too narrow focus on the Strike Price oriented on windfall profit avoidance could backfire when zooming out and looking at the broader picture.

As the Strike Price should be sufficiently high to ensure a realistic chance for all technologies to participate in the CRM (this is particularly relevant with respect to high SRMC technologies, not less for demand response), therefore, in order to find a solution to the trade-off, it has been considered to take into account the level of the activation~~s~~ costs of the CMU within the market, for the CMUs without D~~d~~aily S~~s~~chedule.

For the CMU with Daily Schedule, the calibration process of the Strike Price (cf. 5.) will take into account the variable costs of those CMUs, so that their expected activation costs (short run marginal costs) are reasonably covered.

Indeed, in order to tackle the issue raised regarding the high activation costs superior to their Calibrated Strike Price, the concept is that the Transaction Calibrated S~~s~~trike P~~p~~rice is updated to the D~~d~~eclared M~~m~~arket P~~p~~rice in case of higher D~~d~~eclared M~~m~~arket P~~p~~rice for the CMU without Schedule. The Declared Market Price is considered to be the energy market activation trigger of the CMU as defined in the Availability Requirement & Monitoring Design Note. The Declared Market Price is the price at which the asset is aimed to participate in the energy market in the Day-Ahead, it is declared by the Capacity Provider for each participating CMU the day before the considered delivery day. The mechanism is also offering the possibility to declare several (different) activation prices in the dimension of the participating volume so that multiple prices are possible for the same CMU but delivering different volume for the CMU in the energy market. It is also possible to declare activation prices depending on the product time horizons, like Day-Ahead, Intraday and Balancing. Those prices will be used in the Availability Monitoring of the CMU and should represent the effective energy market participating prices. A sufficient incentive is foreseen in the mechanism to declare the activations costs effectively seen in the energy market, with possible Penalties in case of deviation to the declaration. As the Capacity Provider of CMU considered as CMU without Daily Schedule has the obligation to provide at least a Day-ahead Market Prices at which the full CMU volume is reacting in the energy market, the solution is fully replying to the concern of technology openness while in the meantime limiting the windfall profits of the lower short run marginal costs participating assets.

Indeed, the CMU without Daily Schedule are considered has having possibly an higher activation cost than the Calibrated Strike Price, so that their participation is fully possible in the CRM without impact of the Payback Obligation and its Calibrated Strike Price on the energy market functioning. Otherwise, those could have been activated at the Calibrated Strike Price (possibly under their activation costs).

The CMU without Daily Schedule having an activation costs, modeled in the Declared Market Price lower than the Calibrated Strike Price, will be considered as participating in the energy market if the Reference Price is exceeding the Strike Price and doing so the Payback Obligation and its Calibrated Strike Price are also not impacting the energy market functioning.

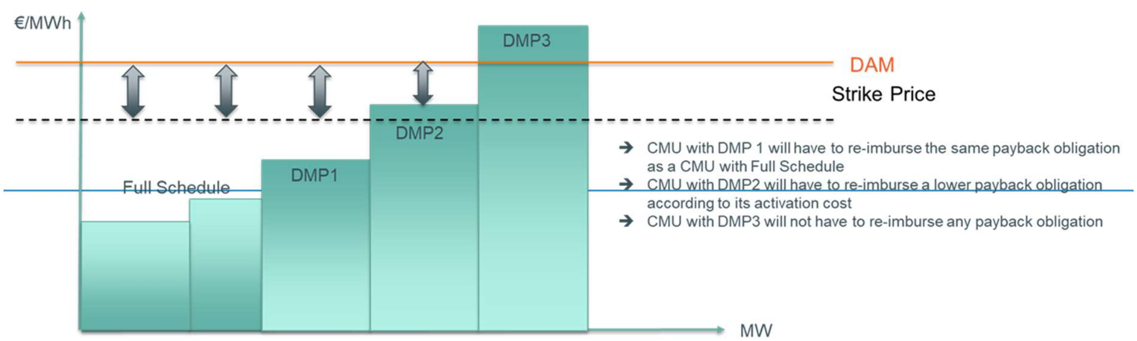


Figure 7: Declared Market Price in the Strike Price for the CMU without Daily Schedule

For example: if the DAM is at 650€/MWh for an hour and the Strike Price of all their Transactions at 500€/MWh:

The two CMUs with Daily Schedule shall reimburse (650 €/MWh – 500 €/MWh) applied on their own Payback Capacity.

The CMU without Daily Schedule and having a DMP equal to DMP1=400€/MWh shall also reimburse (650 €/MWh – 500 €/MWh) applied on its Payback Capacity as the DMP is lower than the Strike Price and lower than the DAM.

The CMU without Daily Schedule and having a DMP equal to DMP2 shall reimburse a lower (650€/MWh – DMP2 €/MWh) = (650 €/MWh – 550 €/MWh) applied on its Payback Capacity as the DMP is higher than the Strike Price but lower than the DAM.

The CMU without Daily Schedule and having a DMP equal to DMP3 shall not reimburse as DMP3 = 750€/MWh, higher than the DAM at 650 €/MWh (and is not expected to be present in the energy market).

The one single S~~s~~trike P~~p~~rice will be applicable for all. However, the P~~p~~ayback O~~o~~bligation of the CMU without D~~d~~aily S~~s~~chedule will be a function of the positive difference between the DAM and, the maximum between the D~~d~~eclared M~~m~~arket P~~p~~rice (representing the activation cost) and the S~~s~~trike P~~p~~rice.

Also, it is important to note that the incentives to set DMP are reinforced such that it should be well set by the C~~c~~apacity P~~p~~rovider. The updated A~~a~~vailability P~~p~~enalties mechanism strengthens Declared Market Price correctness. Indeed, the Penalties foresee a Missing Capacity related to the deviation of the CMU volume monitored and participating in the Energy Market. The Declared Market Price and its different volumes and prices reacting to Day ahead, Intraday and Balancing prices will be compared with the Energy Market Prices actuals, and the monitored availability and metering of the participating asset. Those shall be consistent or the delta observed in the energy market shall be taken into consideration as Missing Capacity in the Penalties calculation.

Finally, the calibration method and its foreseen considerations should sufficiently ensure that the S~~s~~trike P~~p~~rice is at an appropriate level (cf. 5.).

In conclusion, the Strike Price should be sufficiently high to ensure a realistic chance for all CMU with D~~d~~aily S~~s~~chedule ~~technologies~~ to participate in the CRM while at the same time it should be a solution to allow the participation of all pertinent high activation costs CMUs without Daily S~~s~~chedule~~.~~ This ~~is~~ allows~~particularly relevant with~~ a respect of the technology openness and especially towards the~~to~~ high SRMC technologies without D~~d~~aily S~~s~~chedule~~, not less for demand response~~. ~~However,~~It also implies a ~~the~~ Strike Price that is~~should~~ not ~~be~~ e~~e~~xcessive in order to respect the spirit of the CRM L~~l~~aw, i.e. ensuring a Reliability Option with a Payback Obligation and to limit ~~any~~ the windfall profits of lower SRMC-technologies, in particular of the CMU with D~~d~~aily S~~s~~chedule, to the extent that not all inframarginal rents from the energy market are ~~not~~ accounted for in setting the CRM offer prices.

Chapter 5 will propose~~s~~ a concrete calibration methodology bearing in mind the above conclusions.

The **t~~T~~ransparency** offered by a single and market-wide Strike Price towards the e~~E~~nergy market actors creates fairness and enhances competition in **a level playing field** and market-wide mechanism delivering a solution to the society SoS-issues. In the European energy context and the existing CRM, the same type of Strike Price has been settled in the Irish mechanism with a Strike Price level of 500€/MWh.

For the sake of clarity, all assets having a higher activation cost than the single Strike Price valuation are of course allowed to participate to the mechanism.

The **s~~S~~implicity & feasibility** of a single Strike Price development and follow-up is evident. Its simplicity will enhance competition with the participation of new type of technologies and market participants having the opportunity to acquire the required modelling for their auction bids.

The **technology openness and neutrality** of a single Strike Price including the Declared Market Price for the CMUs without Daily Schedule as replacement value of the Calibrated Strike Price in case of higher activation costs is fully replying to the concern of the inclusion of all participating technologies in the mechanism.

As mentioned in Paragraph 1.3., the proposed d~~D~~esign is a trade-off of the multi-objectives function of the Payback Obligation. The choice of the Strike Price with all involved s~~S~~takeholders in the Tasks Forces was not straightforward as they have different interests.

For all these reasons, the Strike Price proposal is:

Design Proposal #5: One Single Strike price~~ choice~~

One Single Strike Price will be applied to all Transactions of the CMUs contracted according to~~ at the same Transaction Date~~ the same A~~a~~uction.

The Transaction Strike Price of the CMU with D~~d~~aily S~~s~~chedule will be the o~~O~~ne Single Strike Price.

The Transaction Strike Price of the CMU without D~~d~~aily S~~s~~chedule will be the maximum between the Declared Market Price (representing the CMU activation cost) and the o~~O~~ne Single Strike Price of the Transaction.

4.2 Strike price in time

Following Art. 7undecies §2 of the CRM Law, the determination of the Strike Price parameters will be decided by Ministerial Decree each year no later than 31/03 of that year. This means that the Strike Price could evolve over time and that contracts concluded as the result of one Auction do not necessarily include the same Strike Price as for contracts concluded following another Auction. In any case, prior to each Auction, the Strike Price applicable for the contracts that will be concluded following that Auction will be known upfront, allowing participants to duly factor in this information in their bids without further risks on the Strike Price level applicable on them.

It is proposed that the ~~last published ~~Strike Price associated to a Transaction will also be transferred with the~~applicable for~~ traded obligations in the Secondary M~~m~~arket when calculating the due amount of the Payback Obligation. The CMU Transaction releasing its obligation~~timestamp of transaction~~ ~~- notification will settle which~~ initial Strike Price~~ will be applicable~~ shall be embedded in the Secondary Market transaction towards another CMU.

The Declared Market Price (DMP) of the CMU without D~~d~~aily S~~s~~chedule remains linked to the CMU releasing the obligation, as it is not a Transaction parameter.

I~~: i~~n the case of a Secondary Market transaction, the ~~latest published~~ Calibrated Strike Price of the Transaction of the CMU releasing its Obligation will be used for the CMU Transaction taking over and delivering on the o~~O~~bligation.~~, this independently from the Initial Strike Price of the initial CMU selling its obligation.~~

This element is further detailed in the design note dealing with Secondary Market arrangements.

~~Because of such Secondary Market deals, but even more due to~~ Because of the existence of multiyear contracts concluded from earlier Auctions and because of Y-4 and Y-1 A~~a~~uctions targeting the same D~~d~~elivery Period~~year~~ do not necessarily rely on the same Strike Price, it is likely that in a given Delivery Period, several Strike Prices are active.

Nevertheless, the Calibrated Strike Price of a Transaction~~an obligation~~ is related to an Auction or to a Secondary Market transaction~~s~~ for which the Strike Price was properly settled and known. ~~The definition of the Single Strike Price remains valid for the entire period of delivery of the elected CMUs bid.~~

In order to cope with one of the main criteria of the Payback Obligation, the relevance of the Reliability Option principle, the Calibrated Strike Price will be indexed in time as of the second Delivery Period [10].

By maintaining a Strike Price fix (and without indexation) for the contract lifetime, the risk of a disconnection with market prices exists. This could create perverse effects on the market functioning if the Strike Price is becoming too low, or suppress all P~~p~~ayback O~~o~~bligations if its level is becoming too high. As a Calibrated Strike Price is associated to an Auction, the time between its determination and its application can possibly span a very long time (up to max 19 years from Y-4 to end of a 15y Capacity C~~c~~ontract). This is considered to be rigid if it doesn't take into account electricity market evolutions.

By having a parallel indexation to the e~~E~~lectricity m~~M~~arket prices evolutions: the Strike Price keeps its function in the Payback Obligation as it avoids becoming too high in comparison with the Reference Price and at the same time avoiding an interference with the e~~E~~nergy m~~M~~arket if the Strike Price is becoming too low. The focus on electricity price ensures the technology neutrality and captures the 'sum of different evolutions'. By having an indexation, this allows to put aside a disconnection with the evolution of the electricity market prices.

[10] Note that the indexation of the Strike Price in time is not part of the current published Market Rules (25/11/2019) but has been introduced in the CRM Task Force.

The average DAM prices movement on the considered periods is replicated in the contracted Strike Price, it allows to smoothly capture trends on electricity prices and SRMC evolutions, while remaining close to the Reference Price (DAM) underlying the actual Payback Obligation.

The objective is clearly to capture trends while filtering ad hoc events, therefore the average DAM is preferred to other set of data to reach the double objective. Indeed, by selecting a narrowed set of data, there is a risk of over-representation of the ad hoc events and a risk of avoidance of the trends capture feature by accenting the extreme events influence on the Strike Price indexation. The choice of the electricity market prices is also driven by a willingness to cope with the electricity market revenues which are considered for the Payback Obligation re-imbursement, reinforcing the technology neutrality.

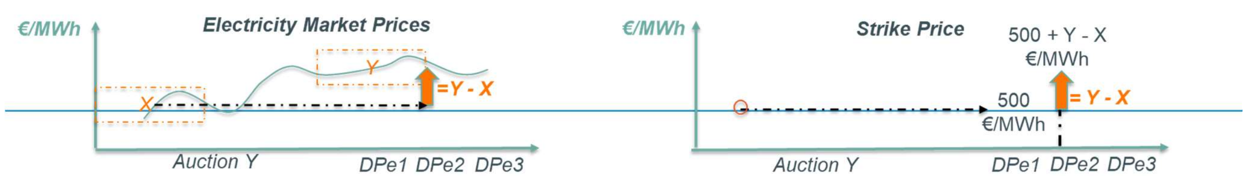


Figure 8: Evolution of the electricity energy prices and Strike Price in time

In the Fig. 8 example, if the Calibrated Strike Price is 500€/MWh, X equals 40€/MWh and Y equals 50€/MWh, the Indexed Strike Price is equal to 500€/MWh + 50€ - 40 €/MWh = 510 €/MWh.

As the matter is an evolution in time of the Calibrated Strike Price, the proposal is to apply a~~n~~ relative update index on the Calibrated Strike Price for the entire duration of a multi-year Capacity C~~c~~ontract as of the second Delivery Period.

The proposal consists in a relative f~~F~~actor rolling formula which is based on the comparison between the DAM simple average prices over the 3 last years preceding the Delivery Period and the DAM simple average prices of the last 3 years prior to November 1st of the Auction y~~Y~~ear. The DAM simple average prices prior to the November 1st of the Auction y~~Y~~ear are remaining a fixed part in the rolling formula, where the 3 years DAM simple average prices prior to the Delivery Period is evolving in time.

The actualization is applied on the Strike Price used for multi-years Capacity ~~c~~Contracts only in the Primary Market, or used if part of it is transferred in the Secondary Market transaction as of the Second Delivery Period as the objective is to maintain a Reliability Option principle applicable in time. No review on the first Delivery Period, neither for the one year Contracted Capacities is applied as the result of the Calibration of the Strike on the first year is a balance of the several objectives and considerations taken into account in the overall CRM d~~D~~esign. Applying an indexation on the Strike Price in the first Delivery Period could hamper the good calibration of other calibrated elements prior to the Auction.

In the below example, in the Auction Y-4 of 2021, the simple average on the 3 years DAM prices prior to November 1st of the Auction year (01/11/2018 to 31/10/2021) is 40€/MWh. The simple average on the 3 years DAM prices prior to the Delivery ~~Year~~Period on which the indexed is applied (as of the second Delivery Period of the Contract) is 50€/MWh.

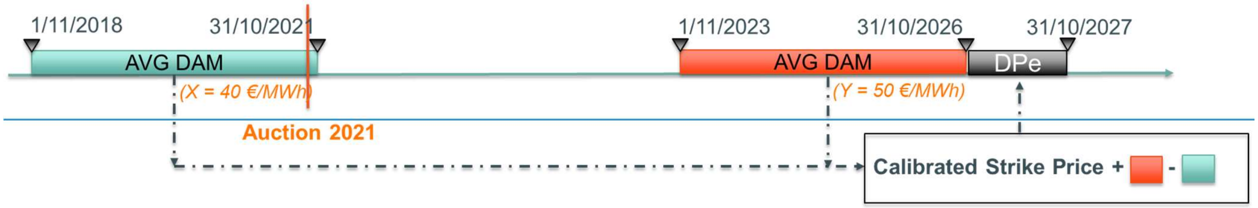


Figure 9: Indexation of the Strike Price on the electricity energy prices

It is proposed to calculate for each Delivery ~~Year~~Period as of the second Delivery ~~Year~~Period a f~~F~~actor modeling the indexation. The f~~F~~actor will be applied on the initial Calibrated Strike Price and is referring to the DAM Prices prior to the November 1st of the Auction y~~Y~~ear and prior to the Delivery Period (DPe) of application.

~~cPO~~

$$Indexed\ Calibrated\ Strike\ Price\ (DPe,\ AuctionYear) \\ =\ Factor\ (DPe,\ AuctionYear) * Calibrated\ Strike\ Price(AuctionYear)$$

Where the f~~F~~actor is given by:

$$Factor\ (DPe,\ AuctionYear) \\ = 1 + \frac{\text{Avg DAM (DPe-3 to DPe-1) - Avg DAM (Auction Y-3 to Auction Y)}}{Calibrated\ Strike\ Price\ (Auction\ Y)}$$

For which the DAM prices are the ELIA Day-Ahead Market Price published on its website.

The DAM prices choice is also consistent with other key parameters of the calibration of the Payback Obligation or of other CRM main elements among others the AMT H~~h~~ours, the Calibrated Strike Price methodology presented in Chapter 5 and the Reference Price definition.

Isolation of fundamental market trends such the CO2 prices, the gas prices and all other fundamental market parameters are captured in the electricity market prices. By averaging the electricity market prices on a window of three years, ad hoc events are filtered out as much as possible. It is then considered that the fundamental market trends are represented in the index.

It is important to note that the applicable Strike Price is always known prior to the start of the Delivery Period, creating no uncertainty on which the index is applied.

The same $Factor\ (DPe,\ AuctionYear)$ will be applied for all multi-years Contracted Capacities following the same Auction whatever the contract duration. This means that both a factor associated to the Auction Y-1 and a factor associated to the Auction Y-4 exist for the same Delivery Period.

~~ff~~This can be modeled in 2 tables of the f~~F~~actors, one for each:

	DPe 2025	DPe 2026	DPe 2027	DPe 2028	DPe 2029	DPe 2030	DPe 2031	…
Auction Y-4: 2021	1,00	Factor (2026;2021)	Factor (2027;2021)	Factor (2028;2021)	Factor (2029;2021)	Factor (2030;2021)	Factor (2031;2021)	…
Auction Y-4: 2022		1,00	Factor (2027;2022)	Factor (2028;2022)	Factor (2029;2022)	Factor (2030;2022)	Factor (2031;2022)	…
Auction Y-4: 2023			1,00	Factor (2028;2023)	Factor (2029;2023)	Factor (2030;2023)	Factor (2031;2023)	…
Auction Y-4: 2024				1,00	Factor (2029;2024)	Factor (2030;2024)	Factor (2031;2024)	…

	DPe 2025	DPe 2026	DPe 2027	DPe 2028	DPe 2029	DPe 2030	DPe 2031	…
Auction Y-1: 2024	1,00	Factor (2026;2024)	Factor (2027;2024)	Factor (2028;2024)	Factor (2029;2024)	Factor (2030;2024)	Factor (2031;2024)	…
Auction Y-1: 2025		1,00	Factor (2027;2025)	Factor (2028;2025)	Factor (2029;2025)	Factor (2030;2025)	Factor (2031;2025)	…
Auction Y-1: 2026			1,00	Factor (2028;2026)	Factor (2029;2026)	Factor (2030;2026)	Factor (2031;2026)	…
Auction Y-1: 2027				1,00	Factor (2029;2027)	Factor (2030;2027)	Factor (2031;2027)	…

Figure 10: Two indexation factors tables of the Calibrated Strike Price

In the previous example, for an initial Calibrated Strike Price at 500€/MWh, with a DAM average price of 40€/MWh on the 3 years prior to Y-4 A~~a~~uction and with a DAM average price of 50€/MWh on the 3 years prior to the 2026 Delivery Period, the f~~F~~actor is equal to:

$$E.g.\ Factor\ (DPe\ 2026,\ 2021) = 1 + \frac{50€/MWh - 40€/MWh}{500€/MWh} = 1{,}02$$

The indexed Strike Price (DPe 2026) will be equal to = 500€/MWh * 1,02 = 510€/MWh

The Strike Price and its possible indexation will be transferred in the Secondary Market transactions, this means that the initial Calibrated Strike Price that will be transferred will also embed its multi-year contract indexation (if any) so that both the Strike Price, the Auction (Y-4/Y-1), and the Auction year are required.

Design Proposal #6: Update of the Strike Price

For capacity contracted in a Y-4 or Y-1 Auctions, the Strike Price for the relevant Delivery Period as decided by Ministerial Decree no later than 31/3 of the year that Auction applies.

A s~~S~~ingle Strike Price will be applied to all Primary Market Transactions of the CMUs at the Auction date:

Strike Price (CMU, t, Transaction Id) = Calibrated Strike Price (Transaction Id) [€/MWh]

For contracts covering more than one Delivery Period, the Strike Price is ~~not~~ updated during the lifetime of the contract~~.~~ a f~~F~~actor will be applied on the initial Calibrated Strike Price and is referring to the DAM Prices prior to the Auction Year and prior to the Delivery Period (DPe) of application. Its formula is:

$$Factor\ (DPe,\ AuctionYear) = 1 + \frac{\text{Avg DAM (DPe-3 to DPe-1) - Avg DAM (Auction Y-3 to Auction Y)}}{Calibrated\ Strike\ Price\ (Auction\ Y)}$$

Implying that:

$$Strike\ Price\ (CMU, t, Transaction\ Id) = \ Factor\ (DPe,\ AuctionYear) * Calibrated\ Strike\ Price(Transaction\ Id)$$

The same $Factor\ (DPe,\ AuctionYear)$ ~~f~~ will be applied for all multi-years Contracted Capacities following the same Auction whatever the contract duration. This means that both a f~~F~~actor associated to the Auction Y-1 and a f~~F~~actor associated to the Auction Y-4 exist for the same Delivery Period.

The ~~last published o~~Single Strike Price that will ~~also~~ be applicable for Transactions ~~i~~from~~n~~ the Secondary M~~m~~arket when calculating the due amount of the Payback Obligation is ~~. T~~the Calibrated Strike Price of ~~timestamp of t~~the Transaction releasing its obligation of the CMU of the Seller of an Obligation. It will be notified to ~~notification as known by~~ Elia in the Secondary Market transaction and will settle the Calibrated Strike Price of the~~a~~ CMU Transaction taking over the obligation ~~Secondary Market transaction~~. The Strike Price indexation formula (if any) will be linked to the transferred Calibrated Strike Price in the Secondary Market transactions.

~~One Single Strike Price will be applied to all Transactions of the CMUs at the same Transaction Date:~~

~~*Strike Price (CMU, t, Transaction Id) = Calibrated Strike Price (Transaction Date) [€/MWh]*~~

Where *Calibrated Strike price (~~Transaction~~ Transaction Id~~Date~~)* represents the value of the Calibrated Strike P~~p~~rice actualization at the Contract~~Transaction~~ Date of the Primary Market Transactions. The methodology & calculation of the Strike price calibration will be defined in Chapter 5 – Strike price calibration.

~~The yearly Strike Price calibration result will be described in Chapter 5 Calibration of Strike Price. As a~~A Specific CMU may at different moments acquire extra Contracted Capacities ~~trade different obligations~~ for the same Delivery Period ~~at different moments~~. This implies that several Transactions with their own possibly different Calibrated Strike Prices could exist on the same Delivery Period. ~~, i~~It is important to distinguish the related Strike Prices per ~~obligation~~ Transaction in the Payback Obligation calculation, so that the Payback Obligation will be calculated by Transaction and the results will be summed up.

~~This leads to a principle of a~~A s~~S~~ingle Strike Price shall be associated to a CMU Primary Transaction ~~elected bid~~ issued from~~for~~ an Auction (associated to an elected bid)~~result period~~. In case of a transfer of ~~obligation~~ (part of the) Contracted Capacity of a Transaction via the Secondary Market, the ~~latest published~~ Strike Price and its possible indexation will be embedded and shall be part of the ~~at~~ notification. F~~f~~or the related Transaction Period, the

Strike Price and its indexation~~delivery year~~ will be applied to the new Contracted Capacity registered on the CMU taking the obligation in case of Payback Obligation calculation.~~'Obligated' Party~~.

Example 1: Primary ~~Auction~~Market

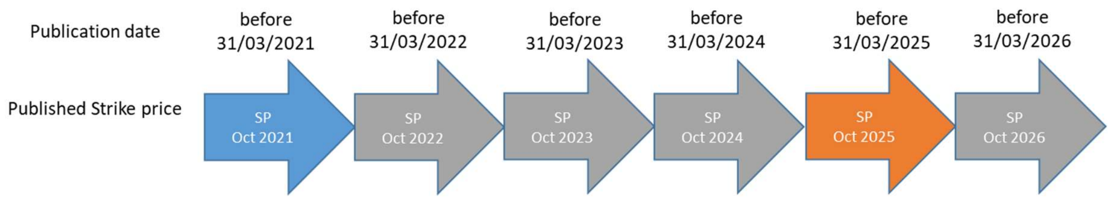


Figure 11~~7~~: Strike Price update considered for an Auction

CMU1 is awarded in Auction 2021 (Y-4) for a 15 years contract starting in Nov 2025 (SP 2025 of Y-4)

CMU2 is awarded in 2021 (Y-4) for one year delivery starting in Nov 2025 (SP 2025 of Y-4)

~~CMU2 is awarded in 2025 (Y-1) for one year delivery starting in Nov 2026 (SP 2026 of Y-1)~~

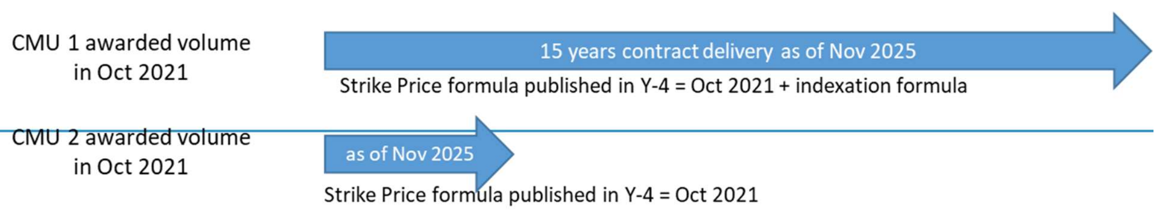


Figure 12~~8~~: Example~~ 1~~: ~~different~~ Strike Prices for the same Delivery Period and indexation

The CMU1 has only one Transaction acquired on the Primary Market in the Auction 2021 for the Delivery Periods 2025-2038 [Nov 2025 – Oct 2039] and will be guaranteed on the same Calibrated Strike Price on which will be applied the indexation factor. For CMU1, it will be used the indexed Strike Price value for the Payback -Obligation calculation.

~~for the Delivery Period [Nov 2025 – Oct 2039]~~

~~Both CMU1 and~~

At first in Oct 2021, the CMU2 has only one Transaction ~~will have~~awarded in the Auction of Oct 2021 and this for one Delivery Period 2025 only [Nov 2025-Oct 2026]. The Transaction has -the same Calibrated Strike Price as the sole Transaction of the CMU1, but without any indexation as the Contracted Capacity rely solely on the first Delivery Period.~~ for the Delivery Period [Nov 2025-Oct 2026]~~

Figure 13: Example: transfer of Strike Price and indexation following a Secondary Market transaction

In a later phase, in August 2025, CMU1 and CMU2 contact each other and notify to ELIA and the Contractual Counterparty a Secondary Market transaction covering two Delivery Periods 2026-2027 [Nov 2026-Oct 2028]. The CMU1 releasing its obligation towards CMU2 also transfers among others the Strike Price associated to its Transaction releasing an Obligation, the Calibrated Strike Price valid at the Auction 2021, and its related indexation.
As a result, both CMU1 and CMU2 have each a Transaction on the period [Nov 2026-Oct 2028] with the exact same Strike Price (and its related indexation).

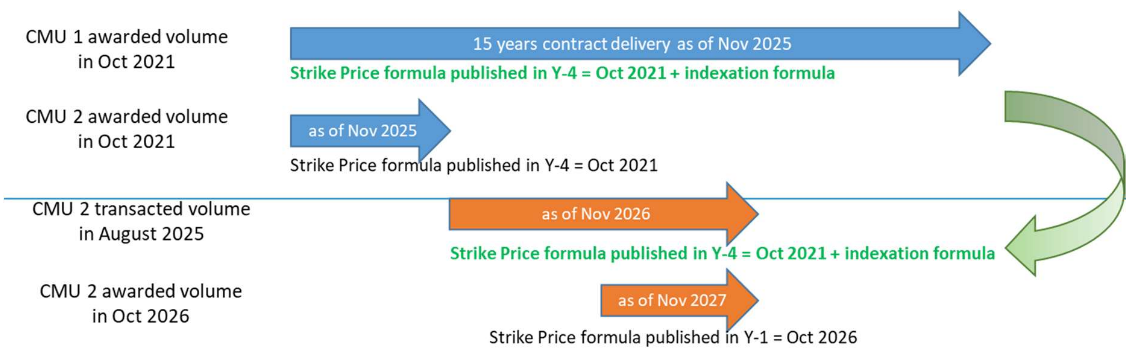


Figure 14: Example: A possible different Strike Price for the same Delivery Period

In Oct 2022 and in Oct 2025, CMU 2 has not been awarded in the Auctions Y-4 and Y-1 for the Delivery Period 2026 [Nov 2026-Oct 2027]. He then has no new Contracted Capacity for that period on top of the Secondary Market previous Transaction.

Finally, CMU 2 has been awarded in the Auction Y-1 of Oct 2026 for the Delivery Period 2027 [Nov 2027-Oct 2028] of a Contracted Capacity related to a Calibrated Strike Price published prior to the Auction of Oct 2026 and possibly modified in comparison to the previous Auction associated Strike Price.

We can conclude that:

CMU1 and CMU2 have each only one Transaction with the same Strike Price for the Delivery Period 2025 [Nov 2025-Oct 2026]

CMU1 and CMU2 have each only one Transaction with the same Strike Price for the Delivery Period 2026 [Nov 2026-Oct 2027], as the CMU2 Transaction was issued from the CMU1 Transaction, they have exactly the same Strike Price and its same indexation. The same Transactions Strike Prices are identified in the Delivery Period 2027 [Nov 2027-Oct 2028]

~~Possibly,~~ CMU1 and CMU2 will also have probably different Calibrated Strike Prices ~~-~~for the Delivery Period 2027 [Nov 2027~~6~~-Oct 2028~~7~~] due to the third Transaction issued of the Primary Market of CMU2 in Y-1 Auction of Oct 2026. This is even very likely as the CMU1 Transaction has been indexed while the third Transaction of CMU is issued for one Delivery Period without indexation.

~~**Example 2: Secondary Market transactions based on Example 1**~~

~~In August 2025, a Secondary Market Transaction occurs : CMU 1 releases part of its obligation to CMU2 for the period of Nov 2026 until Oct 2028 included.~~

~~The Strike Price has been updated before March 31st 2025 → before Oct 2025.~~cd

~~*Figure 9: Example 2: different Strike Prices for the same delivery period*~~

- ~~For the considered Transaction Period, CMU 1 keeps on Strike Price published before Oct 2021 for its remaining volume~~
  - ~~CMU 2 has two obligations with the same Strike Price the Delivery Period Nov 2025 – Oct 202~~ Capacity~~C6~~
- ~~If CMU 2 is awarded in Y-1 auction Nov 2026 of capacities for Nov 2027-Oct 2028, the Strike Price will be different for the same period than the one applied for its Secondary Market transaction (of August 2025).~~

~~It is then possible to summarize the Strike Price of a specific CMU valid for a specific obligation (selected or traded at a specific date).~~

5 Calibration methodology of the Strike Price

As mentioned in the Chapter 4, the Calibrated Strike Price will be ~~calibrated~~ settled yearly and determined via Ministerial Decree no later than March 31st prior to the Y-4 and Y-1 Auctions. It is the purpose of the current chapter 5 to define the methodologies for the calibration of the Strike Price in line with the design principles already described in the previous chapter.

5.1 Considerations and objectives of the Payback Obligation

As previously presented in paragraph 1.3., the Payback Obligation and the Strike Price should take into account considerations and objectives of the CRM. These include technology neutrality and openness, limitation of the CRM overall cost, windfall profits avoidance, insurance of a functioning reliability option principle and keeping the complexity of the CRM under control. These considerations and objectives remain essential when calibrating the Strike Price level.

As pointed out in the previous chapter, particularly technology openness and windfall profit avoidance are directly impacted by the Strike Price level, but the other objectives and considerations should not be overlooked as they could be indirectly impacted.

5.2 Calibration methodology

When developing a methodology, it is deemed important that the outcome of the methodology can be considered objective, tailored to the situation and its calculation is transparent.

Therefore, the proposed calibration methodology relies on observable, measurable and tangible data from the Belgian Day-Ahead Markets. Note that looking at the Belgian DAM is overall coherent with other design aspects such as the choice of the Reference Price, the functioning of the Availability Monitoring Mechanism, etc. In general, the reasons justifying the choice of the Belgian DAM for those aspects remain valid here.

The hourly DAM market offer and demand curves are transparent and are fair signals of the sensitivity to price of capacity present in the Belgian energy market. Although prices have not necessarily often reached high (or extreme) levels, those curves reflect real market behaviors and correspond to actual prices market parties of various technologies are willing to pay/accept in return for energy.

In a nutshell, the proposed methodology boils down to the following:

> The Strike Price should be set at a price level within a pre-specified range, that ensures that a reasonable volume of capacity ~~was~~ offered in DAM~~,~~ would be selected in the DAM prior to reaching the Strike Price level. To assess this price level, a rolling window of historical DAM curves will be used, complemented where needed with further considerations~~ on the market~~.

More concretely, this methodology aims to collect historical hourly offer and demand curves of all Belgian DAM Markets (i.e. EPEX Spot and Nordpoolspot) and to use these data to construct an aggregated curve indicating the DAM participation (expressed as volume) as function of the price level.

Before using such data, relevant pre-filtering is done to be consistent with and focus on adequacy relevant moments. Therefore, and in line with earlier practice for assessing market response volumes, only weekly ~~peak hour~~Peak Hours during the Winter Period are used. More specifically this concerns: Months November to March, hours [8:00 to 20:00[, weekdays only. At least the so-called aggregated curves provided by the NEMOs shall be used. In the approach depicted below, all submitted order types are considered to the extent that it is technically possible to process them.~~It will be further investigated how also the volumes in more complex bid types can be incorporated or estimated in the approach depicted below.~~

In a 1st step, all demand and offer~~s~~ curves of the Belgian Day-Ahead Markets must be collected (this includes their prices and their volumes). A first filter is then applied, for timing matters, by considering only the last 3 Winter Periods in the calculation. Limiting to only recent periods allows to factor in market evolutions, such as the emergence of market response or other technologies. By using three Winter Periods rather than only one, outlier~~,~~ effects are smoothened as DAM participation levels may be subject to exogenous effects (e.g. general economic situation or alike). Next to filtering to the relevant dataset (cf. above), all prices of the offer and demand curves below 0 €/MWh and at the market price cap are excluded of the datasets as they are not considered as market prices reacting to adequacy matters, these are considered as inelastic.~~ The simple blocks, linked blocks, exclusive groups or loop blocks are not considered.~~ In other words, it is reasonable to assume that these volumes would have (been) offered/asked at a higher price cap (at any price) if it had been needed/possible. This for instance due to BRPs needing to complete their portfolio balance.

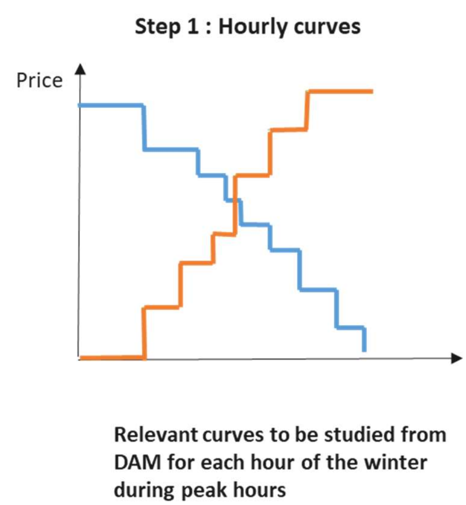


Figure 15~~10~~: Concept of elastic hourly demand and offer curves

As the Belgian Day-Ahead Markets offer and demand curves are built by netting the market parties portfolio positions, both have to be considered at the same level of price sensitivity. It is not possible to distinguish, from the demand and offer curves, the volumes related to production assets or demand assets that could be participating in the CRM. As a consequence, it is necessary to sum up their contribution.

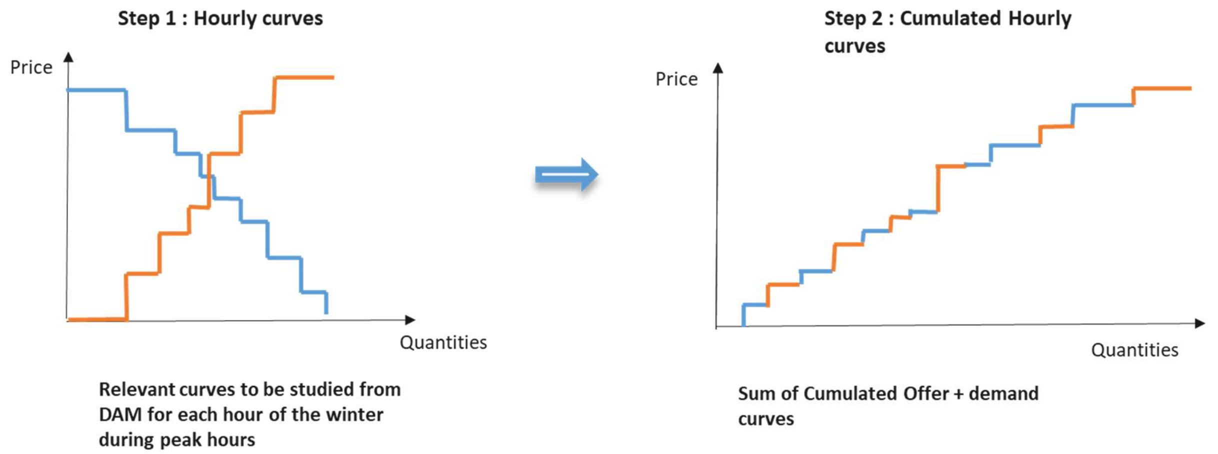


Figure ~~11~~16: From the elastic hourly demand and offer curves to a Day-Ahead Market cumulative price sensitivity curve

In a second step, all orders are sorted according to their price levels. This provides an hourly cumulative curve.

In a third step, an average cumulative curve for a Winter Period is determined. A simple average from the sum of all demand and offer curves of all Belgian Day-Ahead markets leads to a result of a quantity reacting to prices for a considered winter weekly peak period. From this cumulated curve, the winter hourly average total quantity reacting to price in Belgium can be deducted. It is the maximal value of the Simple Average of the Sum of Cumulated offer + demand curve of all Belgian Day-Ahead markets (see green dot on the Fig. 17~~2~~).

Figure 17~~12~~: Winter weekly ~~peak hour~~Peak Hours aggregation of Day ahead Market cumulative price sensitivity curve

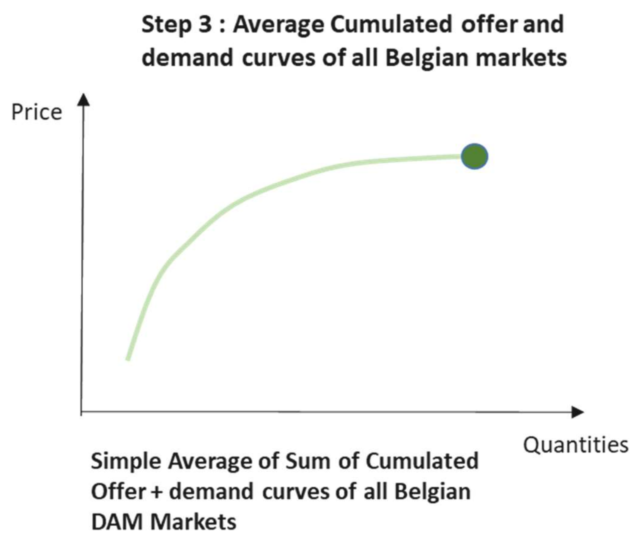


Figure ~~13~~18: Determination of the Maximal quantity of a Winter weekly ~~peak hour~~Peak Hours cumulative price sensitivity curve

In step 4, the quantities of the dataset of the Winter Period (by looking at them cumulatively) are divided by the maximal volume of the simple average of sum of cumulated offer and demand curves. This gives a common percentage of the offer and demand reacting to a market price.

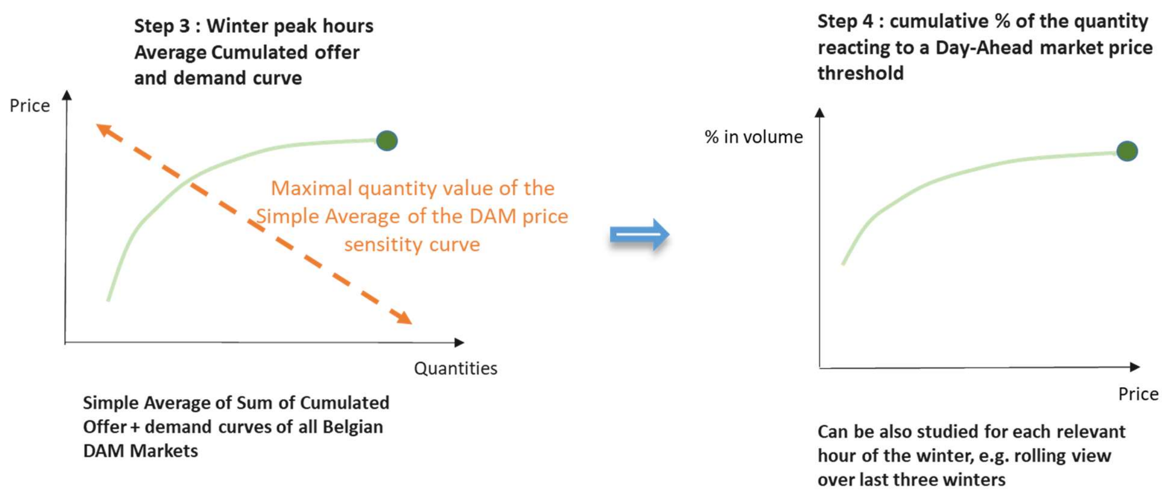


Figure ~~14~~19: Normalization of the Winter weekly ~~peak hour~~Peak Hours cumulative price sensitivity curve

Having repeated this for each considered Winter Period in step 5, the weighted average (maximal volume based (see Fig. 19~~4~~)) of the three last Winter Period's curves is deducted in step 6. From this latter curve, the DAM participation rate (% in volume) at various price levels can be observed.

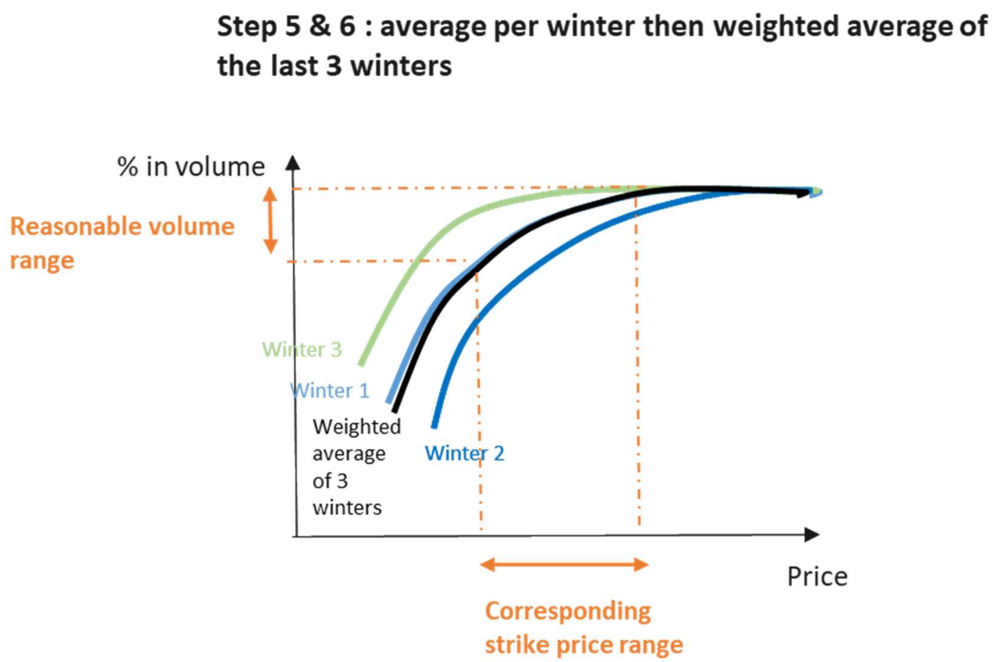


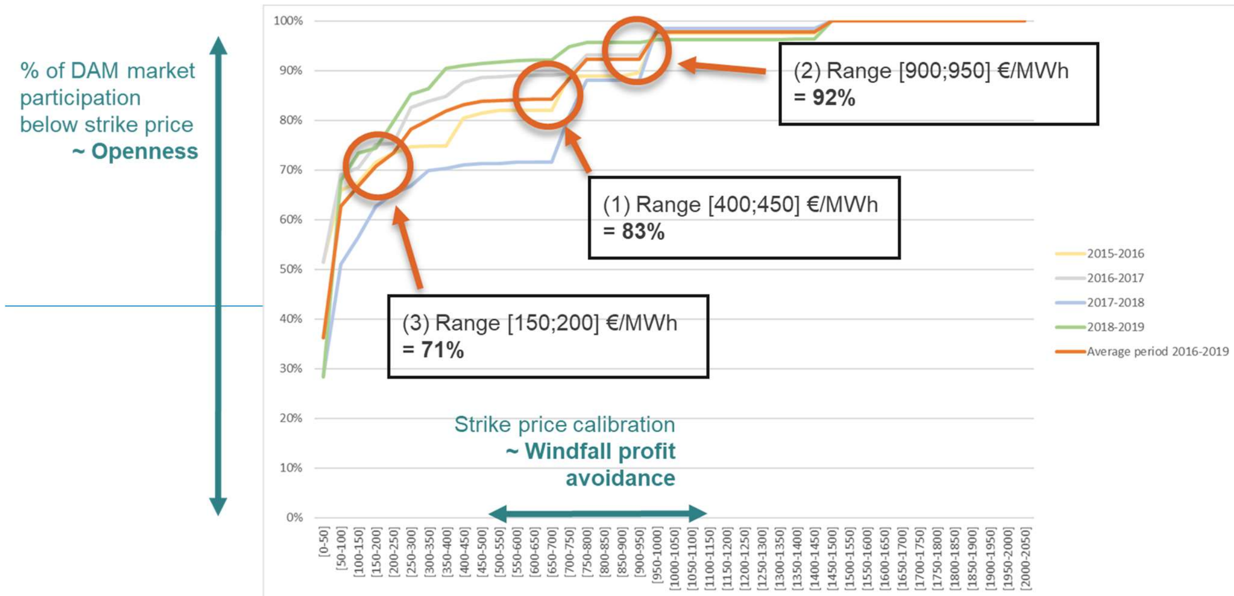
Figure ~~15~~20: Weighted Average (Maximal volume based) of the last three Winters weekly ~~peak hour~~Peak Hours cumulative price sensitivity curve

To finally calibrate the Strike Price at a certain level, a “% in volume” is to be chosen at which a Strike Price level corresponds. It is proposed that the methodology (to be set in a Royal Decree) specifies a range of such percentages, thereby already limiting the Strike Price levels that could result, but still leaving the necessary margin to interpret the curve (e.g. in terms of inflection point, flat areas where changing the Strike Price level hardly impacts the volume accommodated, etc.) and to take into account other relevant aspects.

It is to be noted that by such approach two important objectives and considerations can be covered in a quantitative and objective manner. The % in volume of DAM participation is a clear indicator of the technology openness of the Strike Price level choice. The higher the percentage chosen, the higher the volume that is facilitated. On the other hand, the resulting price levels are indicative to the risk of windfall profits, the lower the price level, the smaller the risk of windfall profits.

The reasoning has to take into account in the framework of the technology openness, the inclusion of the Declared Market Price (DMP) in the Strike Price formula of the CMU without D~~d~~aily S~~s~~chedule for which the DMP is replacing the Calibrated Strike Price if higher. This allows to mitigate the choice of a higher % of volume participation knowing the high activation costs participation in the e~~E~~nergy m~~M~~arket under without D~~d~~aily S~~s~~chedule constraints are covered with the Declared Market Price as replacement value of the one Single Strike Price if higher.

~~For example the exercise has been done on the last 4 Winter Periods average and is giving the following results:~~



~~Figure 16: Example of Calibration curve of the last 4 Winters and Average~~

The Strike Price Calibration and its methodology are now relying on the % range of quantities defined as reasonable volume below the Strike Price.

It is proposed is to apply a range of percentage range between [75~~0~~; 85~~90~~] % in order to calibrate the yearly update of the Strike Price. The definition of this % range as going from 75~~0~~% to 85~~90~~%~~-~~ is based on the observed shapes of the average calibration curve observed for the last 3 years for Winter Period weekly ~~peak hour~~Peak Hours: whether the possible CRM participating assets under D~~d~~aily S~~s~~chedule short run marginal costs are below the chosen Calibrated Strike Price, whether the curve is reaching a flat area ("plateau") at the lower/upper bound of the cumulated % level and whether the inflection points are sufficiently "within range". The 75~~0~~% is, a fortiori, a floor under which the inframarginal rent is decreasing severely as the windfall profit possibility while at the same time the technology openness is limited.

At the opposite, the 85~~90~~% is creating a cap above which it is implying that the windfall profits are appearing in disproportionate growth while at the same time technology is openness is reaching a major potential of new participating assets and the remaining percentages are likely to be under the without D~~d~~aily S~~s~~chedule constraints and their high activation costs could therefore be covered by the inclusion of the DMP in the Strike Price, putting aside possible entry barriers for them.

For example the exercise has been done on the last 3 Winter Periods average and is giving the following results:

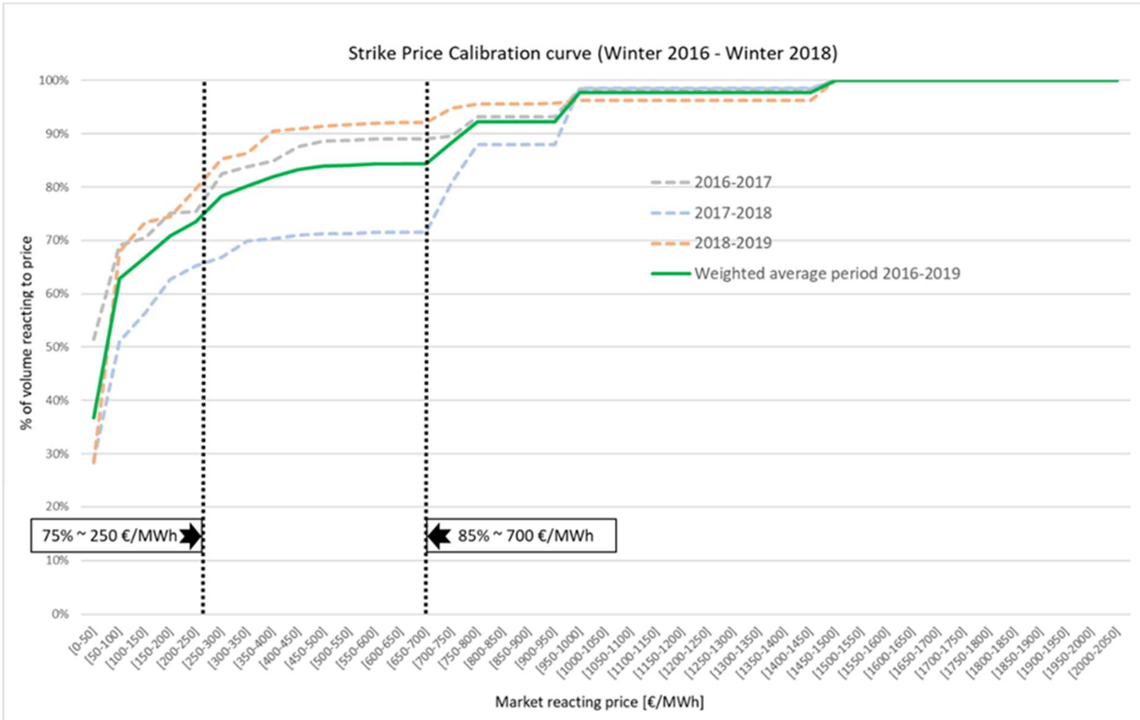


Figure 21: Example of Strike Price Calibration curves from the winter 2016/2017 to the winter 2018/2019

In the rolling process, the percentage within the range that will define the Strike Price level will be yearly carefully assessed and proposed to the Minister following a study on:

- As explained above, the SRMC and its upper bound is considered for this calibration exercise as it is important to target a level of SRMC ensuring that all capacities with a Daily Schedule would be covered by the Strike Price level finally obtained thanks to its calibration. Overly limiting these SRMC may otherwise result in the exclusion of some technologies. This is considered as the first criterion of selection analysis.

- T~~t~~he shape of the average calibration curve observed (applied to the 3 previous Winter Periods, for weekly ~~peak hour~~Peak Hours) e.g. whether the curve is reaching a plateau at the lower/upper bound of the cumulated % level~~.~~ is considered as the second criterion of selection analysis. Indeed, looking at the shape of the weighted average aggregated curve, it appears important to identify if the Calibrated Strike Price is reaching a 'plateau' with an equivalent price-elastic volume of reaction from the market despite an increase of the Strike Price. It can therefore be seen that an increase of the Calibrated Strike Price (up) would not increase the price-elastic volume of reaction of the market and that the added value in term of market openness is limited compared to the increase of windfall profits.

- ~~This will be evaluated~~An evaluation taking into account clear and observable market evolutions possibly having an impact on prices & market actors' reactions is the third criterion of selection analysis and underlines the need for the Strike Price to be calibrated on values which follow a normal trend. In other words, it means that the range of volume of market response [75; 85] % defined in the Royal Decree and its equivalent Calibrated Strike Price should not be based on extreme values, neither should neglect any clearly expected trends that may significantly impact the values obtained.

- ~~while at the same time having~~ A~~a~~ willingness to stabilize the Strike Price over time is the fourth criterion of selection analysis and refers to the fact that the Calibrated Strike Price is preferred to remain stable over time rather than being very volatile. Having a stable Strike Price prevents market participants from expecting tradeoffs between various Auctions (especially between the Y-4 and Y-1 Auctions for the same Delivery Period). Since this fourth criterion is looking at the stability of the strike price over time, it is important to assess the potential future calibration of this parameter. Looking at several future years brings clarity and foreseeability to the market. This is not only relevant for the actors willing to participate to the Belgian CRM, but more generally for all actors active in the energy market. As the Strike Price closely relates to the functioning of the energy market, increased stability helps market parties in better assessing the market behavior over time (e.g. in relation to forward markets). In this respect, the SRMC of the technologies CMU with a Daily Schedule are expected to evolve in time so that it remains an important parameter for the future calibration of the Strike Price.

- The principle of the R~~r~~eliability O~~o~~ption with the P~~p~~ayback O~~o~~bligation application is respected with a reasonable chance that the Strike Price is reached by the Reference Price. This is considered as the fifth criterion of selection.

In summary, the Royal Decree methodology indicates that the calibrated strike price should be selected between the corresponding range [75%; 85%] of the price-elastic volume of reaction from the market reacting to it and taking into account a number of guiding principles:

- The short run marginal costs (hereafter SRMC) of the technologies with daily schedule should be covered by the selected Strike Price.
- The Strike Price calibration takes the calibration curve shape into account.
- The Strike Price calibration takes the energy market evolution into account
- The Strike Price stability in time
- A reasonable chance for the strike price to be reached by the reference price

For all these elements,

Design Proposal #7: Calibration of the Strike Price

~~Within the~~For o~~O~~ne single Strike Price applicable to all Transactions of the CMU's at the same ~~Transaction~~ Auction~~Date~~, a *Calibrated Strike Price* (*~~obligation transaction~~Contract D~~-d~~ate)* is required:

Once a year and before March 31st:

Considering the construction of a *calibration curve* equal to the weighted average of the last previous 3 Winter Periods (November 1st to March 31st) of the sum of all the weekly ~~peak hour~~Peak Hours (weekdays from [8:00 to 20:00[) gathering the elastic part of the cumulative hourly offer and demand curves of all Day-Ahead Belgian Market exchanges (which are taken as couple of prices €/MWh and cumulative quantities in MW) modelled by the following formula:

$$= \begin{matrix} Weighted\ Average \\ on\ 3\ last\ Winters\ of \end{matrix} \sum_{i=1}^{All\ Winter\ Peak\ hours} \ \sum_{j=1}^{All\ Belgian\ DA\ Markets} \begin{matrix} Elastic\ Part\ of\ demand\ curve\ (i,j) \\ + \\ Elastic\ Part\ of\ offer\ curve\ (i,j) \end{matrix} \Big/ \begin{matrix} Number \\ of\ peaks \\ hours\ of \\ Winter \end{matrix}$$

The elastic part of the cumulative hourly demand and offer curves is including all submitted order types to the extent that it is technically possible to process them~~all registered orders~~ except~~ the simple blocks, linked blocks, exclusive groups or loop blocks, and~~ the ones below or equal to a price of zero and the ones at market price cap.

The volume part of the constructed curve will be normalized for the quantities part leading to a curve representing a % range of quantities with their corresponding prices in €/MWh.

The weighted average on the last three Winter Periods will be volume based using the winter maximal volume of the simple average of sum of cumulative offer and cumulative demand curves.

A Calibrated Strike Price (in €/MWh) will be selected for the next publication date on the calibration curve which will represent a % range of cumulated volume of reaction within a range of [7~~0~~5;85~~90~~]%

The selected Calibrated Strike Price level and % within the predefined range shall take into account:

- All variable costs (short run marginal costs) of the potential CRM participating technologies with D~~d~~aily S~~s~~chedule should be below the selected Calibrated Strike Price
- The shape of the average calibration curve observed (applied to the 3 previous Winters, for weekly ~~peak hour~~Peak Hours): whether the curve is reaching a plateau at the lower/upper bound of the cumulated % level
- Market evolutions possibly having an impact on prices & market actors' reactions
- The stability of the Strike Price over time
- A reasonable chance for the Calibrated Strike Price to be achieved by the Reference Price

The *Calibrated Strike Price* will be settled for all Transactions of the Primary Market selected ~~and Secondary Market traded~~ at a c~~C~~ontract d~~D~~ate~~transaction date~~ above or equal to its publication date and before the next *Calibrated Strike Price* publication date.

~~→*Calibrated Strike Price (at Transaction date) = Calibrated Strike Price (at publication date)*~~

6 Modalities of Payback Obligation

The main ingredients of the Payback Obligation, i.e. the Reference and Strike Price, have been described in the precedent c~~C~~hapters. It is, however, key to complete the Payback Obligation with the necessary modalities of application of this Calibrated Strike Price, such as the volume and quantities on which the Payback Obligation is due.

As starting point, in principle the Payback Obligation calculation will be continuous and is valid for all hours during the Delivery Period. Nevertheless, it is reasonable to take into account a number of corrections to this general principle.

In the Payback Obligation part of the formula introduced in chapter 2, it is crucial to clearly determine the *Payback ~~Obligated volume~~Capacity(CMU, t, Transaction Id)*:

*max[0; Reference Price (t) – Strike Price (CMU, ~~at Obligation id t~~Transaction Id ~~date~~)] * Payback ~~Obligated Volume~~Capacity (CMU, t, Transaction Id)*

This chapter defines this concept further (6.1) and introduces three particular elements:

- The Availability Ratio (t) (6.2)
- ~~The Load Following Ratio (t) (6.3)~~
- Application of the Payback Obligation on Energy Constrained CMUs (6.3~~4~~)
- Stop ~~-~~Loss limit on the Payback Obligation (6.4~~5~~)

6.1 Payback ~~Obligated volume~~Capacity of ~~an obligation~~a Transaction

The *~~Payback Obligated Capacity~~Payback Capacity (CMU, t, Transaction Id)* is the total of hourly capacity in MW on which the Payback O~~o~~bligation will be applied for a Transaction. It will be of course related to the Transaction Contracted Capacity of the CMU but should also include a~~ll~~ type~~s~~ of exemption related to the aA~~vailability~~vailability.

As each obligation of the CMU hasn't been contracted in the same m~~M~~arket (Primary Market or Secondary Market) and hasn't been contracted at the same moment with the same Payback Obligation parameters (mainly the Strike Price), it is important to differentiate the calculation and to introduce the *Transaction Id* which is representing the identification ~~of a~~related to a CMU ~~Obligation~~ Transaction~~linked to a specific Transaction. This Transaction Id is related to a Transaction.~~

It appears essential to distinguish the application of the Payback Obligation of a Transaction by the combination of:

- the nature of the CMU type with either Energy Constrained CMU or either N~~n~~on-Energy Constrained CMU and,

- the nature of location in time, Ex-ante for the Transaction of the Primary Market and Secondary Market and the Ex-post for some Transactions of the Secondary Market.

For the Non-Energy Constrained CMU Transaction in Ex-ante or in Ex-post, the Payback Capacity is simply a function of the Contracted Capacity multiplied by the Availability Ratio (cf.

6.2).

For the Energy Constrained CMU Transaction in Ex-ante, the Payback Capacity (CMU, t, Transaction Id) is only positive on the SLA ~~H~~hours and is a function of the Contracted ~~volume~~Capacity divided by the contractual De~~de-~~rating ~~F~~factor of the Transaction and multiplied by the Availability Ratio (cf. 6.2). Its Payback Obligation (CMU, t, Transaction Id) equals zero on the non-SLA hours. The reasoning behind will be explained in 6.3.

For the Energy Constrained CMU Transaction in Ex-post, the Payback Capacity (CMU, t, Transaction Id) is simply a function of the Contracted ~~volume~~Capacity and multiplied by the Availability Ratio (cf. 6.2). The formula is the same on both SLA and non-SLA hours. The reasoning behind will be explained in 6.3.

All the details related to the Secondary Market Transactions and the Ex-post Transactions is explained in the Design Note Secondary Market.

In the paragraph~~s~~ 6.2.~~ and 6.3.~~, the~~ two~~ ratio~~s~~ of Availability~~ and Load following~~ will be defined. This~~These~~ ratio~~s~~ will correct the ~~Payback Obligated Capacity~~Payback Capacity (CMU, t, Transaction Id) and may decrease the Payback Obligation.

Design Proposal #8: Payback ~~Obligated volume~~Capacity definition

1- For the Non-Energy Constrained CMU Transaction in Ex-ante or Ex-post, the Payback Capacity is simply based on the Contracted Capacity:

~~Payback Obligated Capacity~~Payback Capacity (CMU, t, Transaction Id) = ~~Transaction~~ Contracted Capacity (CMU, t, Transaction Id) * Availability Ratio (CMU, t) ~~* Load Following Ratio (t)~~

2- For the Energy Constrained CMU Transaction in Ex-ante, the Payback Capacity (CMU, t, Transaction Id) is only positive on the SLA ~~H~~hours and is based on the Contracted ~~volume~~Capacity divided by the contractual ~~de-rating factor~~Derating Factor of the Transaction.

Payback Capacity (CMU, t, Transaction Id) = Contracted Capacity (CMU, t, Transaction Id) / Derating Factor (CMU, Transaction) * Availability Ratio (CMU, t)

Its Payback Obligation (CMU, Transaction Id, t) equals zero on the non-SLA hours.

3- For the Energy Constrained CMU Transaction in Ex-post, the Payback Capacity (CMU, t, Transaction Id) is simply based on the Contracted ~~volume~~Capacity:

Payback Capacity (CMU, t, Transaction Id) = Contracted Capacity (CMU, t, Transaction Id) * Availability Ratio (CMU, t)

6.2 Availability Ratio

The Payback Obligation targets the re~~-~~imbursement to society of any earned revenues above a pre-defined Strike Price. To the extent it is reasonable to assume that for such a moment the revenues have not been earned in the first place (and thereby no unreasonably high inframarginal rents would have been earned), it is also reasonable not to require a payback during those moments. Otherwise, this would unnecessarily increase risks that would be priced in the Bids in the Auction, thereby risking to increase the overall cost of the mechanism.

Therefore, it is proposed that all planned and unplanned unavailabilities (e.g. planned maintenance, forced outages,…) as also considered according to the Product Availability & Monitoring design, are exempted of the Payback Obligation calculation to the extent of their unavailability.

Note that this only concerns unavailabilities that have been duly communicated to Elia the day before the day on which the Payback Obligation is related.

This princple has been exposed and mentioned in the Availability Requirement design note and the volume of unavailability not duly communicated expressed as an 'unannounced unavailability'. Indeed, it is considered that the decrease of availability that has not been duly communicated to ELIA and the Contractual Counterparty has been bid in the Day-Ahead Market and perceived as a CMU revenue to be considered in the Payback Obligation reimbursement.

Therefore the decrease of the Payback Capacity (CMU, t, Transaction Id) on which the Payback Obligation shall be applied is defined as Announced Missing Capacity (CMU, t). ~~.~~

As explained above, such exemption allows a better risk management by the Capacity Provider, while at the same time it does not dilute the incentives for Capacity Providers to be available. As moments with the Reference Price exceeding the Strike Price are in principle also AMT moments during which other Availability Obligations apply (with P~~p~~enalties), there is an incentive to continue to deliver on the ~~s~~Service.

This is summarized in the Availability Ratio (t) on which the Payback Obligation is due.

Design Proposal #9: Availability Ratio definition

For a CMU the Availability Ratio (t) equals:

MIN[1; [~~Available Capacity~~(Obligated Capacity (CMU, t) – Announced Missing Capacity (CMU,t)) / Obligated Capacity (CMU, t)]

This value is always lying between 0 and 1.

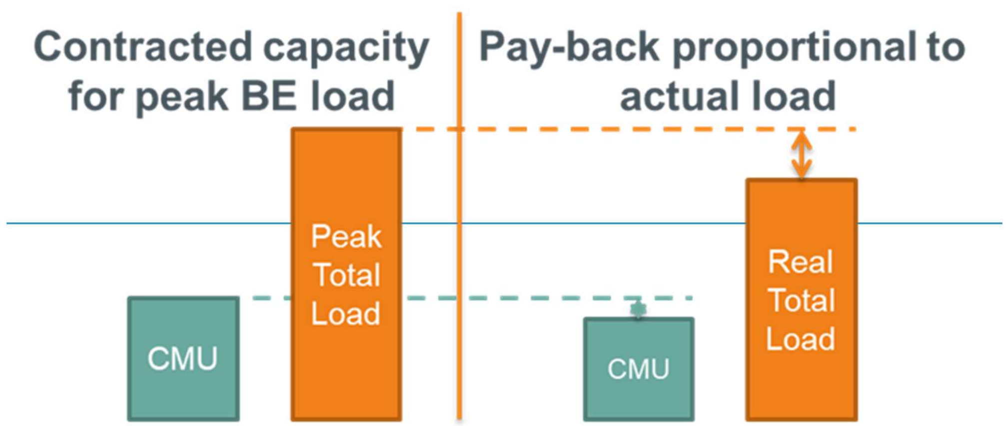
~~6.3 Load Following Ratio~~

~~The CRM will be dimensioned in such a way that Belgian adequacy needs can be met. In a very simplified manner the CRM could be considered as being dimensioned to cover for the Belgian Reference Peak Load. This means that the sum of contracted capacities should equal~~

~~the Reference Peak Load.[11]~~

~~Of course, (near-)scarcity moments and moments where the Strike Price exceeding the Reference Price can occur at moments during which the Total Load is lower than the Reference Peak Load for which the system has been dimensioned. As the CRM targets availability rather than delivery of energy, it is logical that at such moment not all contracted capacities are dispatched via the energy market. For instance, if the CRM is dimensioned for a Reference Peak Load of 14 GW and the moment that a Payback Obligation would be applicable, the Total Load is only 12 GW, it is reasonable to assume that 2 GW of the contracted capacities won't be delivering energy in the energy market (but are nevertheless available to do so).~~

~~Therefore, a ratio with a maximal value of 1 will be applied in the Payback Obligation formula. This ensures that the Payback Obligation is proportionate to the actual Total Load level whereas the Belgian Load Following Ratio (t) is defined as the Total Load at t moment divided by the dimensioning Reference Peak Load level for that Delivery Period. In the above example the ratio (t) would equal 12 GW/14 GW = 0,8571.~~



~~*Figure 17: Load Following ratio applied in the Payback Obligation formula*~~

~~Design Proposal #10: Load Following Ratio definition~~

~~For all CMUs the Load Following Ratio (t) equals:~~

~~min [1; [Total Load (t) / Reference Peak Load (t)]]~~

~~This value is always lying between 0 and 1.~~

~~[11] Obviously, such simplified view ignores several elements such as opt-out volumes, corrections for non-eligible volumes. Also it by no means intends to capture the subtleties related to the determination of the actual volume to be procured, i.e.. by means of a demand curve.~~

~~6.4~~6.3 Application of the Payback Obligation on CMUs with an Energy-Constrained service level

In the Prequalification Process, it is possible for the Capacity Provider or Prequalified CRM Candidate of an Energy Constrained CMU or aggregate to select a SLA (Service Level Agreement), implying that its participation to adequacy is limited in to a predefined set of consecutive hours in the day.

As the Energy Constrained CMUs are allowed to trade and take over extra obligations in the Secondary Market outside of their SLA Hours (see Design Note 7 Secondary Market), it is required to impose the Payback Obligation on these AMT hours and their Transactions Contracted Capacities.

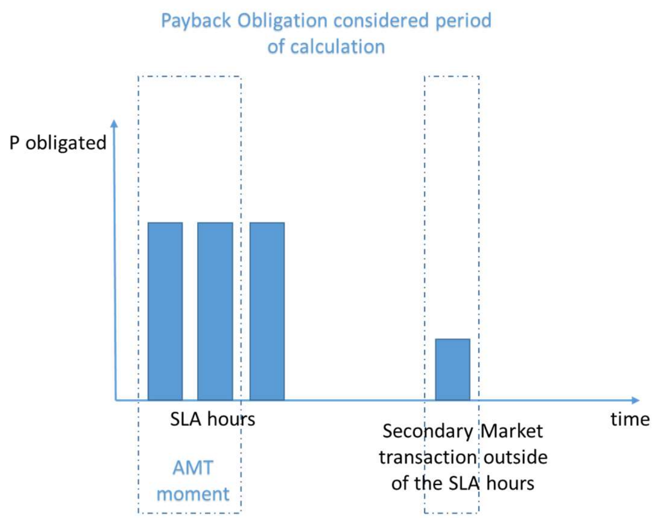


Figure ~~17~~22: Energy Constrained considered period for Payback Obligation calculation within a day

As the Payback Obligation is calculated on the Contracted ~~Transaction~~ Capacities, an exemption outside of the committed SLA should occur for the Energy Constrained CMU Ex-ante Transactions.

As described in the De-rating factors Design Note and the Availability Requirements and Penalties d~~D~~esign n~~N~~ote, the considered hours regarding the SLA are known after the AMT moments identification and the Payback Obligation will be applied on the Contracted Capacity of the Ex-ante Transaction divided by its contractual Derating Factor~~those~~, this to compensate its Payback Obligation exposure on the SLA hours solely.

It is a reasonable assumption that the Strike Price level will be above the P AMT which will define the AMT moments. Therefore, in case of Day Ahead market prices above the Strike

Price level, those moments will be considered as AMT moments. The main objective of this exemption is to select the hours of application of the formula during an AMT moment for the assets under a SLA.

Design Proposal #1~~1~~0: Payment exemption outside of the SLA Hours and extra hourly Transaction Periods for the Energy Constrained CMU

The Payback Obligation is due at any period of the Transaction for which the AMT Moments are considered for Availability Penalties according to the CMU SLA for the Energy Constrained CMU. It is also due for any other period of its extra Secondary Market Ex-post hourly Transactions (during both the SLA H~~h~~ours and non-SLA hours).

~~6.5~~6.4 Stop ~~-~~Loss limit on the Payback Obligation

~~The Payback Obligation has obviously a very clear interaction with the energy market and – as discussed when designing and calibrating the Strike Price (cf. chapters 4 & 5) – the Strike Price level takes into account the technology openness of the mechanism. Without further measures, lower Strike Price levels create risks to technologies with higher short-run marginal costs. If their short-run marginal cost is above the Strike Price, they may be subject to a Payback Obligation while they have not yet been called upon by the energy market.~~

~~As the above risk would be unlimited without further measures and therefore difficult to achieve a reasonable price when bidding in the Auction, a~~A Stop Loss limit is considered appropriate to limit this risk to the contractual value. ~~This contributes to the reflection on the trade-off when setting the Strike Price and considering technology openness as with such StopLoss limit all technologies can effectively assess the risk and price it.~~

~~Note that C~~C~~c~~reating such Stop Loss limit on the Payback Obligation is ~~also~~ from a broader market design perspective desirable. Without such Stop Loss limit, Contracted Capacities would remain liable to a Payback Obligation if at very low CRM remuneration levels. This could become problematic when considering to phase-out the CRM when adequacy concerns have sufficiently faded away. Indeed, when the energy(-only) market provides sufficient returns, incl. at moments where prices would exceed the Strike Price, the CRM should not become a roadblock for capacities to earn their revenues via the energy market. A Stop Loss limit prevents that too many energy market revenues would have to be reimbursed, thereby unnecessarily inflating bid prices in the Auction and thereby making it more difficult to abandon the CRM one day. Stated otherwise, such Stop Loss limit on the Payback Obligation more easily allows the Auction to tend to zero €/MW as Capacity Remuneration.

Therefore, it is proposed to create a stop-loss mechanism per Delivery Period equivalent to the contractual value of the CMU on the Delivery Period as a maximum. This will be calculated based on the CRM annual contractual value (i.e. per Delivery Period, starting in November) and will be totally independent from the Stop Loss related to Penalties of the Availability Requirement and Penalties Design Note. Only the Payback Obligations of a Contracted Capacities ~~(~~from the Primary Market~~)~~ could apply for the Stop Loss. This means that the transactions of the ~~Obligated Capacity~~Contracted Capacities of a CMU coming from the Secondary Market are not taken into account in the Stop Loss calculation and their payments are duly expected even once the Stop Loss limit has been reached. The Stop Loss limit is applied only on the annual Delivery Period and is not a monthly Stop Loss limit.~~The rationale comes from the non-implication of the CRM contractual counterparty in the Secondary Market transaction payment and price. As the initial Capacity Provider releasing its obligation continues to be paid, if there is a willingness of Stop Loss from the Capacity Provider taking over the obligation, it may be part of the bilateral (or exchange) agreement.~~

Design Proposal #11~~2~~: Payback Obligation Stop -L~~l~~oss on Primary Market obligation

A Stop- Loss mechanism applies on the Payback Obligations regarding a Delivery Period of a CMU Contracted Capacities (solely from the Primary Market). It cannot exceed the contract value of the Primary Market Transactions for that Delivery Period and is fixed prior to the start of the Delivery Period.

7 Examples and uses cases

The objective of the section is to ~~describe~~ refer to the –examples and use cases that help the comprehension of the Payback Obligation concept.

In the Task Force of February 6th 2020 have been presented an introduction[12] to four use cases including detailed modalities of the Payback Obligation for those:

- Use Case 1: a new CCGT with a Nominal Reference Power of 300MW and 2 different CMUs
- Use Case 2: a new DSR with Nominal Reference Power of 15MW
- Use Case 3: An existing OCGT with a Nominal Reference Power of 200MW which decides to partially opt-out
- Use Case 4: An aggregator with a Nominal Reference Power of 60MW, composed of 4 Delivery Points, which decides to partially opt-out

The details of the use cases have been sent to the Stakeholders and will be published on the ELIA CRM website[13].

The examples are driven by the present design scope related to Strike & Reference Price comprehension as a goal and could/will not replace the ~~future contract~~ detailed ruless.

~~7.1.1 Example 1: Classical existing Production asset 400MW CCGT~~

~~In the Prequalification Pprocess, the Capacity Provider of an existing CCGT asset of 400MW, selected several parameters where one of them is the spot Day-Ahead Reference Price. EPEX spot Day-ahead has been selected.~~

~~A De-Rating Factor of 0,9 is granted, giving an Obligated Ccapacity of 360MW.~~

~~The pPrequalification occurred successfully on the Capacity Provider with its existing CCGT asset of 400MW.~~

~~The Capacity Provider hasn't 'Opted-Out' its capacity of the CRM mechanism and submits a bid in the Y-4 Auction of Oct 2021 for [November 2025 – October 2026] Ddelivery Pperiod.~~

~~Under the bidding & Auction rules, the CCGT de-rated volume of 360MW is selected and awarded a contract.~~

~~The 360MW obligation is linked to a Strike Price of 500€/MWh.~~

~~In September 2025, in the Secondary Market, the CCGT 400MW CMU is taking over 20MW of obligation of another asset for the period November and December 2025. The latest~~

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[12] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/2020/20200206_02-tfcrm10_crm-full-cycle-use-case.pdf
[13] https://www.elia.be/fr/users-group/implementation-crm

~~published Strike Price at the time of the transaction notification to ELIA and Contractual counterparty was 525€/MWh.~~

~~In December 2025, for the Ddelivery Pperiod of November 2025, the Payback Obligation is calculated according to the following :~~

~~During the month of November 2025, only 2 hours [19:00-20:00] of 29/11/2025 were having an EPEX spot Day-Ahead price above one of the both threshold with respectively~~

~~[825 and 721]€/MWh~~

~~The Load Following Ratio is considered at 0,97 for both hours and the asset availability at 100%.~~

~~The settlement of Payback Obligation is then:~~

- ~~0 € for all hours of November except for the 2 hours mentioned above~~
- ~~For H19:00:~~
    - ~~Primary Auction Y-4:~~

      ~~= max(0;(825€/MWh-500€/MWh)*360MWh* 1 * 0,97)~~

      ~~= 113,49k€~~

    - ~~Secondary Market trade:~~
      ~~= max(0;(825€/MWh-52500€/MWh)*20MWh* 1 * 0,97)~~
      ~~= 5,82k€~~
- ~~For H20:00:~~
    - ~~Primary Auction Y-4:~~

      ~~= max(0;(721€/MWh-500€/MWh)*360MWh obligated* 1 * 0,97)~~

      ~~= 77,1372k€~~

    - ~~Secondary Market trade:~~
      ~~= max(0;(721€/MWh-525€/MWh)*20MWh obligated * 1 * 0,97)~~
      ~~= 3,8024k€~~

~~The monthly November 2025 total Payback Obligation that will be billed to the Capacity Provider is 200,25k€.~~

~~7.1.2 Example 2: Demand-Side management 10MW with 423€/MWh activation cost~~

~~In the Prequalification process, the Capacity Provider of 10 MW DSR process, selected several parameters where one of them is the spot Day-Ahead Reference Price. EPEX spot Day-ahead has been selected.~~

~~A De-Rating Factor of 0,4 is granted as the option 'no limit of duration' SLA category of DSR is chosen by the Capacity Provider, giving an Obligated Capacity of 4MW.~~

~~The Prequalification occurred successfully on the Capacity Provider asset.~~

~~The Capacity Provider proposed a bid for the Y-1 Auction of Oct 2024 for [November 2025 –~~

~~October 2026] delivery period.~~

~~Under the bidding & Auction rules, the DSR de-rated volume of 4MW is selected and awarded a contract.~~

~~The 4MW Transaction is linked with a Strike Price of 525€/MWh.~~

~~In September 2025, in the Secondary Market, the DSR Capacity Provider is releasing 1MW of its obligation to another asset for the period December 2025. The latest published Strike Price at the time of the transaction notification to ELIA and Contractual counterparty was 500€/MWh.~~

~~In January 2026, for the delivery period of December 2025, the Payback Obligation is calculated according to the following:~~

~~During the month of December 2025, only the 1 hour [19:00] of 14/12/2025 was having an EPEX spot Day-Ahead price above one of the both threshold with 923€/MWh.~~

~~The Load Following Ratio is considered at 0,94 for both hours and the asset availability at 100%.~~

~~The settlement of Payback Obligation is then:~~

- ~~0 € for all hours of December except for 1 hour~~
- ~~For H19:00:~~
    - ~~Primary Auction Y-1:~~

      ~~= max(0;(923€/MWh-525€/MWh)*3MWh obligated * 1 * 0,94)~~

      ~~= 1122,36€~~

~~This is the Monthly December 2025 total Payback Obligation that will be billed to the Capacity Provider.~~

~~7.1.3 Example 3: Aggregate of capacities delivering a SLA of 2h and 5MW~~

~~In the Prequalification process, the Capacity Provider of a set of assets for an installed capacity of 25MW, selected several parameters where one of them is the spot Day-Ahead Reference Price. EPEX spot Day-ahead has been selected.~~

~~A SLA of 2 hours is chosen and the related De-Rating Factor of 0,2 is granted as the Capacity Provider has chosen its DSR category, giving Obligated Capacity of 25MW (according the Availability Monitoring & Penalties).~~

~~The Prequalification occurred successfully on the CMU pool of assets.~~

~~The Capacity Provider is now able to insert a bid in the Y-1 Auction of Oct 2024 for [November 2025 – October 2026] delivery period.~~

~~Under the bidding & Auction rules, the pool volume of 5MW is selected and awarded a contract.~~

~~The 15MW obligation is linked with a Strike Price of 525€/MWh.~~

~~In February 2026, for the delivery period of January 2026, the Payback Obligation is calculated according to the following :~~

~~During the month of January 2026, only 3 hours [18:00-20:00] of 17/01/2026 were having an EPEX spot Day Ahead price above one of the both threshold with respectively~~

~~[950;872;861]€/MWh~~

~~Only the first 2 hours are considered according the AMT moments definitions of the Availability Monitoring & Penalties.~~

~~The Load Following Ratio is considered at 0,95 for both hours and the asset availability at 100%.~~

~~The settlement of Payback Obligation is then:~~

- ~~0 € for all hours of January except on the 3 hours~~
- ~~For H18:00:~~
  - ~~Primary Auction Y-1:~~

    ~~= max(0;(950€/MWh-525€/MWh)*25MWh obligated * 1 * 0,95)~~

    ~~= 10 093,75€~~
- ~~For H19:00:~~
  - ~~Primary Auction Y-1:~~

    ~~= max(0;(872€/MWh-525€/MWh)*25MWh obligated * 1 * 0,95)~~

    ~~= 8 241,25€~~
- ~~For H20:00:~~
  - ~~Primary Auction Y-1:~~

    ~~= 0~~

~~Monthly January 2026 total Payback Obligation that will be billed to Capacity Provider is 18 335€.~~

8 The Rules Set

Design Proposal #1: The Payback Obligation Formula

The Payback Obligation generic formula for a given CMU is:

For all t hours where the CMU is under a Transaction,

Payback Obligations (CMU, t) =

Sum on all Transactions of the CMU:

*max[0; Reference Price (t) – Strike price (CMU, t, Transaction Id)] * Payback Capacity(CMU, t, Transaction Id) [in €]*

~~The Payback Obligation formula for a given CMU obligation is:~~

~~For all t hours where the CMU is under a Transaction Capacity,~~

~~*Payback Obligations (CMU, t) =*~~

~~*Sum on all Transactions of the CMU:*~~

~~*max[0; Reference Price (t) – Strike price (CMU, at Transaction Date)] * Payback Obligated Capacity(CMU, t, Transaction Id) [in €]*~~

Design Proposal #2: Reference Price definition

The Reference Price must be observed for each hour of the Payback Obligation in the Belgian Day-Ahead Market segment.

Design Proposal #3: CMU choice of NEMO for its Reference Price

A CRM participating Capacity Provider or Prequalified CRM Participant shall choose for each of its CMUs in the Prequalification process, a NEMO operating in Belgium in the Day-Ahead time frame for setting his Reference Price.

The CMU chosen Belgian Day-Ahead market price reference will be used as CRM Reference Price in the Payback Obligation calculation: Reference Price (t)

Design Proposal #4: modification of the Day-Ahead Reference Price & missing data

The Capacity Provider has the possibility for each CMU to notify a modification of its earlier NEMO choice for the Belgian Day-Ahead Market Reference Price of a CMU. Once a change is notified to ELIA and the Contractual Counterparty, it becomes applicable in the Payback Obligation calculation 10 working days after the notification reception date without retroactive effect. In case of missing or conflicting data related to a specific CMU' NEMO choice, the Reference Price Day-Ahead Belgium (publication by ELIA) will be used as fall-back value. The Reference Price Day-Ahead Belgium is determined as the 'Belgian Bidding Zone Day-Ahead Reference Price'. The valid and binding price for the Belgian bidding zone is the single Day-

Ahead coupling price (“Belgian SDAC Price”) which is calculated by the Market Coupling Operator (MCO) function jointly performed by all Nominated Electricity Market Operators (NEMOs), and is published on the ENTSO-E Transparency Platform and on the websites of the Belgian NEMOs. (https://www.elia.be/fr/donnees-de-reseau/transport/prix-de-reference-day-ahead)

~~The Capacity Provider has the possibility for each CMU to notify a modification of its earlier NEMO choice for the Belgian Day-Ahead Market Reference Price of a CMU up to 5 working days prior to a new month of delivery.~~

~~The change will be effective as from the 1st calendar day of the next month. In case of missing or conflicting data related to a specific CMU' NEMO choice, the Reference Price Day-Ahead Belgium (publication by ELIA) will be used as fall-back value. The Reference Price Day-Ahead Belgium is determined as the 'Belgian Bidding Zone Day-Ahead Reference Price'. The valid and binding price for the Belgian bidding zone is the single Day-Ahead coupling price ("Belgian SDAC Price") which is calculated by the Market Coupling Operator (MCO) function jointly performed by all Nominated Electricity Market Operators (NEMOs), and is published on the ENTSO-E Transparency Platform and on the websites of the Belgian NEMOs. ()~~

Design Proposal #5: One Single Strike price ~~choice~~

One Single Strike Price will be applied to all Transactions of the CMUs contracted according to the same Auction.

The Transaction Strike Price of the CMU with Daily Schedule will be the one Single Strike Price.

The Transaction Strike Price of the CMU without Daily Schedule will be the maximum between the Declared Market Price (representing the CMU activation cost) and the one Single Strike Price of the Transaction.~~One Single Strike Price will be applied to all Transactions of the CMUs at the same Transaction Date.~~

Design Proposal #6: Update of the Strike Price

For capacity contracted in a Y-4 or Y-1 Auctions, the Strike Price for the relevant Delivery Period as decided by Ministerial Decree no later than 31/3 of the year that Auction applies.

A single Strike Price will be applied to all Primary Market Transactions of the CMUs at the Auction date:

Strike Price (CMU, t, Transaction Id) = Calibrated Strike Price (Transaction Id) [€/MWh]

For contracts covering more than one Delivery Period, the Strike Price is updated during the lifetime of the contract a factor will be applied on the initial Calibrated Strike Price and is referring to the DAM Prices prior to the Auction Year and prior to the Delivery Period (DPe) of application. Its formula is:

$$Factor\ (DPe,\ AuctionYear) = 1 + \frac{\text{Avg DAM (DPe-3 to DPe-1) - Avg DAM (Auction Y-3 to Auction Y)}}{Calibrated\ Strike\ Price\ (Auction\ Y)}$$

Implying that:

$$Strike\ Price\ (CMU, t, Transaction\ Id) = Factor\ (DPe,\ AuctionYear) * Calibrated\ Strike\ Price(Transaction\ Id)$$

The same $Factor\ (DPe,\ AuctionYear)$ will be applied for all multi-years Contracted Capacities following the same Auction whatever the contract duration. This means that both a factor associated to the Auction Y-1 and a factor associated to the Auction Y-4 exist for the same Delivery Period.

The Single Strike Price that will be applicable for Transactions from the Secondary Market when calculating the due amount of the Payback Obligation is the Calibrated Strike Price of the Transaction releasing its obligation of the CMU of the Seller of an Obligation. It will be notified to Elia in the Secondary Market transaction and will settle the Calibrated Strike Price of the CMU Transaction taking over the obligation. The Strike Price indexation formula (if any) will be linked to the transferred Calibrated Strike Price in the Secondary Market transactions.

~~For capacity contracted in a Y-4 or Y-1 Auctions, the Strike Price for the relevant Delivery Period as decided by Ministerial Decree no later than 31/3 of the year that Auction applies.~~

~~For contracts covering more than one Delivery Period, the Strike Price is not updated during the lifetime of the contract.~~

~~The last published Strike Price will also be applicable for Transactions in the Secondary market when calculating the due amount of the Payback Obligation. The timestamp of transaction notification as known by Elia will settle the Strike Price of a CMU Secondary Market transaction.~~

~~One Single Strike Price will be applied to all Transactions of the CMUs at the same Transaction Date:~~

~~*Strike Price (CMU, t, Transaction Id) = Calibrated Strike Price (Transaction Date) [€/MWh]*~~

Design Proposal #7: Calibration of the Strike Price

For one single Strike Price applicable to all Transactions of the CMU's at the same Auction, a *Calibrated Strike Price (Contract Date)* is required:

Once a year and before March 31st:

Considering the construction of a *calibration curve* equal to the weighted average of the last previous 3 Winter Periods (November 1st to March 31st) of the sum of all the weekly Peak Hours (weekdays from [8:00 to 20:00[) gathering the elastic part of the cumulative hourly offer and demand curves of all Day-Ahead Belgian Market exchanges (which are taken as couple of prices €/MWh and cumulative quantities in MW) modelled by the following formula:

$$= \begin{array}{c} Weighted\ Average \\ on\ 3\ last\ Winters\ of \end{array} \sum_{i=1}^{\substack{All\ Winter \\ Peak\ hours}} \sum_{j=1}^{\substack{All\ Belgian \\ DA\ Markets}} \begin{array}{c} Elastic\ Part\ of\ demand\ curve\ (i,j) \\ + \\ Elastic\ Part\ of\ offer\ curve\ (i,j) \end{array} \Big/ \begin{array}{c} Number \\ of\ peaks \\ hours\ of \\ Winter \end{array}$$

The elastic part of the cumulative hourly demand and offer curves is including all submitted order types to the extent that it is technically possible to process themexcept the ones below or equal to a price of zero and the ones at market price cap.

The volume part of the constructed curve will be normalized for the quantities part leading to a curve representing a % range of quantities with their corresponding prices in €/MWh.

The weighted average on the last three Winter Periods will be volume based using the winter maximal volume of the simple average of sum of cumulative offer and cumulative demand curves.

A Calibrated Strike Price (in €/MWh) will be selected for the next publication date on the calibration curve which will represent a % range of cumulated volume of reaction within a range of [75;85]%

The selected Calibrated Strike Price level and % within the predefined range shall take into account:

 All variable costs (short run marginal costs) of the potential CRM participating technologies with Daily Schedule should be below the selected Calibrated Strike Price

 The shape of the average calibration curve observed (applied to the 3 previous Winters, for weekly Peak Hours): whether the curve is reaching a plateau at the lower/upper bound of the cumulated % level

 Market evolutions possibly having an impact on prices & market actors' reactions

 The stability of the Strike Price over time

 A reasonable chance for the Calibrated Strike Price to be achieved by the Reference Price

The *Calibrated Strike Price* will be settled for all Transactions of the Primary Market selected at a contract date above or equal to its publication date and before the next *Calibrated Strike Price* publication date.

~~Peak HourPeak Hour~~~~Within the One single Strike Price applicable to all Transactions of the CMUs at the same Transaction Date, a~~ ~~*Calibrated Strike Price (obligation transaction date)*~~ ~~is required:~~

~~Once a year and before March 31st:~~

~~Considering the construction of a~~ ~~*calibration curve*~~ ~~equal to the Weighted average of the last previous 3 Winters (November 1st to March 31st) of the sum of all the weekly peak hour~~Peak Hours ~~(weekdays from [8:00 to 20:00[) gathering the elastic part of the cumulative hourly offer and demand curves of all Day-Ahead Belgian Market exchanges (which are taken as couple of prices €/MWh and cumulative quantities in MW) modelled by the following formula:~~

$$\cancel{= \underset{\text{on 3 last Winters of}}{\text{WeightedAverage}} \sum_{i=1}^{\text{All Winter Peak hours}} \sum_{j=1}^{\text{All Belgian DA Markets}} \frac{\text{Elastic Part of demand curve }(i,j) + \text{Elastic Part of offer curve }(i,j)}{\text{Number of peaks hours of Winter}}}$$

~~The Elastic part of the cumulative hourly demand and offer curves is including all registered orders except the simple blocks, linked blocks, exclusive groups or loop blocks, and the ones below or equal to a price of zero and the ones at market price cap.~~

~~The volume part of the constructed curve will be normalized for the quantities part leading to a curve representing a % range of quantities with their corresponding prices in €/MWh.~~

~~The weighted average on the last three Winters will be volume based using the Winter Maximal volume of the Simple average of Sum of cumulative offer and cumulative demand curves.~~

~~A Calibrated Strike Price (in €/MWh) will be selected for the next publication date on the calibration curve which will represent a % range of cumulated volume of reaction within a range of [70;90]%~~

~~The selected Strike Price level and % within the predefined range shall take into account:~~

- ~~The shape of the average calibration curve observed (applied to the 3 previous Winters, for weekly peak hour~~Peak Hours~~s): whether the curve is reaching a plateau at the lower/upper bound of the cumulated % level~~
- ~~Market evolutions possibly having an impact on prices & market actors' reactions~~
- ~~The stability of the Strike Price over time~~

~~The *Calibrated Strike Price* will be settled for all Transactions of the Primary Market selected and Secondary Market traded at a transaction date above or equal to its publication date and before the next *Calibrated Strike Price* publication date.~~

Design Proposal #8: Payback ~~Obligated volume~~Capacity definition

1- For the Non-Energy Constrained CMU Transaction in Ex-ante or Ex-post, the Payback Capacity is simply based on the Contracted Capacity:

Payback Capacity (CMU, t, Transaction Id) = Contracted Capacity (CMU, t, Transaction Id) * Availability Ratio (CMU, t)

2- For the Energy Constrained CMU Transaction in Ex-ante, the Payback Capacity (CMU, t, Transaction Id) is only positive on the SLA Hours and is based on the Contracted Capacity divided by the contractual Derating Factor of the Transaction.

Payback Capacity (CMU, t, Transaction Id) = Contracted Capacity (CMU, t, Transaction Id) / Derating Factor (CMU, Transaction) * Availability Ratio (CMU, t)

Its Payback Obligation (CMU, Transaction Id, t) equals zero on the non-SLA hours.

3- For the Energy Constrained CMU Transaction in Ex-post, the Payback Capacity (CMU, t, Transaction Id) is simply based on the Contracted Capacity:

Payback Capacity (CMU, t, Transaction Id) = Contracted Capacity (CMU, t, Transaction Id) * Availability Ratio (CMU, t) ~~Payback Obligated Capacity (CMU, t, Transaction Id) = Transaction Capacity (CMU, t, Transaction Id) * Availability Ratio (CMU, t) * Load Following Ratio (t)~~

Design Proposal #9: Availability Ratio definition

For a CMU the Availability Ratio (t) equals:

MIN[1; [(Obligated Capacity (CMU, t) – Announced Missing Capacity (CMU,t)) / Obligated Capacity (CMU, t)]

This value is always lying between 0 and 1.

~~For a CMU the Availability Ratio (t) equals:~~

~~MIN[1; [Available Capacity (CMU, t)) / Obligated Capacity (CMU, t)]~~

~~This value is always lying between 0 and 1.~~

~~**Design Proposal #10: Load Following Ratio definition**~~

~~For all CMUs the Load Following Ratio (t) equals:~~

~~min [1; [Total Load (t) / Reference Peak Load (t)]]~~

~~This value is always lying between 0 and 1.~~

Design Proposal #1~~1~~0: Payment exemption outside of the SLA hours and extra hourly Transaction Periods for the Energy Constrained CMU

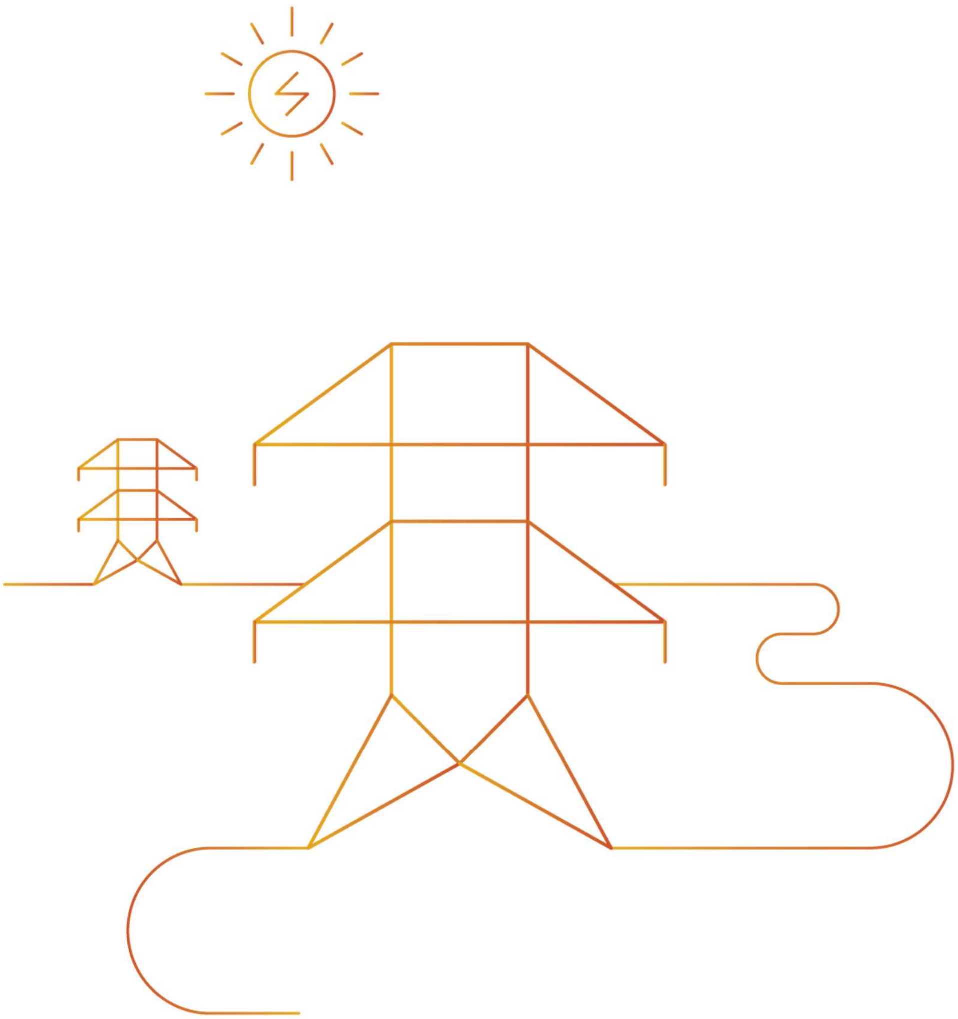
The Payback Obligation is due at any period of the Transaction for which the AMT Moments are considered for Availability Penalties according to the CMU SLA for the Energy Constrained CMU. It is also due for any other period of its extra Secondary Market Ex-post hourly Transactions (during both the SLA Hours and non-SLA hours).

~~The Payback Obligation is due at any period of the Transaction for which the AMT moments are considered for Penalties according to the CMU SLA for the Energy Constrained CMU. It is also due for any other period of its extra Secondary Market hourly Transactions (during the SLA hours and non-SLA hours).~~

Design Proposal #11~~2~~: Payback Obligation Stop~~-~~ L~~l~~oss on Primary Market obligation

A Stop-Loss mechanism applies on the Payback Obligations regarding a Delivery Period of a CMU Contracted Capacities (solely from the Primary Market). It cannot exceed the contract value of the Primary Market Transactions for that Delivery Period and is fixed prior to the start of the Delivery Period.

~~A Stop-Loss mechanism applies on the Payback Obligations regarding a Delivery Period of a CMU Contracted Capacities (solely from the Primary Market). It cannot exceed the contract value for that Delivery Period.~~



CRM Design Note: Availability Obligations and Penalties

30/01/2020

Table of contents

1 Introduction

1.1 Context and goal of the present design note

The goal of this present note is to further clarify and receive any useful feedback from market parties on the latest CRM design proposal for Availability Obligations and Penalties.

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means is a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

~~ABOUT THE PUBLIC CONSULTATION~~

~~This design note is put for formal public consultation and any remark, comment or suggestion is welcomed. 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 **Friday 11 October 2019 at 6 pm**.~~

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn6_crm-design-note---availability-obligations-and-penalties.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf

~~Early October also a second set of design notes will be launched by Elia for public consultation.~~

~~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.~~

~~1.7~~1.2 Scope and structure of the present design notes

LEGAL FRAMEWORK

This design note serves to explain the design concepts proposed for the Belgian CRM concerning Availability Obligations and Penalties aspects.

Article 7undecies §8 of the Belgian Electricity Law[5] states the following on this aspect (own translation from the ~~l~~law):

5 http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&table_name=wet&cn=2019042221

"After consultation of the grid users, the transmission system operator submits the market rules of the capacity remuneration mechanism for approval to the Regulator…

The market rules of the Capacity Remuneration Mechanism entail in particular:

…

3° the obligations for the availability obligations for capacity providers, and the penalties for violation of the obligations;

…"

Furthermore, §7 in this section of the law reads:

"…During the entire period of delivery of capacity, the transmission system operator will verify the availability of the contracted capacity, in accordance with the market rules of the capacity remuneration mechanism intended in paragraph 8."

This means that the law appoints to Elia the task of proposing the CRM Market Rules – to be approved by CREG – and also the execution of the availability verification during the Delivery Period. Given these responsibilities and in preparation of the first iteration of this design cycle, Elia leaves the current design note on Availability Obligations and Penalties up for consultation by the market.

The details for Availability Obligations will be mainly governed by the CRM Market Rules and further described in the Capacity Contract. Article 7undecies §8 also gives a framework for this contract:

"After the auction, the Capacity Providers will close a Capacity Contract with the Contractual Counterparty appointed according to article 7 quaterdecies. The Capacity Contract describes the obligations of the Capacity Provider, in particular the availability obligation…

…The Capacity Contract is in accordance with the market rules of the Capacity Remuneration Mechanism intended in paragraph 8. The standard Capacity Contracts are approved by the Regulator, upon proposal of the Contractual Counterparty, where appropriate drafted in cooperation with the Transmission System Operator, and published on the website of the Contractual Counterparty."

AVAILABILITY OBLIGATIONS AND PENALTIES IN THE BROADER FRAMEWORK

Figure 1 illustrates this provision in the broader legal framework, where Availability Obligations and Penalties are marked by an orange box.

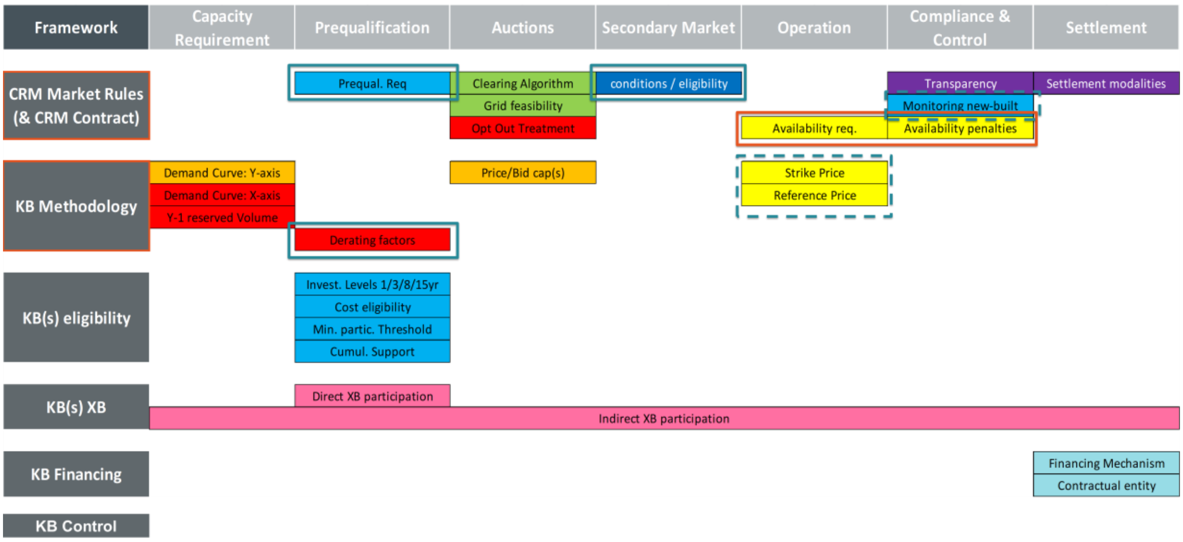


Figure 1: CRM legislative framework

This topic of the Availability Obligations and penalties interacts with other elements of the CRM design. In particular the topics Derating Factors, Secondary Market and Prequalification Requirements – indicated by the green boxes in Figure 1~~Figure 1~~ – link strongly with Availability Obligations and Penalties, and will be referred to throughout the text.

It is also part of the larger view of the "Capacity Product", i.e. the functioning of a Capacity Market Unit (CMU) once it has been contracted in a CRM. Availability Obligations and Penalties need to play a specific role and function in the Capacity Product that fits together with the other elements that compose the CRM design.

Section 2 defines this role as guaranteeing adequacy during the Delivery Period, particularly in the interaction between Availability Obligations and Penalties, Monitoring new-built (henceforth referred to as "Pre-Delivery Period Monitoring") and Strike and Reference Price (indicated by the green dotted boxes in Figure 1~~Figure 1~~). The design of the latter two are however out of scope for this design note and are treated in separate notes ("~~Strike & Reference Price~~Payback Obligation" & "Monitoring").

Section 2 defines objectives the Capacity Product should respect, which are in line with the objectives of the Capacity Remuneration Mechanism and the Market Rules as defined in the Belgian Electricity Law[5~~1~~]. It will conclude on two things:

1. Adequacy, cost-efficiency and no market interference are the prime objectives for the Capacity Product.
2. The Availability Obligations explained in this note as the prime driver of adequacy during the Delivery Period, contrary to the pay-back obligation (capturing windfall profits during the Delivery Period) and Pre-Delivery Period Monitoring (applying before the Delivery Period).

DESIGN OF AVAILABILITY OBLIGATIONS AND PENALTIES

Knowing that the main function of the Availability Obligations and Penalties is guaranteeing adequacy during the Delivery Period, the design is constructed to achieve this objective.

Section 3 develops the Availability Obligations mechanism further. It selects a trigger-based mechanism using the Day-Ahead Market Price as a reference and most appropriate to achieve the Capacity Product objectives. This leads to the definition of AMT Hours and AMT Moments that can be monitored. It will then define a method for all participating CMU's to assess a difference between Obligated and Available Capacity at relevant moments for ~~Monitoring of availability~~Availability Monitoring. In case the Availability Monitoring leads to insufficient proof of capacity to deliver energy when needed (i.e. Proven Availability) for certain CMU's, they are prone to Availability Tests.

An A~~a~~vailability P~~p~~enalty applies to a positive difference between Obligated (including procurements on secondary market) and Available Capacity~~ not covered in the Secondary Market~~. This is referred to as "Missing Capacity" Section 4 presents the proposed method for calculating this penalty. Next to a proportional formula to this difference, it foresees modalities for the escalation of penalties.

2 Definition of the capacity product

The Capacity Product is defined as the complete set of rules and regulations that drive the behavior and performance of C~~c~~ontracted C~~c~~apacity in the CRM. It thus entails the functioning of Capacity Market Units in the Capacity Remuneration Mechanism after contracting. Different forms of rules and regulations determine this:

- The Clean Energy Package, in particular Commission Regulation 2019/943;
- T~~t~~he Belgian Electricity ~~Law~~Act[51];
- T~~t~~he various Royal Decrees concerning the CRM (see Figure 1~~Figure 1~~);
- T~~t~~he Market Rules (see Figure 1~~Figure 1~~);
- The Capacity Contract.

In essence, they need to provide the right signals and incentives to achieve the desired objectives from the Capacity Product. Article 7undecies of the Belgian Electricity Act~~Law~~[5][1] provides a basis for these objectives (own translation):

- § 3. *"The level of security of supply to be achieved predetermined before the CRM shall correspond with the demand curve…"*
- §1: *"…The CRM shall be designed so that the cost is as low as possible"*

This means that the overall objective of the CRM for Belgium is to ensure a level of Security of Supply at the lowest cost possible. Both "Adequacy" and "Cost-Efficiency" are therefore considered as the first two primary objectives for the Capacity Product.

A third primary objective of the Belgian CRM is "No Market Interference". This follows from the ~~Clean Energy Package~~Regulation 2019/943, which imposes that capacity mechanisms ensure among others:

- Technology neutrality of the mechanism
- Level playing field for all participants
- Limit the market distortions caused by a CRM

Figure 2~~Figure 2~~ summarizes the three principal objectives of the capacity product.

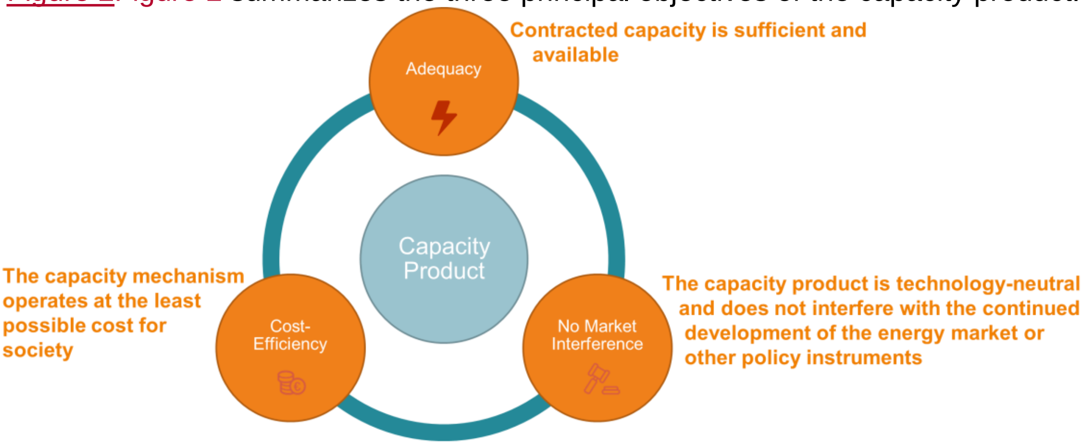


Figure 2: Principal Capacity Product objectives.

Before treating the Availability Obligations and Penalties design, it is useful to define their role in the bigger picture of the capacity product. It is important to keep in mind that they only come into play after selection of a CMU in the A~~a~~uction and signature of the Capacity Contract. However, the interaction with other design elements applying at that point are also of importance. Particularly, the "Pre-Delivery Period Monitoring", "Strike Price" and "Reference Price" have also their characteristics/boundaries and also serve objectives. They will thus also influence the aforementioned functioning of the Capacity Market Units. The boundaries and objectives of each of these elements thus warrant a clear definition.

In this light, the design considers Availability Obligations as the **prime driver for adequacy during the Delivery Period**, by ensuring the availability of CMU's at adequacy-relevant moments. Figure 3~~Figure 3~~ gives a summary of the relationship between Availability Obligations and Penalties, Pre-Delivery Period Monitoring and the Payback Obligation.

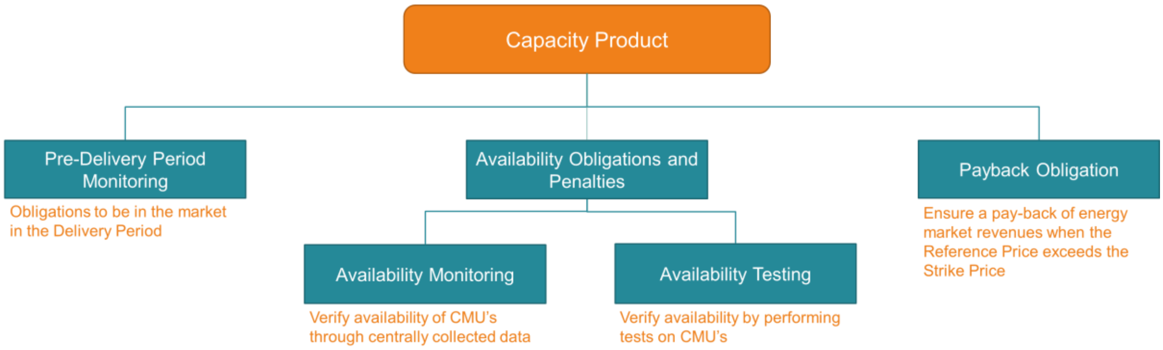


Figure 3: Summary of the different obligations of the Capacity Product

The Pre-Delivery Period Monitoring serves to ensure entry into market of the CMU's that were contracted in the ~~Capacity~~ Auction. It takes place in the period starting from signature of the Capacity Contract right up until the Delivery Period. From this point onwards, the Availability Obligations and Penalties will take over.

The remainder of this design note will treat the cases where a CMU has successfully entered into the market according to the process set out in the Pre-Delivery Period Monitoring. Availability Obligations and Penalties apply in the subsequent Delivery Period. The timeline in Figure 4~~Figure 4~~ illustrates this.

Figure 4: Timeframe for application of Pre-Delivery Period Monitoring vs Availability Obligations

Contrary to the Pre-Delivery Period Monitoring, the P~~p~~ayback O~~o~~bligation characterized by the Strike and Reference Price applies in the Delivery Period. The design note on ~~Strike and Reference Price~~the Payback Obligation will contain the details of the proposed implementation of the Payback Obligation in the Belgian CRM. In general, Availability Obligations and the Payback Obligation are complementary to each other.

Availability Obligations and Penalties is split further into "Availability Monitoring" and "Availability Tests~~ing~~". Section 3 explains these concepts and their application.

3 Availability Obligations

Section 2 concluded that the Availability Obligations are the key for ensuring the availability of CMU's. This relates in particular to one of the main objectives of the Capacity Product: Adequacy. Every contracted CMU in the A~~a~~uction contributes to the achievement of the reliability standard, meaning that Elia should be able to verify the availability of each one. Given that the CMU's could number in the hundreds or thousands, ~~monitoring of their availability~~Availability Monitoring through centrally collected data seems most appropriate.

These data can come from various sources and should be sufficient to reliably assess availability. Given that another main objective is c~~C~~ost-e~~E~~fficiency, the following principle should apply to the data sourcing:

> Use data collected through other market mechanisms as much as possible and limit the amount of additional data requirements imposed by the C~~c~~apacity R~~r~~emuneration M~~m~~echanism.

DISCLAIMER: this principle will be applied as far as other constraints, such as legal considerations, accountability for the data and operational feasibility, permit its application. The used data sources presented in this note should be treated as indicative. The CRM design could still ask for specific data if any of the presented sources are no longer deemed plausible.

~~Several t~~The Availability Monitoring M~~m~~echanism design will be further detailed in this section. Firstly, paragraph 3.1 discusses the identification of the moments during which Elia will check availability. These moments should be relevant for adequacy.

In addition to the moments of monitoring, the mechanism needs to define the required level of availability. This will lead to the definition of **Obligated Capacity** in Paragraph 3.2.

The monitoring mechanism is necessary to establish the **Available Capacity** at every moment of monitoring, based on the centrally collected data. It is apparent from the functioning of other mechanisms that the available data will differ depending on unit size and technology. This will result in the definition of **CMU t~~T~~ypes** determining the monitoring method, explained in Paragraph 3.3.

As a last resort, the Market Rules will foresee **Availability Tests~~ing~~** where the monitoring mechanism is insufficient. The objective of testing is to create equal degrees of monitoring and required proof of availability for all CMUs. Paragraph 3.4~~0~~ proposes a basis for the modalities of testing.

3.1 Availability Monitoring Mechanism

As stated previously, the moments of monitoring have to be relevant for adequacy. In this respect, a CMU that is available all year except for when the system is in real need of this capacity has a limited contribution to adequacy as opposed to capacity that is unavailable for most of the year, but available every time the system requires their capacity. In order to reflect actual contribution towards adequacy, the monitoring should thus happen during adequacy-relevant moments. An objective manner to identify these moments is necessary. This will further be referred to as the **Availability Monitoring Trigger (AMT)**. Moments identified by this trigger are defined as **AMT Moments**.

Design Proposal #1:

Elia can perform Availability Monitoring subsequent to an Availability Monitoring Trigger (AMT). Elia can assess the Available Capacity on all ~~CRM-contracted capacity~~Contracted Capacities during the AMT Moments identified by an AMT.

Paragraph 3.1.1 discusses the appropriate choice of trigger type for the Belgian m~~M~~arket. This will be a uniform trigger for all ~~CRM-contracted capacity~~Contracted Capacities to be monitored on availability, in order to ensure adequacy at system level. It will conclude on a trigger based on the electricity m~~M~~arket p~~P~~rice, for it best allows ~~the best~~ all capacities to contribute at the same adequacy relevant moments ~~for~~ to the system.

Subsequently, Paragraph 3.1.2 proposes the D~~d~~ay-A~~a~~head M~~m~~arket P~~p~~rice for the Availability Monitoring Trigger. The price level for the trigger will be referred to as the **Availability Monitoring Trigger Price, AMT Price** or $\mathbf{p_{AMT}}$.

Finally, Paragraph 3.1.3 sets the basis for the calibration of **the AMT Price.**

3.1.1 Choice of trigger type

In a market environment like the electricity market, scarcity moments are strongly correlated with electricity **market price**, as this price is driven by the merit order of capacity offering to the system. The higher the market price, the less margin typically remains between production and demand and the more the system approaches complete exhaustion of these resources (i.e. scarcity). Stated otherwise, a market price could be a good and reliable summary of the state of the system in terms of adequacy.

A market price has the extra advantage that it is a market-wide signal, for which transparent information exists available to all market parties. It also implicitly takes into account the import capabilities, as foreign offers integrate in the same merit order via the single D~~d~~ay-A~~a~~head M~~m~~arket coupling mechanism. Since Belgium is effectively reliant on import and import capabilities make up a significant share in meeting the peak load, this effect is especially impacting.

Design Proposal #2:

The Availability Monitoring Trigger shall be based on electricity market price.

A summary of the functioning of the Availability Monitoring Trigger is given in Figure 5~~Figure 5~~.

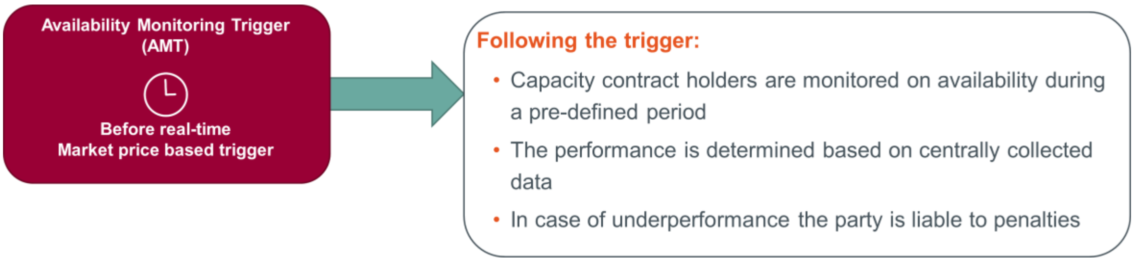


Figure 5: Illustration of the Availability Monitoring Trigger

The following paragraph will determine the appropriate market price trigger.

3.1.2 Choice of Market Price Trigger

The m~~M~~arket p~~P~~rice should be a continuous and visible price signal for the Belgian market, so that there is one reference for all involved actors (Capacity Providers, Elia, Contractual Counterparty,…). More importantly, a high price value in this reference should be relevant for adequacy. In particular it should reflect structural adequacy problems, as these are envisaged to be covered by the CRM.

To this end, the **Belgian Day-Ahead Market P~~p~~rice** fits all criteria:

- Its transparency is attested by e.g. the numerous contract applications where it is used as a reference for transaction settlements.
- It is relevant for structural adequacy, since at the moment of DAM closure, BRP portfolio's need to be settled. Sufficient capacity in the market should be able to settle the portfolio's in day-ahead. Uncertainties after this point are managed via Intraday transactions, Balancing and Ancillary Services. This is more the territory of flexibility, which is not the overall goal of the CRM.
- Its accessibility to market players is attested by its liquidity compared to other markets with transparent information (25-30% of the total load in Belgium).
- In addition, the interval between selling and delivery allows for participation of technologies with slow ramping and start-up constraints. Considering structural adequacy, these types of technologies definitely contributing as well. The CRM design should also accommodate these technologies, which could include slower starting generation units, but also industrial processes that could deliver demand response when timely informed.

The Day-Ahead price signal that identifies an AMT will be a weighted average of the NEMO's active in the Belgian bidding zone according to volume traded via that NEMO.

Contrary to the Day-Ahead Market P~~p~~rice, the Intra-Day price signal has been showing less liquidity so far and by its nature is not a reference for technologies reacting slower than~~e~~ its timeframe. The latter is even more applicable for the real-time balancing price, which requires close-to-real-time reaction. Furthermore, many price spikes in the balancing price are due to flexibility (sometimes temporary) issues and not adequacy. The Adequacy and Flexibility study[6] published by Elia contains more information on how the two subjects are considered separately.

By using the Day-Ahead Market P~~p~~rice as a reference, the design obtains a transparent, accessible and technology-inclusive signal for adequacy-relevant moments. To clarify: this does not limit the choice of Capacity Holders to participate in any of the other existing markets. It only serves to indicate that the capacity should be available in any market at occurrences of a high Day-Ahead M~~m~~arket P~~p~~rice. Section 3.3 contains more information on how this applies.

Day-ahead trades are made through NEMO's, via their dedicated platform. Decoupling of the NEMO from the market could lead to the unavailability of a correct Day-Ahead Market P~~p~~rice. In this case, the AMT trigger should not automatically apply.

Design Proposal #43:

When a NEMO composing (part of) the reference Day-Ahead Market P~~p~~rice is decoupled from the Day-Ahead Market (e.g. due to IT problems), this must not automatically lead to the triggering of an AMT. Elia shall notify the Capacity Providers shortly after Day-Ahead Market clearing according to the procedure and modalities defined in the Capacity Contract.

A sufficient, yet simple and transparent rule for triggering Availability Monitoring would be if the **Day-Ahead Market P~~p~~rice exceeds a certain level**. Since price levels depend largely on the capacity in the market – which can vary from one Delivery Period to another – a **yearly calibration** of this level seems appropriate. This calibration will be subject to the method described in the Market Rules and further clarified in the next paragraph.

The price level causing the AMT will be the system-wide indicator, applicable to all contracted CMU's. This price level will be further referred to as the **AMT Price** or **p_{AMT}**.

[6] http://www.elia.be/~/media/files/Elia/publications-2/studies/20190628_ELIA_Adequacy_and_flexibility_study_EN.pdf

As a consequence of choosing the Day-Ahead Market P~~p~~rice as a trigger, the Availability Monitoring applies on an hourly basis. Every hour causing an AMT – i.e. for which the Day-Ahead Market P~~p~~rice exceeds the AMT Price – is referred to as an **AMT Hour**. A string of consecutive AMT Hours make up an **AMT Moment**.

Design Proposal #~~4~~5:

An Availability Monitoring Trigger occurs when the Day-Ahead Market Price exceeds the AMT Price.

The AMT Price will be calibrated yearly according to the method~~nd~~ defined in the Market Rules

Every hour where the Availability Monitoring Trigger occurs is an AMT Hour. A string of consecutive AMT Hours makes up an AMT Moment.

At any AMT moment, Elia can assess the availability for each AMT Hour composing the AMT Moment.

Figure 6~~Figure 6~~ illustrates this with two example cases, both with an AMT Price of 150 €/MWh. In Case 1 the Day-Ahead Market P~~p~~rice supercedes 150 €/MWh during the block of hours 2 through 5, i.e. consecutively above 150 €/MWh. This interval consists of one single AMT Moment. Each of the consecutive hours 2-3-4-5 are AMT Hours. Hours 1 and 6 are not AMT Hours and are thus not considered for Availability Monitoring, as the price is below 150 €/MWh.

In Case 2 there are two AMT Moments as there are two separate strings with AMT H~~h~~our(s): hours 2-3 (2 AMT Hours) and hour 5 (1 AMT Hour). Elia will not apply monitoring during hours 1, 4 and 6 in this case.

Figure 6: Example cases of AMT Hours and Moments for p_{AMT} = 150 €/MWh

The next p~~P~~aragraph discusses the method for calibration of the AMT Price.

3.1.3 Calibration of the Availability Monitoring Trigger Price

This paragraph aims to describe a method for a yearly calibration of the AMT Price, i.e. a single Day-Ahead electricity price level above which Availability Monitoring will take place. The objective is threefold:

- The trigger should correspond to adequacy-relevant moments
- The trigger should occur sufficiently during the Delivery Period to have clear incentive to be available
- The trigger should be transparent during the Delivery Period

The current design proposal aims to achieve these objectives by taking the steps shown in Figure 7~~Figure 7~~:

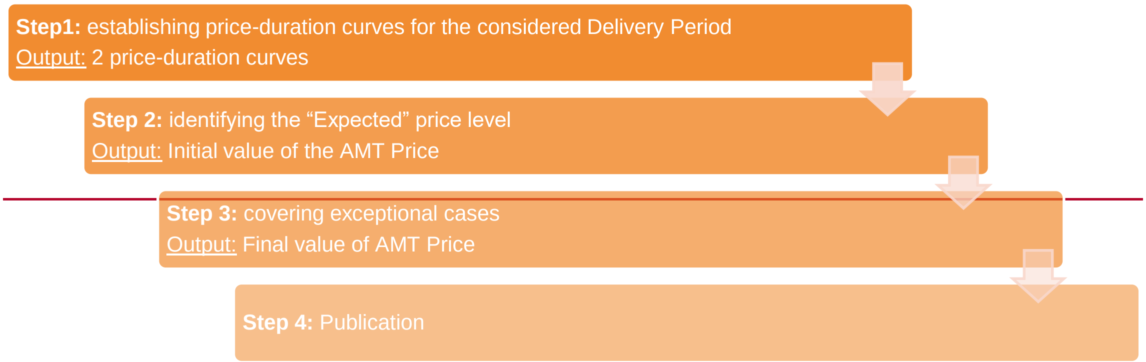


Figure 7: steps in the yearly calibration of the AMT Price

Each step is now explained in more detail.

Step 1: **establishing price-duration curves for the considered Delivery Period**

Determining statistically likely, but adequacy relevant price levels requires price occurrences for the Delivery Period. This is best shown in monotonic price-duration curves (see Figure 8~~Figure 8~~). The moment for establishing these curves and nature of the curves is~~are~~ key to a qualitative calibration. Both will be discussed separately. The moments most relevant to adequacy are at high end of the curve when the highest prices occur.

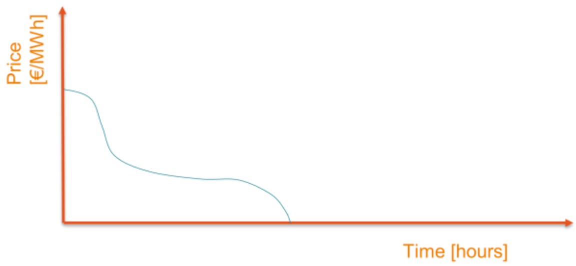


Figure 8: Illustration of a price-duration curve

Moment of calibration:

In order to retain a transparent AMT during any Delivery Period, it is best to determine the value of AMT Price upfront. The absence of an ex-ante transparent signal would result in increased uncertainty for Capacity Providers and – as a result – also increased cost of CRM (which is contrary to the cost-efficiency objective). Additionally, any financial incentives for corrective behavior stemming from the Contractual Counterparty (e.g.: A~~a~~vailability P~~p~~enalties) would come long after the occurrence of the AMT Moments. This results in slow market feedback, to the detriment of the adequacy objective. This then excludes determining the AMT Price based on a price duration curve using the real DAM price values observed during the Delivery Period itself, as they are only known ex-post.

It is therefore proposed that the calibration should be based on the information used in the preparation of the Y-1 auction and also take into account the results of the Y-1 (and earlier Y-4) A~~a~~uction for the relevant Delivery Period. This yields the most recent view on capacity resources for a Delivery Period. This is in the ~~advantage~~ interest of both sufficient monitoring hours and risk perception from market actors due to possible variation of the real AMT H~~h~~ours. In addition, there is no strong need for market parties to know the value of the AMT Price before the ~~Capacity~~ Auction in Y-4 as long as they can have a view on the expected amount of AMT H~~h~~ours. A calibration close to the Delivery Period is desirable. Figure 9~~Figure 9~~ shows a simple timeline.

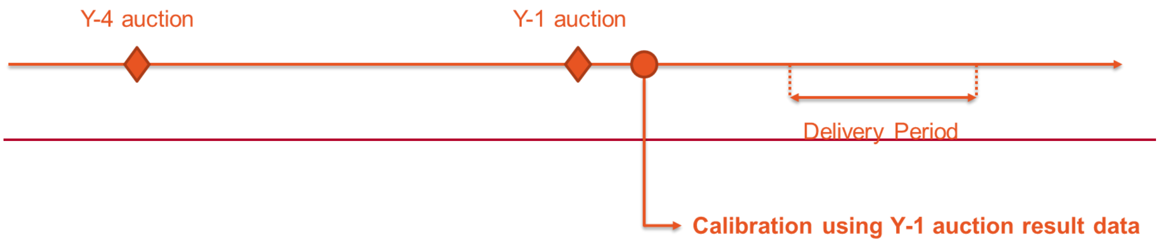


Figure 9: illustration of timeline for calibration

Nature of the price duration curves used for calibration of the AMT Price

Finally, the calibration method should assess multiple statistically relevant cases for which the price-duration curve will have different values. To this respect, the design proposes the inclusion of the following cases stemming from probabilistic calculations:

- **Expected:** a median outlook on the anticipated price-duration curve throughout the Delivery Period
- **Mild year**: anticipated price-duration curve should the underlying drivers cause relatively low prices throughout the Delivery Period (e.g.: mild winter), e.g. via a P_{10} curve
- ~~**Worst case**: anticipated price duration curve should the underlying drivers cause significantly higher prices throughout the Delivery Period (e.g.: harsh winter/high unavailability), e.g. via a P_{90} curve~~

This allows to take into account exceptional cases driven by climate factors and unavailability of capacity. Figure 10~~Figure 10~~ shows an example of all price-duration curves.

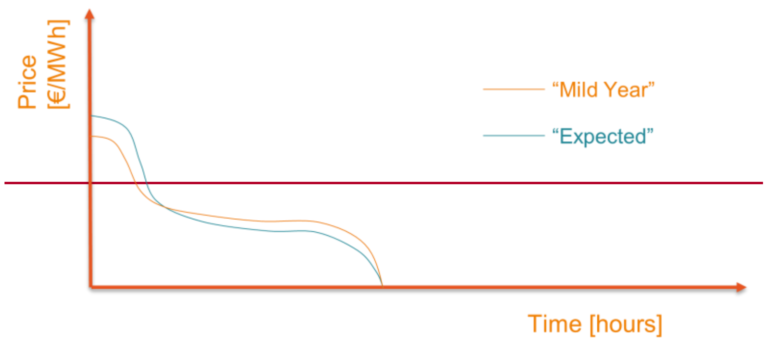


Figure 10: Illustration of different Price-Duration curves to be determined

To achieve these estimations, Elia proposes to use price-duration values resulting from probabilistic market modeling used for the calibration of other CRM parameters (e.g. derating, intermediate price cap,…). In doing so, the estimation is sure to be in line with other considerations. The resulting price-duration curve can now be used for calibration in step two.

Step 2: identifying the "Expected" price level

This price level should correspond to statistically likely, adequacy relevant (i.e. above normal values of the market price) occurrences. A subset of the highest prices estimated by the "Expected" price-duration curve established in Step 1 should include these occurrences. The lowest price observed in this subset is then equal to the AMT Price. Figure 11~~Figure 11~~ shows an example of determining the AMT Price based on an estimated price-duration curve.

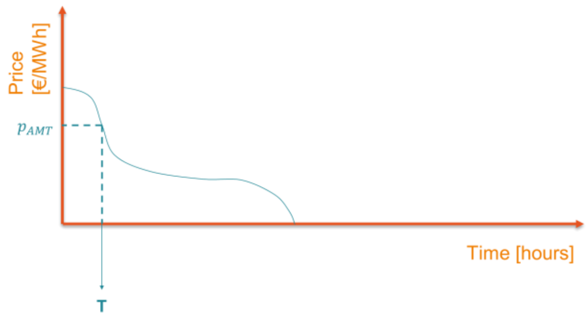


Figure 11: Example of calibrating p_{AMT} using a price-duration curve for the Delivery Period

The choice then comes down to determining a number of hours *T* comprising the likely and adequacy relevant occurrences. This balanced value for *T* is beneficial as too much of a bias in one direction could undermine the initial objectives:

- **Downwards:** too little AMT H~~h~~ours could result in too little credible threat for market parties to make themselves available. This is to the detriment of the adequacy objective.
- **Upwards:** this could lead to excessive availability demand (especially regarding planned maintenance). This is to the detriment of the cost-effectiveness objective.

This period should be specified in the Market Rules for the C~~c~~apacity ~~market~~ Remuneration M~~m~~echanism and will be a relatively stable parameter from year to year.

Elia proposes a value of ***T* = *100 hours***. Such an amount allows for a sufficient set of hours to verify the actual availability, it also allows to ensure availability during a reasonable level of hours. If for instance on a tight day a morning peak would last 2 hours and an evening peak 3 hours, this would correspond to about 20 days during which during peak hours availability could be monitored. Obviously, by relying on a price signal (i.e. the preferred choice for the AMT) a much finer assessment of actual adequacy relevancy can be obtained compared to a very simple morning/evening peak approach.

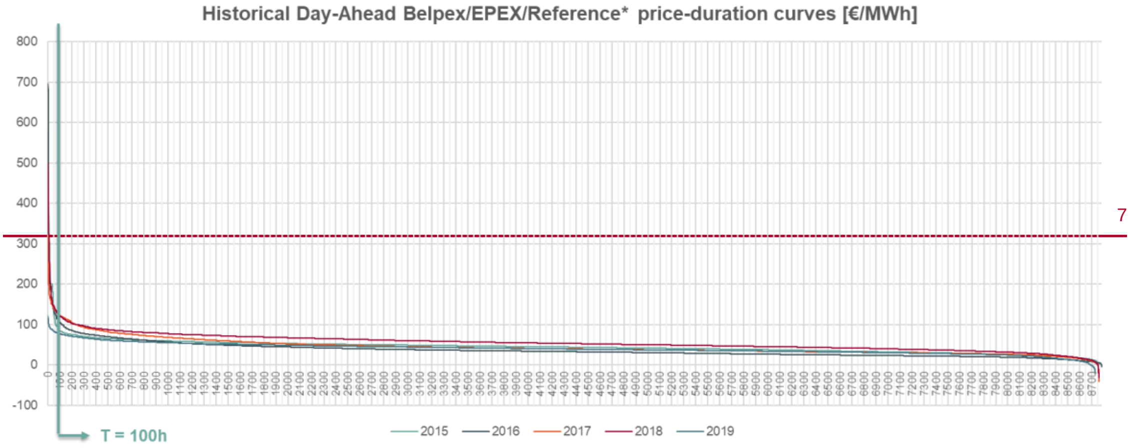
Table 1~~Table 1~~ gives the historical 100 hour price level for 2015-2018 of the BELPEX/EPEX Day-Ahead spot prices, showing that this level can differ considerably from year to year.

Table 1: Historical BELPEX/EPEX Day-Ahead price levels surpassed during 100 hours

Year	Day-Ahead price level only surpassed during 100 hours
2015	82,53 €/MWh
2016	104,94 €/MWh
2017	121,3 €/MWh
2018	120.1 €/MWh

2019	76,49 €/MWh

Figure 12~~Figure 12~~ shows the price-duration curves for the same years. It shows that below 100 hours of duration, the variation in prices becomes significantly higher, whereas for longer durations the curve shows little variation (i.e. a more flat part of the curve). This illustrates that – historically – 100 hours indeed reflects exceptional events.



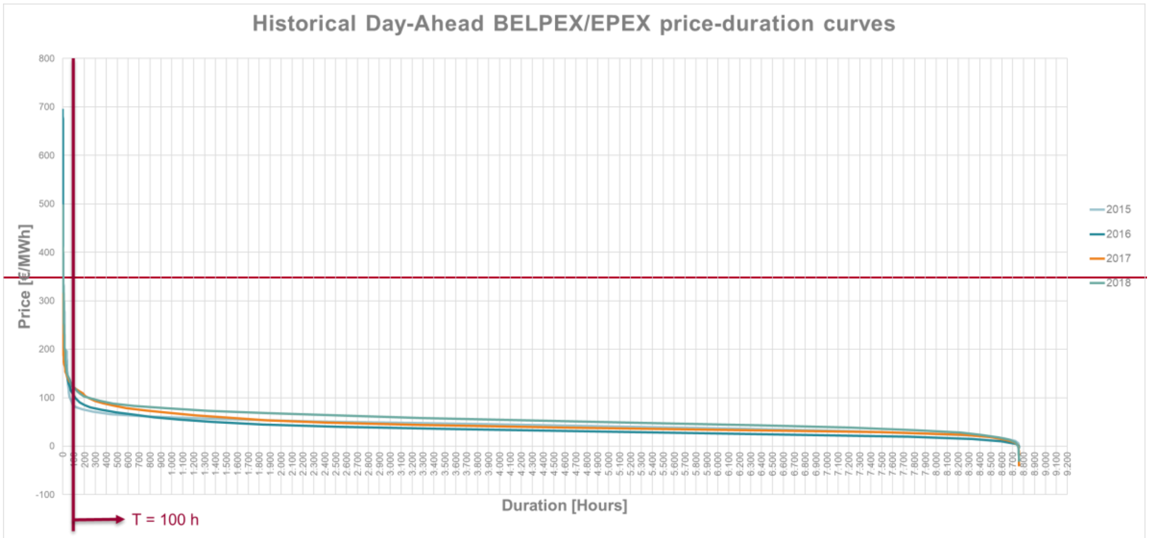


Figure 12: Historical BELPEX/EPEX price-duration curves

[7] As from 03/07/2019, a weighted average reference between Nordpool Spot and EPEX Spot Day-Ahead prices were used as a reference price for this graph.
Additionally, some data from the night of June 7th-June 8th 2019 was not retained in the graph as there was a market decoupling causing very low negative prices.

When looking at the ~~E~~expected price duration curve for the Delivery Period, the price corresponding to T=100h is defined as the initial AMT Price (as Figure 11~~Figure 11~~ illustrates).

Step 3: covering exceptional cases

Step 2 established a(n initial) value for the AMT Price. The methodology should now verify if this value is robust against exceptional cases when considering intra-Delivery-~~Year~~ Period variations. This can be done by comparing the "Expected" price duration curve with those for the "Mild year"~~ and "Worst case"~~. ~~The following two elements are proposed:~~

~~2.~~ ~~**Mild year:**~~This is done by identifying if the duration corresponding to p_{AMT} is larger than a pre-defined value "**T-**" in the '"Mild year" price-duration curve. If not, p_{AMT} becomes the price corresponding to T- in the Mild year price-duration curve. The value of T- will be fixed in the Market Rules. Elia proposes a value of **20 hours** for T-.

3. ~~**Worst case:** the maximum amount of AMT hours that could be monitored during a delivery are capped at the duration corresponding to p_{AMT}. This cap is defined as "**T+**".~~

Figure 13~~Figure 13~~ illustrates the ensemble of calibrating p_{AMT} ~~and T+,~~ using T and T-. This is the last step in calibration the AMT ~~p~~Price before publication.

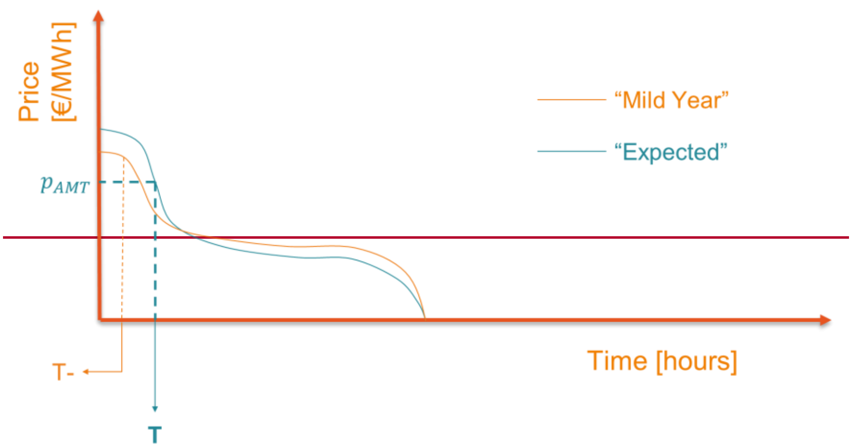


Figure 13: Conceptual illustration for calibrating p_{AMT} and T+ using T and T-

Step 4: publication

Publication of the AMT Price will be after the Y-1 ~~a~~Auction. This is a direct consequence of the calibration timing discussed in step 1 of the process. Additionally, it ensures level playing field Y-4 and Y-1 ~~a~~Auction, as neither have AMT Price information before bidding in the Capacity Auction. The candidates for the Y-1 ~~a~~Auction should not need this information either, for the same reasons as Y-4 candidates (explained in Step 1). Figure 14~~Figure 14~~ a simple timeline.

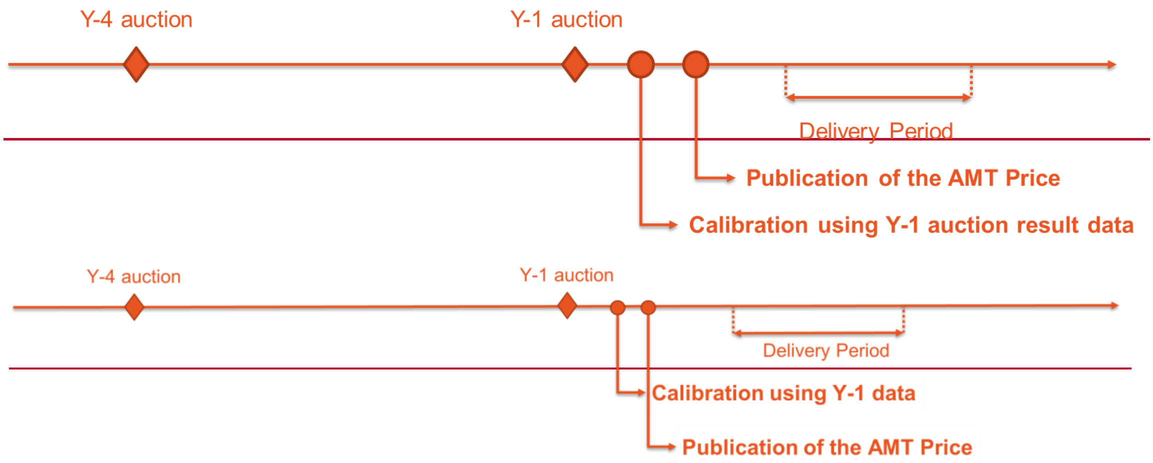


Figure 14: timing of publication of the AMT Price

The Design Proposal below lists the full process.

Design Proposal #5~~6~~:

The AMT P~~p~~rice will be ex-ante determined in the year preceding the Delivery Period, based on “Expected~~”, ~~” and “Mild year” ~~and “Worst case” ~~cases. The cases shall be based on a scenario consistent with the one(s) determined to calibrate the volume to be procured through the CRM as defined in the Royal Decree M~~m~~ethodology meant in Art. 7undecies §2 of the Electricity ~~Law~~Act.

The first value of the AMT Price shall be the price corresponding to a duration of “T” hours in the “Expected” scenario price-duration curve. The Market Rules will specify the period “T”, currently proposed at 100 hours.

It shall be verified if this value for the AMT P~~p~~rice results in a predicted duration that is larger than a pre-defined minimal duration “T-“ in the “Mild Year” ~~scenario~~case. If this is not the case, AMT Price should instead be set to the price value corresponding to a duration of “T-“ in the price-duration curve of the “Mild Year” ~~scenario~~case. The ~~Capacity ~~Market Rules will define the value for “T-“, currently proposed at ~~100 ~~20 hours.

~~A cap will apply on the effective number of monitoring hours during the Delivery Period. Even if there are more AMT hours during the Delivery Period, Availability Monitoring for those hours will no longer be penalized. It is determined as the duration predicted for the AMT price in the predicted price-duration curve for the “Worst case” scenario. This value is denoted as “T+”.~~

Publication of the AMT Price value ~~and T+ ~~occurs after the closure of the Y-1 A~~a~~uction. Once published these parameters are fixed for the concerning Delivery Period.

This finalizes how to establish the single trigger that will result in the monitoring of capacity availability contracted in the CRM framework. The next step is to define which amount of capacity is required at AMT M~~m~~oments for all types of C~~c~~ontracted C~~c~~apacity. This definition needs to be consistent with the way it is taken into account in adequacy modeling, considering the technical aspects of different capacity types, and it should be non-discriminatory.

~~3.3~~3.2 Obligated Capacity

The goal of this paragraph is to define the capacity required at AMT M~~m~~oments from each CMU. Therefore, it will define the rules to establish the “Obligated Capacity” or “$P_{obligated}$” for each CMU and each AMT Hour. The CMU has to make the Obligated Capacity available at every AMT Hour separately in order to ensure adequacy. Paragraph 3.2.1 explains the motivation and application of this principle further.

Generic rules to define the Obligated Capacity apply to all CMUs. In order to ensure the contracted adequacy, the obligation needs to be consistent with how the adequacy model takes the CMUs into account, i.e.: how the D~~d~~erating Factor is determined (more information on this in the Derating Factors design note). For this, there is a difference between N~~n~~on-E~~e~~nergy C~~c~~onstrained and E~~e~~nergy C~~c~~onstrained CMU’s, further explained in paragraphs 3.2.2 and 3.2.3~~0~~ respectively.

The Availability Monitoring Mechanism will then compare this with the measured Available Capacity to assess any volume that is liable to an Availability Penalty in paragraphs 3.3 and section 4.

~~3.3.1~~3.2.1 Ensuring hour-by-hour adequacy

A system is adequate when the capacity in the system is able to cover the load at any time in line with the reliability standard. This is why the ~~Capacity~~ Auction procures a derated volume covering peak demand up until a reliability standard. Therefore, to be adequate, the market should be able to rely on this volume of capacity at all adequacy-relevant moments.

The Availability Monitoring M~~m~~echanism serves as a verification that the procured capacity could indeed respond to a market signal in day-ahead, in order to meet the demand. This means that every CMU should make at least their Total Contracted Capacity ~~divided~~ (see 3.2.2) or the Total Contracted Capacity divided by the Derating Factor available ~~Eligible Volume (see 3.2.2) or the Reference Power~~ according to their SLA ~~(see 0)~~ (see 3.2.3) available to the market. Moreover, they should do so at every AMT H~~h~~our, as insufficient capacity at one AMT H~~h~~our could cause an adequacy issue. Figure 15~~Figure 15~~ illustrates this principle. The volume required to be available for a specific AMT Hour is referred to as the Obligated Capacity.

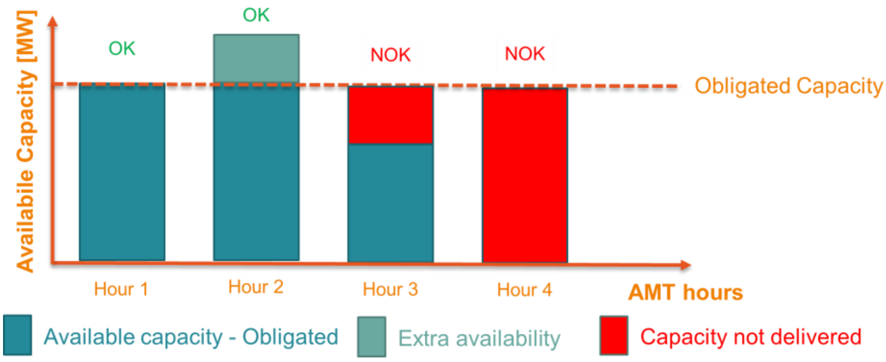


Figure 15: Conceptual illustration of Obligated Capacity for each AMT hour (i.e. for non-energy-constrained CMU's

It is important to note that the AMT Hours are the moments for which the capacity was contracted in the first place. Any unavailability during these hours detracts from the contracted service. For this reason, Availability Monitoring will apply regardless of Forced Outages or p~~P~~lanned o~~O~~utages. The obligation will also not be l~~L~~oad-f~~F~~ollowing, since the check is on availability of capacity, not delivery of energy.

Paragraph 3.3 defines the rules for measuring Available Capacity in the Availability Monitoring Mechanism. In case of Missing Capacity – i.e. a positive difference between Obligated and Available Capacity ~~not covered in the Secondary Market~~ – a penalty could apply, as section 4 describes. To avoid such a penalty, the CMU could instead sell their obligations~~source the missing capacity~~ on the Secondary Market of the CRM. Oppositely, "Hour 2" in Figure 15~~Figure 15~~ illustrates that a CMU could also be available beyond their Obligated Capacity during AMT Hours. In this case, the excess capacity can be sold on the Secondary Market. More information on these types of exchanges can be found in the Secondary Market design note.

At a system level, this creates an incentive to maximize A~~a~~vailable C~~c~~apacity during AMT Hours. Therefore, this design principle incentivizes system adequacy at all AMT H~~h~~ours.

Design Proposal #6~~7~~:

CMU's have to provide their Obligated Capacity at every AMT H~~h~~our. The Obligated Capacity is not influenced by Forced Outages or p~~P~~lanned o~~O~~utages.

~~3.3.2~~3.2.2 Obligated Capacity for N~~n~~on-E~~e~~nergy C~~c~~onstrained CMUs

For these CMU types, the duration of the AMT M~~m~~oment (i.e. the number of AMT H~~h~~ours) does not cause unavailability. This is why a uniform Obligated Capacity for every AMT H~~h~~our should not affect the expected expenses and revenues.

The derating of N~~n~~on-E~~e~~nergy C~~c~~onstrained CMU's is based on statistical drivers, such as F~~f~~orced O~~o~~utage rates and – for e.g. renewable sources – climate conditions. The adequacy model counts on these units to deliver make at least the ~~Eligible Volume~~Total Contracted Capacity available.

Design Proposal #7~~8~~:

For N~~n~~on-E~~e~~nergy C~~c~~onstrained CMUs, the Obligated Capacity is at every AMT H~~h~~our equal to the ~~Eligible Volume~~Total Contracted Capacity as ~~established in the Prequalification Processphase preceding the Capacity Auction~~indicated in the Capacity Contract.

In practice, these units will be available at full capacity at some AMT M~~m~~oments and significantly less or not at all at others. Using the principles of Secondary Market trading as explained above, the CMU's should be able to deliver at least the Eligible Volume on average.

~~3.3.3~~3.2.3 Obligated Capacity for E~~e~~nergy C~~c~~onstrained CMU's

If a CMU is energy constrained (e.g. a battery or an industrial process which can only be stopped for a limited time), it knows beforehand that at AMT Moments lasting longer than its energy constraint, it will have expenses on covering the Missing Capacity (i.e. penalty or replacement capacity). This is not compensated by benefits of availability in the other AMT Moments, exactly because they will be shorter. A CMU like this would then incorporate the expected expenses for a uniform Obligated Capacity at all AMT Moments in the CRM B~~b~~id, inflating the overall cost. This is contrary to the cost-efficiency objective.

Additionally, the adequacy model does not impose such a uniform profile for E~~e~~nergy C~~c~~onstrained CMU's. It determines their contribution **according to their Service Level (SLA)** comprising the energy constraint. This leads to a categorization of derating Table 2~~Table 2~~ shows.

Table 2: SLA's for Energy Constrained CMU's as defined in the derating design

"Aggregation category"	Duration	Limits
SLA #1	1h	1 activation / day
SLA #2	2h	
SLA #3	3h	
SLA #4	4h	
SLA #5	8h	
SLA #6	No Limit	

In order to be adequate, it is sufficient that these CMU types make their capacity available, as long as their energy is not depleted. However, at such moments, the system requires the Total Contracted Capacity divided by the Derating Factor, not the Total ~~Contracte~~Contracted Capacity. ~~Reference Power, not the Eligible one.~~ Figure 16~~Figure 16~~ illustrates this principle for a 50 MW Reference Power limited to two hours delivery.

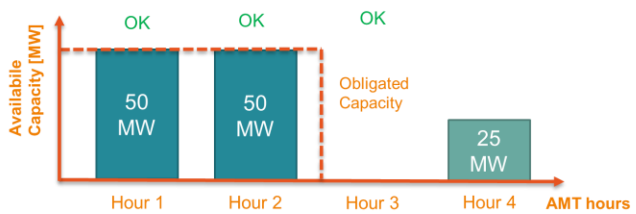


Figure 16 Numerical Example of Energy Constrained Obligated Capacity

If the Capacity Provider offers an SLA that matches the physical limit of the assets behind the CMU, they should not be able to offer any capacity to the Secondary

Market.

However, if a CMU does deliver beyond its SLA (e.g. Hour 4 in Figure 16~~Figure 16~~), it is in excess to what was contracted for the CRM and this capacity can be offered (ex post) to the Secondary Market.

This is especially advantageous when Capacity Providers see reasons beyond the e~~E~~nergy c~~C~~onstraint to be unavailable. Because these types of products are typically very diverse (e.g. demand response, aggregates…), an individual assessment by the C~~c~~apacity P~~p~~rovider of the capacity before SLA derating is advantageous to be able to strike the higher-mentioned balance between costs (i.e. penalties) of not respecting the SLA-determined availability and revenues (from both Primary and Secondary Market). This is why the design allows a Capacity Provider to declare – to an extent – their own Reference Power during Prequalification (see dedicated design note for rules).

Design Proposal #~~9~~8:

For E~~e~~nergy C~~c~~onstrained CMU's, the Obligated Capacity is equal to the ~~Reference Power~~Contracted Capacity divided by the Derating Factor, as determined during the Prequalification ~~phase~~Process, for ~~all~~ AMT H~~h~~ours identified as "SLA Hours", according to the procedure in the Market Rules, for in one day until the energy or activation constraint of the SLA has been met by energy delivery in~~of~~ the ~~assets~~ Delivery Point(s) comprising the CMU. ~~After that~~Outside of those hours, the Obligated Capacity will be equal to 0 MW for any other AMT Hour occurring in the same day.

~~3.4~~3.3 Available Capacity and CMU Types in the Capacity Market

The Availability Monitoring M~~m~~echanism has to define how the Available Capacity can be assessed at each AMT Hour and for every category of CMU. Paragraph 3.3.1~~0~~ specifies the rules for this, respecting the previously determined cost-efficiency principle that it should use data channels from existing market mechanisms as much as possible. The disclaimer at the beginning of this chapter still applies to this principle.

In this segmentation, some categories of CMU's will only truly deliver at prices that could exceed the AMT Price. To take this into account the Declared Market Price (DMP) is introduced. This means that the proof of this Available Capacity's capability to deliver the corresponding energy will be limited to certain price occurrences. This is where Proven Availability becomes relevant. Paragraph 0~~3.3.2~~ elaborates on both principles.

Finally, CMU's contracted in Ancillary Services by Elia are considered available for the contracted period unless proven otherwise via the availability checks foreseen in the context of the A~~a~~ncillary S~~s~~ervices. More clarifications on this link between mechanisms is explained in paragraph 0~~3.3.3~~.

~~3.4.1~~3.3.1 Rules for evaluating Available Capacity for each CMU Type

A first indicator of availability already in place today is the data coming through ~~outage planning agents~~scheduling obligations on the maximum available capacity of units. This is today the case for the CIPU contract typically applicable for units above 25 MW installed capacity, which are obliged to send a full schedule (including nominations of production). The~~se~~ obligations for these units will persist in the future.

In the future, this will be extended in the framework put forward by the System Operator Guidelines (SOGL)[8] and Belgium's national adoption of this regulation. Therein, the obligations ~~for the Outage Planning Agent~~ to communicate asset availability ~~and obligations for assets to have an assigned Outage Planning Agent are~~ are set out. Elia facilitates the implementation of this framework on a Belgian level, in close collaboration with the stakeholders[9]. ~~The current design proposal obliges availability data on generation/storage starting from Type B (currently set as > 1MW installed capacity) as defined following the Network Code dealing with Requirements for Generators and Demand Facilities directly connected to Elia's grid.~~

Remark: *please take note that this framework is still under construction and – whereas the proposal in this Design Note~~s~~ outlines principles based on the latest information – this could still be adapted in function of the final result, as also denoted in the disclaimer at the top of this section.*

The Availability Monitoring will take the information received through ~~Outage Planning Agents~~these obligations where available. The Outage Planning Agent can communicate three availability statuses. The link between the rated "Available Capacity" in the CRM is given in Table 3~~Table 3~~. This will only be applied as a rule to CMU's with a D~~d~~aily S~~s~~chedule obligation.

Table 3: Relation of Availability Status vs Available Capacity

Availability Status	Available Capacity
"Available"	$P_{max,\ Available}$[10]
"Unavailable"	0 MW
"Testing"	0 MW

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.220.01.0001.01.ENG&toc=OJ:L:2017:220:TOC
[9] As part of a larger project commonly referred to as ICAROS (Integrated Coordination of Assets for Redispatching and Operational Security)
[10] Any communicated restrictions on the production capacity, as determined in the SOGL, will be taken into account

CMU's not having a~~ny~~ ~~outage planning~~Daily Scheduling O~~o~~bligation~~s~~, should communicate planned unavailability until D-1 before the Day-Ahead market. This is similar to assets with outage planning obligations under the SOGL and falling under the "Alternative Outage Coordination Calendar" in the current proposal put forward by Elia. Any future evolutions of these rules could apply on the CRM as well.

Design Proposal #~~10~~9:

Available Capacity is primarily determined on the data received via the ~~Outage Planning Agent~~D~~d~~aily S~~s~~chedules and~~,~~ according to Table 3~~Table 3~~. CMU's without ~~outage communicatio~~Daily Scheduling~~n~~ O~~o~~bligations should notify Elia of any planned capacity restrictions before ~~D-1 before Day-Ahead at the latest~~9 AM CET in Day-Ahead at the latest.

~~Specifically for Demand Side Response products and aggregations, the capacity to reduce consumption is important. This is why Available Capacity at any AMT Hour for a demand product (prior communicated outages as mentioned above notwithstanding) will be a comparison of the consumption with an Unshedable Margin (UM), established during the Prequalification Phase. This does not give the CMU an incentive to consume, as the modalities defined in 3.3.2 allow them to indicate when they will reduce consumption (i.e. dispatch themselves based on market signals).~~

~~**Design Proposal #11:**~~

~~Available Capacity at any AMT Hour for demand side response and aggregation will be a comparison of the measured consumption with an Unsheddable Margin (UM), established during the Prequalification Phase.~~

Additionally to a declaration of availability, the capability of delivering energy when required by the market needs to be demonstrated. For units with a ~~full~~ Daily S~~s~~cheduling O~~o~~bligation (i.e. CIPU units today, as defined by the Belgian adaptation of the SOGL in the future) the consistency with the nominated P_{max} is apparent from the usage of that margin today in e.g. the balancing mechanism.

Design Proposal #10~~2~~:

The availability of CMU's with a ~~full~~ Daily S~~s~~chedule including P_{max} nominations will have an Available Capacity at each AMT Hour of P_{max} nominated~~, notwithstanding capacity reserved in Ancillary Services~~.

On the other hand, energy of smaller-scale generation/storage – without ~~full~~ Daily S~~s~~chedule obligation – and demand management assets is much less visible via the typical market mechanisms. Whereas the CRM should not impose the delivery of energy, it should ask for proof of delivery when market conditions are favorable for the market actor. This should be a question of sufficiently high market price. Therefore, the Availability Monitoring takes the o~~O~~utage p~~P~~lanning d~~D~~ata ~~(and consumption for DSR)~~ as a reference except for AMT Hours where the Day-Ahead ~~electricity~~ Market P~~p~~rice surpasses a level declared by the Capacity Provider as favorable. This Day-Ahead Market P~~p~~rice level will further be referred to as the **"Declared ~~Market Price~~Day-**

Ahead Price"~~ or the "**DMP**"~~. Paragraph 0~~3.3.2~~ explains the modalities for ~~communicating such DMP~~declaring prices.

At these AMT H~~h~~ours, the CMU ~~is expected to~~could technically deliver energy at its Reference Power. The Availability Monitoring Mechanism will, however, only ~~-~~verify if the output of the unit indeed matches the Obligated Capacity for those hours (see 3.2). For generation or storage with direct metering this is simply the output at the meter, or "$P_{measured}$". For DSR or delivery at a delivery point with net offtake, this is a comparison of the measured consumption ("$P_{measured}$") with a baseline.

A priori, the baselining method will be consistent with the rules under development in the Transfer of Energy framework thereby ensuring compatibility of CRM arrangements with the energy market functioning (subject to the disclaimer in the beginning of this section).

The establishing of a metered output requires metering in the first place. The Availability Monitoring Mechanism will require quarter-hourly measurements at the Delivery Point(s) for the contracted service. An hourly value is subsequently determined – to create an equivalent granularity as the Day-Ahead reference market – as the average metered output.

Design Proposal #11~~3~~:

CMU's without a ~~full~~ Daily S~~s~~chedule and obligations on production margin are required to prove their capability of delivering the Obligated Capacity when market conditions are such that they would deliver energy into the market. To this end, they are obligated to communicate a Day-Ahead Market P~~p~~rice above which their full capacity will be used, i.e. delivering energy. This is the CMU's ~~DMP~~Declared Day-Ahead Price. The Declared Day-Ahead Price~~DMP~~ must be communicated before Day-Ahead market closure. For AMT H~~h~~ours where the Day-Ahead Market P~~p~~rice is higher than the Declared Day-Ahead Price~~DMP~~, the Available Capacity will be equal to the measured output.

Figure 17~~Figure 17~~ shows a numerical example for an AMT Price of 150 €/MWh and a CMU with the following characteristics:

- 2 hours energy constraint
- Reference Power = 10 MW
- ~~DMP~~ Declared Day-Ahead Prices = 200 €/MWh

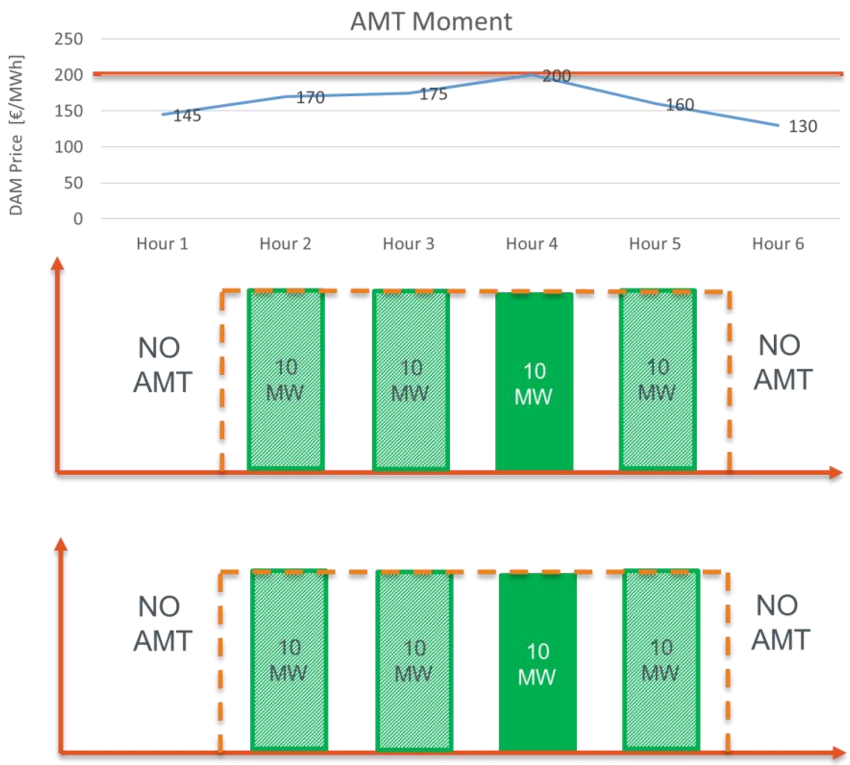


Figure 17: Numerical example for the DMP mechanism

The example CMU will have to be available for all AMT Hours (hours 2-5). It has however indicated that it will not deliver energy until the price surpasses 200 €/MWh. During hours 2 and 3 it will be considered available without delivering energy. During hour 4, however, the price is sufficiently high and a dispatched power of 10 MW should be observed. At hour 5, the price drops below the Declared Day-Ahead Price~~DMP~~ again. The unit will no longer deliver energy, but is still considered available without delivering energy as the energy constraint has not yet been met.

Lastly, as the declared prices impact the Payback Obligation, Elia also applies a monitoring on sufficient retention of margin on the CMU, i.e. the CMU cannot deliver more than what was indicated via the declared prices. The margin retained is assessed as:

- The difference between Nominal Reference Power and $P_{measured}$ for generation capacity;
- The difference between $P_{measured}$ and Unsheddable Margin ('UM') for DSR.

Paragraph 0~~3.3.2~~ ties this way of measuring Available Capacity to Proven Availability. Lastly, Capacity reserved in Ancillary Services is considered available. Paragraph 0~~3.3.3~~ elaborates the modalities for indicating capacity as reserved in A~~a~~ncillary S~~s~~ervices. Table 4~~Table 4~~ summarizes the rules for establishing Available Capacity as described above when no Payback Obligation applies. ~~.~~Table 5 does the same when the Payback Obligation applies.

Table 4: overview of Available Capacity for all CMU types when Payback Obligation does not apply~~overview of determination of Available Capacity for all CMU Types~~

CMU Type	Not Reserved in AS Above DMP	Not Reserved in AS Below DMP	Reserved in AS
Generation/storage with ~~full~~ daily schedule	$P_{available} = P_{max,Nominated}$		$P_{Available} = P_{Reserved,AS}$
Generation/Storage without ~~full~~ daily schedule	$P_{available} = P_{Measured}$	~~See Table 3~~According to outage planning data	
Aggregation/DSR	$P_{available} = P_{baseline} - P_{Measured}$	~~$P_{available} = P_{measured} - UM$ OR See Table 3~~According to outage planning data	

Table 5: overview of Available Capacity for all CMU types when Payback Obligation applies

CMU Type	**Not Reserved in AS**		**Reserved in AS**
	Above DMP	Below DMP	
Generation/storage with daily schedule	$P_{available} = P_{max,Nominated}$		$P_{Available} = P_{Reserved,AS}$
Generation/Storage without daily schedule	$P_{available} = P_{Measured}$	$P_{available} = NRP - P_{Measured}$	
Aggregation/DSR	$P_{available} = P_{baseline} - P_{Measured}$	$P_{available} = P_{Measured} - UM$	

~~3.4.2~~3.3.2 Declared Day-Ahead Price~~Declared Market Price~~ and Proven Availability

CMU's could have a singular Day-Ahead ~~electricity~~ M~~m~~arket P~~p~~rice for which they are willing to deliver their energy, which is constant over the entire year. For such CMU's, a singular fixed DMP is easiest. On the other hand, this price could vary due to e.g. seasonal fuel cost, opportunity costs… calling for a more dynamic Declared Day-Ahead Price~~DMP~~.

Given that both products have their merit and it is in the interest of performing correct monitoring to have the most representative information, both options should be allowed. In any case, the Declared Day-Ahead Price~~DMP~~ should be disclosed before closure of the DA market to avoid gaming (e.g. no later than D-1 at ~~11h30~~9h00).

Design Proposal #124:

For each CMU obligated to communicate a Declared Day-Ahead Price~~DMP~~, the Capacity Provider must fix a singular value for the Declared Day-Ahead Price~~DMP~~ in their ~~contract~~Capacity Contract. The Capacity Provider can update the Declared Day-Ahead Price~~DMP~~ by communicating a new price to Elia. This ~~DMP~~ price cannot apply on AMT H~~h~~ours for which the Day-Ahead market has already closed at the time of communication. For these AMT H~~h~~ours, the last known value before market closure will be used.

A Declared Day-Ahead Price~~Day-Ahead DMP~~ is a minimum requirement, as it is consistent with the reasoning presented in 3.1.1. When the Available Capacity during AMT H~~h~~ours where the DAM price surpasses a CMU's DMP is consistent with the Obligated Capacity for those AMT H~~h~~ours, the CMU exhibits "Proven Availability".

The distinction between "Proven" and "Unproven Availability" can be applied to the example in Figure 17~~Figure 17~~ : the CMU is considered "Proven Available" during hour 4 (solid fill) and "Unproven Available" during hours 2, 3 and 5 (pattern fill).

CMU's with the least "Proven Availability" are most likely to be tested, as explained in 3.4~~0~~. This ensures that a Capacity Provider has the incentive to correctly declare Declared Day-Ahead Price~~DMP~~ for a CMU:

- A Declared Day-Ahead Price~~DMP~~ which is **too low** could require the CMU to react to a day-ahead price for which it would be turning a loss in the e~~E~~nergy m~~M~~arket.
- A Declared Day-Ahead Price~~DMP~~ which is **too high** could be so exceptional that the CMU has almost no Proven Availability and is the top priority to be tested.

In case the CMU would be able to react to intraday or b~~B~~alancing price signals as well~~, for which the prices can be higher~~, it could also indicate prices for these markets. Consistent Available Capacity evaluations during AMT Hours where b~~B~~alancing prices exceed declared levels also contribute to the considered "Proven Availability". However, as the b~~B~~alancing markets are not accessible to all assets contributing to adequacy, these should be considered optional. To clarify: this changes nothing to the market-wide Availability Monitoring Trigger, which is still based solely on the Day-Ahead market.

Design Proposal #13~~5~~:

CMU's can optionally communicate Intraday or Balancing prices above which they would be willing to deliver the energy behind the CMU's capacity. -Elia will take these into account when establishing Available Capacity and Proven Available Capacity in case a Payback Obligation Applies.

Elia can also take these into account in the CMU's considered Proven Available Capacity when establishing priority for testing.

~~Elia can take this into account in the CMU's considered Proven Available Capacity when establishing priority for testing.~~

Lastly, the obligated Declared Day-Ahead Price~~DMP~~ should be the price for which the full Obligated Capacity is activated. For a CMU comprising of multiple assets (e.g. aggregates), each with different costs, the true price and volume could be stepped. In addition to the obligated Declared Day-Ahead Price~~DMP~~, the CMU should be able to submit multiple volume-price pairs in increasing order. Figure 18~~FIG~~ shows an example of this stepped response to a Day-Ahead Market ~~p~~Price.

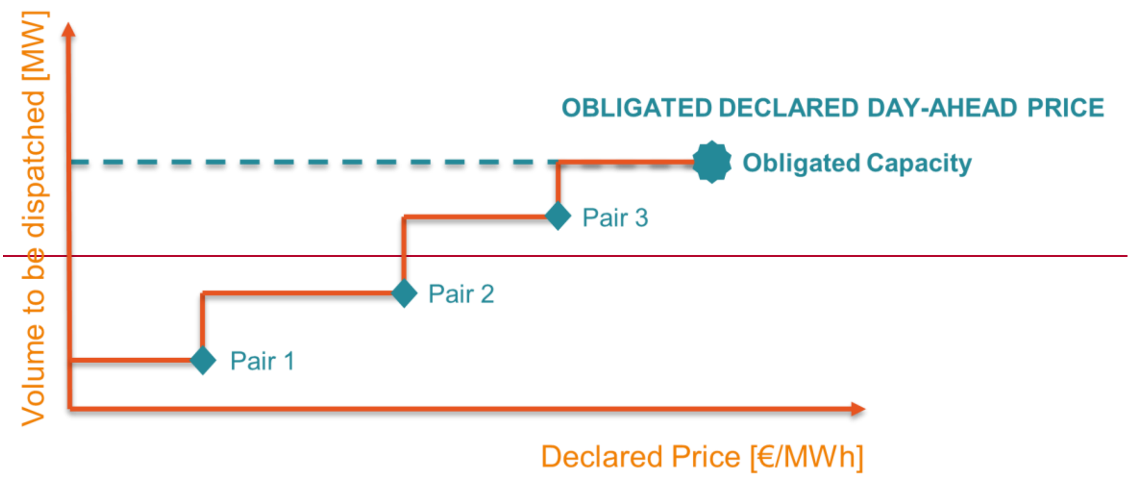


Figure 18: Illustration of multiple price-volume pairs for DMP

Design Proposal #14~~6~~:

Capacity Provider can optionally communicate multiple additional DAM/ID/Balancing price-dispatched volume pairs for a CMU, according to their real dispatching strategy which Elia will take into account when establishing Available Capacity and Proven Available Capacity in case a Payback Obligation Applies.

Elia can also take these into account in the CMU's considered Proven Available Capacity when establishing priority for testing.

It is important to note that any price other than the Declared Day-Ahead Price only has a binding impact on Availability Monitoring itself when the Payback Obligation applies. In this case, out of all the declared prices one 'Declared Market Price' or 'DMP' is selected corresponding to the highest volume the CMU would activate over the different markets. Elia will then monitor:

1. If the CMU activates at least the associated volume (as for 'above DMP' in Table 5)
2. If the CMU retains sufficient margin ~~NRP~~(as for 'below DMP' in Table 5)

Failure to respect either one of these criteria results in Missing Capacity.

Outside of the Payback Obligation, these prices can still be used in establishing priorities for Availability Tests~~ing~~.

~~3.4.3~~3.3.3 Availability for units reserved in Ancillary Services

Capacity reserved in the Ancillary Services is considered available in the context for the CRM for the period during which it is contracted as Ancillary Service, unless the availability checks in the Ancillary Services reveal otherwise.

For the Ancillary Services bidding, Elia receives from the Balancing Service Provider (BSP) an offered volume and the Delivery Points at which that volume will be provided. It is not specified at the bidding stage how this volume is partitioned over the different

Delivery Points. Furthermore, the bidder of the flexibility at a Delivery Point could be a different entity from the Capacity Provider. On the other hand, Elia disposes of the following information:

- **From the Capacity Provider:**
  - Delivery Point(s) for each CMU
  - Obligated Capacity per CMU
- **From the Balancing Service Provider:**
  - Ex post activated volume per Delivery Point

If the reserved bid consists of (a) Delivery Point(s) associated with one single CMU, the AS reserved volume will be added to its Available Capacity at every AMT Hour. In this case, Elia ~~can~~ could directly associate the reserved volume with the CMU.

This is not the case if a Delivery Point associated to a CMU is successfully reserved in the Ancillary Services as part of a larger pool, consisting of multiple CMU's or non-CRM delivery points. ~~Elia will then take note of the activated volume for Ancillary Services ex-post when determining Available Capacity during an AMT Hour. It will be equal to the sum over the delivery points of:~~

- ~~The Available Capacity as determined in Table 4~~
- ~~The activated volumes in the framework of Ancillary Services~~

~~As is the case for $P_{measured}$, the latter will be based on the average of the metered output over the AMT Hour.~~ This is why Elia will apply a more generic rule to establish the Ancillary Services Available Capacity. For one Ancillary Services bid and one CMU this is determined as the minimum of:

- The volume of the Ancillary Services bid
- The Nominal Reference Power of the CMU's Delivery Points in the AS bid
- The maximum prequalified volume for AS for the CMU's Delivery Points

~~This is numerically illustrated in Table 5 for a "DSR/Aggregation" CMU with three delivery points – DP1, DP2 and DP3 – respectively with 3, 3 and 4 MW Obligated Capacity for the considered AMT Hour. It considers all possibilities concerning AS activation and height of DAM price compared to DMP.~~

~~Table 5: numerical illustration of Ancillary Services Available Capacity for a DSR/aggregation CMU~~

	~~Day-Ahead Price < DMP~~	**~~Day-Ahead Price > DMP~~**
~~AS activation of 2 MW in DP 3~~	~~DP 1 and 2 retain a margin of 3 MW compared to UM~~ ~~DP 3 retains margin of 2 MW compared to UM~~	~~DP 1 and 2 consume 3 MW lower compared to baseline~~ ~~DP 3 consumes 4 MW lower compared to baseline~~
~~No AS Activation in DP 3~~	~~DP 1 and 2 retain a margin of 3 MW compared to UM~~ ~~DP 3 retains margin of 2 MW compared to UM~~	~~DP 1 and 2 consume 3 MW lower compared to baseline~~ ~~DP 3 consumes 4 MW lower compared to baseline~~

This method is used to assess Ancillary Services Available Capacity for any monitored AMT Hour within the AS-contracted period.

Design Proposal #15~~7~~:

~~If a CMU is reserved in an Ancillary Services bid consisting only of (a) Delivery Point(s) associated with the CMU in the Capacity Contract, the reserved volume will be added to its Available Capacity for any AMT Hour, taking into account the AS activated volume when measuring the output, for the AS-contracted period, unless the tests applying in the Ancillary Services mechanism demonstrate a lack of capacity. A Missing Capacity will be established according to the results of such tests.~~

~~When (a) Delivery Point(s) associated with a CMU is successfully reserved in the Ancillary Services in one bid associated with Delivery Points not associated to the CMU, the volume of any Ancillary Services activation in the concerned Delivery Point(s) is added to its Available Capacity, on top of the method for determining Available Capacity for the CMU type.~~ If one or more D~~d~~elivery P~~p~~oint(s) of a CMU were successfully contracted in Ancillary Services, the Available Capacity in Ancillary Services for this CMU will as a result of this bid and for the period of application will be the minimum of:

- The volume of the Ancillary Services bid
- The Nominal Reference Power of the CMU's Delivery Points in the AS bid
- The maximum prequalified volume for AS for the CMU's Delivery Points

~~Of course, the AS activation volume could be zero, in which case the full Obligated Capacity must be met with Available Capacity according to the evaluation defined in Table 4.~~

~~3.6~~3.4 Rules for Availability Tests~~ing~~

Paragraph 0~~3.3.2~~ illustrates the importance of Proven Availab~~le Capacity~~ility. Regarding cost-efficiency, it is most effective to determine Available Capacity as much as possible through the rules set out in 3.3. Nevertheless, as these generally applicable rules for monitoring could still cause limited visibility on certain CMU's, provisions for Availability Tests~~ing~~ as a last resort are necessary. Elia reserves the right to test any contracted CMU up to three times successfully during the W~~w~~inter P~~p~~eriod and once successfully during the summer.

Testing implies a delivery of energy up to the ~~Reference Power~~Total Contracted Capacity divided by the Derating Factor, as defined in the Capacity Contract. This is done according to the same modalities for determining the Nominal Reference Power during the Prequalification Process. Elia reserves the right to demand a test for the contracted SLA duration (see 3.2.3~~0~~) up to one time successfully per Delivery Period. Any other test will only evaluate the Obligated Capacity during one quarter-hour.k This means that delivery of the Total Contracted Capacity divided by the Derating Factor~~Reference Power~~ must be maintained for the duration indicated in the SLA. Any other tests will only require a delivery of the Reference Power during one quarter-hour.

The test should be announced ~~at~~ shortly after Day-Ahead Market closure at the latest, because the c~~C~~apacity p~~P~~roduct is designed to respond at least to a day-ahead signal. In the absence of any other ramping/start-up requirements, a later announcement would not match the product definition. The nature of the test remains a “surprise test”. The design regarding Availability Tests~~ing~~ is presented in the design proposal below. Availability T~~t~~ests are at the expense of the Capacity Provider.

Design Proposal #16~~9~~:

Elia reserves the right to test any contracted CMU up to three (3) times successfully during the W~~w~~inter P~~p~~eriod (1 November – 31 March) and one (1) time successfully outside of the W~~w~~inter P~~p~~eriod during the Delivery Period. Included therein, Elia reserves the right to test the duration of the registered SLA one (1) time successfully during the Delivery Period.

To initiate a test, Elia communicates a timeframe during which delivery of the full capacity is due, by ~~closure~~ 15h00 ~~of the~~ -Day-Ahead ~~Market~~ at the latest. The procedure for the test itself will be the same as the test performed during the Prequalification ~~stage~~ Process to determine the Nominal Reference Power. A failure of the test will result in a penalty as defined in section 4~~0~~ as if the Obligated Capacity is the Reference Power and the Available Capacity is the Measured Power.

Any potential costs incurred by the Capacity Provider as a result of such a test will be borne by the Capacity Provider.

The selection of units to be tested is a result of an internal selection procedure from Elia that will not be disclosed in order not to lo~~o~~se on its surprise effect. It is however clear that Elia shall give priority to the following cases:

- CMU’s with previously failed tests
- CMU’s with limited “Proven Availability” during the Delivery Period
- CMU’s exhibiting illogical behavior (i.e. potential gaming on ~~DMP~~Declared Day-Ahead Prices, structural short-term coverage on the Secondary Market,…)
- CMU’s consistently failing to deliver (in Availability Monitoring or preceding Availability Tests)

4 Availability Penalties

Section 3 established the rules for determining Obligated and Available Capacity. Any positive difference between $P_{obligated}$ – including obligations procured on the secondary market – a and $P_{Available}$ ~~which is not covered in the Secondary Market~~ is liable to a penalty. Δ in Figure 19~~Figure 19~~ illustrates this volume for an AMT Hour. This is referred to as “Missing Capacity”. As explained in paragraph 3.2.1, a Capacity Provider’s requirement to cover their Obligated Capacity should be met at any AMT H~~h~~our.

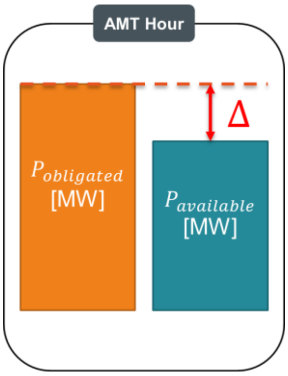


Figure 19: Volume exposed to an Availability Penalty

The penalty exists to create a sufficient incentive for CMUs to cover exposed volumes via the Secondary Market and drive system adequacy as described in Paragraph 3.2.1. A first step to achieve this would be a proportional penalty to the Missing Capacity. Paragraph 4.1~~0~~ establishes a formula for such a penalty.

Consistently underperforming CMUs undermine the adequacy of the system. To discourage this kind of behavior further, an escalation procedure should be foreseen going beyond the proportional penalties. Paragraph 4.2~~0~~ describes this.

Finally, the penalties applied for testing ~~require a specific set of rules, as they are often the result of preceding limited visibility or illogical behavior. Paragraph 4.2 sets out these rules.~~ are the same as those for Availability Monitoring, i.e. the same proportional penalty applies and failed tests count towards the escalation procedure as any AMT Moment would.

4.1 Proportional penalty

The p~~P~~roportional p~~P~~enalty should scale with two elements:

1. The positive difference between Obligated and Available Capacity
2. The value of the Capacity C~~c~~ontract

This latter value should be divided over a certain subset of hours considered representative for the global availability performance. This period will be defined in the Market Rules and is referred to as the “Unavailability Period” or “UP”. The Unavailability Period should reflect the minimum number of AMT ~~Hours~~ Moments that will be effectively monitored for ~~availabiltiy~~availability and for which – if warranted – a penalty is issued by Elia. This is consistent with the fact that the Obligated Capacity should be respected for every AMT H~~h~~our. The renewed formula then becomes:

Finally, a penalty factor should apply. This factor is key in establishing sufficient incentive to be available. The formula then becomes:

$$Availability\ Penalty\ [€] = (1+X) * \frac{\sum_{t=1}^{T} MAX(P_{Obligated,t} - P_{Available,t};0) * Total\ Contract\ Value\_t}{T * UP}$$

Where “T” is the number of AMT Hours in the AMT Moment. ‘UP’ is equal to the expected number of AMT Moments effectively monitored by Elia and is fixed in the M~~m~~arket R~~r~~ules. Elia proposes a value of **15** for UP.

~~With~~ “X” i~~a~~s the p~~P~~enalty f~~F~~actor. As for the value, CMUs that ha~~-~~ve planned their unavailability and communicated this according to the specifications in paragraph 3.3.1 ~~0~~ will be liable to a lower penalty factor (i.e. X = 0) when planned outside the W~~w~~inter P~~p~~eriod. Any outage planned during the W~~w~~inter P~~p~~eriod is likely to put adequacy more at risk, considering the adequacy drivers in Belgium. This is why only a~~A~~nnounced u~~U~~navailability outside of the W~~w~~inter P~~p~~eriod receives a lower penalty factor than u~~U~~nannounced u~~U~~navailability. Table 6~~Table 6~~ further specifies this feature.

Table 6: Penalty factor for Announced vs Unannounced unavailability

	Announced unavailability 01/04/20xx – 31/10/20xx	Unannounced unavailability 01/11/20xx-1 – 31/10/20xx	Announced unavailability 01/11/20xx-1 – 31/03/20xx
X	0	1	0,9~~1~~

Since this is a proportional penalty, the design proposes a yearly penalty cap (stop-loss limit) at the yearly contract value. Reaching the cap does not relinquish the Availability Obligation for the CMU, nor does it imply the escalation procedure discussed in paragraph 4.2. The d~~D~~esign p~~P~~roposal below summarizes the proposal for the proportional penalty.

Design Proposal #17~~8~~:

Elia can perform an availability monitoring on any AMT Hour during the Delivery Period. It should, to that end, define estimated minimal number of effectively monitored hours for the Delivery Period denoted as the “Unavailability Period” or “UP”. The value for UP should be disclosed with the market in the ~~Capacity~~ Market Rules. Elia proposes a value of **15** for UP.

The selection criteria for AMT Hours during which availability will be monitored will not be disclosed to the market, thereby ensuring the full incentive~~ effect~~ to~~on~~ remain~~ning~~ available at all AMT Hours.

UP is in no way a limitation on the number of AMT H~~H~~ours during which a~~A~~vailability can be monitored by Elia. ~~the latter is capped at T+.~~

For any AMT ~~Hour~~ Moment Elia can issue an Availability P~~p~~enalty to a Capacity Provider for a CMU not meeting its Obligated Capacity (after taking into account exchanges via the Secondary Market) as follows:

$$Availability\ Penalty\ [€] = (1+X) * \frac{\sum_{t=1}^{T} MAX(P_{Obligated,t} - P_{Available,t};0) * Total\ Contract\ Value_t}{T * UP}$$

The value of the penalty factor “X” is determined in Table 6. ~~will be 1, with the exception of Announced Unavailability outside of the winter period (1 April until 31 October), where it will be 0~~.

The total yearly charged amount for the proportional penalty shall not exceed the yearly contract value for the concerned CMU.

In addition to the yearly penalty cap, Elia recognizes the value of introducing a monthly cap on the proportional penalties as well, in order to retain an incentive to make capacity available again as soon as possible. Since the W~~w~~inter P~~p~~eriod is most crucial for Belgian adequacy and it spans the first five months of the Delivery Period, a monthly cap at one fifth of the yearly penalty cap is a good choice.~~T~~. It is important to note that this cap does not absolve the CMU of its obligations, nor does it hinder the entry into effect of the escalation procedure (see section 4.2).

Design Proposal #18:

The total amount of proportional penalties charged for one CMU in one month shall not exceed 20% of the yearly penalty cap.

4.2 Escalation of penalties

Aside from the proportional penalty, which is the main incentive for system adequacy as in 3.2.1, extra provisions for consistently underperforming units encourages contracts that reflect true performance of the CMU. To this end, two provisions are envisaged.

Firstly, a consistently underperforming asset should be liable to have remunerated volume revised. The proposed criteria for this are the following:

Design Proposal #19~~20~~:

Elia reserves the right for a downward revision of the monthly C~~c~~apacity R~~r~~emuneration of a CMU proportional to observed Missing Capacity in case of Missing Capacity ~~(i.e. not covered by the Secondary Market)~~ exceeding each time 20% of the Obligated Capacity at three (3) separate AMT Moments (i.e. three (3) non-consecutive AMT Hours) or three (3) failed Availability Tests. This does not diminish the Obligated Capacity demanded at each AMT Hour or Availability Test once this measure is applied.

The original remunerated amount can be reinstated if the CMU exhibits Proven Availability of at least the Obligated Capacity during three (3) AMT Moments or Availability Tests, without taking into account obligations traded on the S~~s~~econdary M~~m~~arket.

The Capacity Provider has the right to request and schedule Availability Tests in order to obtain this criterion.

Secondly, severe offence regarding the Availability Obligations could lead to further contractual impact. This would be the case when a CMU incurs the first penalty escalation and fails to reinstate the original remunerated amount for two subsequent Delivery Periods. In that case, the contract will permanently be revised downwards and terminated by the start of the Delivery Period covered by the first subsequent Y-1 Auction.

Design Proposal #20~~21~~:

Elia reserves the right to instate downward revision of the monthly C~~c~~apacity R~~r~~emuneration of a CMU proportional to observed Missing Capacity and terminate the contract by the start of the Delivery Period covered by the first upcoming Y-1 ~~Capacity~~ Auction, if during two subsequent Delivery Period the Capacity Holder as incurred for the CMU a penalty under the form of a downwards revision of monthly remuneration without reinstating the initially remunerated volume.

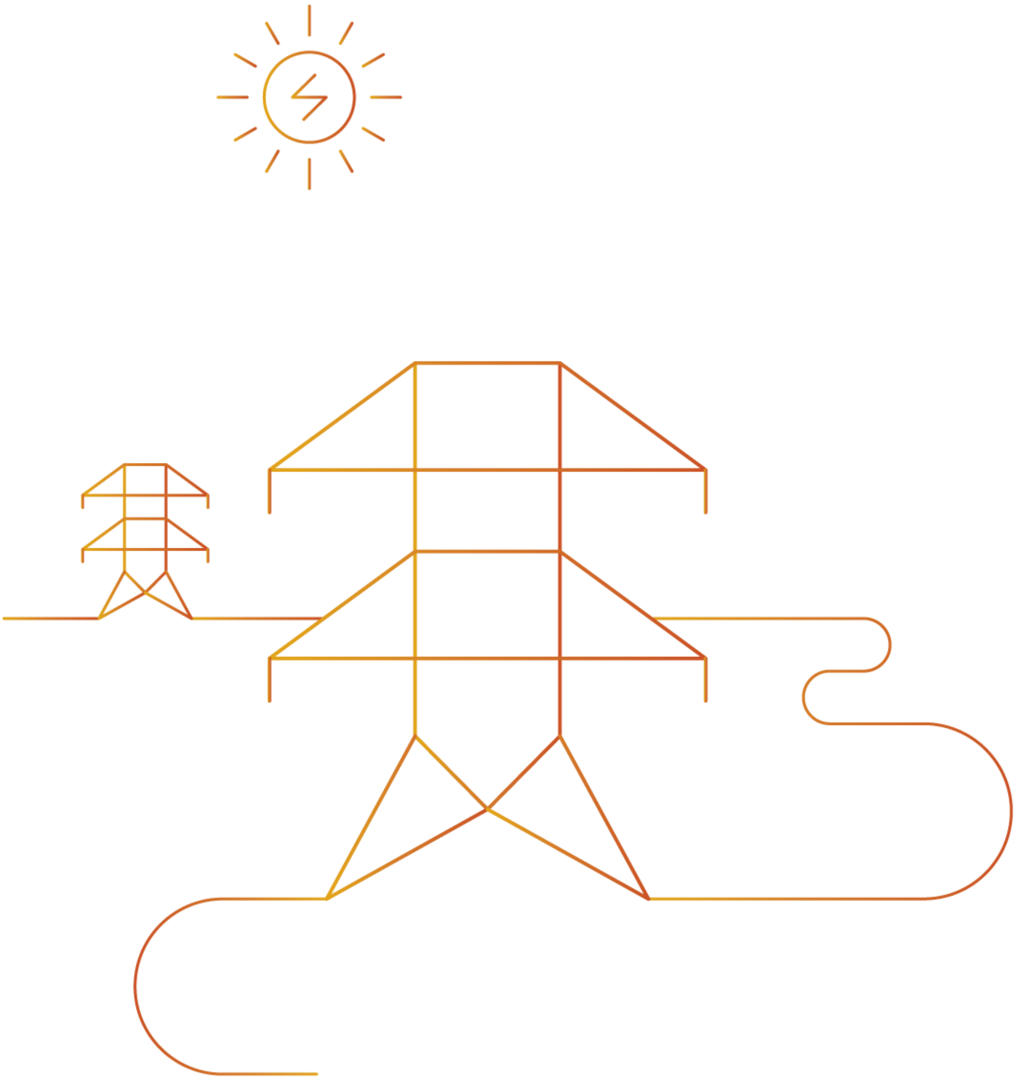
5 Conclusion

The whole of the presented rules and modalities presented in this design note aim to incentivize the desired behavior of any Capacity Provider for its CMUs in the CRM during the Delivery Period and in particular with the objective of maintaining system adequacy.

This behavior can be summarized on a CMU level by the following elements:

- Submitting information reflecting real expected performance in the Delivery Period
- Maximizing availability of capacity for every AMT Hour
- ~~Covering any potential Missing Capacity in the Secondary Market~~Avoid Missing Capacity by trading obligations on the secondary market.
- Giving accurate and complete information during the Delivery Period for e.g. DMP, planned unavailability,…
- Deliver proof of the capability to deliver energy when it would be required in the e~~E~~lectricity m~~M~~arket

A Capacity Provider conforming itself with this behavior is expected to perform well under the design of the presented mechanism.



Updated CRM Design Note: Secondary Market

03/2020

Table of contents

1 Introduction

1.1 Context and Goal of the design note

The purpose of the present design note is to provide all stakeholders with a clear view concerning the Market Rules related to the details on design & process of the organization of the Secondary Market in the context of the Belgian Capacity Remuneration Mechanism.

In addition to this design note, a single detailed list of definitions is provided. As several concepts are relevant for different design aspects, a centralized approach via a single list is opted for.

About the status of this document

This design note is an **updated version published in March 2020** of the initial version[1] that was consulted upon by Elia in October 2019. This updated version takes into account the feedback received from stakeholders during that public consultation[2] and reflects the elements integrated as described in the consultation report. The design reflected in this design note corresponds to the design described by Elia in the draft market rules[3] and draft royal decree[4] on the methodology as published end of 2019. Although the design has matured a lot, it can at this stage not be guaranteed that the design may not undergo further changes as a consequence of the further steps taken in the implementation and adoption process.

Finally, note that the purpose of this document has not changed: it serves to provide interested parties a useful background note in order to facilitate their understanding of the mechanism and the rules. It constitutes by no means is a formal document, unlike the market rules, contract and royal decrees that are foreseen by the Electricity Law.

Legal Framework

The Law setting up a Capacity Remuneration Mechanism, adopted on April 4th 2019[5] (hereafter "CRM Law"), modifying the Electricity law of 29 April 1999 on the organization

[1] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/dn7_crm-design-note---secondary-market.pdf
[2] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191129_consultation-report_final.xlsx
[3] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191125_crm-market-rules-proposal_v2.pdf
[4] https://www.elia.be/-/media/project/elia/elia-site/ug/crm/20191220_updated-kb-elia_volumeparameters_frnl_clean.pdf
[5] http://www.ejustice.just.fgov.be/eli/wet/2019/04/22/2019012267/staatsblad

of the electricity market (hereafter “Electricity law”) introduces the concept of a Secondary Market.

In Art. 7undecies §8 the following elements are defined (own translation):

- The functioning rules of the Capacity Remuneration Mechanism containing especially […]
- […] at the latest one year before the first delivery period, the organization mechanism of the Secondary Market.

1.2 Structure of the design note

One of the main objectives of the design note is to address the driving principles underlying the proposed design choices for the Secondary Market in order to reach a clear understanding of the general contours of the Secondary Market choices proposed, this will be handled by Chapter 2.1.

A focus on the design of the Secondary Market will be expressed in Chapter 2.2.

Further, the note details in Chapter 2.3. the Secondary Market transactions requirements regarding the Secondary Market product guidelines and specifics.

Details on the volumes that can be offered in the Secondary Market will be itemized in Chapter 2.4.

In the end, Chapter 2.5. provides information on the contractual impact of the validated Secondary Market transactions and Chapter 2.6. about the implementation of the solution in time.

1.3 Concept of a Secondary Market in a CRM

Market access to the CRM in a Primary Market will occur via the Y-4 and Y-1 Auctions. These Auctions will contract capacities for a specific period in time (i.e. a number of consecutive Delivery Periods). The purpose of a Secondary Market is to give comfort to the capacity providers to be able to transfer their CMU Contracted Capacities and related obligations to another CMU at an agreed price in order to allow them to manage their risks better. By doing so, a good functioning Secondary Market can contribute to decrease the overall CRM cost.

Under conditions and eligibility criteria as the full Prequalification Process of participating CMUs, the use of a Secondary Market is to be considered as an operational way to manage and optimize the CMU’s availability/unavailability and its obligations, thereby ensuring system adequacy at all times.

In general, the Secondary Market is composed of (at least):

- Buyers of an Obligation (i.e. taking over the obligation)
    - And their prequalified CMU’s capacities able to buy/acquire CRM Contracted Capacities and related obligations

- Sellers of an Obligation (i.e. releasing their obligations)
    - And their prequalified CMU's capacities able to sell their CRM Contracted Capacities and related obligations

Based on their bilateral agreement on terms and conditions, Secondary Market transactions may occur for a certain time period (ranging from 1 hour up to days, weeks...) and for a certain price agreed bilaterally. The Secondary Market Capacity (or Contracted Capacity once transferred) is expressed in the standard unit of MW.

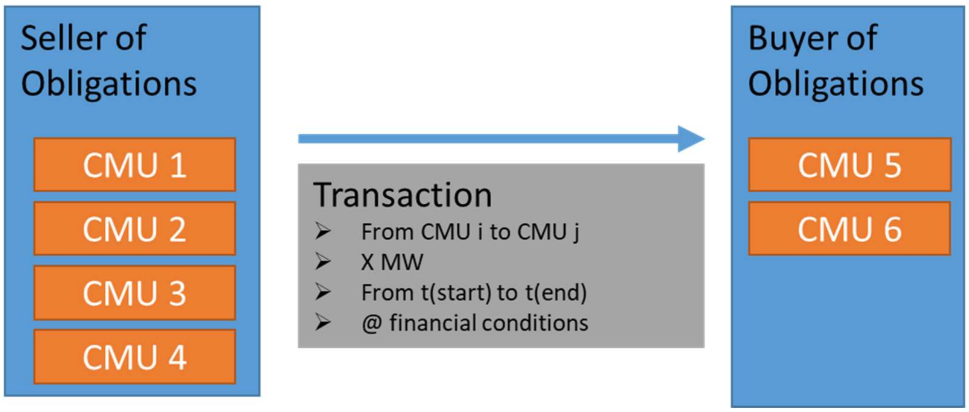


Figure 1: CRM Secondary Market Transaction principle

In the organization of the Belgian CRM, a table containing all the project topics to be developed has been settled.

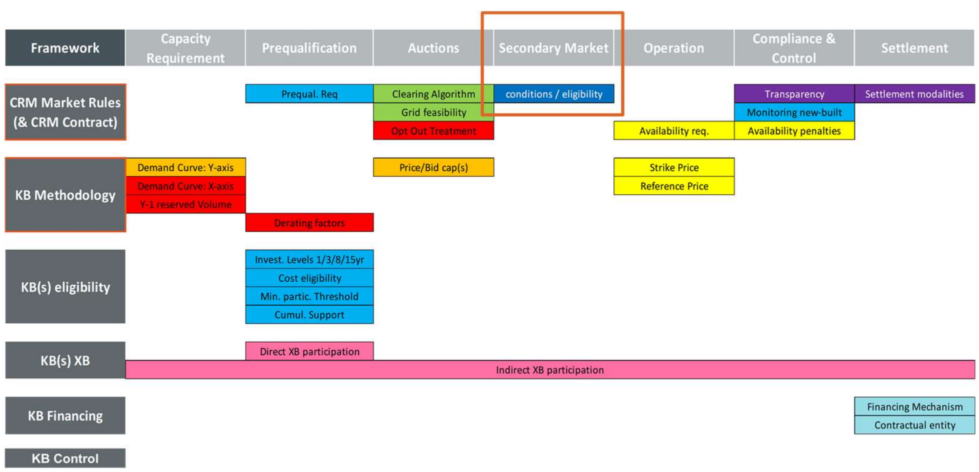


Figure 2: CRM legislative framework

The Secondary Market is defined as a specific market design element under the Market Rules (& Capacity Contract) framework as mentioned in Figure 2. The topic has strong links with most of the other topics, notably: Prequalification Process, Derating Factors, pre-delivery monitoring, opt-out treatment, Availability Monitoring Mechanism, Availability Penalties and Payback Obligation. These links will be explicitly mentioned in the document.

In the Belgian CRM framework and under the light of the Clean Energy Package and other European energy guidelines, the definition of the Secondary Market is considered as a design element where several objectives and important considerations come together, among others: technology openness, limitation of the overall CRM cost via liquidity, and overall complexity avoidance and feasibility. These objectives and considerations are further discussed in the next paragraphs.

The rules are to be designed in order to make sure that all realistically potential technologies are able to participate in the CRM while taking into account their actual contribution to the Belgian adequacy (cf. Derating Factor rules presented in the Design Note 1).

1.3.1 Technology openness

The Clean Energy Package and other European guidelines consider technology openness as a main requirement for the design of the Market Rules & methodologies. For instance, the Clean Energy Package in Art 22 §1 of the Energy Regulation states explicitly that capacity mechanism shall "[...] be open to participation of all resources that are capable of providing the required technical performance, including energy storage and demand side management [...]".

As long as a contribution to the Belgian adequacy is ensured, the developed methodologies and rules have to ensure that there is no creation of undue entry barriers to the CRM.

It is to be avoided that the CRM design and also the Secondary Market would create undue barriers for entry. Especially in the details of the Secondary Market and if not well embedded within a larger design – it could risk to constitute such a barrier for entry. For instance, the Energy Constrained CMU's and their specific SLA may prevent the participation in the CRM if the proposed granularity (hourly, daily…) of transactions on the Secondary Market in terms of period covered by the Transaction is not fitting their technical extra capabilities. As for the Auctions, the Secondary Market should facilitate the participation of all types of technologies.

1.3.2 Limitation of the overall CRM cost by fostering liquidity

The Electricity Law mentions that the CRM should be designed as such to limit its overall cost (cf. Art.7undecies, §1). It is therefore essential to find an overall CRM design solution reaching both a global minimal CRM overall cost, rather than targeting local optimums of parts of the design. In this respect, it is crucial to not only address design elements individually, but also considering them within the bigger picture of the entire CRM. It could be that giving in (slightly) at one place in the CRM design could leverage more positively in terms of cost management elsewhere.

With respect to the Secondary Market, a number of aspects could contribute to this cost objective, e.g. avoiding undue (Secondary) Market entry barriers could increase the amount of participants, thereby improve liquidity on the Secondary Market, which in turn allows participants to the Auctions to better (and less costly) manage their risk which should be reflected in lower bid prices and, ultimately, reduce the overall CRM cost.

One of the Secondary Market roles is a need for an asset selected in the Primary Market to find a risk mitigation in case of unavailability. By doing so, the Primary Market actors calculating their bids will count on a fall-back option in case of undesirable capacity unavailability. In the same way, a design hampering the development of a liquid Secondary Market will create risk premiums in the Primary Market. Stated otherwise, the goal is well to avoid the existence of risk premiums in the Auction bids related to a lack of natural back-door before the penalties are applied.

Regarding this risks decrease, the design of the Secondary Market explicitly endorses the logic of a Secondary Market as fall-back of the Primary Markets obligations, before the Availability Penalties settlement. This means that any Contracted Capacity could resort to the Secondary Market to meet its obligations. For a system perspective, adequacy remains guaranteed in this way, hence there is no need to be overly restrictive or penalizing if market actors are managing their risks in such way. Of course, a precondition remains that all CMU's participating in the Secondary Market are also duly prequalified.

Liquidity is a key enabler to keep overall CRM costs under check. The more liquid the Secondary Market will be, the more confident the market participants will be to find a way to trade (part) of their obligations in order to manage the risks related to their contractual obligations.

Therefore, the proposed design will focus to open the Secondary Market participation to all CMUs to the extent their prequalification and Eligibility Criteria are respected. (cf. 2.3.).

For example, by authorizing in the Secondary Market newly prequalified CMUs that haven't participated yet in the Auction for a specific Transaction Period, they could provide extra liquidity in the Secondary Market and nevertheless create value for the Belgian adequacy.

The liquidity of a Secondary Market is an attention point that has been highlighted from the beginning of the design. The Secondary Market access and related aspects on the eligibility of volumes has been approached according to a philosophy of 'All contracted CMU's not capable to deliver on their obligations, i.e. suffering from Missing Capacity, should be facilitated to be able to find as much as possible alternative CMU's to (temporarily) take over their obligations and avoid unnecessary Availability Penalties.'

Obviously, fostering liquidity is a difficult exercise in a way that the overall capacity need covered by the Auctions should be designed in order to avoid the over-dimensioning of the Belgian system. In a context of adequacy concerns (i.e. a context justifying a CRM in the first place), liquidity in a Secondary Market could be under pressure as generally there tends to be little to no overcapacity available in the system, particularly at adequacy relevant moments.

As a consequence, in order to improve the liquidity of the Secondary Market, it has been opted for opening as much as possible the Secondary Market. In particular five types of sources of capacity for the Secondary Market are identified:

- Extra Available Capacity of the contracted CMU's in the Primary Market for the same Delivery Period (i.e. the volume equivalent to (1-Derating Factor) x Reference Power)
- Prequalified CMU's having participated in the Primary Market Auctions, but that were not selected and contracted (as they were not in-the-money)
- Newly prequalified capacities that haven't participated in the Primary Market
- Opt-out Volumes that have not yet been accounted for in the Auction demand volume (i.e. for which no correction volume of the demand has been introduced in the Auctions for the considered Delivery Period). Note that Opt-out Volumes that have been introduced as correction volume of the demand in the Auction cannot be accommodated in the Secondary Market as this would imply a potential double-counting of the same capacity (i.e. first by lowering the volume procured via the Primary Market Auction and secondly via allowing it take obligations in the Secondary Market).
- The Proven Availability of the Energy Constrained CMU on top of their Obligated Capacity that may be traded in ex-post, giving a room for a broaden optimization not foreseen in the first place (Primary Market or Ex-ante Secondary Market transactions) and this on their SLA and non-SLA hours.

The exercise continues with the common CRM ambition to decrease the CRM cost and to avoid all types of double counting of the capacities: implicitly in the demand while at the same time in the Primary / Secondary Market offer curve. This will be done using the Prequalification Process as a source for the volume of capacities need in Y-1 and Y-4 Auctions.

Finally, Elia has a role to facilitate the Secondary Market. Therefore and in addition to the above principles, in the proposals described throughout this note, it has always been taken into account to provide solutions that would allow power exchanges, brokers, … or other facilitating entities to join the system and facilitate further the liquidity on the Secondary Market.

1.3.3 Overall complexity avoidance & feasibility

Feasible methodologies based on accurate logics that could be managed by all is key for the CRM. A manageable complexity of the CRM system is desirable in order to increase competition and limit the cost of the CRM, both in the development phase and in the risk aversion to uncertainty modelling within the Bid Prices by the participants. Overly complex mechanisms, it is also the case for Secondary Market design. Also, the more complex the mechanism becomes, the less manageable it is. In this respect, feasibility also links to the overall market design in place.

It appears clear that the feasibility of the design of the Secondary Market with a Title Transfer Facility should allow the integration of third parties facilitating liquidity (e.g. power exchanges, brokers, bulletin boards,…) with acceptable levels of complexity. This is further covered under the technical constraints mentioned in the Chapter 2.2.

2 Secondary Market design

2.1 General contours of the Secondary Market: a Title Transfer Facility

As expressed in the introduction, the Secondary Market design concerns the development of an obligation title transfer from one CMU to another CMU in order to manage its risks and make optimal use of the real Available Capacity of the CMU. The design of the Secondary Market should not interfere with the Auctions but should offer solutions to the CMU Availability Obligations, Availability Penalties and Payback Obligation enhancing competition and decreasing the overall CRM cost.

Two entities or levels have to be considered in the design, the Capacity Provider (or Prequalified CRM Candidate) and the CMU. As the Capacity Provider or Prequalified CRM Candidate may trade with multiple CMU's, and knowing the overall CRM design parameters of the Primary Market, the design proposal should continue to meet the objectives and considerations previously presented in 1.3 (technology openness, limitation of the overall CRM cost by fostering liquidity and overall complexity avoidance and feasibility) while at the same time avoid any "gaming" effects. Note that, in any case, all the CMU's picking up obligations – including via the Secondary Market - have to be fully prequalified.

For Contracted Capacity resulting from winning in an Auction, several possibilities regarding the organization of a transfer of obligation exist:

- The first possibility, so-called 'full transfer' is a transfer of Contracted Capacities and related obligations from a CMU to another CMU for which the obligation and all or part the Availability Obligations, Penalties and Payback Obligation are settled on the Capacity Providers (Buyer of an Obligation). Elia (and the Contractual Counterparty) should recognize the transfer as duly performed and the CMU releasing its obligation and its Capacity Providers are not held liable anymore to their initial obligation. In this case, all Capacity Remuneration for the transferred obligation would also be transferred as well as Availability Obligations, Availability Penalties and Payback Obligation towards the Capacity Provider taking over the obligation.
  As all parameters of the released Contracted Capacities are transferred in the Secondary Market transaction, it is technically less complex than the other alternatives. Anyhow, it necessarily implies revealing details of the individual remunerations which are not market-wide known. To the extent it would not refrain participants to engage in a secondary market deal, this could also create complexity in the emergence of potential anonymous exchanges because the offer and demand prices will have to cope with each of the primary Capacity Remuneration transfers. This is particularly relevant in a pay-as-bid context of the Primary Market Auctions, but even in a pay-as-cleared context over time there may be differentiated Capacity Remunerations due to the existence of multi-year

contracts that have not all cleared in the same Auction.

- The second possibility, the so-called ‘obligation transfer’ is identical to the first one (‘full transfer’), except that the (initial) Capacity Provider remains remunerated for its Contracted Capacity following the Primary Market Auction outcome. This implies that he has to negotiate bilaterally (or through an exchange) a price with the Capacity Provider taking over the obligation. All other obligations are transferred to the CMU’s and its Capacity Providers taking over the obligation. In the energy and ancillary services markets in Belgium, the transfer of obligation is currently designed in an obligation release for the Capacity Provider selling its obligation and with a free (i.e. bilaterally negotiated) transfer price between both market parties. This second possibility builds on this principle.

- A third possibility is a transfer of the obligation monitoring on another CMU where the initial Capacity Provider remains responsible for the Availability Obligations, Availability Penalties and the Payback Obligation and their settlement towards Elia and/or the Contractual Counterparty. Such design, so-called ‘subcontracting’, is not a full transfer of the obligation as the initial party remains liable after the transfer of obligation. In other words, the CMU taking over the obligation is considered as a subcontractor of the initial Capacity Provider, i.e. the one having a Primary Market Capacity Remuneration. For the sake of clarity, regarding the obligation transfer, no contractual liability exists with the Capacity Provider of the CMU taking over the obligation towards the overall system, i.e. Contractual Counterparty. It remains fully on the initial Capacity Provider of the CMU which has been granted a Capacity Contract in the Primary Market with its remuneration and its obligations. A question may raise to which extent such design helps in providing sufficient credibility of a Secondary Market and contributes to sufficiently mitigating risks and thereby providing sufficient comfort to participants in the Primary Market Auction to actually lower their bids? The remaining liability of the initial Capacity Provider is likely to be priced in. An important concern related to the third possibility is the mandatory requirement of a permanent link between the CMU taking over the obligation and the initial Capacity Provider releasing its obligation. This is likely to hamper the liquidity on the Secondary Market and may in theory only work if the transfers stop after an iteration. In the following example, the limits of the third possibility are illustrated.

At first, two transfers of 5 MW (Party A to Party B) and 1 MW (Party C to Party B) occur:

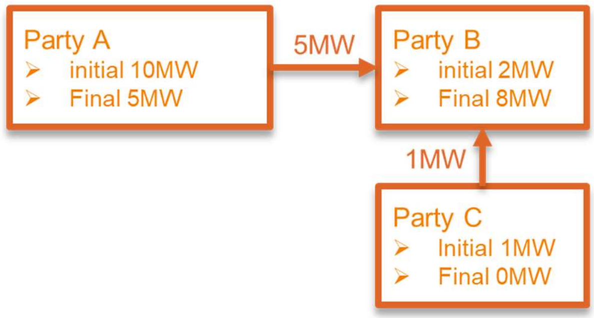


Figure 3: Example of issue on the third possibility of a transfer of obligation (1)

Followed by Party B further transferring part of its obligation to Parties D and E:

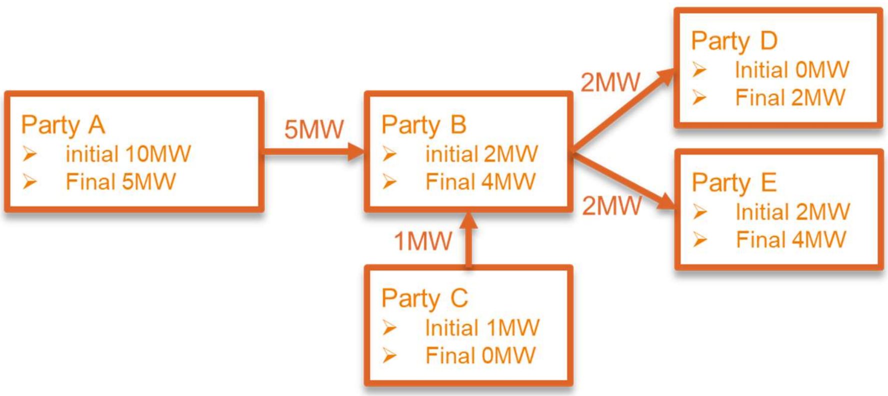


Figure 4: Example of issue on the third possibility of a transfer of obligation (2)

And finally, suppose that Party D has taken over obligations from another party F, but Party D turns out not fully delivering on its obligations:

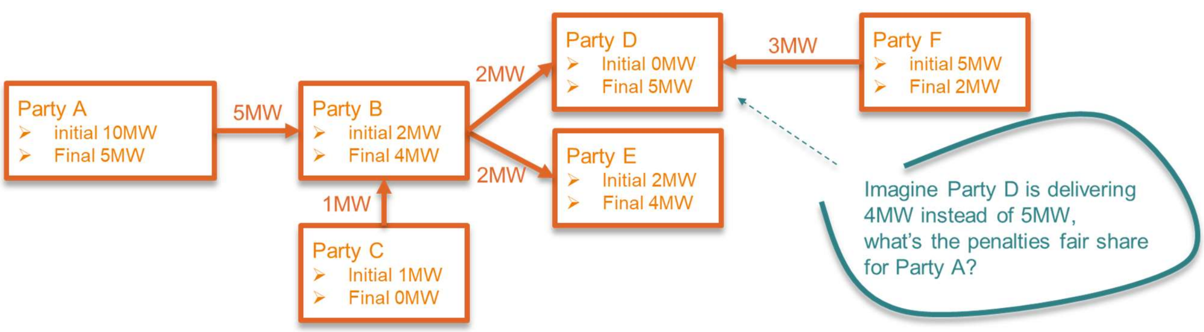


Figure 5: Example of issue on the third possibility of a transfer of obligation (3)

Firstly, it is uncertain which CMUs have to be considered as the final CMU's delivering the 5MW obligation of Party A. In case of sub-delivery of D, it is not clear which share of Party D is considered to be delivered for Party A. It would require arbitrary (proportional or other) rules determining this. This could create extra risks to Party A, for instance related to the financial status of Party D. Although Party D was prequalified, in such a constellation with remaining liabilities for Party A, this Party A may want to put its own requirements in terms of financial indicators (e.g. creditworthiness) of any counterparty. Perhaps Party B meets these criteria, but how could Party A manage this towards further deals with Parties E and D, whereas it nevertheless creates financial risks for Party A?

It requires clearly in any case that Party A is (made) aware of the Transactions from Party B to Parties C and D.

A second consequent issue is the clear impossibility to organize anonymous exchanges in regards to the continuous link between the CMU (like Party B) taking over the obligation and the initial Capacity Provider (like Party A) releasing its obligation.

Summarizing, it would at least require two consequences hampering the good market functioning, the application of a pro-rata rule or equivalent of the Penalties and Payback Obligation, and the credit exposure at such financial flows of the exchange towards the contracting party.

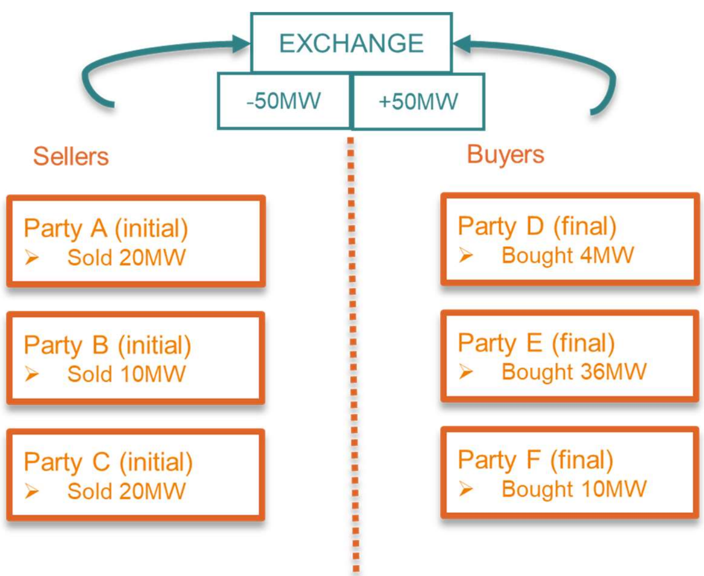


Figure 6: Example of issue on the third possibility of a transfer of obligation in an Exchange

	1 - Full Transfer	2 - Obligation Transfer	3- Subcontracting
Transfer of Contractual Payments	YES	NO	NO
Transfer of Contractual Obligations	YES	YES	NO

Figure 7: Summary on the three possibilities of a transfer of obligation

In regards to the considerations and objectives of a Secondary Market exposed in Chapter 1.3, a trade-off has to be made as a compromise of such objectives. A feasible and liquid Secondary Market, accessible to all with standardized obligation transfer modalities is further proposed. In terms of the possibilities listed above, and following the remarks received in the public consultation phase, Elia proposes possibility 1 (i.e. full transfer, in which the Contracted Capacities and its obligations are also transferred with the Capacity Remuneration from the Auctions towards the final Capacity Provider).

2.2 Design of the Secondary Market

Chapter 2.2. elaborates further on the proposal of a Secondary Market in line with the first possibility of a full transfer (i.e. full transfer, in which both the Contracted Capacities, its contractual obligations and the related Capacity Remuneration from the Auctions are transferred towards the final Capacity Provider).

The main rationale for this decision has been exposed in Chapter 2.1: it gives sufficient comfort to Capacity Providers to find the most liquid and accessible to all possible technologies solution, allowing the facilitation of third parties developments as broker, bulletin board, a power exchange, ... This allows a better risk management and therefore a possible decrease of the CRM overall cost as the Penalties could be decreased by such transfer to another reliable CMU. This under a manageable complexity.

Whereas the Primary Market is based on an Auction with single clearing, settling the bids selection at a certain moment in time for future Delivery Period(s), the Secondary Market is a continuous market letting market participants trade under the Market Rules and Capacity Contract conditions, explained in the present Design Note.

As mentioned in section 2.2., it appears mandatory that the Secondary Market is composed at least of Buyers of an Obligation (taking over the obligation with their prequalified CMU's able to buy/acquire obligations) and of Sellers of an Obligation (releasing their obligations with their prequalified CMU's able to sell their CRM obligations). Based on their bilateral agreement on terms and conditions, Transactions for a certain period and for the Capacity Remuneration as a price value may occur. The obligation transfer is expressed in standard unit of MW.

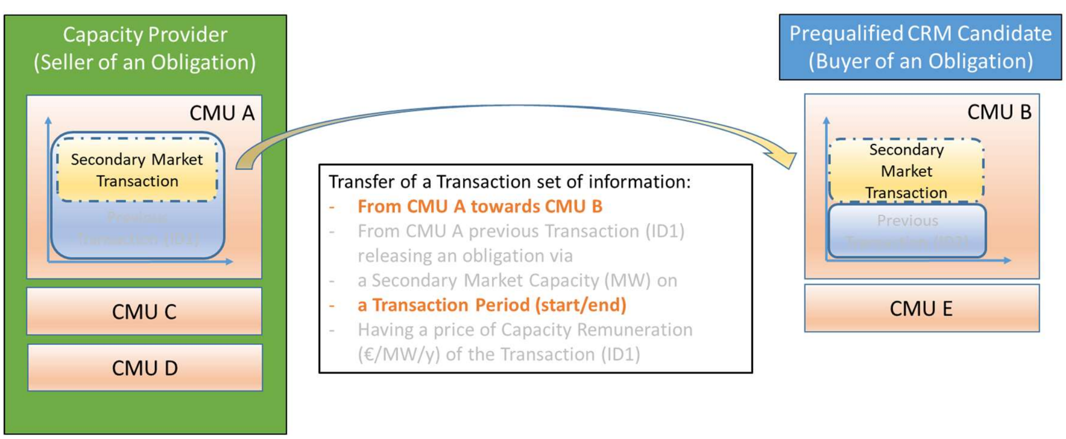


Figure 8: CRM Secondary Market Transaction principle

In the **Step 1 of a Secondary Market transaction**, both parties are negotiating together (directly, or facilitated by a broker or by an exchange platform) prior to the notification of their agreed Transaction. This step is not in the scope of the Secondary Market rules but is of course a pre-requisite for its functioning.

Step 2 of a Secondary Market transaction is to notify a Transaction with its relevant parameters. In order to validate the Transaction, it has to be notified to ELIA (and the Contractual Counterparty) to ensure that the necessary Availability Obligation, Availability Penalties and Payback Obligation will be correctly handled and settled. To be notified all criteria according to 2.3. and 2.4. have to be met by both parties jointly communicating information about the CMU's obligations transfer. The following details are to be communicated to ELIA and the Contractual Counterparty:

The Transaction Date shall be determined and logged as the notification acknowledgment timing. The notification of the Secondary Market transaction will be based on elements that will be crosschecked with the contractual capabilities of both counterparties and the CMU's capabilities to ensure the obligation, e.g. to what extent the Buyer of an Obligation has sufficient prequalified volume not yet contracted on the considered CMU to take over an obligation (cf. 2.4).

For the case of an exchange implying Secondary Market transactions from one to many CMU's or from many CMU's to many CMU's for the same Transaction Period, a split of the obligation transfer has to be organized by the exchange so that ELIA and the Contractual Counterparty are notified of multiple Secondary Market transactions and can validate and confirm to each of the CMU the impact on its Availability Obligations, Availability Penalties and Payback Obligations.

For the sake of clarity, the Capacity Remuneration of the Contracted Capacity transferred and other elements of the Transaction releasing its obligation are to be notified to ELIA and the Contractual Counterparty so that once the Transaction is performed, there is no impact on the CRM mechanism cost.

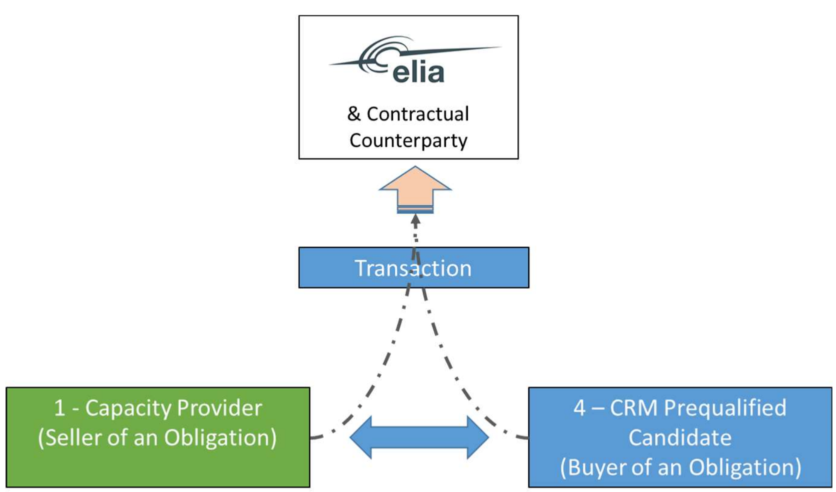


Figure 9: Second Step: A Secondary Market transaction notification following an OTC or Bulleting & Board

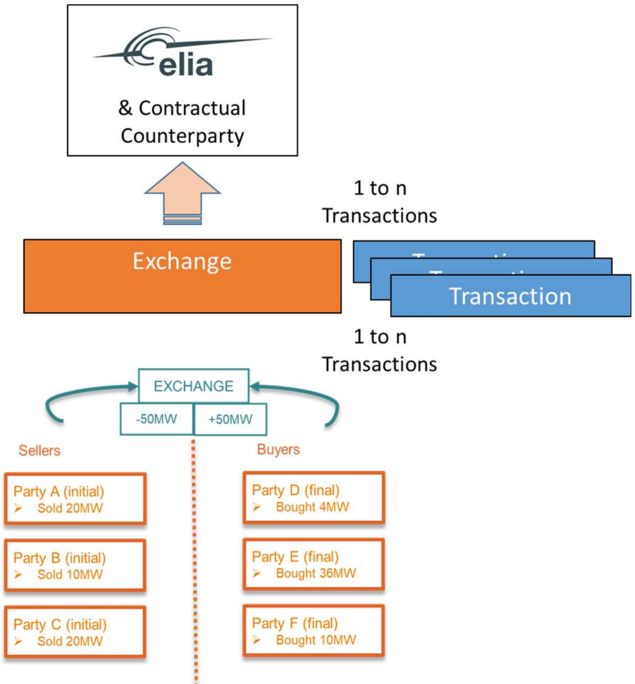


Figure 10: Second Step: Secondary Market transactions notification following an Exchange

ELIA and the Contractual Counterparty will acknowledge the reception of the Secondary Market transaction details and performs several checks according to 2.3. and 2.4. on it.

After a successful validation of the Secondary Market transaction, a confirmation will be sent to the Seller of the Obligation that will be released of the Availability Obligations, Availability Penalties and the Payback Obligations related to the Secondary Market Capacity for the Transaction Period on the CMU. A confirmation will be sent to the Buyer of the Obligation that will take over the Secondary Market Capacity regarding the Availability Obligations, Availability Penalties and the Payback Obligations for the Transaction Period, this in the form of the creation of a new Transaction on the CMU.

In **Step 3 of a Secondary Market transaction**, as the initial CMU (owned by the Seller of an Obligation) has been released from (part of) its Contracted Capacity, it is not liable anymore for it on Availability Obligations, Availability Penalties and Payback Obligations.

Also, this initial party (as Seller of an Obligation) won't receive anymore the Capacity Remuneration based on the Secondary Market Capacity, considered as (part of) the Capacity Contract it has signed with the Contractual Counterparty, so that the Capacity Remuneration resulting from the Auction remains unchanged in €/MW/y but is applied on a lower Contracted Capacity (e.g. from 5 to 3MW in case of a 2MW Secondary Market Capacity successfully transferred as in Fig.11).

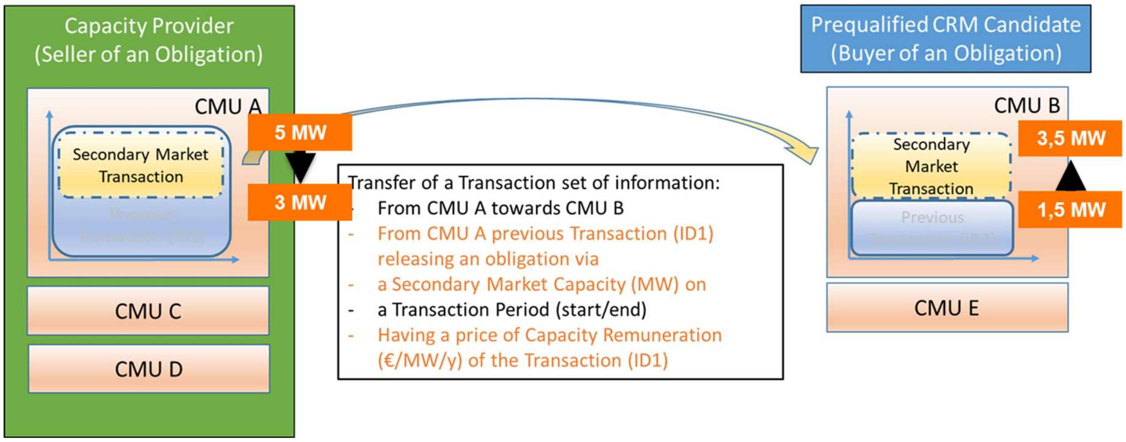


Figure 11: Third Step: A Contracted Capacity decrease on the Transaction releasing its obligation (from 5 to 3MW)

In **Step 4 of a Secondary Market transaction**, all the Contracted Capacity and its related obligations that have been transferred will be monitored on the CMU taking over the obligation. The CMU, which has taken over the obligation has to deliver the Contracted Capacity (for an amount equivalent to the Secondary Market Capacity) on top of any previous obligations on this CMU for the same period and will be liable to Availability Obligations, Availability Penalties and the Payback Obligations.

On top, the Buyer of an Obligation as owner of the CMU taking over the obligation shall be remunerated by the Contractual Counterparty for the Contracted Capacity and its related obligations, according to the Capacity Remuneration of the validated Secondary Market transaction (e.g. in case of a 2MW Secondary Market Capacity successfully transferred as in Fig.11).

Note that the Capacity Remuneration transfer could be complemented by bilateral payments agreed between both Capacity Providers as concluded in Step 1 of the Secondary Market transaction but are out of scope in the normal CRM flows discussed here and don't involve in any case the Contractual Counterparty payments.

The solution following this stepwise approach is a Title Transfer Facility. All transfers of Contracted Capacity are arranged between Capacity Providers or Prequalified CRM Candidates creating Transactions to be communicated to Elia and the Contractual Counterparty. The Title Transfer Facility will be designed in order to also facilitate the third parties development of market interfaces (bulletin board, OTC brokers platform, exchanges clearing platform, …). Indeed, it is the purpose to offer a Secondary Market solution that is market-wide and open to all future development of Secondary Market transaction types in order to maximise liquidity.

Figure 12: Title Transfer Facility principle

Design Proposal #1: Secondary Market definition

The Secondary Market is **a Title Transfer Facility** mechanism. Its purpose is to manage all transfers of obligation on a Transaction, which are arranged between Capacity Providers as Seller of an Obligation and Prequalified CRM Candidates/Capacity Providers as Buyer of an Obligation creating Secondary Market transactions communicated to and validated by Elia & Contractual Counterparty.

The Contractual Counterparty & Elia will receive from both Capacity Providers as Seller of an Obligation and Prequalified CRM Candidates/Capacity Providers as Buyer of an Obligation, the Secondary Market transaction notification and will acknowledge the reception and confirm, in case of compliance:

- The Contracted Capacity of the Transaction from which the obligation shall be deducted of the CMU releasing its obligation will be decreased by the Secondary Market Capacity on the Transaction Period. The Capacity Remuneration, Availability Obligations, Availability Penalties and the Payback Obligation will be applied on the remaining Contracted Capacity of the Transaction from which the obligation shall be deducted of the CMU releasing its obligation.

- A new Transaction based on the Secondary Market Capacity and the Transaction Period will take place on the CMU taking over the obligation, so that for the new Transaction, the Capacity Remuneration equal to the one of the Transaction from which the obligation shall be deducted of the CMU releasing its obligation. The Availability Obligations, Availability Penalties and the Payback Obligation will be settled on the Buyer of an Obligation for the Secondary Market Capacity on the Transaction Period.

2.3 Secondary Market transactions requirements

This section aims to describe the mandatory requirements of the elements of a successful Secondary Market transaction notification.

2.3.1 Contractual requirement

The participants and their CMUs need to have signed a Capacity Contract Framework in order to participate in the Secondary Market. This ensures that, from a system perspective, any capacity picking up an obligation is confronted with the same rights and obligations.

Design Proposal #2: Contractual Requirement of Secondary Market

All potential participants to the Secondary Market have to sign a Capacity Contract Framework with the Contractual Counterparty prior to any transaction in the Secondary Market and its notification to ELIA or the Contractual Counterparty.

Once all contractual documents are signed, Capacity Providers or Prequalified CRM Candidates can start to trade and notify transactions on the Secondary Market.

2.3.2 Prequalification & status of the participating CMU's

The prequalification of both CMU's is a pre-requisite to the notification of the Secondary Market transaction to ELIA and the Contractual Counterparty. This will be ensured via the need of a successful prequalification by Elia. It is certainly the case for the Seller of an Obligation's CMU releasing an obligation which already has been prequalified for the Transaction Period as it acquired a Contracted Capacity. The prequalification of both CMUs of the transaction ensures towards the overall system and adequacy that only capacities actually capable of delivering on the required Service could participate in the Secondary Market.

In order to take over (part of) the Contracted Capacity coming from either the Primary Market, either from the Secondary Market, the CMU of the Buyer of an Obligation has to be considered as under a status 'Existing Capacity'. The Existing Capacity status of the CMU taking over an obligation is required to prevent from any undesirable trading-away of Contracted Capacities.

It is therefore obvious that nor un-prequalified CMU's, neither any CMU's going through 'Fast-Track' Prequalification Process are eligible for the Secondary Market.

All Transactions notified to ELIA and the Contractual Counterparty with un-prequalified CMU's will be rejected.

Design Proposal #3: Prequalification requirement & status of the CMU

All participating CMU's to the Secondary Market have to be successfully prequalified under the Prequalification Process. Nor un-prequalified CMU's, neither any CMU's going through 'Fast-Track' Prequalification Process are eligible for the Secondary Market.

The CMU taking over a Contracted Capacity and its related obligations in a Secondary Market transaction has to be under the status 'Existing Capacity'.

2.3.3 Transaction type

As mentioned in 2.2., the Title Transfer Facility is designed in order to allow and facilitate all Transactions types among others:

- OTC
- Exchanges
- Bulletin board
- …

For the sake of clarity, the Secondary Market part of the CRM will facilitate the integration of such third party developments in the context of the Secondary Market but Elia will not develop them. It goes beyond Elia's role to organize such activities.

2.3.4 Volume of the Transactions

Chapter 2.4. will treat the Secondary Market Remaining Eligible Volume and the quantities of capacities allowed for a Secondary Market transaction. In any case, for each transaction on the Secondary Market the volume shall be notified.

2.3.5 Notification timing

As the title transfer has no impact on adequacy, it is foreseen to accept notifications ex-post up to 10 working days after an AMT Moment. Allowing such Ex-post Secondary Market transactions also helps in fostering liquidity and overall optimizing the cost of the system by avoiding unnecessary Availability Penalties (i.e. limiting the amount of Availability Penalties to the volume that was really unavailable to match adequacy needs).

A notification prior to an AMT identification related to a Transaction Period is considered as "Ex-ante" and is to be distinguished from a notification "Ex-post", notified after an AMT identification related to a Transaction Period, the AMT identification is the Day-Ahead Market prices publication (cf. Availability Obligations & Penalties Design Note). Despite the fact that both are facilitated in the proposed Secondary Market mechanism, ex-post Transactions are possible up to 10 working days after start of the Transaction Period. In other words, if the timestamp of the Transaction is later than 10 working days after its delivery start date and time, the Secondary Market transaction will be rejected.

Figure 13: Ex-ante defined as before the AMT identification

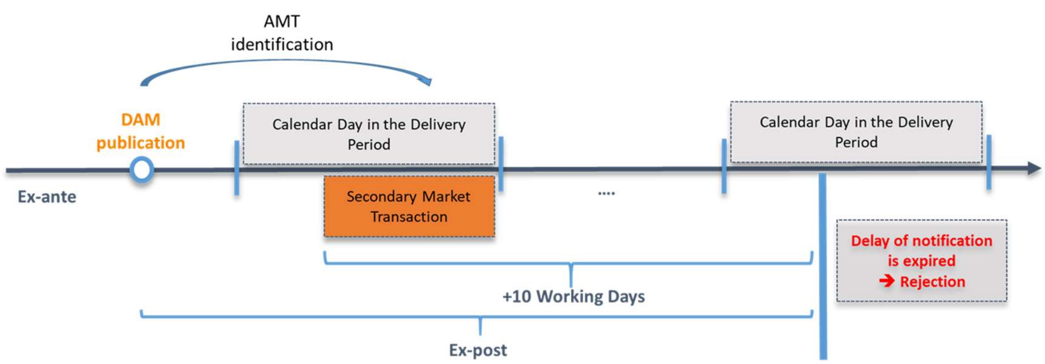


Figure 14: Ex-post Secondary Market transaction timeline

Design Proposal #4: Ex-ante and ex-post notification

An ex-ante Secondary Market transaction is considered as notified before the moment of AMT identification related to a Transaction Period, where the AMT identification is moment of the Day-Ahead Market prices publication.

In contrast, an Ex-post Secondary Market transaction is considered as notified after the moment of AMT identification related to a Transaction Period, where the moment of AMT identification is the Day-Ahead Market prices publication.

Ex-post Transactions are authorized up to 10 working days after the start of the Transaction Period, considered as an AMT Hour.

2.3.6 Transaction Period

For the management of Secondary Market transactions and in order to apply all the other requirements, it implies that Secondary Market transactions have to follow specific timing granularities. By a market-wide approach, daily and hourly granularities are very important to offer sufficient levers for the market participants to find the most suitable Secondary Market product. This will generate an optimal treatment of the portfolio(s)'s synergies and increase the overall Secondary Market liquidity. This is particularly the case for the Energy Constrained CMU having a SLA with a limited amount of hours. Those aggregates or Energy Constrained CMUs could find in the extra hours (non-SLA) an extra remuneration.

It means that a Secondary Market transaction either covers a set of consecutive days, either it covers a set of consecutive hours, but not a combination of both.

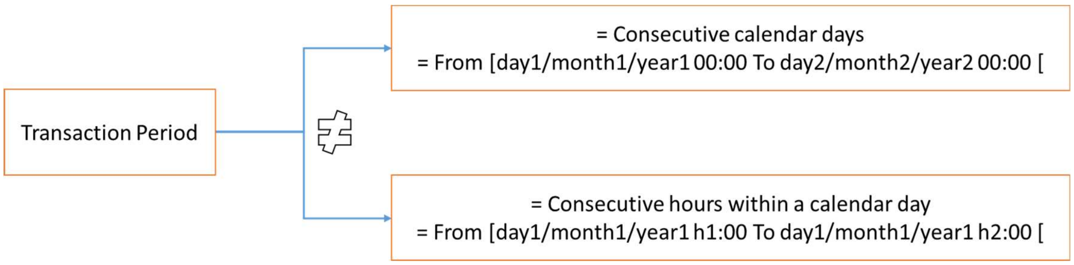


Figure 15: Secondary Market Transaction Period granularity

For example:

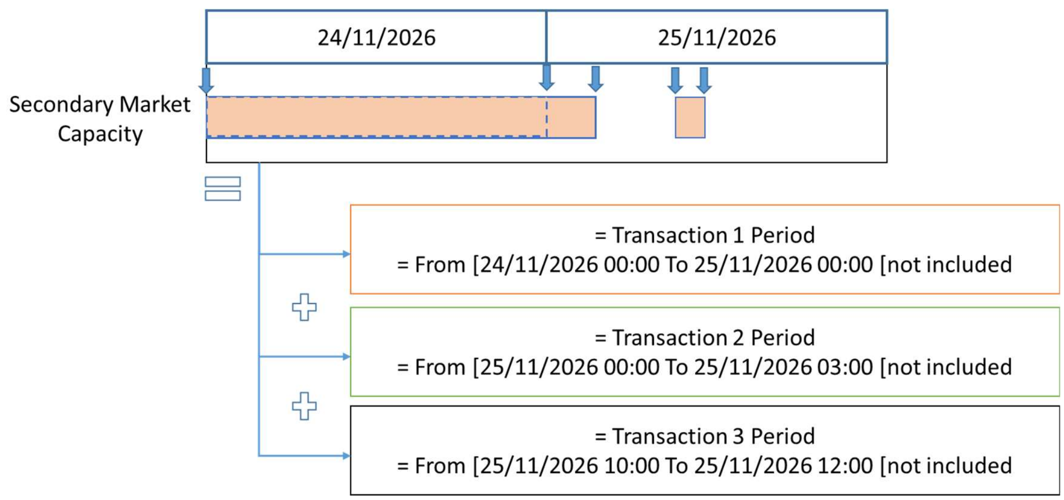


Figure 16: Example of Secondary Market transactions applied on different granularities in terms of Transaction Period

Design Proposal #5: Secondary Market transaction period

All Secondary Market transactions granularity in terms of period covered by the Secondary Market transaction shall be of:

Either, multiple of days where days start at 00:00 and finish at 00:00 not included of the day after.

Either, multiple consecutive full hours in a day.

The time definition shall be the Belgian time (CET).

Also, for obvious reasons, it appears clear that no Secondary Market transactions are tradable for a period in time not covered by a Contracted Capacity. This will be part of the Secondary Market transactions notification validity check.

2.3.7 Notification content

As mentioned in paragraph 2.2, the necessary notification information towards the Title Transfer Facility is common to all Transactions types' solutions (OTC, bulletin board, exchanges, …).

Design Proposal #6: Secondary Market t**ransaction notification dataset**

Secondary Market transaction subset of information required:

1- Identification of the Capacity Provider of the CMU releasing its obligation and considered as the Seller of an Obligation;

2- Identification of the CMU releasing its obligation

3- Identification of the Transaction from which the obligation shall be deducted of the CMU releasing its obligation

4- Identification of the Capacity Provider or Prequalified CRM Candidate of the CMU taking over the obligation and considered as the Buyer of an Obligation

5- Identification of the CMU taking over the obligation

6- The volume of the Secondary Market Capacity that is transferred

7- The Transaction Period indicating the start and end

8- The Capacity Remuneration of the identified Transaction of the CMU releasing its obligation

9- The Strike Price of the identified Transaction of the CMU releasing its obligation and if applicable its indexation

A time stamp of the Transaction Date/time will be taken as the official notification acknowledgment time on the Contractual Counterparty / ELIA user interface for the Secondary Market.

The Transaction Date of the Secondary Market transaction is used for further purposes, such as the ex-post Transaction Date validity.

At notification, ELIA and the Contractual Counterparty ensure the feasibility of the Secondary Market transaction (e.g. via automatic data entry checks or other kinds of validation) followed by a notification acknowledgment and notification confirmation. The feasibility checks are in particular:

- The period of the transfer of obligations (Transaction Period)
- The volume to be transferred (Secondary Market Capacity/ Contracted Capacity)
    - Based on the 2.4. Secondary Market Remaining Eligible Volume
    - The previous registered Transactions included in the Contracted Capacity
- The Strike Price and if applicable its indexation based on the Transaction releasing an obligation
- The contractual status of the CMUs and its Capacity Providers or Prequalified CRM Candidates
- …

The explanation of any notification rejection will be consistent with the design proposals described in Chapter 2.

If multiple requests for the same CMU's / owners are sent to ELIA / Contractual Counterparty, they will be ordered by notification time stamp for the treatment and the above described checks will occur one by one.

2.3.8 Notification of an hourly transfer of Energy Constrained CMUs

In the prequalification phase, it is necessary for the Prequalified CRM Candidate of an Energy Constrained CMU to identify/select a SLA, implying that its participation to adequacy is limited to a predefined set of consecutive hours in the day. This is mainly done to cover for any energy constraints of the concerned CMU. The Availability Requirements & Penalties design note provides details on the SLA Hours application within the AMT Hours of the day the Capacity Provider has to deliver.

As the Energy Constrained CMU's are allowed to trade and take over extra Contracted Capacities and their related obligations in the Secondary Market outside of their SLA Hours and what remains available on their SLA Hours, all Secondary Market transactions leading to precise hours notification (transactions granularity in terms of period covered by the transaction lower than days) and related to an Energy Constrained CMU, can only be notified under the ex-post notification process.

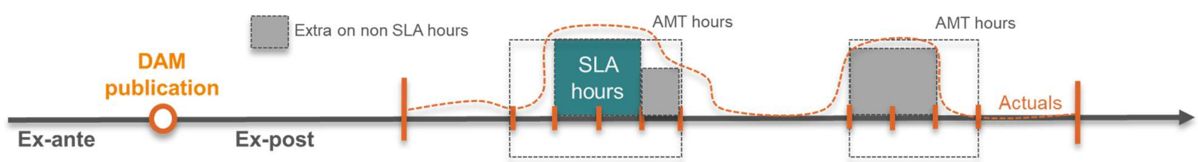


Figure 17: mandatory Ex-post notification for non-SLA Hourly Secondary Market transaction

The proposal is to allow Secondary Market transactions on hours out of the SLA Hours (the non-SLA Hours) and on what remains available on the SLA Hours, by imposing a notification in ex-post, it ensures that the SLA Hours related to the Energy Constrained CMU are duly identified by the Capacity Provider and doing so that he may capture opportunities to be present at the other available AMT Hours of the day while creating value for the adequacy (grey blocks in Fig. 17). Such value could be traded in the Secondary Market and the Capacity Provider will be accountable for such volumes in the Availability Obligation, Penalties and Payback Obligation, receiving at the same time the Capacity Remuneration for the Contracted Capacity in the Secondary Market. By acting ex-post, it gives leverage for the Capacity Provider to fine-tune its Secondary Market Capacity in order to avoid any Availability Penalties on the transferred Contracted Capacities and related obligations. Therefore, the Proven Availability feature of the Energy Constrained CMU is essential as the Availability Obligation, Availability Penalties and Payback Obligation will be settled on its actual presence in the energy market.

This restriction to an ex post notification process for Energy Constrained CMUs, is justified as it could be uncertain for the Contractual Counterparty whether extra hours have been traded with actual real availability. At the same time for the Capacity Provider, the provisional capacity out of its SLA Hours is harder to define and to commit to in ex-ante, and much easier in Ex-post.

In the Fig. 17 above an example of a 2 hours SLA Energy Constrained CMU is given for which the SLA Hours are duly identified according to its Availability Obligations and Availability Penalties. Following its actual CMU capability on the AMT Hours, the grey zones on the Fig. 17 are tradable for an Ex-post Secondary Market transaction. As the Availability Obligations and Penalties will be settled on its presence in the energy market, it will not be penalized for those hours. For instance, it gives room for DSR assets within a participating CMU to capture energy market opportunities out of their SLA Hours if their features allow it, while at the same time they can capture an extra revenue via the Secondary Market.

By performing so, having a certainty on their Proven Availability in the energy market, no transfer of Availability Penalties is expected. Such expectation should increase the related traded volume in the Secondary Market, leading to a liquidity improvement and a CRM overall cost decrease.

Design Proposal #7: Hourly Transaction on SLA Hours and non-SLA hours notification

All hourly Secondary Market transactions transferring an obligation to an Energy Constrained CMU on its SLA and non-SLA Hours can only be notified in ex-post. For the hourly Secondary Market transactions on SLA Hours and non-SLA hours notified in ex-post, the Secondary Market Capacity on those hours is to be based on Proven Availability of the CMU taking over the obligation.

2.3.9 Secondary Market transactions technical possibilities

As mentioned above, apart from the notification process, no transactions platforms are foreseen in the Secondary Market development phase by Elia.

The Secondary Market transactions have to comply with the 2.3. Requirements for their notifications and for the rest the modalities are not defined. It could either be traded among others by:

- Voice and contract
- OTC with brokers
- Exchanges platform
- Bulletin board
- …

The result should be the same towards Elia and the Contractual Counterparty at the notification under the condition that the subset of information is compliant with sections 2.3. and 2.4 requirements.

Further practical arrangements (communication channel and process) will be described in the Capacity Contract Framework.

2.3.10 Strike price associated to a Transaction issued from the Secondary Market

The Calibrated Strike Price linked to the Transaction from which the obligation is released will transferred to the Transaction from the Secondary Market registered on the CMU taking over an obligation.

In the framework of the Payback Obligation (cf. Design Note Payback Obligation), for the CMU taking over an obligation, the Strike Price that applies on the Transaction from the Secondary Market will be the transferred Calibrated Strike Price.

The Calibrated Strike Price will be accompanied by its indexation in time if applicable. This means that even for a shorter period than the multiyear contract, the Strike Price will be adapted accordingly to the initial indexation factor foreseen for the multiyear contract, this shall be part of the notification dataset.

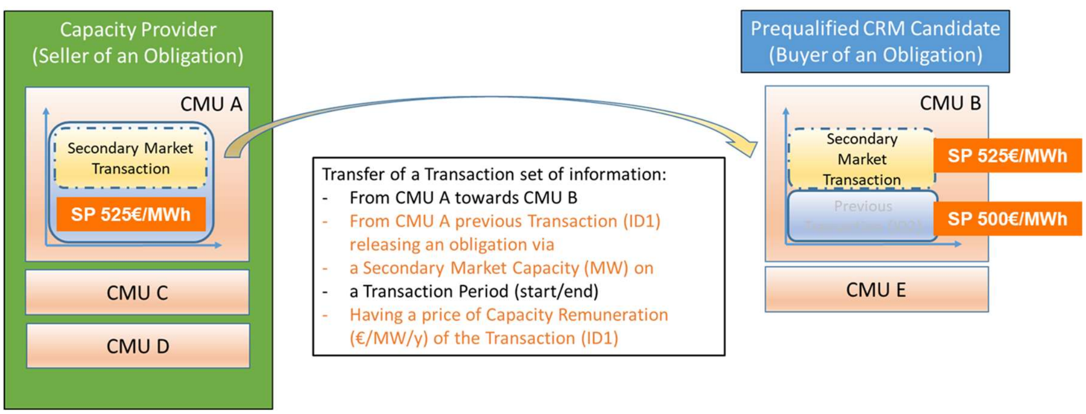


Figure 18: Strike price associated to a Secondary Market obligation transfer (e.g. a Strike Price at 525 €/MWh is transferred)

Following section 1.3. on considerations and objectives, determining the Strike Price in this manner facilitates feasibility. The proposed solution indeed means an “inherited” Strike Price from earlier Transactions and thereby requiring a consistency check on the initially Contracted Capacity Strike Price.

It guarantees an absence of trade-off with parties potentially being able to ‘optimize’ to some extent Payback Obligations via Secondary Market Transactions. By doing so the Reliability Option principle and its application are secured.

In case of third parties facilitating Secondary Market liquidity, they have to incorporate these additional Strike Price parameters into multiple dimensions (i.e. Secondary Market Capacity, Secondary Market transaction price (e.g. bilateral or by an Exchange) & Strike Price) for the same Transaction Period.

Design Proposal #8: Strike price of Secondary Market transaction

When calculating the due amount of the Payback Obligation, the Calibrated Strike Price that will be applicable for a Transaction resulting from a Secondary Market transaction shall be the Calibrated Strike Price of the Transaction releasing its obligation through a Secondary Market transaction.

The Calibrated Strike Price will be linked with its indexation parameters in time if applicable.

The Seller of an Obligation and the Buyer of an Obligation shall communicate in the notification subset the Strike Price, and if applicable, the indexation parameters, of its identified Transaction of the CMU releasing its obligation.

2.3.11 Capacity Remuneration associated to a Secondary Market transaction

The Capacity Remuneration that applies on the CMU taking over an obligation for its Payback Obligation (cf. Design Note Payback Obligation) Transaction from the Secondary Market will be the Capacity Remuneration applicable for the Transaction releasing its obligation through a Secondary Market transaction.

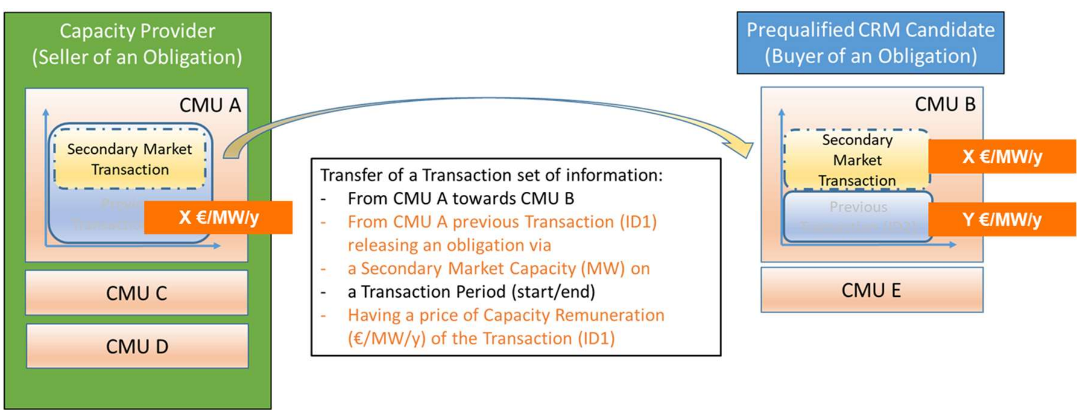


Figure 19: Capacity Remuneration associated to a Secondary Market obligation transfer

Following section 1.3. on considerations and objectives, determining the Capacity Remuneration in this manner facilitates feasibility. The proposed solution indeed means an “inherited” Capacity Remuneration from earlier Transactions and thereby requiring a consistency check on the initially Contracted Capacity.

Contrary to the Strike Price transfer, the Capacity Remuneration is simply to consider as an offset parameter for both counterparties. Indeed, knowing that the Contractual Counterparty shall transfer, in case of validated Secondary Market transaction, the payment of the Capacity Remuneration for the considered Transaction Period and Secondary Market Capacity from the Seller of an Obligation towards the Buyer of an

Obligation, those two parties shall take this into account for their bilateral agreement and settlement.

Design Proposal #9: Capacity Remuneration of a Secondary Market transaction

When calculating the due amount of the Payback Obligation, The Capacity Remuneration that will be applicable for a Transaction resulting from a Secondary Market transaction shall be the Capacity Remuneration of the Transaction releasing its obligation through a Secondary Market transaction.

The Seller of an Obligation and the Buyer of an Obligation shall communicate in the notification subset the Capacity Remuneration of its identified Transaction of the CMU releasing its obligation.

2.3.12 Penalties in case of unavailability following a Secondary Market Transaction

For a Contracted Capacity, the Availability Penalty is proportional to the Capacity Remuneration value. Doing so, everyone is proportionally subject to a similar Availability Penalty.

For the Secondary Market transactions impacting the Total Contracted Capacity and so the Obligated Capacity, as the Capacity Remuneration is transferred accordingly to a Transaction issued from the Secondary Market, there is also a contractual value, so that a proportional penalty is possible.

Design Proposal #10: Penalties for the CMU having Secondary Market Transactions

For the CMU Penalties calculation, the Contracted Capacities and their Capacity Remuneration from the Transactions issued from the Secondary Market are treated as the Primary Market Transactions. The Penalty applies as defined in the Availability Obligations and Penalties design note.

2.3.13 Capacity Contract escalation in case of recurring non-delivery on the obligations following a Secondary Market obligation

Like for any Availability Obligation for Contracted Capacity, the necessary extra penalizing actions should be in place to ensure that all Capacity Providers have sufficient incentives to deliver on their obligations related to the Contracted Capacities of the Secondary Market Transactions. Penalties related to unavailability are the first line of defense. However, in case of recurring and/or severe underperformances for a CMU having Secondary Market Transactions, it should be possible to rely on more impacting sanctions and to escalate this.

As for the Contracted Capacity following an Auction for which in any case a collateral is implicitly present by means of the potential to withhold the Capacity Remuneration, for CMU's carrying obligations following a Secondary Market Transaction, such Capacity

Remuneration could be considered as insufficient (e.g. a short Transaction Period in a period submitted to adequacy issue and is not available to base incentives on.) Alternative mechanisms should therefore be foreseen.

Figure 20: CRM Remuneration as collateral of a CMU

Whereas a potential extra bank guarantee related to the Secondary Market could fulfill a similar role as collateral like withholding the Capacity Remuneration, a bank guarantee – even if proportional to the participating volume (MW) – could still be perceived as a barrier for entry, particularly for smaller players whose access to financial means could be more challenging. Therefore, as a general principle, for Secondary Market Transactions an approach based on contract escalation measures has been opted for instead of a bank guarantee. This means that in case of underperformance, contractual parameters or the right to act on the Primary and Secondary Market could be impacted. This means, however, also that good performing CMU's have little to fear and still have easier access to the CRM than via a bank guarantee.

Related to this matter, three types of CMUs exist differentiated by their participation in the Primary Market solely, the Secondary Market solely or their participation in both Markets.

Type	CMU with Primary Market Transaction(s) only	CMU with Secondary Market Transaction(s) only	CMU with Primary & Secondary Market Transactions
Capacity Remuneration as collateral	Yes (cfr. Stop Loss limit)	Yes but could be very limited in regard to the obligations	Yes but could be very limited in regard to the obligations

Figure 21: Status of the collateral of a Primary Market

For the first type, i.e. those CMU's with only having contractual obligations following their selection in the Primary Market - a CMU netting of the Capacity Remuneration and the Penalties & Payback Obligations has been considered sufficient as underlying 'collateral' to base incentives upon and the standard Availability Obligations and Availability

Penalties and their escalation as proposed in the Design Note on Availability Obligations and Penalties applies. Note that for the Availability Penalties and the Payback Obligation, a Stop-Loss limit equivalent to the yearly contractual value of the Primary Market Transactions applies for each.

For the second (i.e. CMU's with only having Contracted Capacities following Transactions on Secondary Market) and third (i.e. CMUs with Contracted Capacities following their selection in the Primary Market Auction and following Transactions on Secondary Market) types, the standard Availability Obligations and Penalties and their escalation as proposed in the Design Note on Availability Obligations and Penalties applies but there is possibly significantly less collateral compared to the first type and a further contract escalation is proposed according to the following principles.

Type 1: CMU's with only having Contracted Capacities following their selection in the primary market Auction

In the first type, no extra specific Capacity Contract escalation compared to the standard Availability Obligations and Penalties and their escalation as proposed in the Design Note on Availability Obligations and Penalties applies.

Like for all CMU's, in case of underperformances, only penalties as foreseen. However, after 3 underperformances of more than 20% of the Obligated Capacity on the Delivery Period, a first escalation occurs with a downwards of the remuneration to the delivered Capacity level (use of the collateral) while at the same time the Availability Obligations, Penalties & Payback Obligation remain on the Contracted Capacity level. If the CMU Capacity Provider fails to recover the Contracted Capacity level via its intrinsic portfolio modification or via a Secondary Market Transaction, after 2 Delivery Periods (years) the contract termination clause is activated.

Type 2: CMUs with only having Contracted Capacities following Transactions on Secondary Market and Type 3: CMUs with Contracted Capacities following their selection in the Primary Market Auction *and* Contracted Capacities following Transactions on Secondary Market

In the second type and third type, the standard Availability Obligations and Penalties escalation are considered as partially sufficient as there is some Capacity Remuneration in play that could be withheld, but proportionally (potentially significantly) less compared to the situation for Type 1. If the Capacity Remunerations of the Transactions from the Secondary Market are well linked to its Contracted Capacities, it is possible that those amounts are limited in regards to the possible extra Availability Penalties and Payback Obligations of the Transactions issued from the Secondary Market, this especially in case of shorter Transaction Period.

Indeed, as the Primary Market Transactions Capacities are paid on a Transaction Period which is a multiple of entire Delivery Period(s), the collateral is considered sufficient to cover the Availability Penalties related to such Primary Market Contracted Capacity. In comparison, the collateral calculated on Secondary Market Transactions with possible

Transactions Periods short as multiple hours or multiple days, this especially in a context of transfer of obligations in the moments of system stresses where the possibility of Availability Penalties and Payback Obligations are much higher than on a yearly basis, could be considered as insufficient. This risk for has to be covered additionally.

As for CMUs of Type 1, in case of underperformances, penalties are foreseen.

However, on top of the standard Availability Obligations and Penalties escalation, having Secondary Market Transactions implies that after 3 consecutive underperformances of more than 20% of the Obligated Capacity, a first escalation occurs with a suspension of the CMU for further Transactions to buy obligations in the Secondary Market (first protection to compensate the possible lack of collateral) while at the same time the Availability Obligations, Penalties & Payback Obligation remain at the Contracted Capacity level based.

If the CMU Capacity Provider fails to recover the Contracted Capacity level via its intrinsic portfolio modification or via a Secondary Market Transaction, after 20 working days a termination clause is activated with the specifics that the Capacity Provider remains responsible for the already Contracted Capacities and related obligations prior to the clause activation and with a possible suspension of further Transactions for the Capacity Provider (or from other subsidiaries of the mother company of the Capacity Provider) on the remainder of the current Delivery Period, the next Delivery Period and the next upcoming Y-4 and Y-1 Auctions. Only after those, the Capacity Provider can participate again (if successfully prequalified).

Design Proposal #11: Contract escalation for the CMU having Secondary Market Transactions

On top of the standard Availability Obligations and penalties escalation, having Secondary Market Transactions implies that after 3 consecutive underperformances of more than 20% of the Obligated Capacity, a first escalation occurs with a suspension of the CMU for further Transactions to buy obligations in the Secondary Market and if applicable a downwards of the Capacity Remuneration equivalent to the undelivered capacity level.

If the Capacity Provider fails to recover the Contracted Capacity via its intrinsic portfolio modification or via a Secondary Market Transaction, after 20 working days the termination clause is activated with the specifics that the Capacity Provider remains responsible for the already contracted obligations (Obligated Capacities) prior to the clause activation and that a possible suspension of further Transactions for the Capacity Provider (or from other subsidiaries of the mother company) on the remainder of the current Delivery Period, the next Delivery Period and the next upcoming Y-4 and Y-1 Auctions. Only after those, the Capacity Provider can participate again.

2.4 Secondary Market Remaining Eligible Volume

The purpose of this section is to describe the allowed volume related to the Contracted Capacity for a Transaction on the Secondary Market. It starts in 2.4.1 with the description of the different sources of Contracted Capacity possibilities, to introduce in 2.4.2 with the generic formula of the maximal authorized Contracted Capacity between two Non-Energy Constrained CMUs (Transaction of type 1).

In regards to their specific features, section 2.4.3 will describe the different cases related the definition of the maximal authorized Contracted Capacity of Transactions involving at least one Energy Constrained CMU(s).

2.4.1 Sources for liquidity in the Secondary Market

As introduced in section 1.3.2, there are generally five sources of liquidity for the Secondary Market:

- Extra available capacity of the contracted CMUs in the Primary Market for the same Delivery Period (i.e. the volume equivalent to (1-Derating Factor) x Reference Power)
- Prequalified CMUs having participated in the Primary Market Auctions, but that were not selected and contracted (as they were not in-the-money) or only for part of their Eligible Volume.
- Newly prequalified capacities that haven't participated in the Primary Market for the same Delivery Period.
- Opt-out Volumes that have not yet been accounted for in the Auction demand volume (i.e. for which no correction volume of the demand has been introduced in the Auctions for the considered Delivery Period). Note that Opt-out Volumes that have been introduced as correction volume of the demand in the Auction cannot be accommodated in the Secondary Market as this would imply a potential double-counting of the same capacity (i.e. first by lowering the volume procured via the Primary Market Auction and secondly via allowing it to take obligations in the Secondary Market).

The Proven Availability of the Energy Constrained CMU on top of their Obligated Capacity that may be traded in ex-post, giving a room for a broader optimization.

Extra available capacity of the contracted CMUs in the Primary Market Auctions for the same Delivery Period

A first source of liquidity of the Secondary Market is the extra tradable capacity of the selected CMUs in the Primary Market Auctions having an obligation for the concerned Delivery Period.

As for these CMUs, their Total Contracted Capacity is lower than the Reference Power due to the application of a Derating Factor, it is possible to find extra volumes on some specific periods in time allowing to take over an 'extra' obligation. This volumes equals Reference Power x (1-Derating Factor).

For instance, in Ex-ante, in case of a Non-Energy Constrained CMU such as a thermal unit, when the installation is fully available for the energy market, its entire Reference Power is available, incl. the volume above the Contracted Capacity.

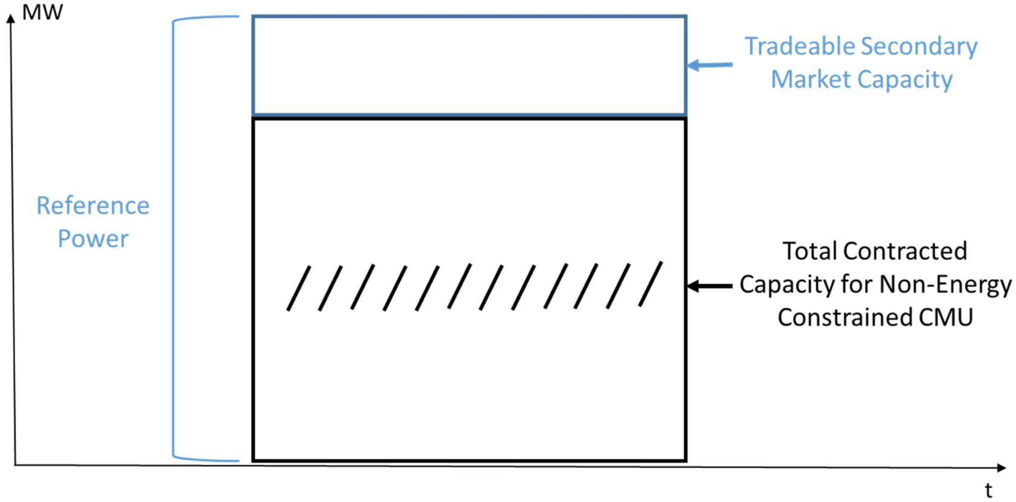


Figure 22: Extra Secondary Market Remaining Eligible Volume of a Non-Energy Constrained CMU

Prequalified CMUs having participated in the primary market Auction, but that were not awarded a Capacity Contract or not for its entire Eligible Volume

Another source of liquidity is the participation in the Secondary Market of any volumes which did participate in the Primary Market but that haven't been selected.

In the following Auction example, the CMU E is existing (or would nevertheless enter the market prior to the Delivery Period) and hasn't been contracted in the Auction for the Delivery Period. This CMU E could however participate in the Secondary Market.

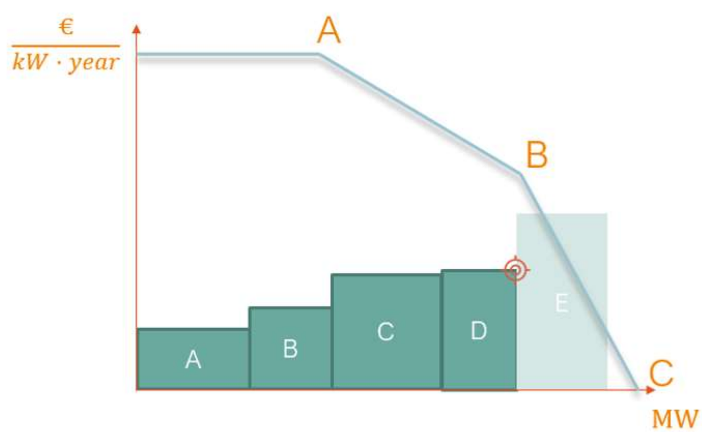


Figure 23: Unsuccessful CMU E from the primary market Auction

Newly prequalified capacities that haven't participated in the Primary Market Auction

Another source of liquidity concerns any newly prequalified capacities. Those capacities weren't participating to the Primary Market (they were for instance not yet sufficiently developed at that time). They also have to be prequalified and monitored at the same level as all the selected Auction CMUs.

Opt-out Volumes that have not yet been accounted for in the Auction demand volume

A source of liquidity concerns CMUs having opted for an Opt-Out for the concerned Delivery Period. Such Opt-out Volumes are considered to be possibly integrated for the part of their asset that hasn't been considered in the Primary Market Auction correction volume of the demand. The Opt-Out Volumes that are considered in the Secondary Market are the part of the Opt-Out "IN" that hasn't been considered in the Primary Market Auction and the Opt-Out "OUT" (according to Design Note Auction Algorithm). Note that Opt-out Volumes which are considered integrated for the part of their asset in the Primary Market Auction correction volume of the demand cannot be accommodated in the Secondary Market as this would imply a potential double-counting of the same capacity (i.e. first by lowering the volume procured via the Auction and secondly via allowing it to take obligations in the Secondary Market), such volume is considered as Opt-Out Volume 'IN" times the Last Published Derating Factor.

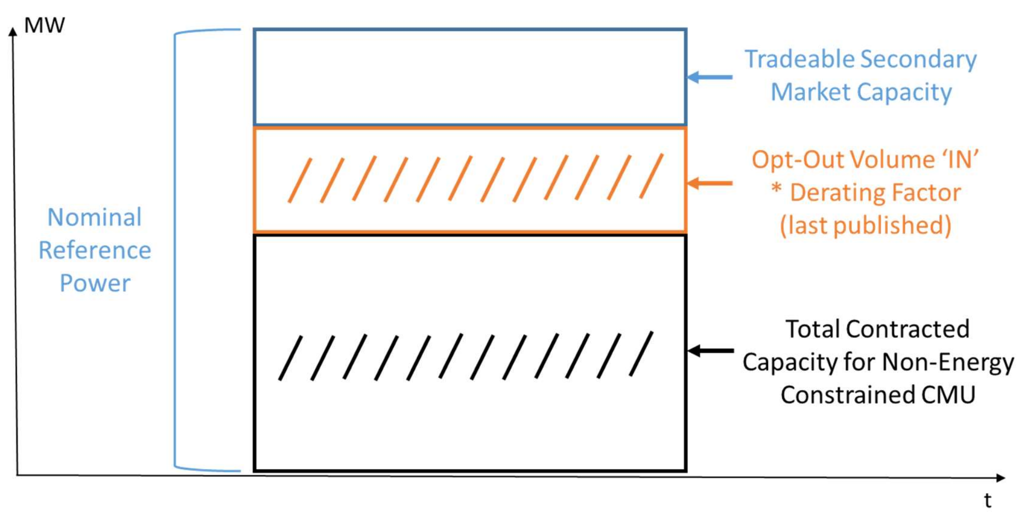


Figure 24: Secondary Market Remaining Eligible Volume of a Non-Energy Constrained CMU with Opt-Out (according to the Opt-Out design note "IN" status)

Design Proposal #12: Types of CMU Secondary Market Remaining Eligible Volume

All duly prequalified CMUs for the Delivery Period having Contracted Capacities may participate to the Secondary Market as Seller of an Obligation.

All duly prequalified CMU considered as Existing Capacities for the Delivery Period may participate to the Secondary Market as Buyer of an Obligation.

The Fast Track Prequalification Process cannot be considered sufficient to prequalify for the Secondary Market.

The Secondary Market allows for those CMUs owned by Prequalified CRM Candidates to acquire new Contracted Capacities and its related obligations either via:

1-The extra tradable capacity of CMUs delivering in the CRM on the Delivery Period

2-The prequalified CMUs having participated in the Auction on the Primary Market and not selected on the period

3-The newly prequalified CMUs that weren't participating in any Auction previously, not even at the mandatory prequalification phase

4- The share of Opt-Out Volume that has not resulted in a reduction of the CRM Required Volume (correction volume of the demand), is allowed to participate in the Secondary Market for the Delivery Period to which the opt-out notification relates.

5- The Proven Availability of the Energy Constrained CMU on top and if above the CMU Obligated Capacity can be contracted in ex-post via the Secondary Market.

The Secondary Market allows for those Existing Capacities owned by Capacity Provider to release their Contracted Capacities and related obligations.

2.4.2 General rule on the determination of the Secondary Market Remaining Eligible Volume & Non-Energy Constrained CMU Secondary Market Remaining Eligible Volume

As previously mentioned in section 2.2, all Transactions will be executed in MW on the Transaction Period. The Capacity Providers with prequalified CMUs or Prequalified CRM Candidates have the possibility of Transactions:

- Either to sell their Contracted Capacities and related obligations up to their total Contracted Capacity acquired in the Primary Market or Secondary Market
- Either to buy/acquire extra Contracted Capacities and related obligations up to certain remaining amount

Nevertheless, for the market parties' comprehension and calculation of Secondary Market potential, from the product perspective, a distinction has to be made between:

- the CMU as releasing a Contracted Capacity and its related obligations or the CMU as acquiring a new Contracted Capacity and its related obligations

- a Secondary Market transaction involving non-Energy Constrained CMUs and a Secondary Market transaction involving at least one Energy Constrained CMUs

- a Secondary Market transaction notified in ex-ante and a Secondary Market transaction notified in ex-post

There are then four possible types of Secondary Market transactions:

Authorized Transactions	SELLER OF ITS OBLIGATION	BUYER OF THE OBLIGATION
Type 1	Non-Energy Constrained	Non-Energy Constrained
Type 2	Energy Constrained	Non- Energy Constrained
Type 3	Non-Energy Constrained	Energy Constrained
Type 4	Energy Constrained	Energy Constrained

Figure 25: Authorized transaction types

The Non-Energy Constrained CMUs that may acquire extra Contracted Capacity or release the Contracted Capacities (e.g. to cover their Missing Capacity)

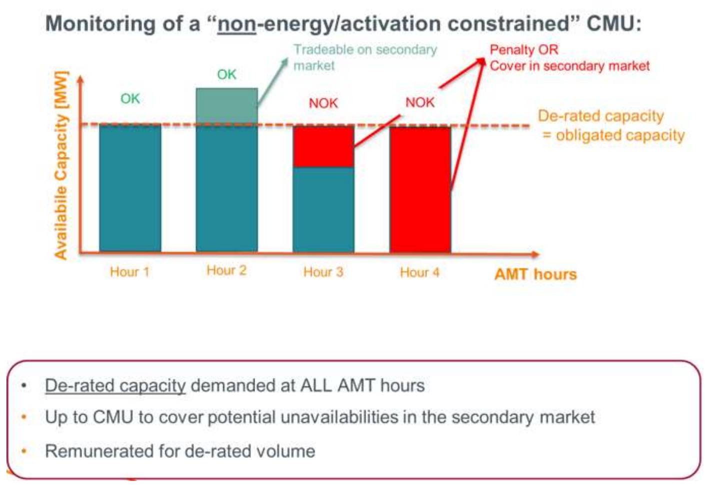


Figure 26: Extra tradable capacity or missing capacity of a non-Energy Constrained CMU

To take over new Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Non-Energy Constrained CMU of a Buyer of an Obligation has a maximal authorized Secondary Market Remaining Eligible Volume equals to:

- In ex-ante:

$$Max(0\,; Nominal\ Reference\ Power\ (CMU,\ t) - \ Total\ Contracted\ Capacity\ (CMU,\ t) - [OptOut\ Volume(CMU, t) * Last\ Published\ Derating\ Factor(CMU)])$$

- In ex-post:

$$Max(0\,; Proven\ Availability\ (CMU,\ t) - \ Total\ Contracted\ Capacity\ (CMU,\ t) - [OptOut\ Volume(CMU, t) * Last\ Published\ Derating\ Factor(CMU)])$$

Where *Opt-Out volume (CMU, t)* is the volume considered as IN, and after multiplied by the Last Published Derating Factor is offered as a correction volume of the demand in the Auction according to Auction Design Note.

To be released of a Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Non-Energy Constrained CMU of a Seller of an Obligation has a maximal authorized volume equals to:

- *In Ex-ante:*
  $Max(0\ ;[Total\ Contracted\ Capacity(CMU,t)])$

- *In Ex-post:*
  $Max(0\ ;[Obligated\ Capacity(CMU,t)])$

For the avoidance of doubt, at AMT Moments, Obligated Capacity equals Total Contracted Capacity for Non – Energy Constrained CMUs.

For obvious reasons, this prevents to sell more than what has been contracted in the previous Primary and Secondary Market previous Transactions.

For the sake of clarity, *Total Contracted Capacity (CMU, t)* and *Obligated Capacity (CMU, t)* are incorporating the previous Secondary Market Transactions for the same period so that the formula could be used at any time to measure the capabilities of Secondary Market new transactions.

2.4.3 Specific rules on the Secondary Market Remaining Eligible Volume for a Secondary Market transaction for Energy-constrained CMUs

This above reasoning (cf. 2.4.2.) for non-energy constraints is not different for Energy Constrained CMUs except that in Ex-ante some correction based on the previous Transactions Derating Factors have to be taken into account on SLA hours. Also only in ex-post, may be traded the Secondary Market Capacities with an hourly granularity (cf. 2.3.8 and 2.4.3).

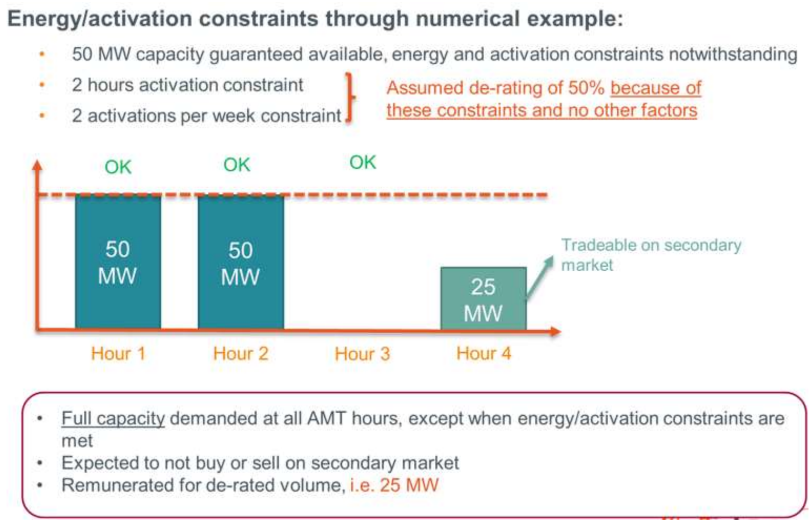


Figure 27: Extra tradable capacity of an Energy constrained CMU

The CMU maximal authorized Secondary Market Remaining Eligible Volume to take over obligation is becoming:

- In Ex-ante:

$$Max\left(0\,;[Nominal\ Reference\ Power\ (CMU,\ t)\right.$$
$$-\left[\frac{Total\ Contracted\ Capacity(CMU,\ t)}{Derating\ Factor\ (CMU,t)}\right]-OptOut\ Volume(CMU,t)]$$
$$\left.*\ Last\ Published\ Derating\ Factor(CMU)\right)$$

- In Ex-post on the SLA hours:

$$Max(0\,;[Proven\ Availability(CMU,\ t)-Obligated\ Capacity(CMU,t)$$
$$-\ OptOut\ Volume(CMU,t)]*Last\ Published\ Derating\ Factor\ (CMU))$$

- In Ex-post on the non-SLA hours:

$$Max(0\,;[Proven\ Availability(CMU,\ t)-Obligated\ Capacity(CMU,t)])$$

Where Opt-Out volume (CMU, t) is the volume considered as IN, and after multiplied by the Last Published Derating Factor is offered as a correction volume of the demand in the Auction according to Auction Design Note.

Where Derating Factor (CMU, t) is the weighted average based on Contracted Capacities of the previous registered Transactions Derating Factors on moment t.

To be released of a Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Energy Constrained CMU of a Seller of an

Obligation has a maximal authorized volume equals to:

- *In Ex-ante:*
  $Max(0\,;[Total\ Contracted\ Capacity(CMU,t)])$

- *In Ex-post:*
  $Max(0\,;[Obligated\ Capacity(CMU,t)])$

For the sake of clarity, the $Total\ Contracted\ Capacity(CMU,t)$ and $Obligated\ Capacity\ (CMU,t)$ are including all the previous CMU Transactions duly registered as expressed (cf. 2.5.).

2.4.3.1 The Energy-Constrained Secondary Market Capacities for transactions during SLA Hours

The present section 2.4.3.1. is covering the capabilities of an Energy Constrained CMU in a framework of a Secondary Market Transactions on SLA Hours.

The prequalified CMUs have the possibility of engaging into Secondary Market transactions:

- Either to sell their Contracted Capacities and related obligation up to a function of their Contracted / Obligated Capacity acquired in a Primary Market Auction or a Secondary Market Transaction
- Either to buy/acquire extra Secondary Market Transactions Contracted Capacities a d related obligations on the same CMU

The key change compared to the rules described above for Non-Energy Constrained Assets is that Transactions may occur between an Energy-Constrained CMU and another CMU, meaning the Transaction types 2, 3 and 4. It is then important to take into account properly the Derating Factor (specifically resulting from the limitation of the energy constraint) for a conversion in order to get back to a Secondary Market Capacity which is allowing such Transaction to occur within the standard formula exposed in 2.4.3.

Authorized transactions	**SELLER OF ITS OBLIGATION**	**BUYER OF THE OBLIGATION**
Type 2	Energy Constrained	Non- Energy Constrained
Type 3	Non-Energy Constrained	Energy Constrained
Type 4	Energy Constrained	Energy Constrained

Figure 28: Energy constrained Transaction types

In section 2.4.3.1.1 the focus is on type 2. Section 2.4.3.1.2 deals with type 3 and in section 2.4.3.1.3 type 4 is covered.

The CMU's maximal authorized Secondary Market Remaining Eligible Volume to take over obligation is becoming:

- In Ex-ante (In Ex-ante, the Energy Constrained CMUs are aimed to deliver on the SLA Hours):
  In Ex-ante, as the Energy Constrained are only reliable for the SLA Hours, its Total Contracted Capacity has to be divided by the weighted average contracted Derating Factor of the CMU.
  This can't been double registered in the Secondary Market, this is neither the case for the Opt-Out volume.
  On top, as the Secondary Market Capacity is a capacity aimed to be transferred, the Last Published Derating Factor is applied for the conversion, so that:

$$Max\left(0\,;[Nominal\ Reference\ Power\ (CMU,\ t) - [\frac{Total\ Contracted\ Capacity(CMU,\ t)}{Derating\ Factor\ (CMU, t)}] - OptOut\ Volume(CMU, t)] * Last\ Published\ Derating\ Factor(CMU)\right)$$

- In Ex-post on the SLA hours:

  What has been registered on the CMU as Contracted Capacities is resulting in an Obligated Capacity in ex-post, this can't been double registered in the Secondary Market, this neither for the Opt-Out volume. On top, solely the Proven feature of the delivery could be traded in ex-post Secondary Market hourly transactions so that:

$$Max(0\,;[Proven\ Availability(CMU,\ t) - Obligated\ Capacity(CMU, t) - OptOut\ Volume(CMU, t)])$$

Where Opt-Out volume (CMU, t) is the volume considered as IN, and after multiplied by the Last Published Derating Factor is offered as a correction volume of the demand in the Auction according to Auction Design Note.

Where Derating Factor (CMU, t) is the weighted average based on Contracted Capacities of the previous registered Transactions Derating Factors on moment t.

To be released of a Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Energy Constrained CMU of a Seller of an Obligation has a maximal authorized volume equals to:

- *In Ex-ante:*
  $Max(0\,;[Total\ Contracted\ Capacity(CMU, t)])$
- *In Ex-post:*
  $Max(0\,;[Obligated\ Capacity(CMU, t)])$

For the sake of clarity, the $Total\ Contracted\ Capacity(CMU, t)$ and $Obligated\ Capacity\ (CMU, t)$ are including all the previous CMU Transactions duly registered as expressed, coming from the Primary and Secondary Market (cf 2.5.).

2.4.3.1.1 The type 2 specifics: Energy Constrained CMU as seller, Non-Energy Constrained CMU as buyer: impact on potential Obligated Capacity

For a Transaction with an Energy-Constrained CMU as Seller of an Obligation, the Contracted Capacity is deducted after application of the Derating Factor on the desired decrease of its Obligated Capacity.

This will be applied using the Last Published Derating Factors for the concerned SLA.

Firstly, the Secondary Market Capacity (e.g. 2MW) is calculated based on the desired decrease of the Contracted Capacity (e.g.2MW but representing 8MW of potential Obligated Capacity on the SLA Hours as divided by the Derating Factor (e.g. 0,25)). Secondly, the Secondary Market Capacity (e.g. 2MW) transferred is simply added to the Non-Energy Constrained CMU's Total Contracted Capacity (5MW becoming 7MW). As the Buyer of Obligation is a Non-Energy Constrained CMU, its Total Contracted Capacity represents its Obligated Capacity during AMT Moments.

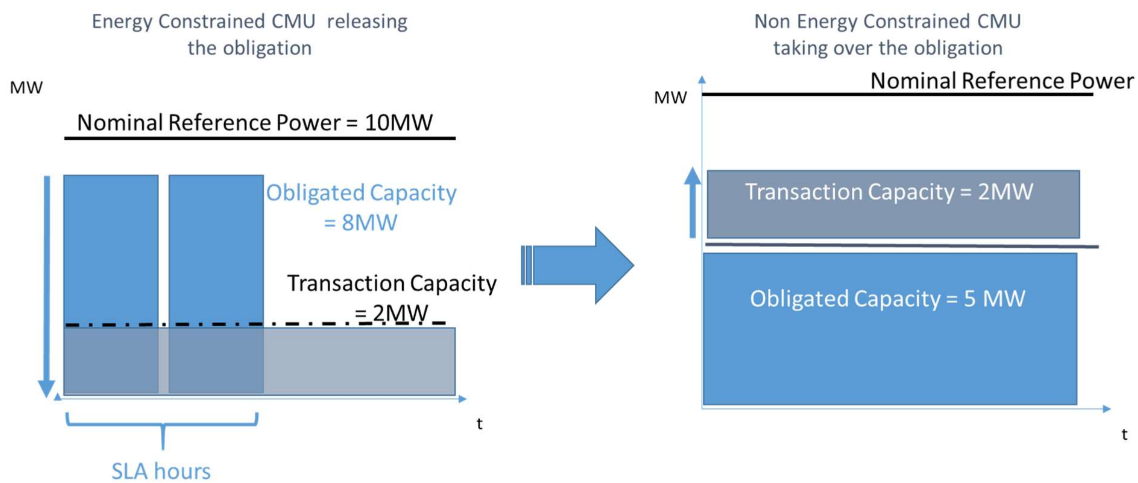


Figure 29: Type 2: Energy Constrained CMU Selling its Contracted Capacity to a non-Energy constrained CMU

2.4.3.1.2 The type 3 specifics: Non-Energy Constrained CMU as Seller, Energy Constrained CMU as Buyer: impact on potential Obligated Capacity

Compared to Type 2, Type 3 doesn't have to convert with a Derating Factor from the Seller perspective its decrease of Contracted Capacity to calculate the Secondary Market Capacity.

But as the Buyer of the Obligation has energy constraints covered via an SLA, the extra Contracted Capacity is converted in a (higher) potential Obligated Capacity using the Derating Factor according to its SLA and according to the Availability Obligations and Penalties conversion for an Energy Constrained CMU.

Firstly, Secondary Market Capacity from the Seller of the Obligation is defined (e.g.

2MW) as the decrease of the Contracted Capacity. Secondly, the Contracted Capacity transferred is added as a new Transaction leading to an increase of the Total Contracted Capacity of the Buyer of the Obligation, such increase is considered as the Secondary Market Capacity (e.g. 2MW) involving an increase of the energy constrained buyer's potential Obligated Capacity as the Contracted Capacity is divided by the Derating Factor (e.g. 0,6666), giving an increase of the potential Obligated Capacity (e.g. from 5MW to 8MW as 5MW + (2MW/0,6666)).

Increase of the Total Contracted Capacity of the Buyer of the Obligation is equal to its previous Total Contracted Capacity plus the new Secondary Market Transaction Contracted Capacity.

The potential Obligated Capacity of the Buyer of the Obligation is increased up to its previous Obligated Capacity plus the new Secondary Market Transaction Contracted Capacity divided by the Derating Factor of the SLA of the CMU at the moment of the Secondary Market Transaction is validated/registered.

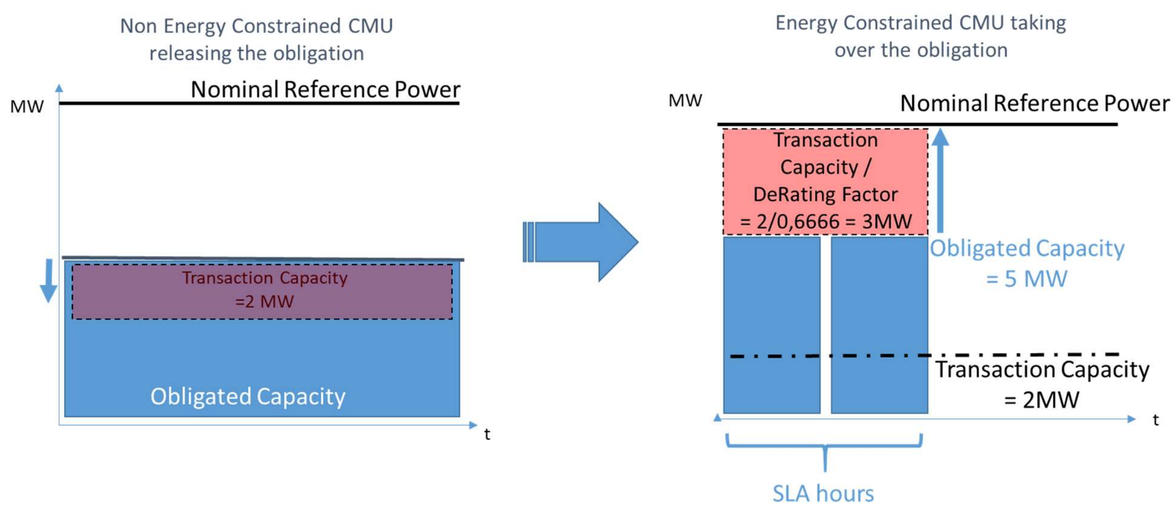


Figure 30: Type 3: Non-Energy Constrained CMU Selling its obligation to an Energy constrained CMU

2.4.3.1.3 The type 4 specifics: Energy Constrained CMU as seller, Energy Constrained CMU as buyer: impact on potential Obligated Capacity

As the buyer and the seller may have different SLAs, Type 4 is a combination of both constrained of Type 2 and Type 3.

For a Transaction with an Energy-Constrained CMU as Seller of an Obligation, the Secondary Market Capacity is deducted from the Total Contracted Capacity of the CMU releasing an obligation.

The remaining Transaction releasing its obligation Obligated Capacity is still calculated on the Transaction Derating Factor of the SLA of the CMU.

Firstly, the Secondary Market Capacity (e.g. 1MW) is calculated based on the desired decrease of the Contracted Capacity (e.g. 1MW which is divided by the Derating Factor (e.g. 0,6666) in order to measure the impact on the seller's Obligated Capacity (e.g. 1MW / 0,6666 ➔ 1,5MW).

Secondly, the Secondary Market Capacity (e.g. 1MW) transferred is simply added as an increase of the Total Contracted Capacity of the CMU taking over the obligation, such increase results in an increase of the potential Obligated Capacity calculated as the Secondary Market Capacity transferred divided by the Last Published Derating Factor related to the Buyer of the Obligation's category (e.g. 1MW divided by 0,5 ➔ increase of 2MW).

The Obligated Capacity of the Buyer of the Obligation increases up to its previous Obligated Capacity plus the new Secondary Market Transaction Contracted Capacity divided by the Derating Factor of the SLA of the CMU at the moment of the Secondary Market Transaction is validated/registered (e.g. 5MW + (1MW / 0,5) = 7MW).

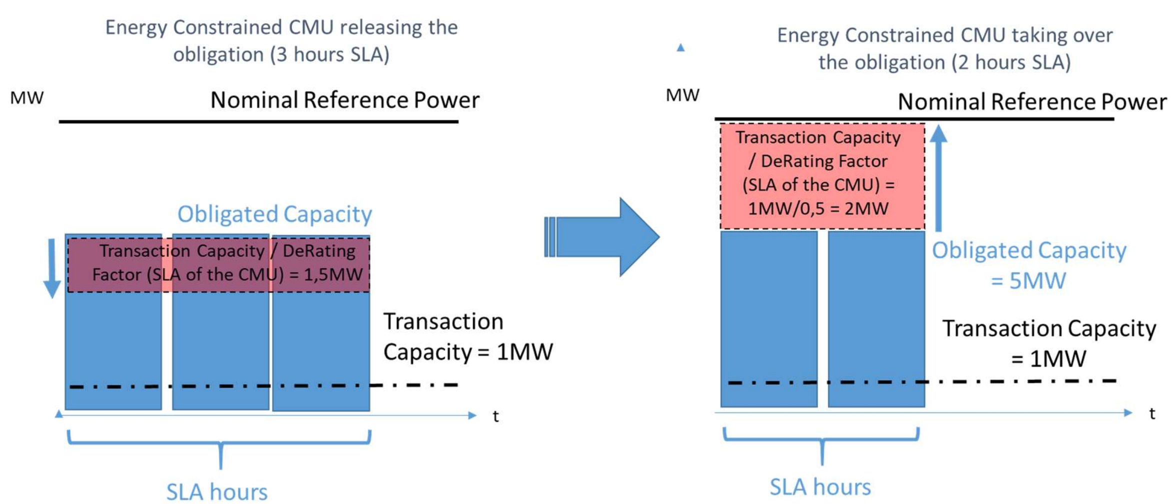


Figure 31: Type 4: Energy Constrained CMU Selling its obligation to an Energy constrained CMU

2.4.3.1.4 The generic rule for Non-Energy Constraints CMU and SLA hours of the Energy Constrained CMU

Design Proposal #13: Secondary Market Remaining Eligible Volume **for Non-Energy Constrained CMUs and Energy Constrained CMUs on their SLA Hours**

To take over new Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Non-Energy Constrained CMU of a Buyer of an Obligation has a maximal authorized Secondary Market Remaining Eligible Volume equal to:

In ex-ante:

$$Max(0\,;Nominal\ Reference\ Power\ (CMU,\ t) - \ Total\ Contracted\ Capacity\ (CMU,\ t) -$$

$[OptOut\,Volume(CMU,t) * Last\ Published\ Derating\ Factor(CMU)])$

In ex-post:

$Max(0\,; Proven\ Availability\ (CMU,\ t) - \ Total\ Contracted\ Capacity\ (CMU,\ t) - [OptOut\,Volume(CMU,t) * Last\ Published\ Derating\ Factor(CMU)])$ Where *Opt-Out volume (CMU, t)* is the volume considered as IN, and after multiplied by the Last Published Derating Factor is offered as a correction volume of the demand in the Auction according to Auction Design Note.

To be released of an obligation in the Secondary Market for the Transaction Period, the Non-Energy Constrained CMU of a Seller of an Obligation has a maximal authorized volume equal to:

In Ex-ante:

$Max(0\,; [Total\ Contracted\ Capacity(CMU,t)])$

In Ex-post:

$Max(0\,; [Obligated\ Capacity(CMU,t)])$

To take over new Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Energy Constrained CMU of a Buyer of an Obligation has a maximal authorized Secondary Market Remaining Eligible Volume equal to:

In Ex-ante:

$$Max\left(0\,; [Nominal\ Reference\ Power\ (CMU,\ t) - [\frac{Total\ Contracted\ Capacity(CMU,\ t)}{Derating\ Factor\ (CMU,t)}] - OptOut\,Volume(CMU,t)] * Last\ Published\ Derating\ Factor(CMU)\right)$$

In Ex-post on the SLA hours:

$$Max(0\,; [Proven\ Availability(CMU,\ t) - Obligated\ Capacity(CMU,t) - OptOut\,Volume(CMU,t)])$$

Where *Opt-Out volume (CMU, t)* is the volume considered as IN, and after multiplied by the Derating Factor is offered as a correction volume of the demand in the Auction according to Auction Design Note.

Where Derating Factor (CMU, t) is the weighted average based on Contracted Capacities of the previous registered Transactions Derating Factors on moment t.

To be released of Contracted Capacities and related obligations in the Secondary Market for the Transaction Period, the Energy Constrained CMU of a Seller of an Obligation has a maximal authorized volume equals to:

In Ex-ante:

$Max(0\,; [Total\ Contracted\ Capacity(CMU,t)])$

In Ex-post:

$Max(0\,;[Obligated\ Capacity(CMU,t)])$

2.4.3.2 The Energy Constrained CMU Transactions on non-SLA hours

The CMU maximal authorized Secondary Market Remaining Eligible Volume to take over obligation is becoming:

- In Ex-post on the non-SLA hours:
  $Max(0\,;[Proven\ Availability(CMU,\ t) - Obligated\ Capacity(CMU,t)])$

The CMU the maximal authorized Secondary Market Remaining Eligible Volume to be released of its obligations:

- *In Ex-post* on the non-SLA hours*:*
  $Max(0\,;[Obligated\ Capacity(CMU,t)])$

Design Proposal #14: Secondary Market Remaining Eligible Volume for Energy Constrained CMUs on their non-SLA hours

The Secondary Market transactions of the Energy Constrained CMU with a Transaction Period granularity of hours are mandatory traded in ex-post.

On the non-SLA hours, the Proven feature of the Availability is required to acquire Contracted Capacities and related obligations.

The CMU maximal authorized Secondary Market Remaining Eligible Volume to take over obligation is becoming:

In Ex-post on the non-SLA hours:

$Max(0\,;[Proven\ Availability(CMU,\ t) - Obligated\ Capacity(CMU,t)])$

The CMU the maximal authorized volume to be released of its obligations:

In Ex-post on the non-SLA hours*:*

$Max(0\,;[Obligated\ Capacity(CMU,t)])$

2.5 Contractual impact of a validated Secondary Market transaction

According to the pre-requisites of 2.3 and 2.4, once a Secondary Market transaction is validated by ELIA and the Contractual Counterparty (approved), it implies that;

For the Energy Constrained CMUs as Buyer of an Obligation, a new Transaction will be created on the CMU for the Transaction Period with a Contracted Capacity equal to the

Secondary Market Capacity of the Secondary Market transaction. The potential Obligated Capacity will be updated by adding the Transaction Contracted Capacity divided by the Transaction registered Derating Factor for its SLA category (latest publication at the Transaction creation date).

For the Energy Constrained CMUs as Seller of an Obligation, the Transaction releasing (part of) its Contracted Capacity and related obligations will be updated on the CMU for the Transaction Period by deducting the Secondary Market Capacity of the Secondary Market transaction from the Transaction releasing an obligation Contracted Capacity. The potential Obligated Capacity will be updated by the Transaction Contracted Capacity divided by the Transaction Derating Factor registered on the Transaction for its SLA Category.

For the Non-Energy Constrained CMUs as Buyer of an Obligation, a new Transaction will be created on the CMU for the Transaction Period with a Contracted Capacity equal to the Secondary Market Capacity of the Secondary Market transaction. The potential Obligated Capacity will be updated by adding the Transaction Contracted Capacity.

For the Non-Energy Constrained CMUs as Seller of an Obligation, the Transaction releasing (part of) its Contracted Capacity and related obligations will be updated on the CMU for the Transaction Period by deducting the Secondary Market Capacity of the Secondary Market transaction to the Transaction releasing an obligation Contracted Capacity. The potential Obligated Capacity will be updated by the decrease of the Transaction Contracted Capacity.

Design Proposal #15: Contractual impact of a validated Secondary Market transaction

For the Secondary Market transaction approved by ELIA and the Contractual Counterparty:

For the CMU releasing an obligation (with its Seller of an Obligation), the previous Transaction from which the obligation will be deducted as mentioned in the dataset, shall be updated by deducting the Secondary Market Capacity to the previous Contracted Capacity of the Transaction releasing an obligation on the Transaction Period.

For the CMU taking over an obligation (with its Buyer of an Obligation), a new Transaction will be created with a Contracted Capacity equal to the Secondary Market Capacity on the Transaction Period.

The newly created Transaction will acquire a Derating Factor equal to the Last Published Derating Factor of the CMU acquiring an obligation at the moment of the validation.

The newly created Transaction will acquire the Strike Price of the Transaction releasing an obligation and if applicable, its indexation parameters.

The newly created Transaction will acquire the Capacity Remuneration of the Transaction releasing an obligation.

Once the new Transaction and the changes on the previous Transaction releasing an obligation are registered, all modalities and obligations are related to the updated Contracted Capacities.

2.6 Timing of the solution deployment

As mentioned by the CRM Law, the Secondary Market will have to be created no later than one year before the start of the first Delivery Period. As the first Delivery Period intends to start on 1st November 2025, the Secondary Market should be open as of no later than 1st November 2024.

Design Proposal #16: deployment timing of the Secondary Market

The Secondary Market entry in force will occur no later than one year before the first CRM Delivery Period.

ELIA and the Contractual Counterparty will be in best effort approach to deliver upfront.