ELIA TRANSMISSION BELGIUM

Connection with flexible access: evolution of the framework at federal level
Design note

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Executive Summary

The present note aims at describing the evolutions related to connections with flexible access in the mid/short term and with a focus on the federal grid. These evolutions were initiated for the following reasons:

- The growing importance of connections with flexible access, in an energy transition context leading to a massive increase of connection requests for renewables, storage and electrified processes that often require to be connected earlier than the grid reinforcements that are necessary to absorb those additional injections/offtakes.
- The received feedback and concerns from Market Parties, highlighting the fact that the current way to treat connections with flexible access needs to be clarified. On the one hand, more transparency is needed on the way the flexible volumes are estimated and on the way Elia makes use of those connections with flexible access in operation. On the other hand, there is a need for more guarantees so that concerned Grid Users can calculate the viability of their business case.
- The willingness from the CREG to amend the Code of Conduct (federal regulatory framework) and have a dedicated and comprehensive framework for connections with flexible access.
- The 2024 incentive related to a "Vision and roadmap on flexibility for congestion management and transparency on flexibility activations for connections with flexible access" as described and approved in CREG decision project (B)658E/84.

The present design is based on the existing "Gflex product", where the flexibility is activated in Real Time with setpoints based on measurement of critical grid elements. Three workshops were organized in Q1 2024 in order to support the proposal of this design and a fourth workshop is planned in June 2024. Based on the present design and on the feedback from Market Parties to the related public consultation, Elia will:

- Propose a modification of Code of Conduct to the CREG;
- Identify the other regulated documents (e.g. Connection Contract, Coordination Rules for Congestion Management…) that should be adapted;
- Propose an implementation plan.

In addition, further discussions related to the development of new products in order to deal with the evolving context and with needs of specific Grid Users (e.g. "slow" demand facilities) will take place later in 2024, with the objective to provide a roadmap of evolutions by the end of the year in a dedicated workshop to be organised in Q4 2024.

This note is structured as follows.

The first Section (introduction) gives more insight on the context of connections with flexible access, the trigger and scope of the proposed design and the expected further evolutions.

Section 2 gives an overview of the existing European, federal and regional regulatory frameworks related to connections with flexible access as well as the expected evolutions. This section highlights that there are divergences between the regulatory frameworks at federal and regional level and that there is a need for harmonization between the different voltage levels.

Section 3 elaborates on the concept of “temporary period” for Grid Users choosing for a connection to the grid prior to the realization of the needed grid reinforcements. This would be possible with a connection with flexible access during a temporary period where the Grid Users would have to bear the cost (i.e. no compensation) of the activated flexibility needed to solve congestions.

Section 4 analyses the current situation of the connection process (connection studies and capacity reservation process) and proposes improvements in order to streamline those processes and to avoid “sleeping” reserved capacities. The main proposed changes consist in applying a serial approach for linked orientation studies (this in order to avoid situations where the results are obsolete by the time the study reports are sent), in limiting the (prolongations of reserved capacities, and in introducing a bank depositin order to avoid “sleeping” reserved capacities.

Section 5 describes the procedures and criteria used when performing connection studies. This includes, amongst others, the clarification of the reference context (which existing and future GUs are considered, what are the considered profiles…), which system states are analyzed and what are the applicable technical criteria, what are the considered connection solutions and what is the methodology for computing the flexible volumes.

Section 6 describes the guarantees that need to be provided to Grid User with flexible access in order to enable them to assess the viability of their business cases. The proposed guarantees are related to the maximal duration of the temporary period (covering cases where grid reinforcements are already foreseen or not) and to the use of flexibility during this temporary period. A binding cap is defined, beyond which potential flexibility activations are subject to a compensation to the Grid User. The compensation is defined consistently with the iCAROS framework. Finally, the section includes considerations on the revaluation of flexible volumes calculated in the grid connection study.

Section 7 explains how connections with flexible access are considered in the operational congestion management process. In a nutshell, the connections with flexible access that have not yet reached their cap are considered first in the merit order (after internal elia remedial actions) to solve congestion on a limited set of monitored grid elements. After having reached their cap, the connections with flexible access are treated the same way as contracts with a firm access in the forecasts and activations (redispatching) in Day-Ahead and Intraday – but activations in Real Time can still occur for residual congestions that were not forecasted (and are compensated according to modalities described in section 6). In a general way, activations of connectionswith flexible access are always performed in Real Time in order to avoid unnecessary activations of flexibility– but Elia intends to inform the concerned market parties if preventive activations are forecasted in Day-Ahead or in Intraday.

Section 8 describes the data on the flexibility activations of connections with flexible access that will be reported to the CREG and to the concerned Grid Users, as well the aggregated data that will be published on Elia's website.

Section 9 describes a proposed Target Model (i.e. a vision) on how Grid User flexibility could be used for congestion management purpose in the future. This section describes the fundamental principles of the proposed Target Model first, and then elaborates on how long term grid planning and client connection processes would evolve based on this proposed vision. Finally, this section elaborates on the need to develop new congestion flexibility products in the future.

Section 10 describes the next steps that will follow the public consultation of the present design note, being the gap-analysis with the current regulatory framework, the analysis of the received feedback and the resulting modifications of the proposed design, a proposal of amendment of the Code of Conduct to the CREG and the organization of additional workshops.

Glossary

- CBA : Cost-Benefit-Analysis
- CoC : Code of Conduct
- CNE : Critical Network Element (Grid User
- DA : Day Ahead
- DP : Delivery Point
- DP_{SU} : Delivery Point Single Unit
- $DP_{PG:}$: Delivery Point Providing Group
- EDS : Detailed study
- EOS : Orientation study
- EMS : Energy Management System
- EHV : Extra High Voltage
- iCAROS : Integrated Coordination of Assets for Redispatching and Operational Security
- ID : Intraday
- MIC : Minor Change
- PTDF : Power Transfer Distribution Factor
- RA : Remedical Action
- RT : Real Time
- (Core) ROSC Methodology: Core TSOs' common methodology for Regional Operational Security Coordination
- SA : Scheduling Agent
- SoC : State of Charge

1 Introduction

The energy transition implies a massive integration of renewable energy sources and the electrification of (industrial) processes leading to an increase of demand and increasing needs for flexibility in the system. In this context, Elia must provide a robust and fit-for-purpose power grid to the Belgian society. To reach this purpose and in order to meet the Belgian and European objectives of renewables integration, electrification of demand and market integration, Elia proposes the appropriate grid reinforcement projects, striving for a techno-economical optimum for society.

During these last years, the energy transition has significantly accelerated, leading to an increasing number of Grid Users' connection requests for renewables, storage and electrification of industrial processes. In case of connection requests in a grid area without enough hosting capacity[1], grid reinforcements[2] must be realized to enable a connection with firm access of those Grid Users. Given the significant difference in lead time[3] between the development or reinforcement of Grid Infrastructure on one hand and electrification/renewables projects on the other hand, instead of refusing the connection requests – and therefore slowing down the energy transition – and if agreed by the Grid User, Elia can propose a (temporary) connection with flexible access[4] to the Grid User so that he can connect before the realization of the needed grid reinforcement projects.

Besides, the so-called "Gflex" solution[5] was historically developed in 2010 in order to manage congestions on the transmission grid (high/medium voltage transformers, upstream lines) due to local production (onshore wind and solar) at DSO level. Due to the acceleration of the energy transition, this solution – which was only marginal at first – is expected to be used more frequently, including for TSO-connected units. Connections with flexible access can therefore no longer be considered as a marginal

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[1] i.e. in "congested" grid areas

[2] Which can be already anticipated and foreseen in the federal development plan, or not identified yet.

[3] Typical lead time of an electrification or renewables project varies from 1 to 3 years, while the lead time of a grid infrastructure project can vary from 5 to 15 years depending on the type of project (substation, line or cable) and the concerned voltage level

[4] For the sake of clarity, losses or reductions of access to the grid remaining from planned maintenance of the connection equipments is not considered as flexibility. Moreover connection with interruptible access, i.e. connections contracted by a grid user in the knowledge that the outage of one or several grid equipments implies a complete loss of access to the grid, are not in the scope of this design note.

[5] The Gflex solution is based on real-time surveillance of some critical lines or elements and sends real-time setpoints with the maximal admissible injection or withdrawal at the level of the connection point to the concerned Grid Users when a risk of congestion is detected. This solution was historically developed for Generation (Generation-flexible), but the same concept can be applied to batteries (Bflex) and load (Lflex).

solution. In this context, Elia has launched the *Grid User Flexibility for Congestion Management project* in 2023, aiming at:

- Defining the vision concerning the consideration of flexibility of Grid Users for congestion management in Long Term Grid Planning, connection contracting, operational planning and grid operations processes (the so-called "Target Model")
- Developing congestion management products suited for more frequent congestions and that can be used by demand, storage and generation.

Complementary to those objectives, the CREG has defined[6] an incentive related to flexible access to be performed in 2024 and covering the following aspects:

- Ensure transparency related to the activation of connection with flexible access to solve congestions.
- Develop a vision and methodology to integrate flexibility in the cost-benefits analysis of the connection options proposed to Grid Users in the context of orientation and detail studies.
- Develop a vision and a roadmap to integrate Grid User's flexibility in the long-term grid planning.

Two public consultations related to connections with flexible access already took place in 2023:

- During Summer 2023 and upon CREG request, Elia launched a public consultation of a Design Note describing the criteria used to assess when a connection with flexible access can be proposed and the current way to use connections with flexible access, aiming at gathering the main concerns and comments of stakeholders as regards to the existing "flexible connection product".
- In Autumn 2023, the CREG launched a public consultation[7] of the Code of Conduct aiming at adapting the approval process by the CREG for granting connections with flexible access.

The feedback from Market Parties captured through those public consultations highlighted that the current way to treat connections with flexible access needs to be clarified. There is a need for more transparency on the way the flexible volumes are estimated, on the way Elia makes use of those Gflex units and a need for more guarantees so that Grid Users can calculate the viability of their business case.

In that perspective, the CREG asked Elia to prepare a proposition of amendment of the Code of Conduct and submit it to the CREG in September 2024.

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[6] Decision (B)658E/84 of 12 october 2023

[7] https://www.creg.be/nl/openbare-raadplegingen/prd2667

Elia aims to address these needs and to support the definition of a federal regulatory framework on connections with flexible access which can be implemented from Grid Studies to Operations in the short/mid term. While investigating the subject and having exchanges with market parties, Elia has identified new questions and interlinks with other topics (such technological particularities, needs to develop potentially different products, European evolutions such as ROSC, etc.) that are leading us to work in different steps. Defining a regulatory framework addressing all those questions and interlinks at once would indeed imply a very long leadtime before the first benefits would be made available given that new products would need to be developed.

In a first step, Elia will therefore focus on the clarifications and guarantees that can be given to flexible contracts for Grid Users according to the existing "Gflex[8] product" – open to all technologies (production, storage and demand) which have the capability to react to real-time activations of flexibility for congestion management purpose – and according to the existing operational context. This approach is meant to cover a significant part of the identified Grid User needs and concerns and enable an implementation from grid studies to operations in the short/mid term, so that contractual conditions (including the guarantees given to Grid Users) and operational rules of activations applicable to connections with a flexible access are clear and transparent.

In a next step, Elia will develop a global vision aiming at integrating existing and new products taking into account European, federal and regional framework evolution. Section 9 already lays some elements of this Target Model. It is to be noted that this parallel trajectory will already be initiated this year.

The present design note, which is part of the incentive related to flexible access and which will lead to an amendment of the regulatory framework in 2024-2025, is therefore written in that perspective. Most of the content has been discussed in workshops with Market Parties in Q1 2024. In parallel to those workshops, the CREG has published a vision note on flexible access. This vision note is intented as an input for the discussion and can evolve as a result of discussions with the Market Parties and with Elia. Elia carefully assessed the CREG vision note; on those areas where this design note differs from the one from CREG, Elia also included the underlying rationale.

Following the public consultation of the present design note, Elia will prepare a proposal of modification of the Code of Conduct and submit it to the CREG in September 2024. In parallel, Elia will identify the other regulated documents (e.g. Connection Contract, Coordination Rules for Congestion Management…) that should also be adaptedand propose an implementation plan.

In a later stage in 2024 Elia will gather additional needs for evolutions (for example specific needs for "slow" demand facilities, contextual european and regional evolutions

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[8] During the present note, we will systematically use "Gflex" to refer to "activation of flexibility of Grid User with a connection with flexible access by using RT setpoints"

that might impact operational processes…). These needs will be presented and discussed during workshops with stakeholders, and Elia will then propose a roadmap for all those identified necessary evolutions.

The present design note describes Elia's vision for all Grid Users connected on Elia's grid and will be applied for connections with flexible access at the federal grid in a first stage. As regards to the regional grids, Elia will comply with the particularities of the existing regional frameworks and will pursue discussions in order to harmonize the frameworks as much as possible.

When building the proposals in the present document, it is important to ensure consistency between the different processes. This is necessary to ensure a global consistency between the methodology to calculate the required flexibility in the grid connection study, the operational processes that activate the flexibility and the methodology to determine the activated flexibility for the purposes of reporting, of how the activated volumes are counted and of what happens if/when the volumes activated reach or exceed the required volumes estimated in the studies.

The design note is structured as follows:

- Section 2 gives an overview of the existing federal, regional and European regulatory framework related to connections with flexible access as well as their expected evolutions.
- Section 3 defines and justify the temporary period concept.
- Section 4 proposes some clarifications and adaptions related to the connections processes[9].
- Section 5 describes the procedures and criteria for client-connection studies.
- Section 6 describes a proposal of guarantees to be provided to Grid Users with flexible access.
- Section 7 provides a description of operational principles related to connection with flexible access.
- Section 8 describes the data on the activations of connections with flexible access that will be reported and published.
- Section 9 describes the "Target Model" (i.e. Elia's vision on how connections with flexible could evolve in the long term for congestion management purpose)
- Finally, section 10 describes the next steps that will follow the public consultation of the present design note.

[9] Orientation and Detail Studies process and reservation/allocation of capacities. These aspects are not foreseen in the scope of the incentive on flexible access. However, given the strong synergy and link with flexible access, Elia proposes to include these processes in the scope of the present design note and in the proposition of Code of Conduct that will follow.

2 Regulatory framework

2.1 The regulatory framework at European level

At European level, the principles for access limitation of new connections are established in article 42.2 of Directive (EU) 2019/944.

> *2.The transmission system operator shall not be entitled to refuse the connection of a new generating installation or energy storage facility on the grounds of possible future limitations to available network capacities, such as congestion in distant parts of the transmission system. The transmission system operator shall supply necessary information.*
>
> *The first subparagraph shall be without prejudice to the possibility for transmission system operators to limit the guaranteed connection capacity or to offer connections subject to operational limitations, in order to ensure economic efficiency regarding new generating installations or energy storage facilities, provided that such limitations have been approved by the regulatory authority. The regulatory authority shall ensure that any limitations in guaranteed connection capacity or operational limitations are introduced on the basis of transparent and non-discriminatory procedures and do not create undue barriers to market entry. Where the generating installation or energy storage facility bears the costs related to ensuring unlimited connection, no limitation shall apply.*

From this the TSO can conclude connection contracts with flexible access in the following conditions:

- For generation and storage faciltities,
- In case of congestions that would lead to a refusal of the connection,
- Upon approval of the regulatory authority.

Furthermore, article 42.1 states that:

> *The transmission system operator shall establish and publish transparent and efficient procedures for non-discriminatory connection of new generating installations and energy storage facilities to the transmission system. Those procedures shall be subject to approval by the regulatory authorities.*

From this, the TSO should establish and publish these procedures for connection, including connections with flexible access.

Next to this, article 13.7 of Regulation (EU) 2019/943 states that:

> *Where non-market based redispatching is used, it shall be subject to financial compensation by the system operator requesting the redispatching to the operator of the redispatched generation, energy storage or demand response facility except in the case of producers that have accepted a connection agreement under wich there is no guarantee of firm delivery of energy. […]*

This implies that a financial compensation is not compulsory as long as the Grid User has accepted a connection contract where firm access is not guaranteed. Nonetheless, one can conclude that this does not prevent the TSO to foresee compensation beyond a contractually defined flexibility threshold.

The above-mentioned framework has been adapted with the recently adopted Electricity Market Design Reform[10] that explicitely includes the concept of flexible connection agreements as opposed to firm connection agreements. The adopted Electricity Directive[11] coming from this reform should enter into force soon and should be transposed in national law within the 6 months of its entry into force. According to the Directive, these flexible connection contracts should:

- Be allowed for all Grid Users who request a connection in an area where there is limited or no network capacity available;
- Not delay network reinforcements;
- Be converted to firm connection agreements when the network is developed while they can be considered as a permanent solution if network development is not considered as an efficient solution.

Besides, these contracts should include at least:

- The firm and flexible capacities with time differentiation throughout the year;
- The applicable network charges for these firm and flexible capacities;
- The duration of the flexible connection.

These evolutions further develop the EU legal framework for connections with flexible access. The framework proposed in this document has been developed according to the above-mentioned principles and evolutions.

2.2 The regulatory framework at federal level

The federal regulatory framework for connections with flexible access is described in the Code of Conduct[12]. Article 61 of the Code of Conduct describes the procedure to be followed when the transmission system operator proposes a connection with flexible access during an orientation study or a detailed study. This procedure can be summarized as follows:

Access refusal (art. 15, §1 of the Electricity law)	Access can only be refused in case of lack of capacity.

[10] Electricity market reform: Council signs off on updated rules - Consilium (europa.eu)

[11] Directive of the European Parliament and of the Council amending Directives (EU) 2018/2001 and (EU) 2019/944 as regards improving the Union's electricity market design (https://data.consilium.europa.eu/doc/document/PE-2-2024-INIT/en/pdf)

[12] Code of Conduct of 20 October 2022 establishing the conditions for connection and access to the transmission system and the methods for calculating or determining the conditions for the provision of ancillary services and access to cross-border infrastructure, including the procedures for capacity allocation and congestion management.

Orientation and detailed studies (art. 22 §4 and art. 46 §§2 and 3 of the Code of Conduct)	Possibility of proposing a connection with flexible access during the orientation and/or detail study for generation units, energy storage units and consumption facilities, if the necessary capacity is not available (permanent access refusal)
Procedure (art. 61 §1 of the Code of Conduct)	Elia draws up a technical report to send to the applicant and the CREG, for approval, to justify its choice on the basis of objective and well-founded criteria. A copy is sent to the DG Energy of the FPS Economy.
Technical report (art. 61 §3 of the Code of Conduct)	The technical report specifies the planned timing of any reinforcements, the permanent and flexible power, and an estimate of the average and total duration of flexibility per year.
Activation of flexibility (art. 61 §4 of the Code of Conduct)	The flexibility is activated in the event the following cumulative conditions are met: congestion and when network security and reliability are threatened.
Limitation in time (art. 61 §§2 and 3 of the Code of Conduct)	The flexible access is limited in time until the necessary reinforcement of the network is carried out. - If the reinforcement does not take place when planned, Elia asks the CREG for an extension of the flexible access. - If the development plan does not provide for the necessary reinforcement of the network, there is no time limit.
Capacity reservation (art. 33, 34 and 57 of the Code of Conduct) and standard connection contract (art. 60 §1, 11e and §2, 9e of the Code of Conduct)	When the study is ordered (consumption facility)/sent (other installations) the capacity is reserved and when the connection contract is signed the capacity is allocated, taking into account the flexible nature of the access. The connection contract type contains the terms and conditions for flexible access, as well as the terms and conditions for active power control.

The current Code of Conduct does not further specify how objective and well-founded criteria as mentioned in article 61 §1 should be defined and according to which process they should be evaluated. In such context Elia currently proceeds according to the methodology it has developed based on own experience and described in the document that was publicly consulted in the summer of 2023 as described in section 1.

Based on article 42 of Directive (EU) 2019/944, the CREG[13] requests Elia to establish these procedures and criteria. These should *in fine* be included in the Code of Conduct upon proposal of Elia and after decision of the CREG. Next to these procedures and criteria, the CREG asks Elia to develop a general framework for connections with flexible access[14]. The latter should indeed not only include the procedures and criteria for flexible connection studies but also operational and contractual modalities to have a fully-fledged framework for the implementation of connections with flexible access. The questions that the CREG asks Elia to tackle in its proposal of regulatory framework are further clarified in section 1 of CREG's Note (Z) 2779 of 28 March 2024 (own translation):

The following questions should be answered.

1. *On what grounds may the TSO refuse a connection with firm access? Should a refusal of connection with firm access always be accompanied by an allocation of flexible access?*

In case of flexible access:

2. *How does the TSO determine the share of the requested connection capacity that can be connected with either firm access or flexible access? How does this share evolve over time?*
3. *What methodology does the TSO use to estimate congestion risks?*
   3.1. *What is the reference grid?*
   3.2. *What are the input data and assumptions regarding generation, consumption and storage capacities connected to the grid?*
4. *How does the TSO translate congestion risks into a risk of activation of the relevant requested connection capacity in the study phase? What parameters should be expressed to understand this risk for the evaluation of the business case of the (candidate) Grid User?*
5. *What information must the TSO provide to CREG and to the (candidate) Grid User requesting an orientation study or submitting a connection request, for evaluation of the report and of the business case?*

[13] Note (Z) 2717 of 14 december 2023, Chapter 5

[14] Ibidem.

6. *What data from the detail study on the requested connection capacity will be contractually defined (e.g., in the connection contract)? In other words, which parameters from the detail study should be made binding? What are the implications if in reality these parameters should deviate from the contractual values?*
7. *What future evolutions could lead to a revaluation and, if necessary, revision of connection with flexible access?*
8. *How is flexible access used in the operational time window?*
    8.1. *What is the risk of effective activation? When may the TSO request the activation of the flexible connection? When does the TSO identify the need for activation of flexible connection? How does the activation of flexible connection compare to other congestion management remedial actions?*
    8.2. *Will the activation of flexible connection be reimbursed?*
    8.3. *Does the TSO correct the perimeter of the BRP when the flexible connection is activated?*
9. *What is the impact of flexible access on the ability of the connection capacity to participate in the provision of ancillary services? How will this impact be mitigated?*
10. *What information should the transmission system operator make publicly available to support (prospective) Grid Users in considering connection projects?*
11. *Where appropriate, additional questions arise as to whether technology neutrality applies, or whether there is justification for different sets of criteria and procedures for consumption facilities, power generation units, or energy storage facilities (or some other categorization).*

The objective of this design note is to provide answers to these questions. Questions 1, 10 and 11 will be discussed in section 9, questions 2-5 will be clarified in section 5, questions 6-7-9 will be clarified in section 6 and finally question 8 will be further developed in section 7.

Next to these aspects, there is also a strong relationship between the proposal of a flexible connection by Elia and the usual connection process described in the Code of Conduct[15]. More specifically, the capacity reservation and allocation process directly impact the hypotheses of the reference grid mentioned above in question 3.1. This in turn influences the potential congestions identified in the studies and therefore the estimated flexibility percentages. Given this, Elia also proposes evolutions to the current connection process in section 4 of this design note. The objective is twofold: address the needs of the connection requestors by streamlining current procedure and ensure that reserved/allocated capacities correspond to sufficiently concrete projects.

[15] Chapter 2.1.1 for orientation studies and Chapter 2.1.2 for connection requests

2.3 The regulatory frameworks at regional level

2.3.1 Wallonia

The Walloon region has a framework for connections with flexible access applicable to both DSOs and the local transmission network since 2016. The principles from the Electricity decree are implemented through the dedicated "Arrêté de Gouvernement Wallon"[16]. The latter is subject to an ongoing revision[17] in order to implement the new principles introduced by the modification of the Electricity decree in 2022. The existing and future principles are described in the overview table below.

2.3.2 Flanders

In Flanders there is no framework for connections with flexible access at the moment. Congestions must be solved by market flexibility or can be solved, under specific conditions, by the technical flexibility regime as foreseen by the Flemish Electricity decree[18]. The latter foresees the possibility for the system operator to impose flexibility activations to Grid Users in specific conditions against (possible) cost-based compensation. The VREG is currently considering implementing a framework for connections with flexible access via its proposal for a technical regulation for the local transmission network[19]. The characteristics of this framework are described in the overview table below.

2.3.3 Brussels

In Brussels, there is no framework for connections with flexible access. So far Elia has not faced the need for such regime in Brussels but would recommend implementing it in order to anticipate on eventual needs to come.

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[16] Arrêté du Gouvernement wallon du 10 novembre 2016 relatif à l'analyse coût-bénéfice et aux modalités de calcul et de mise en œuvre de la compensation financière.

[17] Proposition d'arrêté du Gouvernement wallon relatif à la gestion des congestions issues des unités de production et de stockage d'électricité raccordées sur le réseau moyenne et haute tension | CWAPE

[18] Article 4.1.17/5 from Decreet van 8 mei 2009 houdende algemene bepalingen betreffende het energiebeleid (Energiedecreet)

[19] https://www.vreg.be/sites/default/files/document/bijlage_1_trpv_2024.pdf

2.4 Overview

The following table aims at giving a non-exhaustive overview of the characteristics of the current and anticipated regimes on connections with flexible access in Belgium. It shows the variety of regimes, each with a different level of maturity and its own specificities.

Principle	Federal (current regime)	Wallonia (current regime) (future regime)	Flanders (TRPVN proposal[20])
Scope	Injection and offtake of consumption, production and storage facilities at transport level.	Injection of production facilities and storage facilities at local transport network and DSO network levels.	Injection of green production facilities at local transport network level.
Alternative to flex access ?	No	No	Yes, refusal is possible under the same conditions.
Justification for flexible access	Permanent access refusal because of congestions.	Permanent access refusal because of congestions.	Permanent access refusal because of congestions + flex volume > 5%
Assessment of flexibility level	Not defined	Permanent vs flexible capacity Flexible energy volume at unit level	Flexible energy volume of all units connected to same network element
Decision of regulator	Yes, based on a technical report.	Yes, based on a specific report + CBA. The CBA will only be performed if flexibility volume is >15% or in N-situations.	No → Notification.
Network reinforcement vs. flexibility	Based on network reinforcements already foreseen in development plan.	CBA by CWaPE to determine if a network reinforcement is justified.	Not defined
Temporary period for flex access	Until the realization of the network reinforcement or illimited if no reinforcement is foreseen.	5 years after contract signature (after realization order by the client) if decision from CWaPE that a network reinforcement is justified.	No
Financial compensation	No	Cost-based. Only for green production facilities and only for	Below the 5% flex volume : “technische flexibiliteit” regime

[20] Ontwerp van Technsich Reglement Plaatselijk Vervoernet van Elektriciteit, 23/02/2024 : https://www.vreg.be/sites/default/files/document/bijlage_1_trpv_2024.pdf

		activations in the permanent capacity. Compensation between the flex volume estimated by the system operator and 5% of the flex volume, between 5% and 15% of the flex volume and above the flex volume estimated by the system operator (if the latter is >15%).	with cost-based compensation. Above the 5% flex volume : flex access regime without compensation
Order of activation	Not defined	**Local constraints:** Technology based (1°Storage, 2° grey, 3° green production) + LIFO. **Upstream constraints:** PTDF + technology based (1°Storage, 2° grey, 3° green production) + LIFO.	Not defined

Table 1 : Overview of the characteritsics of the current and anticipated regimes related to connections with flexible access in Belgium

2.5 Recommendations regarding evolutions of the regulatory framework

2.5.1 Harmonization

The overview table in previous section shows the need for harmonization between the different voltage and competence levels regarding the connections with flexible access regime.

This is further illustrated in Figure 1 below, showing the compensation regimes applicable or foreseen in Wallonia, Flanders and at federal level (the proposal at federal level will be explained further in the present document).

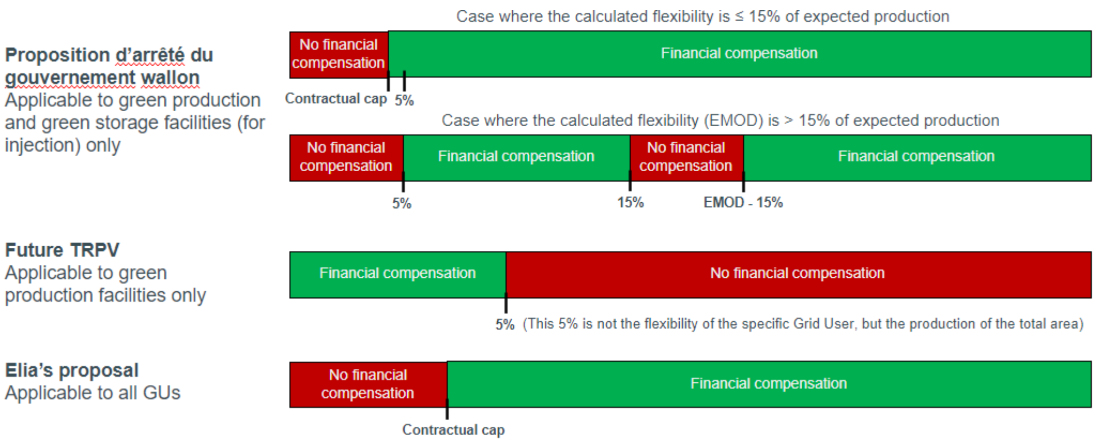

Figure 1 : illustration of fragmented regulatory requirements

Those differences in regimes lead to several sub-optimal or conflicting situations. Therefore, applicable access conditions would be more complex for Grid Users. These would also have incentives to connect to specific voltage levels and/or in specific regions in order to benefit from the most favorable access conditions. Next to this, these differences will increase the time-to-market of designed solutions, delaying benefits for the Grid Users and generating additional costs for society.

2.5.2 To whom will the new framework apply?

When implementing the new framework, the question arises whether it will apply retroactively to Grid Users who have already received their EDS / signed their connection contract.

This question is under analysis and will be discussed with stakeholders in detail during the 4th workshop on the 14th of June 2024. Elia will take into account stakeholder's feedback on the public consultation of the present document on what will be presented during the workshop.

Important to note: retroactivity means that the rules apply on existing contracts, not that the use of flexibility and possible remuneration will be corrected for the period preceding the entry into force of the new GUFlex contractual modalities

3 Early connection – notion of temporary period

The difference in time required to develop new grid infrastructure or to develop new generation, storage and demand electrification projects constitutes an important challenge for system development:

- For electrification of demand, storage or renewables generation projects, the total lead time ranges from 1 to 3 years
- For building new Grid Infrastructure, the lead time depends on the type of project and on the concerned voltage level:
  - Substation projects: typically, 5 years
  - Cable projects: typically, 5 years
  - Overhead line projects: typically, 5 to 10 years for regional grid and typically, 10 to 15 years for 150, 220 or 400kV line

These challenges are overcome with several actions:

- As it will be more detailed in section 9.4, grid development plans are designed to enable connection of future generation, storage and load capacities that are expected to be part of future scenarios for the power system. Connection requests of projects aligned with the future plans (in timing and localisation) should therefore be realized without delays associated to the expansion of the transmission grid. The hosting capacity maps published by Elia allow to provide transparency on connection possibilities provided by the grid development plans to new generation, storage and demand electrification projects.
- In case local hosting capacity is not sufficient (because a firm connection capacity would require the realization of a grid reinforcement project which was not identified or not planned in this timing), the promoter of the new generation, storage and demand electrification projects has several options:
  - Anticipate its connection request, in order for development plans to be adapted to be able to host the connection request at the request connection date.
  - To the extend possible, connect to a (more) appropriate substation or at a later timing (after realization of the needed grid reinforcement) where or when grid connection capacities are available.
  - Accept a connection with flexible access as an alternative compared to a later firm connection after realization of the needed grid reinforcements.

Therefore, in case the connection request requires a (planned or not identified nor planned) grid reinforcement project and if agreed by the Grid User, Elia can propose a connection before the realization of the grid infrastructure identified in the context of the development plans. In those conditions, flexibility will be applied to solve the congestion associated to the operation of a power system with this new capacity but without the needed grid reinforcements during a temporary period. As it is the Grid User’s choice to connect earlier, those inherent flexibility costs shall not be socialized but shall be borne by the Grid User until the end of the so-called *temporary period*, which is linked to the needed time to realize (or identify then realize) the necessary grid reinforcements projects (the definition of the temporary will be more detailed in section 6.3).

This last option enables to quickly connect new Grid Users without additional costs borne by society. The absence of remuneration aims at incentivizing Grid Users to ask for a connection in a timely way, at the appropriate location and to contribute to the definition of (local and global) scenarios of the future power system energy mix.

Note that, if the choice would have been made that the congestion during the temporary period would be managed by redispatching, the cost of these actions would impact the grid tariffs and would therefore be socialized. Additionally, Elia would need to secure the local availability of these means which is not always possible if congestions are created by demand users for example. All Grid Users would then be impacted by the earlier connection of this new Grid Users and there would be no incentive for this new Grid User to anticipate its connection request or connect to a (more) appropriate substation. These are the reasons why this solution is not retained.

Therefore, it is proposed, when a Grid User makes the choice to connect earlier, to keep the current approach where inherent flexibility costs are borne by the Grid User until the end of the temporary period.

Nevertheless, it is proposed to reduce the risks for those new Grid Users by providing guarantees so thateach Grid User can assess the viability of his business case, as it will be further detailed in Section 6.

4 Clarifications on connection process: studies & capacity reservation

The adaptation of the connection process is not foreseen in the scope of the incentive on flexible access. However, given the strong synergy and link with flexible access, Elia proposes to include clarifications on the connection process in the scope of the present design note and in the proposition of Code of Conduct that will follow.

Due to major changes in the context (a.o. a lot more connection requests, a lot of new (candidate) Grid Users, large reservations of capacity for projects,…) the current way of working is no longer fit for purpose. This section describes the proposed changes in the framework of the connection process. Some clarifications are given on the current situation in order to better understand the proposed changes.Connection request

An application form has to be filled out by the (candidate) Grid User on the website of Elia to launch a connection requestThe request can be made to perform an orientation study (or "EOS") or a detailed study (or "EDS")[21]. Information is asked about the company of the requestor, while for existing Grid Users this information is already known by Elia. A change in an existing connection can only be requested by the Grid User itself. For a new Grid User, it is not always clear which type of study to request.

(Candidate) Grid Users often have questions before launching a connection request. This can include questions on the connection process, on the request form or on the network situation. Existing Grid Users can contact their key account manager with their questions.

Elia observes that there is a lot of value in aligning with the (candidate) Grid User even before a connection request is launched and proposes to make this step more transparent on its website. It should be clear how to ask for an exchange and on which topics. As such a meeting can be set up by the customers department with the right experts around the table. This exchange will be free of charge and has the purpose to clarify all questions concerning a new connection or changes in an existing connection.

The hosting capacity map that is published on the website of Elia gives the (candidate) Grid User some first information on the available capacity in a region. Elia is of the opinion that a first mutual understanding of the project and connection constraints allows to provide better guidance and information to (candidate) Grid Users.

In order to avoid filling data in an application form that is already known by Elia, Elia is developing the possibility for existing Grid Users to ask a connection request through its client portal (namely the EPIC platform). As such the application form can be simplied.

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[21] See following sections for an explanation of purpose of an EOS and an EDS and their main differences.

Elia is willing to guide (candidate) Grid Users on which study is needed based on some criteria. This will be further elaborated in the next sections.

4.1 Orientation study

An orientation study is a preliminary study, before the detailed study, that assesses, through network calculations (see section 5for the applied methodology), the possibility to connect a new asset to the grid, and that sets out the technical connection options with a high-level estimation of costs and planning. Often multiple options are suggested to connect a new asset to the Elia network. Each technical connection option can be granted with a permanent or flexible access to the grid, in which case a technical report has to be sent to the regulator (see section 2.2) before sending the study report to the (candidate) Grid User. 5

The different steps in an orientation study are visualized in the graph below. The blue part covers the process as described in the Code of Conduct and the orange part covers some additional steps in the internal Elia process.

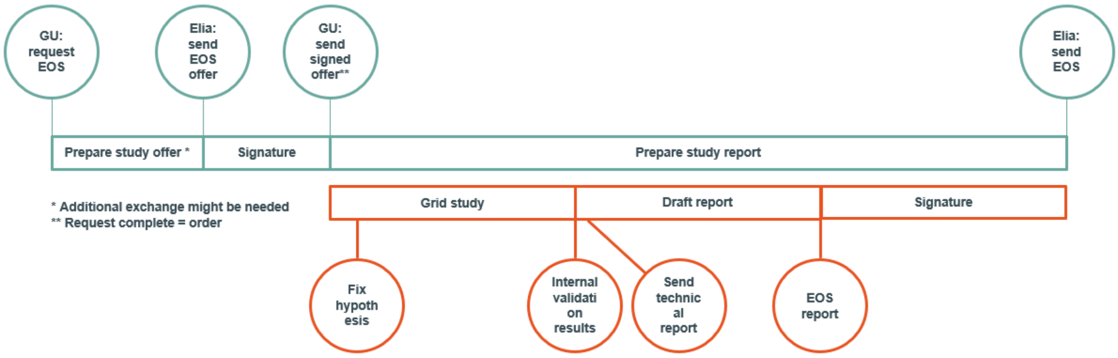

Figure 2 : Different steps of an orientation study

The timing for an orientation study is fixed and is defined in the Code of Conduct. However, this timing of 40 working days (hereafter “WD”) dates from a time where a limited number of studies was requested. Due to the large increase in study requests (multiplication by a factor 5 over the last 4 years), the increased complexity of the studies as well as of the reference context, some changes and improvements are proposed in the processes and some additional resources are foreseen to conduct the studies. Despite these changes, it is still expected to lead to some situations where the timing of 40WD cannot be respected, requiring the Code of Conduct to be adapted accordingly in line with today’s context. The proposal would be to keep in the Code of Conduct a requirement to deliver as soon as possible, complemented with a indicative target for the maximum number of WD. This target should be met for most of the studies, provided that the request is complete, there is no need for additional information, and there is no flexible connection proposal.

The timing for an orientation study is fixed for the moment and therefore multiple studies are often running at the same time in parallel. In case of studies that are linked (which means that the studies are impacting the same congestion), this may lead to results that are obsolete by the time of sending the study report. This is visulalized in the graph below.

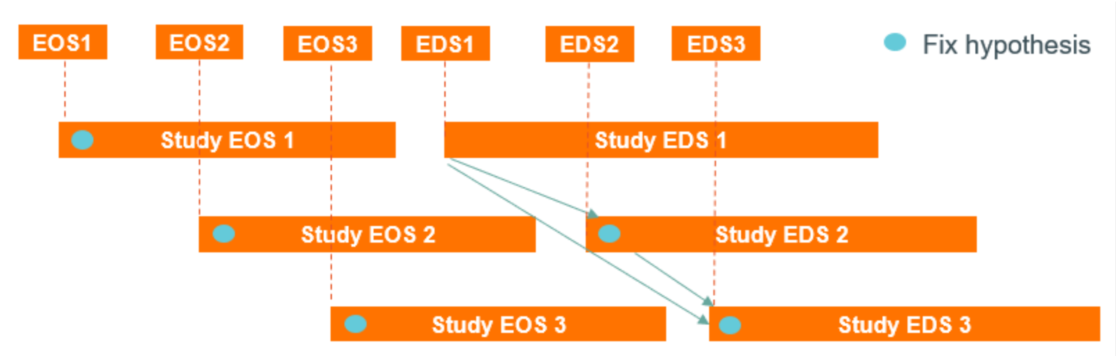

Figure 3 : Linked studies

After the study request is complete, the network calculations start by fixing the hypothesis. This includes identifying which other studies should be taken into account. Since only detailed studies lead to a reservation of capacity, other orientation studies are not taken into account in the hypothesis. In case a detailed study is requested after fixing the hypothesis (Study EDS 1 is requested after fixing the hypothesis for Study EOS 2 and 3), this is impacting the study results (Study EOS 2 and 3 are obsolete by the time of sending the study results). Due to the fixed timing and multiple studies running in parallel, the hypothesis are not updated.

Remark: it is important to mention that this will not be the case for all studies. In the case of sufficient potential and infrastructure to connect, studies will not impact one another.

In order to guarantee that the results are valid at the time of sending of the study report, the proposal is to apply a serial approach for linked studies. This is visualized in the graph below.

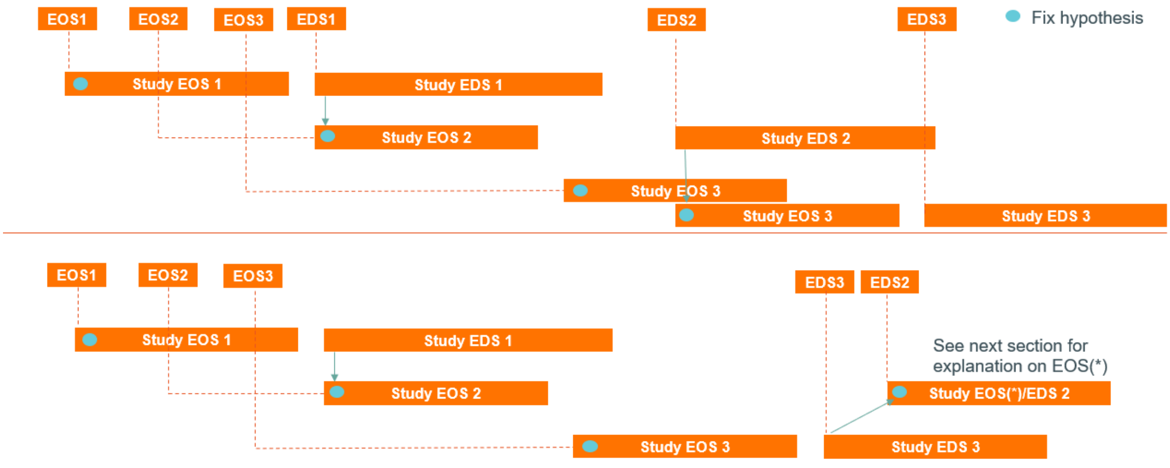

Figure 4 : Proposed serial approach for linked studies

In case of multiple linked EOS requests, the studies will be conducted one by one, respecting the order of the requests. The advantage is that there is a guarantee that the results are valid at the time of sending the study report. In case a detailed study is requested, only one study is impacted for which the hypothesis can be updated before delivering the study report. Another advantage is that this approach respects the order of requests including some decision time to move to a detailed study. The proposed process also provides some transparency on other ongoing requests, without sharing confidential data of other Grid Users. In this case the (candidate) Grid User can better assess the guarantee of the study results. A consequence of this approach is that in case of linked studies the defined timing will be depending on the number of linked studies. However, the timing can be made more transparent by communicating the number of linked studies and follow up on the EPIC platform (Elia is already developing this feature on the EPIC platform). In case of an unforeseen peak in the number of study requests, the serial approach will also help to flatten the number of simultaneous studies, without being discriminatory.

After the internal validation process, a study report has to be drafted and in case of a flexible connection proposal a technical report has to be sent to the regulator. The proposal would be to share already at this stage the results of the study with the (candidate) Grid User. This will be in slide format, without an official correspondence. The (candidate) Grid User could decide based on the results to stop the study (in this case 50% of the study is paid). In case of a flexible connection, this should be done before the end of a possible escalation request[22]. In case of a connection with firm access this should be done within 10WD. The (candidate) Grid User can also decide to

[22] The “escalation” should be understood at light of the newly introduced §6 of article 61 in the CREG’s proposal to review the Code of Conduct (Public consultation document : (PRD)2667 available at PRD2667FR.pdf (creg.be).). The proposal from CREG consists in the possibility for the (candidate) Grid User to introduce an appeal to the CREG on the technical report.

move to the detailed study based on the results, in this case the study report will be finalized (in case of flexible connection after the 20WD escalation period and in case of a connection with firm access after 10WD).

For the moment, Grid Users need to reach out to their key account manager in order to informally receive information about the status and delivery times for their studies. The proposal is to work on more transparency through the EPIC platform. The process should also be more streamlined with closer follow up.

For the moment, the CoC does not state clearly on whether an orientation study is needed or not, what can sometimes lead to confusion for the requestor. For the sake of clarity, the proposal is to make an orientation study obligatory, except for specific cases where a fast track is possible.

The proposed future decision flow is visualized in the graph below. The definition of potential can be found in section .

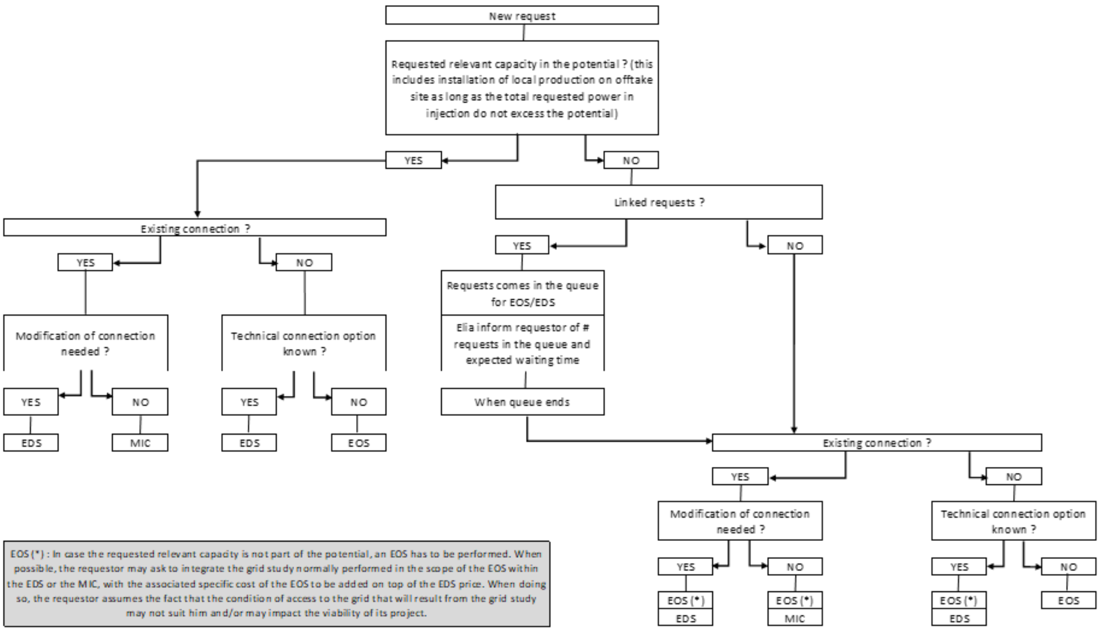

Figure 5 : Proposed future decision flow to evaluate the need of an EOS

The application form to request an orientation study sets out the rules on what can be asked in an orientation study (one location, the technology, the capacity, …). However, a limited number of sensitivities (f.e. multiple capacity levels, other profile, …) can be studied on request of the (candidate) Grid User and after consultation with Elia.

4.2 Detailed study

A detailed study is an in-depth study that sets out the technical solution and associated cost and timing. In case in the orientation study multiple options are elaborated, the detailed study elaborates on one solution for the connection. This is why, in the application form, some additional technical specifications are required to conduct the study. The project of the (candidate) Grid User should already be concrete and should not just revolve around reservation of relevant capacity on the grid. The main focus of a detailed study is about the infrastructure needed to realize the connection of the (candidate) Grid User.

The different steps in a detailed study are visualized in the graph below. The blue part covers the process as described in the Code of Conduct and the orange part covers some additional Elia steps. As from the detailed study the capacity is reserved (with a difference in timing for load and production/storage units).

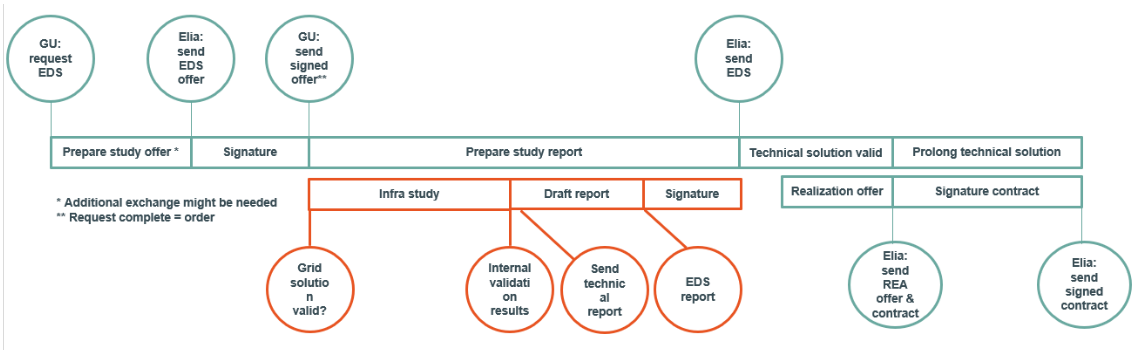

Figure 6 : Different steps of a detailed study

Since a detailed study is an in-depth study focusing on one solution, all technical specifications should be set from the start, covering the exact location of the connection, the requested capacity, the single-line-diagram and who will install the other connection installation. The detailed study will be used in a later step to refer to in the realization phase (reserved capacity, location of the connection, costs, materials to be ordered…), which leaves no room for multiple options. In case of a scope change (technical or responsibility) during the study, it should be decided whether this is possible or whether a new study should be launched. This will be depending on the stage of the study and the requested change.

In case the detailed study is requested after the orientation study without any changes in the hypothesis, no new grid calculations are needed during the detailed study. The more time after the orientation study, the higher the probability that there are some changes in the hypothesis. In this case an update of the orientation study should be performed. In case of a flexible connection, a new technical report should be sent to the regulator.

For the moment, the detailed study consists in elaborating on technical details that are often not needed at this stage of the study for the (candidate) Grid User or not yet known by the (candidate) Grid User at this stage of the study. Elia proposes to shift some content from the detailed study to the realization phase, while keeping all the necessary content in the detailed study in order to make a decision to go to the realization. This will help respecting the defined timings from the Code of Conduct.

The timing for a detailed study is fixed and is defined in the Code of Conduct. However, this timing of 60WD dates from a time where a limited number of studies was requested. Due to the large increase in study requests some changes and improvements are proposed in the processes and some additional resources are foreseen to conduct the studies. Despite these changes, it is still expected to lead to some situations where the 60WD are unrealistic and the Code of Conduct should be adapted accordingly.

The proposal would be to keep in the Code of Conduct a requirement to deliver as soon as possible, complemented with an indicative target for the maximum number of WD. This target should be met for most of the studies, provided that the request is complete, there is no need for additional information, and there is no flexible connection proposal.

4.3 Capacity reservation

The reservation and allocation of capacity is visualized in the graph below. The rules for capacity reservation are set in the Code of Conduct and are covering the period between the ordering of the detailed study and the signing of the connection contract (or appendix 8 for existing connection contract). Once the capacity is allocated, which means once the connection contract (or appendix 8 for existing connection contract) is signed, the rules defined in the connection contract are applicable.

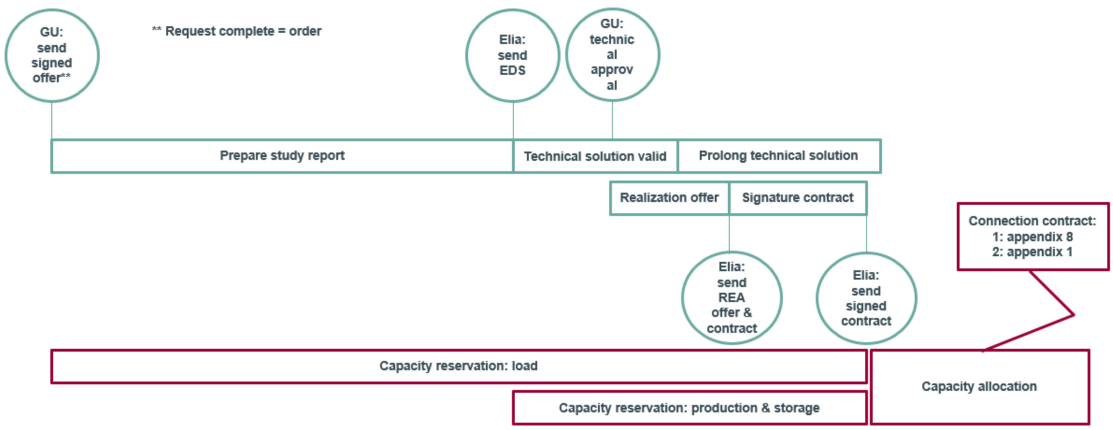

Figure 7 : Reservation and allocation of capacity

It is important to avoid sleeping capacity that may impact other (candidate) Grid Users or may trigger network reinforcements. Elia strictly applies the rules for capacity reservation and allocation and proposes to make the rules more straightforward.

For the moment, in case of a capacity reservation the technical solution is valid for 120WD, with a possibility to prolong with 60WD on request of the (candidate) Grid User (without the possibility of refusal by Elia). After this period there is a possibility to prolong as long as the connection conditions (e.g. a new linked detailed study having an impact on the available capacity) do not change. The proposal would be to limit the prolongation of the reservation to 1 period of 120WD without the possibility of refusal by Elia.

At the latest 70WD after the prolongation of the technical solution the Grid User should give its technical approval, in order to leave 20WD for Elia to prepare the connection contract and offer, and 30WD for the Grid User to sign the offer and contract. Once the capacity is allocated the rules set out in the connection contract apply. In case the application of the rules by Elia is disputed (which may lead to a situation where the capacity is no longer allocated), an appeal can be filed to the CREG.

For the moment there is no payment for the reservation or allocation of the relevant capacity[23] before the related access point comes effectively in service and the allocated capacity is invoiced based on the tariff for Power Put At Disposal (PPAD). This makes that large capacities can be allocated for a potentially unlimited periodhaving a large impact on network development and other studies without any consequence if, ultimately, the project is not realized by the (candidate) Grid User.Elia propose to request a bank deposit that has to be paid by the (candidate) Grid User as from the ordering of the realization. In this case, when the connection is ordered, a connection contract is signed, the appendix 8[24] of this contract is filled-out and signed with mention of the relevant requested capacity that is allocated. The expected realization date of the project (which should be defined by the (candidate) Grid User) is also considered to define the bank deposit to be paid for the relevant requested capacity. The graph below gives some clarity on the application of the bank deposit.

[23] Relevant Connection Capacity: The maximum Apparent Power for Injection and/or Offtake, expressed in megavolt ampere (MVA), directly linked to a specific Connection Request.

[24] Appendix 8: Execution modalities and periods with regard to the realization of a new Connection or a substantial modification of an existing Connection, or the Commissioning of a Generation Unit

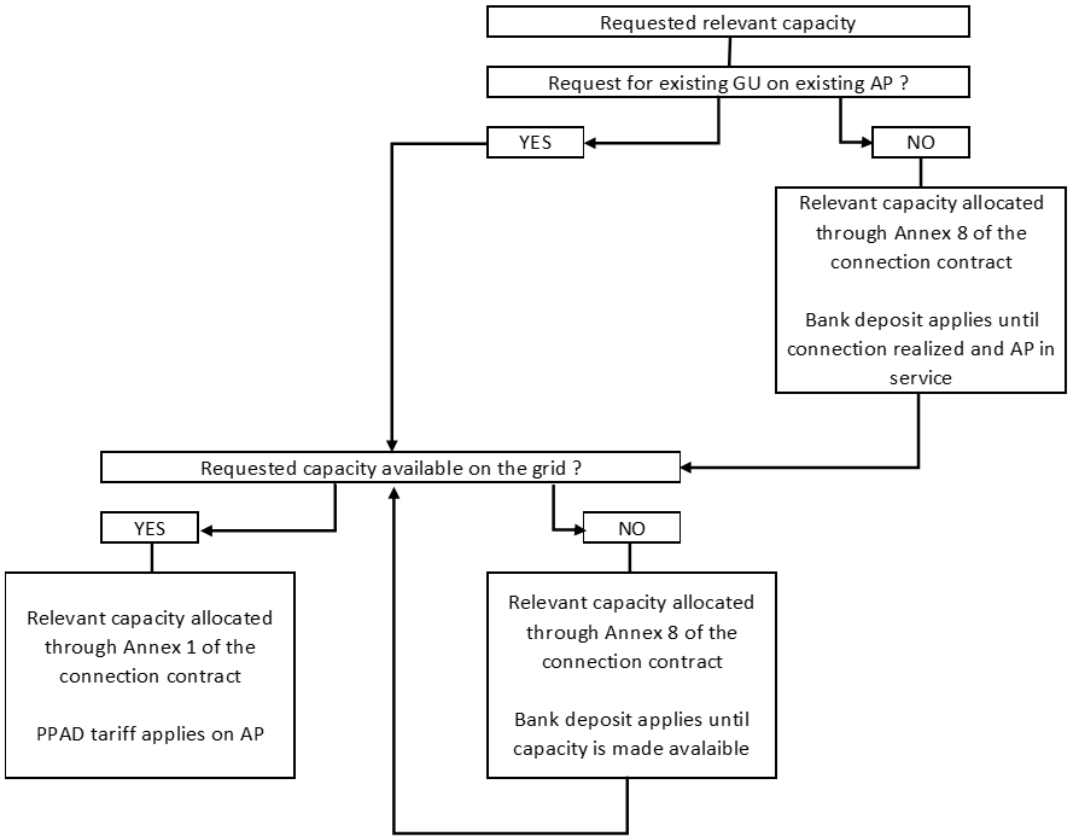

Figure 8 : Application of the bank deposit

The proposal for the bank deposit is to reflect the number of years during which there is no payment for the relevant capacity, the number of MVAs of the relevant capacity and the tariffs applied for the power put at disposal:

Amount of the deposit = Number of years x MVA x yearly tariff PPAD

Thisdeposit could also be applied for storage facilities and power generation modules with an amount calculated based on the PPAD tariff that applies for offtake. In case there is a relevant capacity for injection and offtake, a bank deposit is requested for the reservation of the relevant capacity in both directions.

The purpose of the bank deposit is to provide an incentive for (candidate) Grid Users not to block capacity unless they intent to use it. Therefore, Elia asks to pay a bank deposit for the relevant capacity (based on the PPAD tariff) as of the moment the capacity is allocated and till the effective connection of the (candidate) grid user or the moment the relevant requested capacity is put at disposal by Elia on the grid in case the connection of the (candidate) grid user is delayed. If the connection commissioning happens as planned the Grid User is reimbursed for the amounts blocked and the tariff for PPAD is applied. If the realization is abandoned, Elia keeps from the bank deposit the yearly bank deposit amount for the number of years the capacity has been unduly blocked. The rest is reimbursed. If the project is realized but delayed, Elia keeps the yearly bank deposit amount for each full year of delay and reimburses the rest.

5 Procedures and criteria for client-connection studies

This section describes the principles and methodology applied to the grid connection study part of an orientation or detail study. Compared to the current methodology description which is placed into appendix of orientation and detailed studies and was placed in appendix of the consultation “Raccordements avec accès flexible: cadre régulatoire” organized by Elia in the summer 2023, much more details are provided to enhance transparency.

The objective of the grid connection study is to propose to the applicant a series of variants for connection to the electricity grid that allows the connection of the requested power to the requested geographical location while complying with the needed technical criteria for Elia to fulfil its mission as a network operator.

The study also makes it possible to identify the points of attention specific to this request in order to facilitate the connection of the object of the request (consumption facility, production or storage units, etc.) while respecting the rules in force.

The latest version of this methodology is attached in appendix of the orientation or detailed study.

5.1 Principle and context of the study

5.1.1 Clarification of the reference context

The reference context corresponds to the expected situations of the power system in the future years impacted by the study. It is built on the basis of:

- The evolution in the overall level of offtakes (from consumption facilities and storage units) and injections (from production and storage units);
- The geographical distribution of offtakes;
- The geographical distribution of injections;
- The planned evolutions of the electricity grid, constituting the reference network[25];
- The estimation of the functioning of the electricity market, taking into account typical annual profiles for temperature, solar irradiance and wind;

[25] It can be noted that this approach for defining the reference network is aligned with the one of the CRM functioning rules: "ELIA uses the most recent status and anticipation of the planned and approved grid infrastructure projects as listed in the latest Federal Development Plan & Regional Investment Plans".

- Reactive power control and voltage adjustment options.

The overall level of offtakes and their geographical distribution in the Belgian control area for a reference year is compiled by Elia, on the basis of statistical data from the past, announced changes of offtake at existing or new connection points, as well as macroeconomic information for Belgium and its various sectors of activity.

The overall level of injections and their geographical distribution in the Belgian control area for a reference year is compiled by Elia and takes into account the latest known agenda for the commissioning and decommissioning of production units and storage systems as well as expected developments in the macroeconomic scenarios for generation and storage.

The evolution in offtake and injections may therefore result from evolution of allocated and reserved capacities, but also from growth potential by technology[26], geographically distributed, not yet reserved or allocated, but taken into account when proposing the portfolio of projects presented in the federal and regional network development plans.

At the level of the foreign grids, the reference context in the other countries covered by the ENTSOe TYNDP is established by Elia on the basis of the information exchanged between transmission system operators as part of the data collection organised by ENTSOe as well as on the basis of other bilateral information exchanged between Elia and neighbouring system operators.

The reference network is the network as it is expected to evolve according to the project portfolio at the time of the study. This portfolio covers the horizon of the latest validated federal and regional network development plans as well as in the event that such a vision is available, the anticipated developments beyond the horizon of the plans.

A description of this reference context is made available to the regulator in Annex of the orientation study.

5.1.2 Adaptation of the reference context as part of the Grid connection study

Depending on the type and localization of the connection request, this reference context is adapted in order to achieve the following key objectives:

- Remain consistent with contractual engagement Elia has already made to other Grid Users with either firm or flex access where a cap is defined on the volume of modulated energy borne by the Grid Users.

[26] By technology, we consider the following categories separately: load, wind generation, solar generation, hydroelectric generation, storage, co-generation, other conventional generation.

- Ensure that grid hosting capacities will be present for evolutions in low-voltage generation and consumption which do not require capacity reservation and can therefore connect without further notice.
- Ensure that grid hosting capacities will be present for the growth potentials considered as one of the objectives for development plans[27]. Connection request realizing this growth potential will then benefit from these grid hosting capacities while only the remaining grid hosting capacities prior to grid reinforcement will be available for the connection requests outside of the identified potential.
- It must therefore be concluded that low-voltage connections and connection requests within identified potential come first before other connection requests. Doing otherwise would lead to an unwanted situation where opportunistic demand requests could be made to tap in a developed hosting capacity that was initially intended and approved for another purpose. Within these categories of connection requests or for the other connection requests, the principle of first come first served applies.
- Avoid socializing (through tariff) congestion management costs which would results from market position of Grid Users (injection or consumption profiles) that cannot be anticipated.

Concretely, a local zone of network influence is defined around the location of the connection request. The purpose of this zone is to identify other existing and future Grid Users (with or without reserved capacity) that have a significant influence on the conclusions of the grid connection study.

In this local zone of network influence, the following adaptations to the reference context are made:

- Reserved or allocated capacities with permanent access that is not already included in the reference context are taken into account.
    - Note that this is done in order to be coherent with the contractual engagement Elia has made with the other Grid Users. It must be noted that the consideration of these EDS could either increase or decrease the hosting capacity for the new connection request.
- Reserved capacities or capacities allocated with flexible access that correspond to capacities that are within the potential, mentioned in Section 5.1.1, and that would not already be included in the reference context are taken into account. Their flexibility will not be used to reduce the flexibility of connection request.
    - Note that this is done in order to be coherent with the contractual engagement Elia has made with the other Grid Users; the flexibility of these other Grid Users will therefore not be used to reduce the flexibility of connection request.

[27] Today, in order to reach the energy mix of the scenario considered in the currently published development plans, in addition to existing, reserved and allocated capacities, growth capacity potential is needed to be defined for wind, photovoltaic, heatpumps, electric vehicle and transmission connected demand electrification.

- Evolutions in low-voltage generation and consumption for which a capacity reservation is not necessary are taken into account.
  - Note that these capacities correspond to generation or consumption growth that do not need to follow a connection reservation procedure to the DSO grid [28]and can therefore connect without further notice. It must be noted that the consideration of these potential growth could either increase or decrease the hosting capacity for the new connection request.
- Depending on whether the connection request concerns injection (renewable generation, conventional generation or storage system when its profile is in injection mode) or consumption (load or storage system when its profile is in consumption mode):
  - If the connection request concerns an injection, the consumption growth potentials (load or storage system when its profile is in consumption), mentioned in Section 5.1.1, for the zone are set to zero and generation growth potentials of other types are taken into account.
    - Note that growth potentials are expected to come and their capacity shall be ensured inline with the objective of the development plans. However, because they correspond to capacities that have not yet requested an EDS, uncertainty remains on the timing of their connection. If the generation growth potential is realized as it is expected, the hosting capacity of the new request will be as considered in the grid connection study. If it is realized later, the activated volume of flexibility could be lower than computed in the context of the grid study. Concerning the consumption growth potential, uncertainty remains on the timing of their connection and Elia cannot guarantee it will be present to increase the hosting capacity for the connection request.
  - If the connection request concerns consumption, the generation growth potentials (renewable generation, conventional generation or storage system when its profile is in injection mode), mentioned in section 5.1.1, for the zone are set to zero and consumption potentials of other types are taken into account.
    - Note that growth potentials are expected to come and their capacity shall be secured inline with the objective of the development plans. However, because they correspond to capacities that have not yet requested an EDS, uncertainty remains on the timing of their connection.
- Depending on the situation, whether or not the connection request corresponds to a capacity identified in the potential, mentioned in section 5.1.1, for the zone and technology of the request:

[28] The capacities that need to follow the connection reservation procedure to the DSO grid are also reserved and allocated capacities (CAPAC process – that has the same implication as the EDS process) like any other capacities to the TSO grid.

- If the connection request corresponds to a capacity identified in the potential, the reserved or allocated capacities with flexible access that correspond to capacities that are outside of the potential, referred to in Section 5.1.1, for the zone and technology of the connection request are set to zero.
  - Note with such an approach the need for flexibility means is not computed twice and the hypothesis made for the connection grid study of the connection request is coherent with the hypothesis made for the connection grid study of the reserved or allocated capacities with flexible access that correspond to capacities that are outside the potential.
- If the connection request corresponds to a capacity that is outside the potential, reserved or allocated capacities with flexible access that would not already be included in the reference context are taken into account.
  - Note that this is done in order to be coherent with the contractual engagement Elia has made with the reserved or allocated capacities with flexible access. The expected volume of flexibility for these other Grid Users would then not be increased to facilitate the connection of this new connection request.

The adaptations in the local zone of network influence can therefore be illustrated and summarized by the following table:

	Connection request in line with potential considered in the development plan		Connection request outside the potential considered in the development plan	
	Injection request	Consumption request	Injection request	Consumption request
Existing permanent and flexible capacities & permanent reserved or allocated capacities & expected low-voltage potential	Considered present for the study	Considered present for the study	Considered present for the study	Considered present for the study
Reserved or allocated flexible capacities in the potential	Considered present for the study	Considered present for the study	Considered present for the study	Considered present for the study

Reserved or allocated flexible capacities outside the potential	Not considered for the study	Not considered for the study	Considered present for the study	Considered present for the study
Injection potential of the same type of technology	Not considered for the study	Not considered for the study	Not considered for the study	Not considered for the study
Injection potential of other technologies	Considered present for the study	Not Considered for the study	Considered present for the study	Not considered for the study
Consumption potential of the same type of technology	Not considered for the study	Not considered for the study	Not considered for the study	Not considered for the study
Consumption potential for other types of technology	Not considered for the study	Considered present for the study	Not considered for the study	Considered present for the study

Table 2 : Adaptation of the reference context in the local zone of network influence

As the above-mentioned adaptations in the local zone of network influence may have an impact on the Belgian level of offtakes and injection identified in the reference context described in Section 5.1.1, adaptations are also made in geographical areas other than the one concerned by the connection study in order to avoid significant deviations in total installed capacity per type as well as in Belgian power balance compared to the reference context.

In terms of production or consumption profile:

- With the exception of connections of renewable energy production units for which a specific production profile is applied, the connection project will be considered to be operating permanently at maximum power and under all realistic reactive power setpoints[29]. In the context of a storage facility, two studies are carried out,

[29] Note that, during the workshops of 23rd of February and of 16th of April, market profiles were incorrectly proposed for conventional generation. However, depending on the type of assets and on its use, different market profiles could be possible (embedded generation with goal of netting annual

one with a constant injection profile and the other with a constant withdrawal profile. These profiles will be taken into account when determining the contractual conditions associated with connection and access to the network.

  - Note that wind and PV (without embedded storage) are not considered capable of producing more than the available power and producing less at these moments is not expected to create issues in the grid as currently, the Grid User is not present. For dispatchable generation, storage and demand facilities, an expected profile cannot be ensured and contractually secured.

- The capacity of an existing renewable generation or consumption facility (in operation for more than one year) is represented by a realistic profile based on historical measurements and a projection of this profile for future years.
- The capacity reserved, allocated or in operation for less than one year of a new renewable generation or consumption facility is represented by a profile that is representative of the sector of activity and such that all its capacity is used at least once in the future year.
- The reserved, allocated or installed capacity of a conventional generation or storage facility is initially represented by a profile generated as part of a simulation of the future functioning of the electricity market. Subsequently, in the local zone of network influence of the connection request of a storage facility, the profiles of the other storage facilities are modified as follows:
  - When studying the connection request with a constant injection profile, the consumption values of the profile of the other storage systems are set to zero.
    - Note that, in the reference context, storage systems profiles are obtained by energy market-based dispatch. However, other revenue streams are available for storage system such as system balancing and BRP portfolio balancing. This is the reason why, in the context of the study, a modified profile is considered for the other storages in the local zone of network influence as explained above. This proposal, which doesn't increase injection values above energy market-based dispatch and which doesn't replace consumption values by injection values still bears some risks of unforeseen congestion as it is not the worst case profile for the other storages in the zone. Risk is however considered acceptable

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consumption, peak consumption shaving, for embedded generation process driven, for GT, CCGT, diesel backup generators, CHP, etc.). Therefore, different types of market profile should be generated and an agreement with the client should be made on the profile to use, knowing that this would lead to discrepancies in case the use of the asset evolves. Therefore, it is proposed to consider that for the connection project of a conventional production unit, the profile considered is a permanent operation at maximum power (and under all realistic reactive power setpoints). This is aligned with the current methodology of application since many years for connection request. Section 6.4.2 describes how this will be consistently taken into account in the way the use of the flexibility is quantified in operation as these storages have been connected considering, for them, a flat profile.

  - When studying the connection request with a constant consumption profile, the production values of the profile of the other storage systems are set to zero.

- In the case of a connection request for a mixed installation, different combinations of the profiles of the individual parts, for the determination of injection capacity or withdrawal capacity, are considered as illustrated by the table below:

	Consumption capacity	Production capacity
Profile for the consumption part	constant consumption profile	zero profile
Profile for the conventional generation part	zero profile	constant production profile
Profile for renewable generation	specific production profile (PV, Wind, etc.)	specific production profile (PV, Wind, etc.)
Profile for the storage system	constant consumption profile	constant production profile

Table 3 : Combinations of the profiles for connection request of mixed installation

It must be noted that an analysis of the way Gflex modulation is activated and monitored in cases of mixed sites is described in Section 7 Depending on the outcome, the approach currently followed in this section could need to be reviewed for some specific cases.

5.1.3 Technical characteristics of the object of the connection request

Unless explicitly stated at the time of the application, typical technical characteristics resulting from a conventional design of the production, consumption or storage unit will be considered.

- For production units, these characteristics cover the limits in active and reactive power, current limits, impedances, regulators (speed, frequency, voltage, etc.), the step-up transformer, the consumption of auxiliary services, etc.
- For consumer installations, these characteristics cover reactive behaviour, three-phase short-circuit power contributions, etc.
- For storage units, these characteristics include active and reactive power limits (MW, Mvar), storage capacity, ramping rate, impedances, regulators (frequency, voltage, etc.), step-up transformer, auxiliary consumption, etc.
- …

5.1.4 Analyzed situations

In future years, evolutions in the reference context, as well as periods of network infrastructure works may lead to different connection or operating constraints for the subject of the application. Phases, periods during which the constraints will be considered equivalent, are identified.

For each identified phase, different possible operational situations are considered. They are the result of the synchronized combination of production profiles, consumption profiles and of the market.

The situations considered are chosen in such a way as to identify the main constraints of the power system in the presence of the applicant's new installation(s)/unit(s), for each phase and for each of the proposed connection solutions.

Typically, 100 situations per year will be analysed in order to best represent all the different market situations of an average year in terms of temperature, wind or sunshine profile. Each of the 100 situations will therefore have a weight, resulting from a grouping of the 8760 hours of the average year and will be used to determine the conditions of the connection, including the average annual flexibilization volumes required in the case of a connection with flexible access.

5.1.5 Analyzed system states

For each of the identified situations, the currents and voltages in the system, the dynamic stability and the compliance with the requirements in terms of voltage quality are checked for different system states. A state is characterized by a planned or unplanned outage of one or more grid elements (line, cable, busbar, network user, etc.) in relation to the reference context and the analyzed situation.

Typically, the following are studied:

- N state, where all the grid elements available in the reference context are operational. For each phase of network evolution, a new N state is studied.
- N-1 state, where relative to the N state, a grid element or user is disconnected (either planned or unplanned) from the system.
    - With the exception of specific situations linked to certain types of grid elements or to the phasing of network development works, the average unavailability of grid elements is 1% of the time. This unavailability rate includes both network maintenance and incidents. It should be noted that since the frequency of maintenance is not annual, the annual volume of flexible energy that could be needed, may therefore vary around the average value determined in the grid connection study.
    - In the context of the realization of network infrastructure works, the unavailability of certain grid elements can be significantly greater. For network development works in the zone of the connection request, in progress or planned within 3 years after the commissioning date of the

connection request, as well as for network development works to upgrade the 400kV network and which would impact the determination of the permanent power or the volume of needed flexible energy, phases of work realization will be taken into account as part of the grid connection study.

- N-1-1 state, where a grid element is preventively taken out of service in order to carry out maintenance, updates or repairs and during which an unplanned incident occurs. It should be noted thatthis state mustrespect operational criteria only during a sufficient number of situations (or periods of the year) (and not during the whole year) to carry out the tasks of the network operator.It is also important to identify, during the study, whether specific agreements need to be made between the network operator and the connection applicant in order to enable each party to manage its own system.

5.1.6 Technical criteria

5.1.6.1 Limits for a responsible system operation

The grid development criteria of application in the context of the grid connection study are deemed to be met, for each situation and state, if:

- The requirements set out in the contingency list of the "methodology for coordinating operational security analysis in accordance with EU 2017/1485 (SOGL)"[30] and the requirements of Regulation (EU) 2019/943 of June 2019 on the internal market for electricity are met;
- The voltage at each point of the network remains within the specified limits;
- The currents in the various grid elements do not exceed the maximum specified values provided; the maximum values of grid elements that must not be exceeded are divided into permanent and temporary maximum values. Temporary maximum values can be used in an unplanned N-1 situation when curative actions are available to reduce currents below permanent maximum values within a 15' timeframe.
- The short-circuit currents do not exceed the maximum specified values;
- The dynamic and transient stability of the production units is ensured;
- The requirements in terms of voltage quality are met.

30 https://www.acer.europa.eu/sites/default/files/documents/Individual%20Decisions_annex/Annex%20I%20-%20ACER%20Decision%20on%20CSAM.pdf

5.1.6.2 Limits for a responsible system development

Additionally, in the context of connection studies, criteria exist for the proposal of the connection point of a new Grid User:

- If a voltage level is planned to be dismanteled, as mentionned in the network development plan, in the electrical zone where is located the connection request (e.g. 70kV), generally no connection options on this voltage level are proposed as the Grid User would then need to switch to other voltage level later. It could however, still be proposed if this variant is techno-economical interesting for the a Grid User even if he would then need to foresee multi-voltage transformers and connection links.
- If a new voltage level is created in a zone (e.g. 150kV), a connection option is proposed to a Grid Users if the network evolution is within relevant time horizon or if anticipation of the infrastructure project is possible.
- Based on the typical ratings of grid elements and depending on the capacity of the connection request, a connection option having the adequate voltage level will be proposed. This criterion, illustrated on the figure below with maximum capacity per voltage level on source substation (i.e. a substation of a given voltage level supplied by more than one transformer from a higher voltage level) and on remote substation, enables investment in public grid infrastructure to benefit more than a single Grid User.

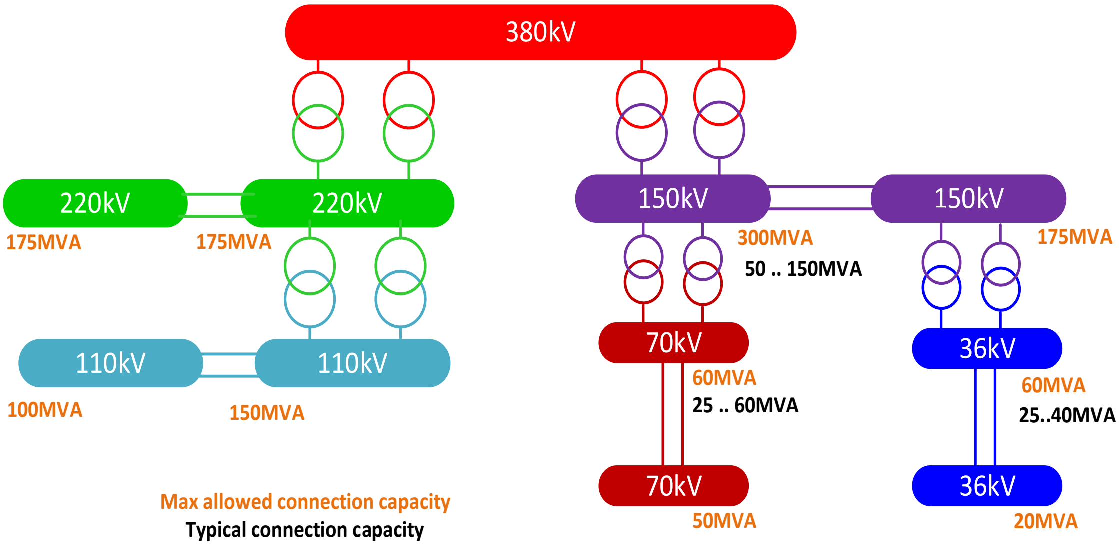

Figure 9 : Maximum allowed connection capacity per voltage level for source substations and remote substations

5.1.6.3 Connection solutions considered

For illustration purposes, here is a non-exhaustive list of considered connection solutions:

- A standard connection to a substation of the transmission network. This connection may consist of one or two bays (for a redundant connection). In the case of a redundant connection, Elia will specify in the orientation study the authorised operating mode(s) in the customer's facilities in order to avoid any transit flow through the customer's facilities in N or N-1 in the transmission network (diagram on the left in the figure below).
- A double-tapping connection with the unavailability of one of the customer's two connection links in the event of maintenance or work on the concerned transmission grid element[31] (diagram in the middle of the figure below).
- A single tapping connection at voltages below 400kV and for a production or storage facility with an interruptible connection contract. The customer connection links in the event of an incident, maintenance or work on the concerned transmission grid element[32].
- A standard connection to a substation of the transmission system through one or more links temporarily made available to the customer for exclusive use (Part B)[33] but which could possibly be partly integrated into the transmission network and part of which will then become Part Z[34]. This will involve the construction of a substation and the relocation of the customer's connection point (diagram on the right in the figure below).

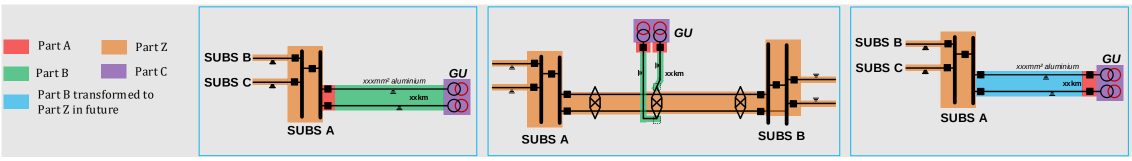

Figure 10 : Considered connection solutions

5.1.6.4 Actions considered for controlled network operation

- **Standard operating topologies and preventive actions**

In the context of the grid connection study, network security is ensured by proposing a network infrastructure and operating topologies that can be adapted for sufficiently identifiable, predictable and stable situations. The potentially very fast ramping rates of storage units rule out the use of real-time adaptation of the operating topology to manage potential network congestion.

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31 Max one tapping per grid element allowed.

32 Max one tapping per grid element allowed.

33 Part B = all equipments making up the connection link between the connection bay at Elia substation (Part A) and the own installation of the (candidate) grid user (Part C)

34 Part Z = equipments and infrastructure part of the global Elia grid

The main objective ofpreventive actions is to ensure that in a planned N or N-1 situation, the grid elements are not overloaded beyond their permanent maximum value and, at the same time, to ensure that after an unplanned incident the grid elements are not overloaded beyond their temporary maximum value.

If these preventive actions are not sufficient, network reinforcement and/or connection with flexible access (possibly pending network reinforcement) are proposed. In the case of a connection with flexible access, the active power connection request will be modulated in the network situations that require it up to a level where all technical criteria are met again.

- **Curative actions in case of unexpected N-1**

After the loss of an element, certain technical criteria will be between their permanent and temporary limits. The return of the system within the permanent limits of these technical criteria will require the use of a limited number of curative actions that can be carried out in less than 15 minutes.

If these curative actions are not sufficient, network reinforcement and/or connection with flexible access (possibly pending network reinforcement) is proposed. In the case of a connection with flexible access, the active power connection request will be curatively modulated in N-1 or N-1-1 situations.

The probability of a curative activation is therefore the product of the probabilities of an unplanned N-1 and of a situation where the grid element's permanent capacity in N-1 would be exceeded.

- **Modulation of the Grid User (in case of connection with flexible access)**

In cases where preventive or curative internal Elia's RAs are not sufficient and in the event that network reinforcement alternatives cannot be implemented before the Grid User request is connected, a modulation of the requested power is proposed. These modulations therefore only concern situations where the Grid User is still connected to the network and exclude situations where the Grid User is disconnected from the network following an N-1 situation. These particular situations are covered contractually with the Grid User who has opted for a non-redundant or interruptible connection.

The flexibilization volumes determined in the grid connection study are based on the assumption that the new connection will be modulated in the event of congestion caused or exacerbated by this new connection request, before the other Grid Users taken into account in the reference context adapted for the study (see Section 5.1.2) except in cases where the connection request has a low influence on a congested grid element and a more efficient means is available in real time to resolve the congestion. Under these conditions, the constraint is not taken into account for the calculation of the flexibility energy volume. The following metrics are used to determine the influence of connection request on grid elements:

- For congestion located at a voltage level equal to or higher than the voltage level of the proposed connection point for the request, the critical network element will only be considered if the product of the PTDF[35] of the applicant on this element by the ratio of the power of the request to the power of the network element is greater than a threshold (unless no other means are available in real time).

$$U_{CNE} \geq U_{GU}; \left(\left| PTDF_{GU,CNECGU} \right| \times \frac{S_{nom_{GU}}}{S_{nom_{CNEC_{GU}}}} \right) > x\,\%$$

- For congestion located at a voltage level lower than the voltage level of the proposed connection point for the connection request, the critical grid element will only be considered if the PTDF of the connection request on that element is above a threshold (unless no other means are available in real time).

$$U_{CNE} < U_{GU}; \qquad PTDF_{GU,CNECGU} > y\,\%$$

The appendix of the orientation study clarifies the thresholds x & y in force at the time of the study.

5.2 Methodology and conclusion of the study

The connection request is integrated into the reference situation at different grid connection locations in the physical vicinity of the object of the connection request. The resulting system is simulated in the situations and states mentioned above. The simulations cover the functioning of the market, that of the power system (load-flow, etc.) and the manual actions of dispatchers and automatic systems.

Through an iterative process, in order for all technical criteria to be met,

- Connection variants to the electricity grid are being considered. Variants that are technically not feasible or not economically justified, in discussion with the customer, are not retained. The list of all variants considered, whether or not they have been selected, shall be communicated to the applicant.
- Realistic adaptations to the timing or phasing of planned infrastructure projects and/or changes in the way the network is operated will be proposed.

Once this objective is achieved,

- A non-binding estimate of the cost (direct investment needed for the connection equipments and applicable connection yearly fees in accordance with the tariffs as approved by the CREG) to be borne by the applicant to enable its connection

[35] Power Transfer Distribution Factor (PTDF): the PTDF describes how an exchange between two nodes is distributed over all grid elements.

is made. It is accompanied by an estimated time frame for the completion of all required network adaptations.

- Where applicable, a period, during which the connection is possible subject to flexibilization of the Grid User, is determined. It should be noted that, if the need for flexibility is only present in rare situations (with a probability of occurrence below a threshold) and other means are available in real time to ensure the sound operation of the network), a connection with firm access will be proposed. Among these rare situations, we will find the need for flexibility in the case of N-1-1 for the maintenance of grid elements (N-1-1 for infrastructure project not included here) which are then only taken into account if there are no other real-time means to ensure the sound operation of the network.

  The maximum power that is never modulated to meet the criteria will be referred to as "permanent power". If the latter is less than the power requested, then the remained power which can be modulated is called "flexible power".

  For an orientation study proposing a connection with flexible access to the federal transmission network, a technical report mentions the conditions for flexible access to the network. This report is sent to the competent regulator for approval. A copy of this report is sent to the Directorate General for Energy.

- The additional non-exhaustive technical requirements from the technical regulation of application to the connection solution (federal technical regulation, local transmission network technical regulation, regional transmission network technical regulation, etc.) are communicated.
- In the event of a potential impact of the Grid User on the stability of the network, the study mentions the need to carry out a detailed dynamic stability study during the connection study, which follows the grid connection study. The dynamic stability study may possibly lead to additional or different investments at the expense of the Grid User, such as a different choice of design of the production unit or the step-up transformer. The dynamic stability study may also result in additional network investments, which may lead to a delayed commissioning of the object of the connection request.
- In the event of a potential impact of the Grid User on the voltage quality, the study mentions the need to carry out a detailed Power Quality study during the connection study, which follows the grid connection study. The Power Quality study may possibly lead to additional investments at the cost of the Grid User, such as filters. The Power Quality study may also result in additional network investments, which may lead to a postponement of the commissioning of the object of the request.

In addition, the following technical information is provided to the Grid User:

- Connection variants considered

Connection variant	Access type	Connection point	Explanation
Variant 1		*PPPPPUUU*	*Considered / Disgarded*
Variant 2		*PPPPPUUU*	*Considered / Disgarded*
Variant 3		*PPPPPUUU*	*Considered / Disgarded*
PERM variant	PERM	*PPPPPUUU*	*e.g. Disgarded given length of the connection link that is not technically-economically justified.*

- Relevant network evolution phases

Phases	Period	Description
Phase 1	2027 - Q4 2028	e.g. before commissionning of project X
Phase 2	20xx - 20xx	xxx
Phase 3	20xx - 20xx	xxx
Phase 4	20xx - 20xx	xxx
Finale Phase	20xx - 20xx	xxx

- In the case of connection solutions with flexible access, and in order to provide the network user with factual information on the risks of activating flexibility, the information in the following table is provided.

Profile consumption/injection		**Variant 1**			**Variant 2**
		Phase 1	**Phase X**	**Finale Phase**	**... (idem)**
Injection	Flexible Power (MW)	xx			
	Permanent Power (MW)	yy			
	% preventive flex (time)	aa			
	% curative flex. (time)	bb			
	% flex. (active energy)	cc			
	Description of market conditions with power modulation of the connection request (eg. high offtake and low production in the zone, or high imports from FR combined with high offshore wind infeed)				

Consumption	... (idem)				

To understand this table, it is important to remember that the need for power modulation of connection request in the event of congestion is typically linked to one, the other or both of the phenomena described below:

- A high flow (higher than its permanent maximum power in N or higher than its temporary maximum power in N-1) on a critical grid element linked to a combination of the position of several players on the Belgian and EU markets. This phenomenon is the main cause of preventive flexibilized volume (see table above). A description of the market conditions, among the 100 situations per year analyzed of the average year in terms of temperature profile, wind or sunshine, and correlated to these modulation needs is provided in the table.
- Unplanned or planned disconnection of grid elements (lines, cables, transformers, etc.), resulting in a high flow on another critical network element. This phenomenon is the main cause of curative flexible volume (see table above).

6 Guarantees provided to Grid Users that have a connection with flexible access

6.1 Introduction

As explained in Section 3, when a Grid User requests an early connection before (identification and/or) realization of the required grid infrastructure, the temporary flexibility needed in this context shall be associated to the connection contract and the related costs shall therefore be borne by the Grid User. This approach is in the interest of the Grid User – as he can connect earlier – and in the interest of society – as these costs are not socialized.

This principle is already applied: a Grid User with a flexible contract is activated by sending real-time modulation set points, known as "Gflex”. Those flexibility activations are in most cases not compensated (see section 2), which is consistent with the principle that the Grid User bears the costs of the flexibility.

However, at least for the federal level, there are currently no binding limits to the use of the flexibility. The Grid User with a flexible contract receives a non-binding estimation of the percentage of time where flexibility will be activated. The period during which those non compensated activations can occur is currently defined in article 61 of the Code of Conduct but provides limited guarantees to the Grid User. This is an uncertainty for the business case of the Grid Users, for which guarantees are necessary on 2 levels:

- The definition of the temporary period;
- The use of flexibility during the temporary period.

The purpose of this section is to provide clarifications and guarantees on those aspects, respectively in sections 6.3 and 6.46.4. The guiding principles that are used to design the proposal are described in section 6.2.

In order to be able to provide clear guarantees to the Grid Users, the need for flexibility evaluated in the grid connection study and resulting in the tables illustrated at the end of section 5.2 need to be translated, for each variant and for each direction, in a table showing the flexibility levels and the permanent power per year. This is illustrated in Table 4 for an example of a 40MW wind park which has a planned temporary period of 8 years.

	2026	2027	2028	2029	2030	2031	2032	2033
Flexibility [MWh]	12.000	12.000	12.000	6.000	6.000	2.500	2.500	2.500
Perm band [MW]	0	0	0	10	10	15	15	15

Table 4 : Illustration of the calculated need for flexibility expressed per year

On the contrary of what is done today, Elia proposes that the values from this table will have a binding character. Therefore, these values will be the basis to define **the cap**. Flexibility activations exceeding the cap will lead to a compensation of the Grid User.

6.2 Guiding principles

The design proposed is built considering the following 4 guiding principles:

1. Consistency between the different processes
2. Balance between risk borne by the GU and risk of socialization
3. Simplicity of design, implementation and operation for Grid User and for the TSO
4. Robustness against market distortion and gaming

6.2.1 Consistency between the different processes

As described in the introduction, it is necessary to ensure a global consistency between the methodology to calculate the required flexibility in the grid connection study, the operational processes that activate the flexibility and the methodology to determine the activated flexibility for the purposes of reporting, "cap consumption[36]" and compensation beyond the cap.

6.2.2 Balance between risk borne by the Grid User and risk of socialization

The principle of the temporary period explained in section 3 is that the costs for an early connection are to be borne by the Grid User, and hence ar not socialized. However, as soon as the need to provide contractual guarantees to Grid Users is accepted, it implies to define limits beyond which the Grid User can't anymore be requested to solve congestion issues without compensation. Therefore, in the event the flexibility needed resulting from the connection of the Grid User is higher than estimated in the EDS, the related congestion management costs will be socialized.

Consequently, while it's clear that contractual guarantees are necessary for the Grid Users, it inevitably leads to a risk of socializing costs. The proposal aims at finding a balance between the risk borne by the Grid User and the risk of socialization of costs.

[36] The way Elia will count the usage of the flexible volumes during the temporary period up to the cap

6.2.3 Simplicity of design, implementation and operation for Grid User and for the TSO

Complexity is a barrier. Keeping the design and the resulting contractual rules as simple as possible will allow Grid Users to better understand and quantify the risks and will lower operational and monitoring costs for all impacted parties. For some choices, the advantage of exhaustively covering all possible cases will not weigh up against the cost of additional complexity required.

In addition, the simpler the design, the less time needed to implement it, allowing to grasp the benefits earlier. The evolutions proposed in the present design note already require a significant implementation track, while only being a first step towards the Target Model. Limiting complexity of the design will also allow to focus on the Target Model as soon as possible.

6.2.4 Robustness against market distortion and gaming

Rules leading to a risk of market distortion and/or gaming could lead to an inefficient dispatch and an increase of costs for society.

6.2.5 Conclusion

The proposal is to be considered as a complete package, which aims to find the best balance of risks while remaining simple, consistent with related process and robust against gaming and market distortion. While some of the proposals may seem unbalanced individually, Elia believes they make sense as a whole.

6.3 The definition of the temporary period

The EDS mentions the different phases and the corresponding need for flexibility. When the project which is expected to solve the congestions created by the Grid User's connection is planned to be commissioned, the temporary period ends. Currently, art. 61 §§2 and 3 of the Code of Conduct specifies the following:

"De flexibele toegang is beperkt in de tijd en ***eindigt op de datum van de ingebruikname van de nodige versterkingen van het netwerk voorzien door het ontwikkelingsplan*** *bedoeld in het eerste lid. Op deze datum wordt het ter beschikking gesteld flexibel vermogen een permanent vermogen en wordt deze toegevoegd aan het reeds ter beschikking gesteld permanent vermogen.* ***Deze flexibele toegang is niet beperkt in de tijd als het voornoemde ontwikkelingsplan niet de nodig versterkingen biedt****.*

Het technisch rapport bedoeld in paragraaf 1, eerste lid, specificeert de voorwaarden voor het verlenen van flexibele toegang, waaronder: [...] 3° een schatting van de gemiddelde duur en de totale duur per jaar gedurende dewelke het flexibele vermogen kan worden verminderd. ***Als de noodzakelijke netwerkversterkingen waarin in het ontwikkelingsplan*** *als bedoeld in artikel 13 van de wet is voorzien,* ***niet plaatsvinden op het geplande tijdstip*** *overeenkomstig § 3, 1°,* ***kan de transmissienetbeheerder de CREG verzoeken om flexibele toegang voor een bepaalde periode uit te breiden****, afhankelijk van voorwaarden in dat geval."*

Elia has investigated the possibility to provide additional guarantees to the Grid Users on the definition of the temporary period. To do so, it's important to note that different situations can occur:

- There is no project in the development plan allowing to remove the congestion identified in the connexion study;
- There is a project in the development plan allowing to remove the congestion identified in the connexion study, but the project is not yet initiated and hence the exact scope and timing is not yet defined;
- There is a project ongoing, possibly to be commissioned soon after the client's connection.

The rules need to cover those different situations, for example:

- The end of the temporary period can't be linked to the planned or effective commissioning of an infrastructure project if there is no project identified to solve the congestion;
- Defining a standard fixed period will not be appropriate to situations where the infrastructure project is already ongoing and close to be commissioned. Example: a fixed period is set to 10 years but the project is about to be commissioned 1 year after the start of the temporary period.

In addition, next to the guiding principles described in the previous section, the proposal should ensure that **the Grid User is concerned by the permitting process**. Permits are a frequent cause of delay of infrastructure projects. If the temporary period is based on the initially planned commissioning date, a delay in the permitting process has a limited impact on the Grid User, as he will be compensated once the temporary period has ended.

For this reason, Elia believes that the end of the temporary period should not be set by the initially planned commissioning date of the infrastructure project solving the congestion (as the Grid User would be less concerned about Elia obtaining its permit).

Elia makes the following proposal:

- For the connection contracts for which the infrastructure project expected to solve the congestions has a planning which is sufficiently robust (to be further determined) at the moment the connection contract is signed:
  - The planning of the project is mentioned in the connection contract.
  - The temporary period automatically ends when the infrastructure project is commissioned.
  - A standard margin of 1 year is applied to the end of the temporary period of the connection contract. Given the uncertainties in the realization of infrastructure projects at the time horizons in question, this can be considered as a reasonable margin.
  - In addition, Elia has the possibility to request, once for each connection contract, an extension of the temporary period or a postponement of a phase within the temporary period. Elia shall motivate the request based

on elements which are not under its control[37] and inform the CREG. This provision allows to keep the Grid User concerned by the permitting process and to mitigate the risk of socialization of costs.
    - The values of flexibility considered for the years beyond the timeline provided in the connection contract are the values of the last year of this timeline.
- To cover the cases where there is no infrastructure project with a sufficiently robust planning and to give an additional guarantee to the Grid Users, a maximum duration of the temporary period is defined.
    - This duration starts at the signature of the connection contract and depends on the voltage level of the congested grid elements impacted by the connection of the Grid User:
        - 15 years for 380-220kV
        - 10 years for 150-70-36kV
        - 5 years for MV
    - These values are considered to be in line with typical durations of development of infrastructure projects. Considering 5 years for MV also allows to ensure continuity with the rules applicable in the Walloon Region.
    - The reason the voltage level of the congested grid elements is considered and not the voltage level where the Grid User is connecting is that it better reflects the time needed to develop the grid in order to solve the congestion issue.
    - As mentioned in Section 5, a minimum impact threshold is applied to avoid that a Grid User having a small impact on a congested grid element (e.g. a 220-380kV grid element) would receive a flex access during a long temporary period (e.g. 15 years for a 220-380kV grid element).

6.4 The use of flexibility during this temporary period and the compensation beyond the predefined limits

6.4.1 Definition of the cap

The grid connection study results in a yearly value of flexible volume, as illustrated in section 5.

[37] such as delay in obtaining the permit

An example for a 40MW wind park which has a planned temporary period of 8 years is illustrated in the :

	2026	2027	2028	2029	2030	2031	2032	2033
Flexibility [MWh]	12.000	12.000	12.000	6.000	6.000	2.500	2.500	2.500
Perm band [MW]	0	0	0	10	10	15	15	15

As mentioned in section 5, the evolution of the grid infrastructure is taken into account by specifying different values per grid development phase.

Note: depending on the technologies, the cap will be expressed either in MWh either in % of time at nominal power. This is further developed in section 6.4.2.

6.4.1.1 Which activations are counted towards the cap?

The majority of the activations will be based on measurements on the Critical Network Elements (CNEs) which have been identified in the grid connection study and are monitored by the Gflex mechanism. However, as explained in section 7, some exceptions are not to be excluded.

In addition, as described in section 5 some contracts with a flexible access have a permanent power. However, as described in section 7, activations of the permanent power can't be excluded.

Given those elements, the following question arises:

- Which activations are counted towards the cap, and are hence not compensated?
- Which activations are considered not to be within the cap? In this case, the activations are not counted towards the cap but they are compensated even though the cap is not yet reached. For example, if the cap is 12.000MWh and that 3.000MWh have been activated, a 100MWh activation could be considered beyond the cap, meaning Elia would compensate those 100MWh but the counter of the cap would remain unchanged at 3.000MWh.

Regarding the permanent power

> Elia proposes to consider possible Gflex activations within the permanent power as not included in the cap.

This approach entails additional complexity, but it allows the Grid User to have the guarantee that all activations within the permanent power will be compensated according to modalities in section 6.4.3. In particular, it allows to set a limit on the impact of flexibility activations on the balance position of the BRP.

Regarding the reasons of activations

2 approaches can be considered:

1. All Gflex activations within the flexible band are not compensated up to the cap. This means that the cap in the contract is binding, but the relations to CNEs are indicative
2. Only Gflex activations within the flexible band, up to the cap, and related to a congestion on the CNEs predetermined in the grid connection study are not compensated. This means that both the cap and the CNEs identified in the contract are binding

Elia proposes not to make the distinction between the reasons of the activation.

This corresponds to the 1st option, proposed for the following reasons:

- Making the distinction between the network elements increases complexity in settlement and registration of activations with no clear benefit neither for society nor individual market parties, as in practice the impact on the amount of non compensated activations is expected to be limited.
- In any case, the Grid User keeps the guarantee that activations beyond the cap will be compensated and the maximum volume of non compensated activations doesn't change even if the operational needs differ from the situations identified in the study.

Elia acknowledges that the proposed approach introduces an inconsistency between the grid connection study and the way the use of the cap is measured. However, as the impact is expected to be limited, Elia believes in the added value of a simple approach.

For the sake of clarity, note that this doesn't imply that connections with flexible access will be used as a first mean to solve any kind of congestions. As explained in section 7, other types of congestion management means will be used in priority to solve congestions that have not been identified in the grid connection study.

Note: maintenance on the equipements which are dedicated to the Grid User's connection, e.g. on part B of the connection, are treated separately in the connection contract. There are not in the scope of this design note and will not lead to cap consumption nor to compensation as described in this section.

6.4.1.2 Is the cap annual or multi-annual?

Based on the outcome of the grid connection study, it's necessary to determine when exactly the cap is considered to be reached. 2 extreme solutions could be considered:

- **An annual cap**: each year, the used flexibility is compared with the needed flexibility calculated in the grid connection study. The cap is considered reached when the used flexibility during the year is equal to the estimation of the yearly

flexibility during that year in the grid connection study. Counters are reset at the beginning of each year.
- **A cap on the full temporary period**: the volumes of flexibility are summed up over the planned temporary period. The cap is considered reached when the used flexibility is equal to the cumulated estimated flexibility.

From the point of view of the Grid User, a cap on the full temporary period provides insufficient guarantees, as the "cumulated cap" could be fully used during the 1st years, which could jeopardize its business case. This risk for the Grid User would be eliminaited with an annual cap.

However, there is a higher risk that the cap will be exceeded, leading to socialization of costs. The following risks have been identified:

- **Risks related to the planning of maintenances** on grid elements from part Z (maintenance on the equipements which are dedicated to the Grid User's connection are treated separately in the connection contract) which increase the need for flexibility. Those activities are considered in the connection study based on the average unavailability of grid element and, as mentionned in section 5, since the frequency of maintenance is not annual, the flexible energy on the year where maintenance is planned could be higher than the average annual volume determined in the connection study.
- **Risks related to a change of planning of infrastructure projects that impact the phases identified in the grid connection study.** As mentionned in section 5, phases are defined for different evolution status of the transmission system as well as for the realization of a given set of network infrastructure works. For example, if a given infrastructure evolution allows to decrease the need for flexibilty, this will be considered accordingly in the annual values resulting from the grid connection study. If the associated infrastructure project is delayed, the calculated cap during the period where the project was planned to be realized but was not yet realized will be underdimensioned. Secondly, concerning the phase linked to the realization of a given of network infrastructure works, if the work was initially planned for one particular year (e.g. 2030) at the moment of the grid connection study, but is delayed by 1 year, the flexibility in 2031 will be highly insufficient. It must be noted that the further in time, the higher will be the uncertainty on the planning.
- **Risks in case of other evolving needs for flexibility** during the temporary period
    - Assumption-related risk: forecasts of load and production have to be made at the moment of the grid connection study. The further in time, the higher the uncertainty on those forecasts.
    - Methodology-related risk: the load and production forecast used in the grid connection study are averaged over a period of several years (a phase). Therefore, even when the forecasts of load and production are correct, the methodology of the grid connection study leads to differences between the calculated flexibility need and the effective flexibility need

- Risks related to increase the use of flexibility due to **curative activations** (see section 7). As the occurrences are expected to be limited, this risk is considered not be significant.

It's to be noted that those risks can go both ways: underestimation or overestimation of the needed flexibility. However, from a financial point of view, while an overestimation will have positive consequences for the Grid User as he will not be activated, an underestimation would lead to cost socialization. For example, if works are initially planned in 2030 and eventually occur in 2031, the Grid User will be activated much less than planned in 2030 and the cap will be exceeded in 2031.

Therefore, Elia proposes 2 alternatives to the annual cap, aiming at providing strong guarantees to Grid Users while limiting the risk of socialization of costs. Market parties are invited to provide their feedback on the 2 options in the public consultation.

Option 1: multi-annual cap of 3 years

This option corresponds to the proposal that has been made during the workshop on the 16th of April.

The cap would be defined as a multi-annual cap over fixed 3-year period, as a balance between the annual cap and the cap on the full temporary period.

This would concretely be implemented in the following way:

- For the first year of the connection, the volume of flexibility is calculated prorata. For example, if the Grid User connects on the 1st of May 2026 and has a calculated flexibility of 12.000MWh during that year, the value that will be taken into account from the 1st of May to the 31st of December 2026 will be 8.000MWh, as the Grid User will be connected during 8 out of the 12 months of the year.
- As of the 2nd year, the volumes of flexibility are summed up over the following 3 years. The cap is considered reached when the used flexibility is equal to the cumulated calculated flexibility over the 3 years. In the example, the cap between 2027 and 2029 would be 36.000MWh.
- The counter is reset at the end of the 3 years.
- For the last period, which is presumably shorter than 3 years, the cap is determined by summing up the values over the remaining period, with a prorata calculation for the last year.
- In case of extension of the temporary period, the principle applied is described in section 6.3.

	2026	2027	2028	2029	2030	2031	2032	2033
Flexibility [MWh]	12.000	12.000	12.000	6.000	6.000	2.500	2.500	2.500
Perm band [MW]	0	0	0	10	10	15	15	15

Table 5 : multi-annual cap of 3 years

Regarding the permanent power, the proposal is to consider the values initially calculated for each year in the grid connection study. This is proposed for the sake of simplicity, in the knowledge that it might lead to a risk of socialization in case of evolution of the planning of maintenances and works.

A possible alternative would be to use a rolling-window of 3 years, but this leads to even more complexity without clear benefits for the Grid User.

Option 2: annual cap carrying unused flexibility over to subsequent years

This option is proposed by taking into account the feedback and suggestions received from market parties during the workshop of the 16th of April. In particular, Elia understood the need for the Grid Users not to exceed the annually calculated values of flexibility shortly after the connection. An approach that should answer this concern while limiting the risk of socialization is to be define an annual cap, but to carry over to subsequent years the volume of flexibility that has not been used.

Example based on the table above:

- The Grid User is connecting on the 1st of May, meaning the cap until end 2026 is 8.000MWh
- If the volume of flexibility activated between the 1st of May and the 31st of December 2026 is 10.000MWh, the cap is exceeded by 2.000MWh and the Grid User will be compensated for these 2.000MWh.
- If the volume of flexibility activated between the 1st of May and the 31st of December 2026 is 7.000MWh, the cap in 2026 is not reached, as a volume of 1.000MWh has not been activated.
- This volume of 1.000MWh will be carried over to the subsequent years.
- As a result, in 2027, the cap would be set to 13.000MWh (12.000MWh + 1.000MWh).
- If in 2027, the flexibility used is 9.000MWh, the cap in 2028 will be 16.000MWh (12.000MWh + 1.000MWh from 2026 + 3.000MWh from 2027).

Elia sees following advantages to this approach:

- The Grid User has a guarantee in the 1st year. In addition, the Grid User has the guarantee that the maximum volume of non compensated flexibility that could happen is to have the entire annual cap used each year. If, for a given year, the cap is not fully used, the Grid User has the possibility to make provisions for the subsequent years.
- The risk of exceeding the cap in the 1st year is limited, as Elia has a quite clear view on the occurrence of major works and maintenances shortly after the Grid User's connections.
- The risk of major works being delayed is covered. If a high need for flexibility has been identified for this reason in 2030 but that works are postponed to 2031, no costs are socialized. This is consistent with the fact that the delay has a limited impact for the Grid User (provided the Grid User is sufficiently informed on the planning of the works).
- The risk of delays in infrastructure projects that lead to a change of phase reducing the need for flexibility is partly covered, as each year in which the cap is not used provides a margin for the following years. This allows to focus the

discussion on the end of the temporary period (see section 6.3) mainly on the end date, and not on the intermediate phases.
- The principle remains fairly simple in terms of design and implementation.

Elia is open to discuss additional rules aiming to avoid that flexibility volumes keep summing up to unnecessarily high levels after several years. A possibility could be to limit the carrying over of volumes to 3 years. This would mean that an unused volume in 2026, if not used in the period 2027-2029, would not be considered anymore in the cap for 2030.

Regarding the permanent power, as for previous option, the proposal would be to consider the permanent power for each year as initially calculated in the grid connection study.

Elia believes option 2 (annual cap carrying unused flexibility over to subsequent years) offers a pragmatic and balanced compromise. Elia invites stakeholders to provide feedback on the options.

6.4.2 Quantification of flexibility in operation

6.4.2.1 Introduction

The quantification of flexibility is done by comparing the Gflex setpoint sent to the Grid User with a baseline. The baseline is designed to be an acceptable approximation of what the Grid User would have injected / offtaken if no Gflex setpoint was sent.

Because different technologies have different injection / offtake profiles, baselining methods suitable to each technology have to be defined. In addition, there are 2 different objectives when quantifying the use of flexibility in operations, and in some cases each of them can lead to a dedicated baselining approach. These 2 objectives are the following:

1. **Measure the use of flexibility within the cap**

   The objective is to quantify the volume of flexibility which is activated without compensation, and as a result the remaining volume that can be activated without compenstation before reaching the cap.

   In order to have a valid comparison, the method to determine the use of non compensated flexibility has to be consistent with the profiles used in the grid connection study (see section 5).

2. **Determine the volume to compensate beyond the cap**

   The objective is to determine the volume of flexibility activated that is not considered to be within the cap defined in the grid connection study. In this case, a volume, expressed in MWh, has to be determined in order to be able to calculate the compensation.

The method to determine this volume doesn't necessarily have to be consistent with the profiles used in the grid connection study, the target in this case being to evaluate as precisely as possible the energy which couldn't be injected / offtaken because of the Gflex setpoint.

The following baselining methods have been considered.

- **AAP**: the Grid User needs to send the Available Active Power (AAP) in real time to Elia. Altough the unit is being activated for flexibility it is still able to estimate the AAP without flexibility activation. It's to be noted that this methodology is only available for specific technologies.
- **Control Group**: this baseline methodology uses a reference control group which is not influenced by the flexibility activation. This control group is of the same type as the impacted Grid User.
- **Historical baseline**: use of historical measurement data taken quite recently (several days up till 1 month prior to the day of activation) to calculate the baseline for the period of activation. An example of historical baseline is the high X of Y method that is currently applicable for mFRR.
- **Declarative baseline**: the Grid User needs to send in a baseline prior to a predefined deadline. An example of declarative baseline is the baseline applicable for aFRR (as described in the T&C BSP aFRR).
- **Meter Before Meter After (MBMA)**: take a single meter reading or the average of multiple meter readings before and/or after activation of the product and compare them to calculate the flexibility activation. An example of MBMA baseline is the last quarter-hour baseline applicable for DP_{PG} in mFRR (as described in the T&C BSP mFRR).

This section describes the baseline method(s) for each type of technology.

Important notes:

- The methods to quantify the use of flexibility in operation described in this section are consistent with the monitoring of the flexibility activations that will be implemented by Elia and published as of the end of 2024. The modalities for reporting are further developed in section 8.
- In order to implement the quantification of the use of flexibility, and hence to provide the guarantees to the Grid User, it is important that the Grid User sets up the necessary real time data exchange. This is currently not always the case.

6.4.2.2 Wind and solar

For wind and for solar, provided it's available, **the Grid User shall use the AAP baseline**. This approach is also in line with the method used for the subsidy mechanism of the Princess Elizabeth Zone (PEZ). As the AAP baseline represents the potential production, the difference between the AAP and the Gflex setpoint sent by Elia is the best possible proxy of the volume of modulated energy.

When the AAP is not available, the Control Group baseline will be used. The control group consists of one or multiple reference units situated in the same area as the production unit. The power output of the control group will be scaled to calculate the potential production of the production unit. Concretely, the Control Group method works in the following way:

- As soon the setpoint falls below the nominal power, the Individual Contribution Factor (ICF) of the production unit to the total production of the region is being calculated based on production values of the previous quarter hour;
- The ICF is fixed during the global modulation period[38];
- This ICF is then used to calculate the potential production of the production unit;
- As the resulting baseline represents the potential production, the difference between this baseline and the Gflex setpoint sent by Elia is a good proxy of the volume of modulated energy.

Both methods are illustrated in Figure 11, where the "Potential prod" is to be interpreted either as the AAP, either as the potential production calculated according to the control group method.

Note: in this illustration, the potential production, which is to be considered as the baseline, is only computed during the global modulation period (connected period that starts when the setpoint drops below the nominal power and that ends when the setpoints equals again the nominal power).

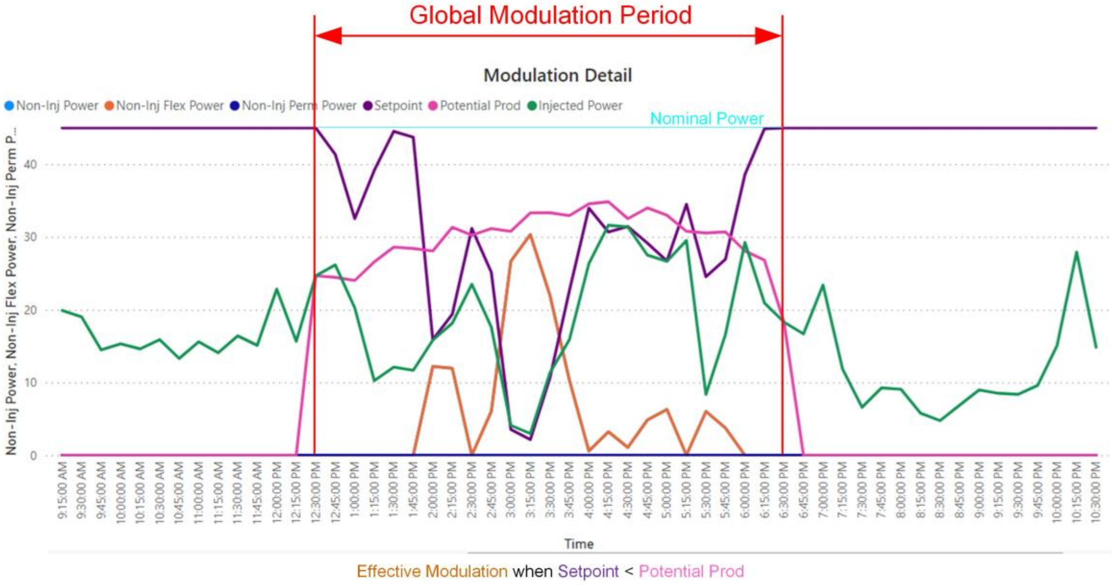


Figure 11 : illustration of AAP and Control Group methods

38 The global modulation period is defined as the period between the quarter hour before the setpoint becomes lower then the nominal power until the quarter hour the setpoint is returning to nominal power

For both approaches, the following corrections will be taken into account in the baselines:

- The Outage Planning: the baseline will be capped to the maximum available power provided by the Outage Planning Agent, which takes into account planned and forced outages;
- Redispatching activations: the volume activated in redispatching will be deducted from the potential production;
- Voluntary reduction of injection below the Gflex setpoint: the baseline will be set to injected power.

Both methods are suited for the purpose of quantification of the flexibility for reporting purposes and to contractual ends, whether it's to measure the use of flexibility within the cap or the volume to compensate beyond the cap. The estimation of the modulated volume is more precise than with the other methodologies considered, there is little implementation needed and there is no gaming risk, as the baseline is not under the control of the Grid User.

6.4.2.3 Electrical storage system

There is no simple and reliable way to calculate what a battery would have done if it had not been activated:

- The precise usage of electrical storage systems can not be anticipated by Elia. In some cases, e.g. when the battery is doing portfolio balancing or reactive balancing, the Grid User himself is not able to anticipate the precise usage;
- Fast variations within the quarter hour are possible;
- The setpoint can have a direct impact on the State of Charge (SoC) of the electrical storage system, not impacting only the immediate output in the direction of the setpoint, but also the output in the other direction, as well as what the electrical storage system will do later in time.

Therefore, defining an adequate baseline for electrical storage systems is challenging.

For the case of electrical storage systems, Elia suggests to make the distinction between the measurement of the use of flexibility within the cap, and the determination of a volume to be used for compensation beyond the cap. This is explained in this section.

Approach to quantify the use of flexibility within the cap

Approaches based on volumes to determine the use of flexibility within the cap require to define assumptions in the grid study on the profile of the electrical storage system. Concretely, this means that a market profile would have to be assumed in the grid connection study to ensure consistency between the grid connection study and quantification of the flexibility in operation. However, electrical storage systems are expected to have different strategies (ID spread, implicit and/or explicit balancing,…) and Elia doesn't have the information required to define specific assumption to each electrical storage system.

As a result, the cap would be calculated on the basis of a theoretical (and eventually quite "random") profile, which might lead to a significant difference between the result of the grid calculation and the actual use of flexibility, resulting in a significant uncertainty on the cap calculation.

This is the reason why the use of a flat profile at nominal capacity in injection and in offtake is proposed in section 5. Consistently with this approach, Elia proposes to quantify the use of flexibility within the cap by comparing the Gflex setpoint with the nominal power in the same direction[39]. As a result, the quantification of the volumes is not based on a baseline representing what the Grid User would have injected / offtaken without Gflex activation by Elia.

Example: a 100MWh flexibility for 100MW electrical storage system without permanent power corresponds to a setpoint at 0MW during 1 hour, as well as to a setpoint at 90MW during 10 hours.

Following elements are important to note in order to understand why this approach is fair and fully consistent with the consideration of a flat profile in the grid connection study:

- Only the setpoint sent to the Grid User is being considered. If the Gflex setpoint doesn't constraint the Grid User, for instance because the electrical storage system was in offtake during the period of the activation in injection, the « counter » of the cap is incremented anyway. This explains why the volumes calculated for electrical storage systems will be higher than for wind for example, as they don't represent the "energy not injected / offtaken" but the constraint sent by Elia.
- The setpoint is sent independently from the injection / offtake of the electrical storage system. The Gflex mechanisms doesn't "wait" for the Grid User to reach the limit of the lines, it calculates the maximum acceptable injection / offtake values and sends a Gflex setpoint as soon as this value is below the nominal power.
  Example: if a 50MW electrical storage system is injecting 10MW, it will still receive a Gflex setpoint at 30MW if exceeding this value would lead to a congestion. As a result, the « counter » of the cap will be incremented (by 20MW multiplied by the duration of the modulation).

Approach to determine a volume to be used for compensation beyond the cap

For activations that are considered not to be within the cap, the need is to determine a volume of flexibility to be able to calculate a compensation, not necessarily to be consistent with the grid connection study.

[39] Note that the approach is completely equivalent to the proposal presented in the workshop on the 16th of April, only the units in which the flexibility is quantified differ (MWh instead of % of time at full power). This modification is proposed to make it more clear and to use the same units as for other technologies.

Several baselining options have been investigated and compared for this specific need: MBMA, declarative baseline (according to principles comparable to the declarative baseline applicable in aFRR) and historical baseline.

Based on the analysis shared with stakeholders during the workshop of the 16th of April 2024[40], Elia proposes to use an historical baseline for the following reasons:

- The MBMA method introduces a possibility of arbitrage between (implicit or explicit) balancing and "Gflex benefits", providing incentives to Grid Users not to grasp opportunities which would be beneficial from a system perspective;
- The declarative baseline
  - Requires significant implementation from the Grid User to simulate the evolution of the SoC in its baseline;
  - Entails a gaming risk, which could only be partly covered by monitoring and would require BRPs to share their strategy on the use of the electrical storage system when questioned on the baseline.
- The historical baseline is expected to deliver acceptable results on average (even though not very precise for each activation individually), while being simple, transparent and robust agains gaming.

The principles of the historical baseline are explained in this paragraph. The proposed method consists in comparing the historical observed injection (or offtake) of the unit with the setpoint during the activation period. More precisely the following steps are applied:

1) The energy historically injected (or offtaken) by the unit above the setpoint during a given period in the past is calculated;
2) This energy is expressed in % of time at nominal power for the same period in the past;
3) The energy considered as modulated correspond to the % at nominal power calculated in step 2 applied top the duration of the activation.

Concretely, the historical baseline applied to electrical storage systems would operate in the following way:

- The injected energy over the last 4 weeks is measured in % of time at full power. In the example illustrated in Figure 12, this corresponds to a value of about 30% of time at nominal power, meaning the amount of energy injected during the 4 preceding weeks is equivalent to an injection of 50MW during 30% of this 4 week period.
- This value of 30% is applied to the duration of the modulation and to the nominal power to determine the volume not injected, expressed in MWh.

[40] Slides are available on this link: https://www.elia.be/en/users-group/workshop/20240416-workshop

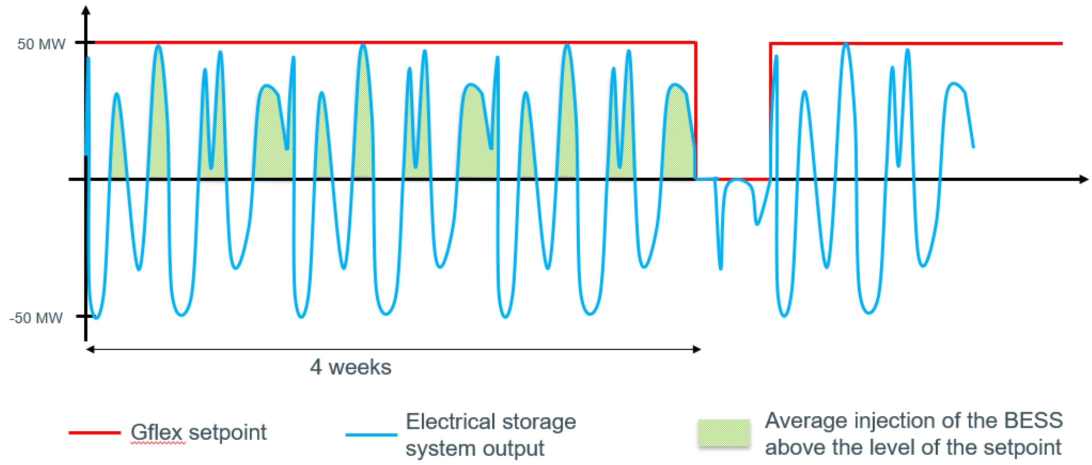


Figure 12 : illustration of historical baseline applied to electrical storage systems

- The method is also applicable when the setpoint is not equal to 0MW: the injected energy above the level of the Gflex setpoint over the last 4 weeks is measured. In the example illustrated in Figure 13, this corresponds to a value of about 10%, meaning the amount of energy injected above the Gflex setpoint during the 4 preceding weeks is equivalent to an injection of 50MW during 10% of this 4-week period. This value of 10% is then applied to the duration of the modulation and to the nominal power to determine the volume not injected, expressed in MWh.

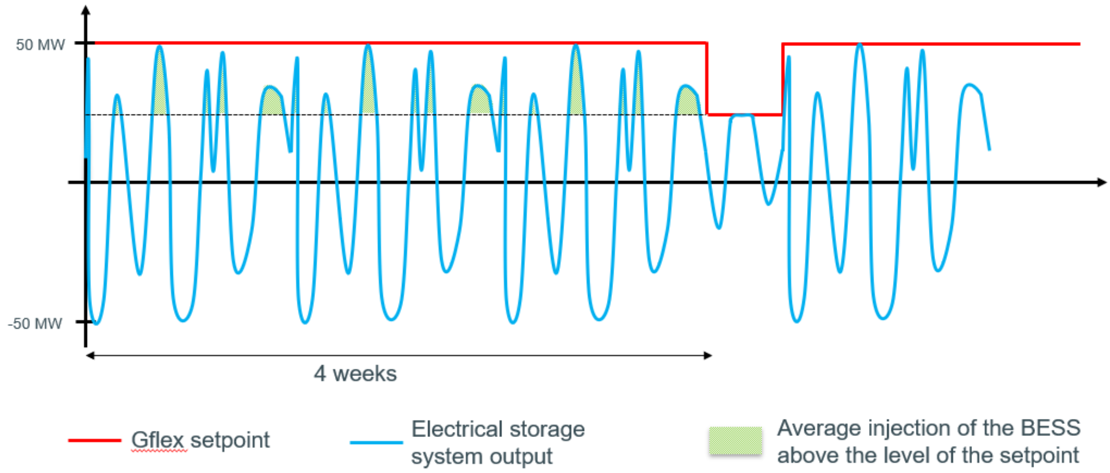


Figure 13 : illustration of historical baseline applied to electrical storage systems – case of a non-zero Gflex setpoint

- Following additional principles will be applied to quantify the volume:
  - Moments with balancing activations are not excluded from the sample, as balancing activations are part of how the battery is operated by the Grid User.

- Moments where a Gflex setpoint was sent are excluded from the sample. It would indeed not be fair to evaluate the average historical production of an electrical storage system based on periods where it was contrainted by a Gflex setpoint.
  Note: for contracts with a flexible band in both directions, Elia proposes to also exclude from the sample moments where a Gflex setpoint was sent in the opposite direction. The reason is that, in case of long lasting Gflex activations of a significant part of the nominal power, those eventually prevent the battery to operate in both directions, as the reservoir will be full (in case of setpoint in injection) or empty (in case of setpoint in offtake).
- The period of 4 weeks can be extended in case frequent Gflex activations lead to an amount of data points which is insufficient to have a representative historical baseline. The precise criteria still has to be defined.
- In the unlikely event that no sufficient data is available, e.g. in case of modulation of the permanent power shortly after the connection, all relevant available historical data will be considered.

6.4.2.4 Conventional production

For conventional production, Elia suggests to make the same distinction between the measurement of the use of flexibility within the cap, and the determination of a volume to be used for compensation beyond the cap as for the electrical storage systems. This is explained in this section.

Approach to quantify the use of flexibility within the cap

To ensure consistency with the grid connection study, Elia proposes to quantify the use of flexibility within the cap by comparing the Gflex setpoint with the nominal power. The approach is identical to the one for electrical storage systems.

Approach to determine a volume to be used for compensation beyond the cap

For conventional production beyond the cap, it has been considered to use schedules (declarative baseline). However, while this is considered a valid baselining method for redispatching activations, there are several shortcomings when applying it to Gflex activation:

- Gflex activation within the cap are more predictable than redispatching activations, as the congestion is linked to a predetermined set of CNEs with a very high probability of activation in case of congestion on those CNEs. This could lead to a gaming risk.
- Not all units are capable to submit accurate schedules (for ex. units < 25MW).

Therefore, it is proposed to use the last quarter-hour (MBMA type of baseline) or High X of Y (historical type of baseline) baselines, similarly to the methodologies used for DP_{PG} in the mFRR service.

These methods would be applied to measure the use of flexibility within the cap as well as to determine the volume to compensate beyond the cap.

6.4.2.5 Conclusions

As a conclusion, Elia proposes following approaches to quantify the use of flexibility:

- **Wind and solar:**
  - AAP baseline when available
  - When it's not the case, Control Group baseline
- **Electrical storage systems:**
  - To quantify the use of flexibility within the cap: comparison of the Gflex setpoint with the nominal power in the same direction
  - Beyond the cap: historical baseline
- **Conventional production:**
  - To quantify the use of flexibility within the cap: comparison of the Gflex setpoint with the nominal power
  - Beyond the cap: use of last QH or High X of Y (similarly to the mFRR baseline)
- **Demand facilities:** would have the possibility to use most suited method among those defined above in alignment with Elia, provided they are able to cope with flexibility activated in real-time.

While a harmonized approach would have been simpler in apparence, it would not have allowed to quantify the use of flexibility in a sufficiently precise way. E.g. using a historical baseline for wind parks for which the AAP method is available would be a missed opportunity. This approach will however lead to an additional challenge to solve for some specific cases of mixed sites. When different technologies are present behind an access point and that those technologies have different baselining approaches, the methodology to quantify the flexibility needs and activations might have to be revaluated. This depends a.o. on the outcome of the discussion initiated in section 6.4.3.

6.4.3 How to compensate beyond the cap

As further detailed in section 7, beyond the cap, the operational processes and the priorities of the different means is changed. As a consequence, the Gflex activations will be limited to specific situations.

As a result, this should generally decrease the occurrences of Gflex activations. However, as Gflex might still occur, it's needed to define how to compensate the concerned market parties for this activation.

This section is divided in 2 parts:

- The remuneration of the volumes not injected / not offtaken

- The perimeter correction of the BRP[41]

6.4.3.1 Remuneration

Elia proposes to base the rules for remuneration on the rules applicable in the iCAROS framework.

This means remuneration would be cost-based. The justification developed for the cost-based approach for iCAROS apply also for Gflex. Additionally, Elia believes that this remuneration approach is especially suited for Gflex since the congestions can be more predictable, and a market-based approach would lead to a gaming risk.

Even though there are significant differences between redispatching and Gflex activations (timing of activation, activation at the level of the access point vs. Delivery Point, possibility to request a Return To Schedule in iCAROS), using similar rules ensures a maximum consistency between the products and allows to limit the impact for the Grid User / Scheduling Agent when activations are performed via one or the other product.

Reminder of iCAROS framework

In iCAROS, the redispatching energy bid price:

- Reflects the costs for activating the flexibility and therefore is reasonable, directly related to the activation and demonstrable
- Is based on a **cost formula proposed by the Scheduling Agent** and challenged / approved by Elia at the signature of the T&C SA
  - Elia can, in agreement with the CREG, request a revision of the formula if cost reflective conditions are not respected
  - The cost formula can be adapted based on mutual agreement between SA and Elia

The components of the activation price formula should respect the following principles:

- The price is **reasonable**: the costs reflect an additional cost or loss of revenue that cannot be recovered or remunerated elsewhere, based on available information at the moment of the submission.
- The price is **demonstrable**: the Party charging the cost must be able to justify the amount by supporting information of a reliable source (invoices, price offers of a contractor, reference prices, …), which must be kept at disposal for the CREG and for ELIA.

[41] Perimeter correction of the BRP is be understood as imbalance adjustment

- The price is **directly related to the request**: the cost would not have been incurred if the request for activation had not taken place.

The table below is a non exhaustive list of price components that accepted / not accepted.

Accepted components	Not accepted components
Fuel costs	Loss of opportunity related to e.g. no volumes sold on ID/balancing market
CO2 related costs	Investment costs (for developing tools, for enabling the provision of the service etc)
Loss of subventions (e.g. green certificates)	Costs related to risk-taken e.g. integrating possible penalties for non-delivery
Start-up/shut-down costs (for specific relevant situations)	
Impact on industrial processes directly related to the activated Operating Mode	
The costs to restore the state of charge change due to the activation, in case a Technical Facility with limited energy reservoir was used for the activation	
Operational costs (impact on life cycle, additional maintenance etc)	

Table 6 : non exhaustive list of price components that accepted / not accepted

Notes:

- The reminder provided in this section intend to increase readability of the document. Any feedback on those principles is to be provided in the framework of iCAROS and not in the public consultation of the present design note. Stakeholder's feedback on the use of the same remuneration principles for both products is of course welcome in the framework of this public consultation.
- Demand facilities do not have the obligation to apply the iCAROS framework. Depending on the type of demand facilities that would be willing to accept a flexible contract, the list of accepted / non accepted price components could be completed, based on the same guiding principles as for iCAROS.
- For units which do not have a Scheduling Agent contract, the cost-based formula will have to be included in the connection contract.

6.4.3.2 Perimeter correction

When Elia is activates GFlex, it can create an imbalance for the concerned BRP. Let's consider a unit producing 100MW at a given quarter hour and that the BRP of this unit is balanced (for example, he sold the production on the ID market). When the Gflex setpoint limits the injection at 70MW, the BRP will suddenly face an imbalance of 30MW.

For Gflex activations within the cap, correcting the perimeter would lead to a socialization of costs, which is not consistent with the notion of temporary period according to which the costs related to the flexibility are to be borne by the Grid User. In addition, the Grid User has the possibility to take the impact into account in its business case, even though it increases its uncertainty on the impact of the flexibility.

For Gflex activations beyond the cap, if the only compensation to the Grid User is a cost-based basis of the remuneration of the non injected / not offtaken volume and that the perimeter is not corrected, the BRP(s) of the Grid User will be exposed to the imbalance price. As a result:

- The guarantees provided to the Grid User would not be appropriate.
- A significant discontinuity is created between redispatching activations and Gflex activations.

As a result, the proposal is to **correct the perimeter for activations beyond the cap only**.

As Gflex is activated at access point level, the question arises how to perform the perimeter correction when there are several BRPs behind the access point. Elia has investigated this question and proposes different possible approaches to collect stakeholder's feedback.

To ensure that the approach that will be retained is future proof, the examples have been developed for mixed sites. Figure 14 illustrates the example that will be used throughout this paragraph. In this example, the Grid User has appointed different BRPs to cover different different assets within its industrial site at the level of Delivery Points (corresponding to separate measurements); those BRPs are called BRP_{DP}. Note that, as foreseen in the "multiple BRP" design, there will always be a BRP responsible at the level of the access point, called BRP_{AP} .

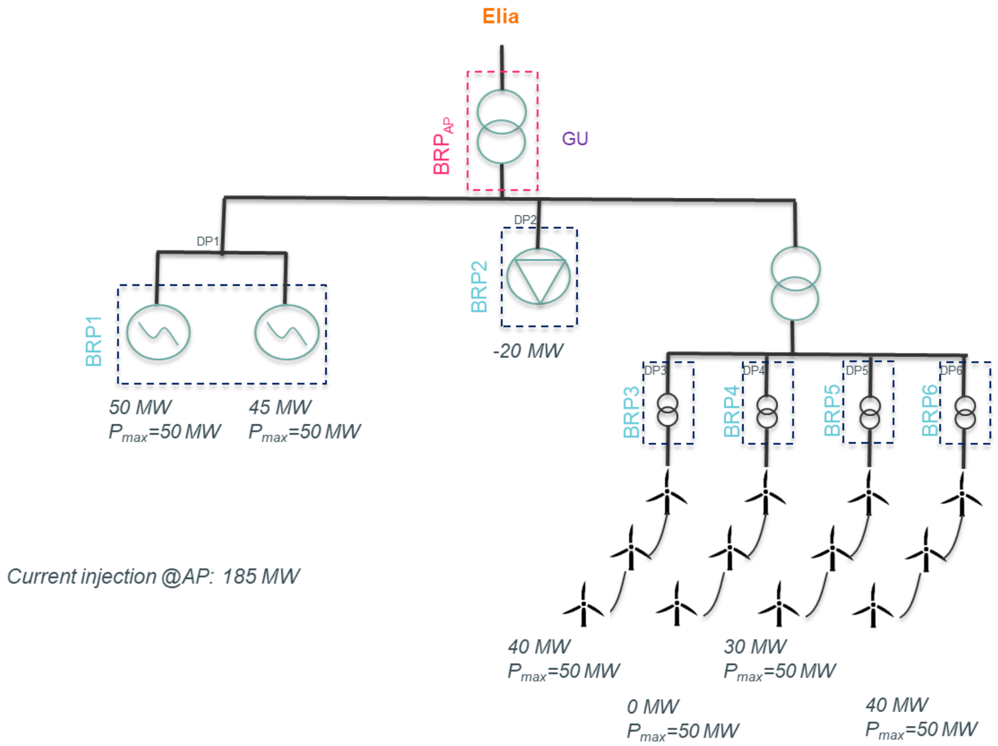


Figure 14 : Example of several BRPs behind an access point

As illustrated in Figure 15, 3 options have been considered to analyse the feasibility of the perimeter correction in case of Gflex on a site with multiple BRPs, depending on:

1. Whether one setpoint is sent by Elia to the Grid User to limit the injection (or offtake) at the level of the access point (options 1 and 2), or whether the setpoint is directly split by Elia into different separate setpoints to limit the injection (offtake) of each DP individually, which corresponds to the option 3;
2. In case of 1 setpoint sent by Elia to limit the netto injection (or offtake) at the access point, whether only one perimeter correction is applied to the BRP_{AP} (option 1) or whether perimeter corrections are applied to all concerned BRP_{DP} (option 2).

They examples developed will consider a Gflex setpoint in injection.

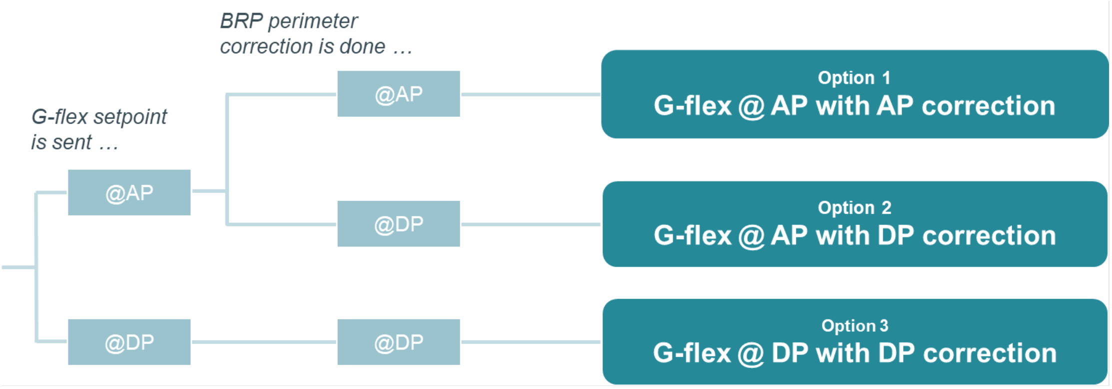


Figure 15 : 3 different options for the perimeter correction

These 3 options are evaluated based on the following criteria:

- **Possibility to optimize** the distribution of the Gflex constraint among the Delivery Points with variable repartition keys:
  - It might be interesting for the Grid User to have the freedom to distribute the Gflex constraint according to their specific operational conditions (e.g. generation schedules, maintenance, etc.) at the moment of the Gflex activation.
  - In addition, the analysis shows that for some options, the impact of a Gflex setpoint might in practice result in an injection by the Grid User which is lower than the constraint set by Elia. This is acceptable from a congestion management point of view, but is not ideal, as it's not necessary for congestions and causes an additional challenge for balancing of the grid.
- The **accuracy of the Gflex volume calculation**. As described in section 6.4.2, the quantification of the volume depends on the technology. The case of mixed sites can be an issue from that perspective.
- Operational robustness / **respect of Gflex signal**. Any additional interface between Elia and the Delivery Point that will eventually constrain its injection implies a risk that the Gflex setpoint is not properly followed at the access point level.
- **Implementation** required. In all options, new communication streams from Elia to the BRPs behind the access point will be necessary to inform them that a Gflex activation is taking place and to specify if it falls within or outside the cap. Depending on the option, additional communication streams and logics need to be implemented.
- **Roles and Responsibilities of different parties**, including administrative and contractual impact, in particular:
  - What will be expected from the BRP_{AP}, from the individual BRPs behind the access point and from the Grid User;

- ○ The contractual agreements needed between the different parties;
- ○ The impact in case of change of BRPs.

- **Robustness towards future evolutions**. In the Target Model, the possibility to coordinate the balancing and congestion activations will be further evaluated. The option selected might impact the possibility to do so.

The options are described one by one and an overview of how each of the options perform towards these criteria is provided at the end of this paragraph.

When receiving the Gflex setpoint at access point level, the Grid User will have to transfer the Gflex setpoint to the individual Delivery Points. The Grid User can do this with or without optimization. Those 2 cases are illustrated in Figure 16 and in Figure 17.

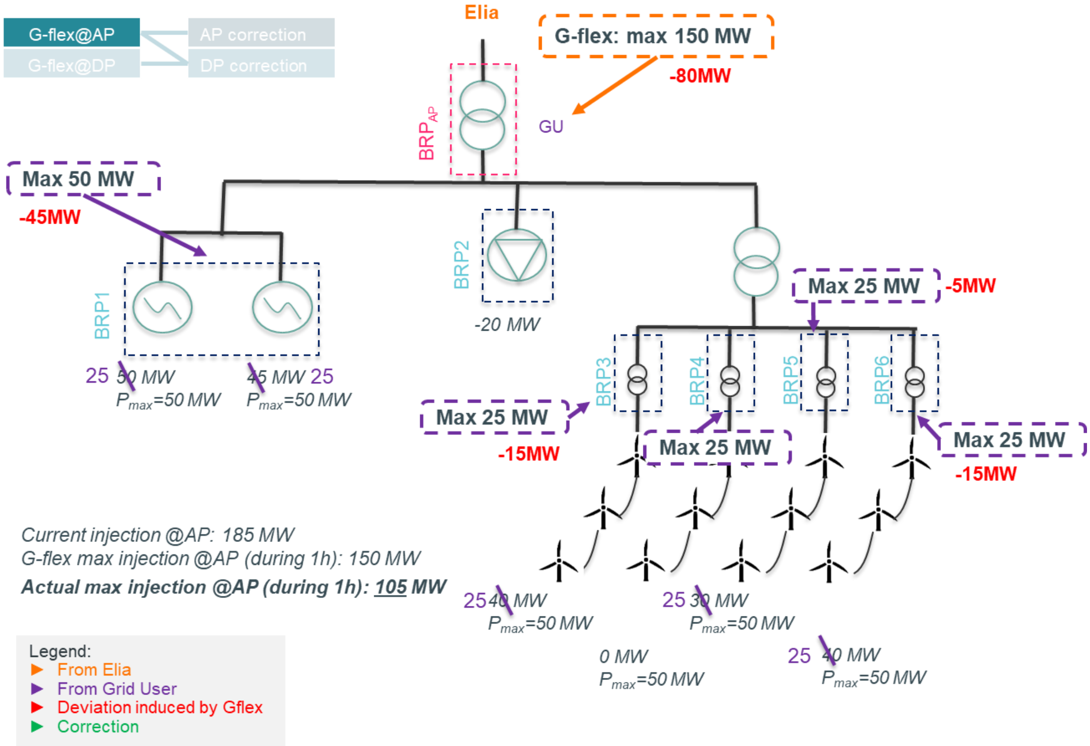


Figure 16 : Gflex setpoint sent to access point – without optimization by Grid User

Without optimization, one can notice in this example that the impact of the Gflex setpoint is higher than expected. In this example Elia sends a Gflex setpoint corresponding to a limitation of the injection to 150MW at the level of the access point to the Grid User. If the Grid User splits this signal with a fixed and simple repartition key into limits (illustrated in purple) for all its injection DPs (that are in portfolio of BRP1, BRP3, BRP4, BRP5 and BRP6), as the repartition key is fixed, each injection DPs reduces its individual injection without taking into account the situation of other DPs.

In this particular example DP4 is in maintenance and is producing less than the individual setpoint it receives (BRP 4) and DP2 is consuming 20 MW. As the repartition key is fixed injection DPs 1, 3, 5 and 6 reduce their individual injection without taking into account the "margin" left by DP4 and DP2. As a result, while the Gflex setpoint at access point level is 150MW, the injection will be limited to 105MW. This is acceptable from a congestion management point of view, but is not ideal, as it's not necessary for congestions and causes an additional challenge for balancing of the grid.

This can be solved if the Grid User optimizes the setpoints sent to the individual Delivery Points, as illustrated in Figure 17.

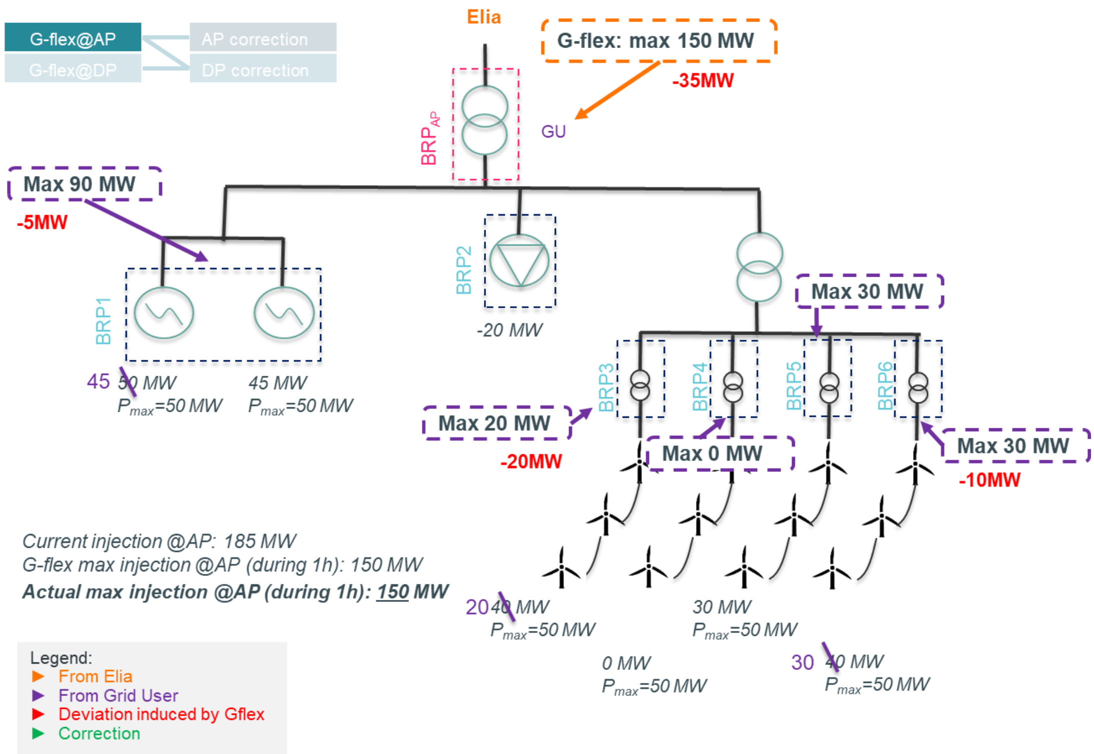


Figure 17 : Gflex setpoint sent to access point – with optimization by Grid User

In this case, the fact that DP 4 is not producing and that DP 2 is consuming 20MW is taken into account in the signals sent to DP 1, 3, 5 and 6. As a result, the Grid User will not inject less than the Gflex setpoint he receives at the level of the access point.

For the different options on how to correct the perimeter that are considered here below, the assumption is made that the Grid User prefers having the possibility to use a dynamic repartition of the main setpoint (setpoint sent by Elia at the level of the access point) into different setpoints within its site in order to optimize the allocation.

<u>Important note</u>: when there's no (full) optimization, the corrected volume will have to be capped to the Gflex setpoint. In other words, Elia will not correct a higher volume than the volume requested (estimated according to section 6.4.2).

Figure 18 illustrates option 1, where the BRP perimeter correction is done at access point level, meaning Elia is correcting only the perimeter of one BRP, the BRP_{AP}.

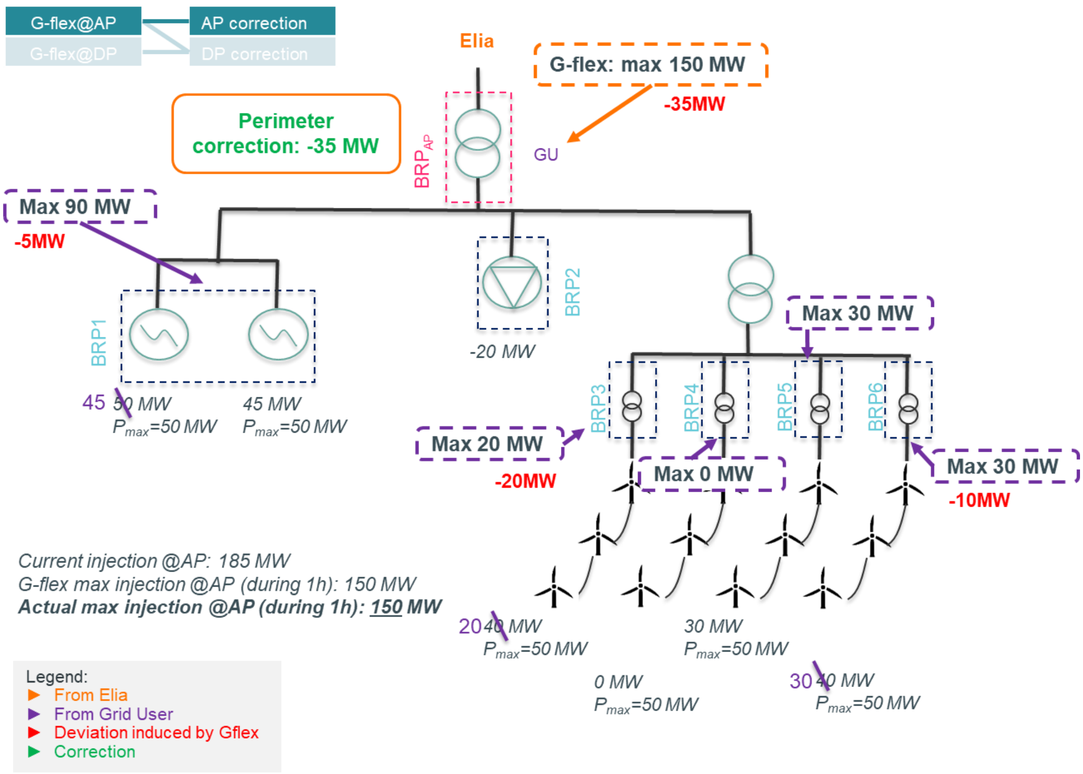


Figure 18 : Gflex setpoint and perimeter correction at access point level (Option 1)

The specificities of option 1 are the following:

- **Possibility to optimize**. The Grid User can choose whether he will optimize the distribution of the setpoint or not.
- The **accuracy of the Gflex volume calculation**. An important challenge of this option when applied to mixed sites is that Elia will need to calculate the volume to be corrected at access point level. As described in section 6.4.2, the quantification of the volume is however depending on the technology. Hence, as soon as there are different technologies involved, this would require the definition of default baseline (e.g. last QH) that should be considered sufficiently representative at the level of the access point. Therefore, until further analysis, the approach could only be considered for access points behind which the DPs have the same baselining approach.Operational robustness / **respect of Gflex signal**: no direct connection between Elia and the Delivery Point that will constrain its injection.
- **Role of different parties**:
    - The option entails important complexity for the Grid User and for the BRP_{AP}, as they will need to manage the interfaces with the downstream BRPs (from an operational perspective as well as from a financial perspective).

- A transparency and/or conflict of interrest issue could occur in the event the Grid User is also the BRP_{AP} and is also responsible for a downstream Delivery Point.

In option 2, the perimeter is corrected directly at the level of the BRP_{DP}s responsible for DPs behind the access point, as illustrated in Figure 19.

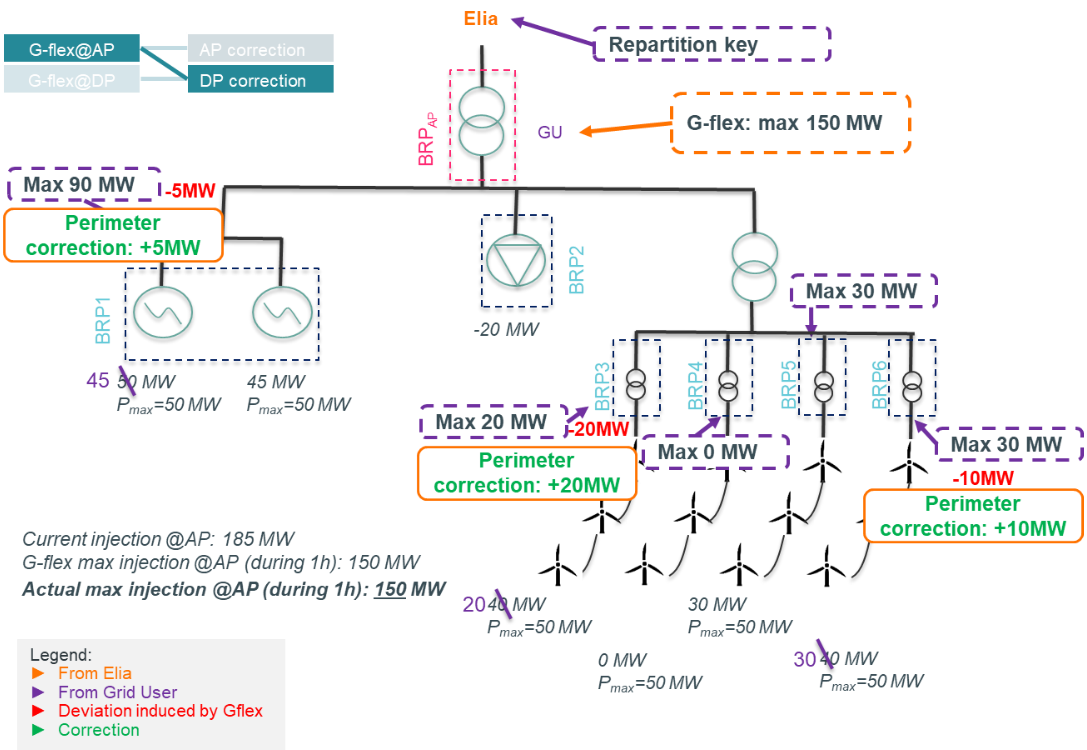


Figure 19 : Gflex setpoint at access point level, perimeter correction at Delivery Point level (Option 2)

For Elia to know how to individually correct the perimeters of the BRPs, the Grid User needs to send a repartition key to Elia. A default repartition key, which can be static (e.g. fixed pro-ratas) or variable (e.g. in function of the planned operation of the industrial site) has to be defined. In addition, the Grid User has the possibility to overwrite the default repartition key near real-time "dynamically" for more optimisation from the Grid User. In this example, it's assumed that the repartition key is dynamic, which is consistent with the assumption that the Grid User optimizes the setpoints. Based on this repartition key, Elia calculates the volume at each Delivery Point submeter according to the most appropriate quantification method for the given technology.

In this example, BRP_{DP} 1, 3 and 6 have their perimeter corrected.

The specificities of option 2 are the following:

- **Possibility to optimize**. The Grid User can however choose whether he will optimize the distribution of the setpoint or not.
- The **accuracy of the Gflex volume calculation**: the issue noted in option 1 for the mixed sites is resolved in this option: volume quantification occurs directly at the level of the Delivery Point.
- Operational robustness / **respect of Gflex signal**: no direct connection between Elia and the Delivery Point that will constrain its injection.
- **Implementation**: an additional communication signal is needed from the Grid User to Elia for the dynamic repartition key. Elia will need to process this repartition key in the quantification of the volumes to be corrected for each downstream BRP. The modalities of this information exchange (timing, frequency of updates, etc.) will need to be defined.
  One can note that a similar process is already in place in aFRR, where the BRP perimeters are corrected based on the information from the BSP on which Delivery Points are used for activation.
- **Role of different parties**: the option provides flexibility
  - The Grid User can choose to optimize with a dynamic repartition key or only provide a static repartition key;
  - It is implementable even without agreements between all BRPs with a default repartition key (e.g. pro-rata);
  - The repartition key can be sent by Elia to the BRP_{DP}s to ensure they have the information to control the volumes corrected by Elia in their perimeter.

The 3rd option is to send the Gflex setpoint separately for each BRP behind the access point, as illustrated in Figure 20.
Note: in practice, the Grid User would have to ensure the on-site cabling to the assets, but Elia would send to the Grid User separate setpoints for each DP that could be restricted.

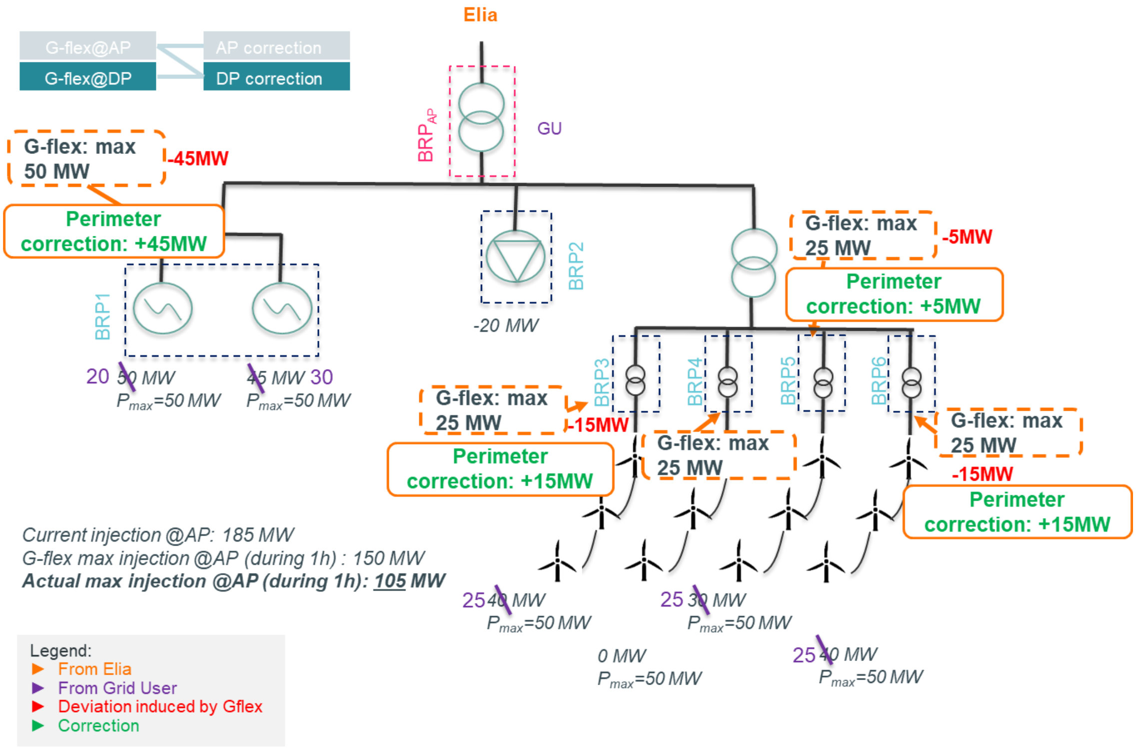


Figure 20 : Gflex setpoint and perimeter correction at Delivery Point level (Option 3)

The specificities of option 3 are the following:

- **Possibility to optimize**: no setpoint optimisation would be done by Elia, as this has to remain under the responsibility of the Grid User. Elia could, e.g., consider a pro-rata of the nominal powers, possibly corrected by the Outage Planning information of each Delivery Point.
- Operational robustness / **respect of Gflex signal**: there is a one-to-one relation between the setpoint sent by Elia and the expected injection from the DP, improving the robustness compared to the other 2 options.
- **Role of different parties**: The Grid User doesn't need to coordinate the Gflex setpoint distribution downstream. He remains however responsible for the respect of the Gflex setpoint at access point level.

Table 7 below summarizes the advantages and drawbacks of the 3 options.

	Option 1	Option 2	Option 3
	G-flex@AP / AP correction	G-flex@AP / DP correction	G-flex@DP / DP correction
Optimization behind the access point	Possible	Possible	Impossible

Gflex volume calculation accuracy	Ok if same technologies For mixed sites: suboptimal baseline and inconsistency with grid connection study	Ok	Ok
Operations / respect of Gflex signal	Additional interface for Gflex setpoint	Additional interface for Gflex setpoint	Minimal interface for Gflex setpoint ➔ safer
Implementation		High frequency of update of dynamic repartition key might be heavy	
Role of different market parties	Most complex for the Grid User / BRP_{AP}. Transparency if the BRP_{AP} is also responsible of a downstream DP?	Implementable even without agreements between all BRPs with a default repartition key (e.g. pro-rata). Most flexible option: Grid User can optimize or only provide a static repartition key	Easy for the Grid User: no coordination required on the Gflex setpoint split downstream
Robustness towards future evolutions	To be investigated	To be investigated	Ok

Table 7 : Perimeter correction : comparison of different options

Option 3 has the advantage of being more robust with regard to operations. Depending on the feedback of stakeholders, in particular on the interest of optimizing the Gflex setpoint, Elia is open to further investigate options 1 or 2.

6.4.4 Links between Gflex activations and Ancillary services and CRM

6.4.4.1 Obligations related to Balancing Services and CRM

In the current process, Gflex is activated indepently of the activation of balancing services and of the activation control (Avalability Monitoring) of the CRM. The purpose of this section is to evaluate whether it would be suitable to consider Gflex activations as a reason to not apply the penalties related to the balancing / CRM obligations.

Before looking at the links between Gflex and balancing / CRM, it's relevant to remind the situation of the links between redispatching activations and balancing / CRM:

- Regarding the CRM obligations: the redispatching activations are taken into account in the availability control of the CRM.
- Regarding the balancing obligations:
  - Redispatching activation with the contracted balancing volume of a Delivery Points occurs in the framework of the balancing contracts.

Hence, BSPs are not exposed to a higher risk of penalties as a result of a redispatching activation.
    - Redispatching activation with the volume of a Delivery Points different than the contracted balancing volume occurs most of the time before balancing energy gate closure time (with the exception of the direct activations), so that the BSP has the time to update its balancing bids. BSPs also have the possibility to update their bids after balancing energy gate closure time for this specific reason. Hence, BSP are not exposed to a higher risk of penalties if appropriate actions are taken.
    - In case of a CRI level leading to bid filtering:
        - Delivery Points with contractual obligation that are filtered out but were entered before indication of CRI high of medium are considered as compliant with their contractual obligations. Hence, BSP are not exposed to a higher risk of penalties.
        - The BSP is required to make a best effort to reallocate its volume to other Delivery Points. For this case, the BSP is exposed to contractual breach if he doesn't implement the necessary processes to do so.

The conclusion is that **the framework for redispatching allows the BSP / Grid User to avoid most negative consequences related to their balancing / CRM obligations**.

When analyzing the question for Gflex activations, it's important to note that those are potentially more predictable, even beyond the cap, as the unit will primarily used to solve some specific congestions on certain predefined CNEs (limited set of congestions) and as, in some situations, the unit could be the only option to solve the congestion.

The balancing and CRM services rely on 3 pillars:

- The **dimensioning** process;
- The **auction** process;
- The **activation** process.

Taking Gflex activations into account in the controls related to the activation processes will have an impact on the 3 pillars. The concrete consequences if Gflex activations are considered as a reason to not apply the penalties related to the balancing / CRM obligations are the following:

- In the **activation** process:
    - For the CRM process, this means that the activation of Gflex would contribute in the evaluation of the delivered service compared with the contracted capacity. As such, Gflex activation could reduce the volume which can be accounted to for Security of Supply (SoS) during the delivery period.
    - For balancing services, the BSP has no incentive to use other Delivery Points to deliver the service.
- In the **auction** process:

- For CRM: the Grid User doesn't need to take the Gflex activation risk into account in its CRM bids. Hence, there is no incentive for the Grid User to assess it's own contribution to SoS at times of scarcity relevant moment. In addition, there is no incentive to connect at an adequate location on the grid.
- For balancing services:
    - The BSP doesn't need to take the Gflex activation risk into account in its balancing capacity bids. Hence, there is no incentive to rely on Delivery Points at an adequate location on the grid. For assets with high activation costs, there is even an incentive to be in a congested area in order to secure the incomes from the capacity market while limiting the activation probability.
    - There is a gaming risk in case of predictable congestions, as the BSP could get incomes from the capacity market for Delivery Points that will be constrained by a Gflex activation.

- In the the **dimensioning** process:
    - Generally, the increase of redispatching and Gflex activations lead to a risk of unavailability of a part of the volume dimensioned.
    - However, as illustrated above, considering Gflex activations as a reason to not apply the penalties related to the balancing / CRM obligations further increases the risk not to have the adequacy / balancing volumes available when needed.
    - In particular, given the contracted volumes of aFRR, a single Gflex activation could lead to the unavailability of the full aFRR volume in a given direction.

On this basis, **Elia's proposal is to apply the penalties related to the balancing / CRM obligations irrespectively of Gflex activations, including beyond the cap**.

It's indeed important that the BSP / Brid User bears the financial risk related to simultaneous activation of Gflex and balancing activations / CRM availability monitoring. The related penalties should provide the right incentives to take the risk into account, e.g. by adapting the offered volume in the auction process or (for balancing markets) to foresee support providing assets.

Consistently, **all Delivery Points behind an access point with a flexible access are allowed to participate to the balancing and CRM markets.**

For the specific case of the delivery of aFRR with Delivery Points with Limited Energy Reservoir (LER), it's not requested to BSPs to take the risk of Gflex activations into account in the Energy Management Strategy (EMS).

These principles allow to:

- Allow all market parties to participate the balancing and CRM markets, taking the risks into account;
- Avoid providing wrong incentives on service delivery and on location;

- Avoid gaming risk for balancing;
- Mitigate the risk of loosing significant balancing volumes;
- Avoid to increase the impact of Gflex activations on the dimensioning.

Important notes:

- The Gflex signal is always prevalent to any other signal
- Balancing activations that would be prevented by a Gflex activation of the permanent power should be unfrequent and will be handled on a case-by-case basis

As part of the Target Model, further reflections will take place on the interactions between congestion management, balancing and CRM. These reflections will require a holistic approach, tackling the 3 pillars together.

6.4.4.2 Obligations related to voltage and reactive power management service

The Gflex setpoint is in MW, not in MVA. As far as the Gflex setpoint remains above the minimum active power threshold of the unit to provide voltage services, the VSP obligation remains. If the Gflex setpoint is below the minimum active power threshold of the unit , according to the VSP contract the service should not be delivered during this period..

Therefore, Gflex activations are implicitly considered in the controls for the voltage and reactive power management service when sending a Gflex setpoint below the minimum power threshold as defined in the VSP contract.

6.4.4.3 Obligations related to Black start

There is no risk of Gflex activation during an actual black start, and hence the tests performed in the framework of the RSP contract should not lead to penalties. In addition, those tests are expensive for the RSP, so it’s important to avoid having to redo a test because a Gflex activation prevented the RSP to succeed the test.

Therefore, Elia will postpone the test if it appears that the risk of Gflex activation is not negligible.

6.5 Revaluation of flexibility needs resulting from the grid connection study

In case of a flexible connection, the question arises whether the conditions of the flexibility (cap and/or temporary period), which are defined in the connection contract based on the results of the EDS, should be revaluated in some situations, e.g.:

- The approval of a new regulatory framework
- The approval of a new development plan
- Evolutions of the reference context: decommission of existing Grid Users's installations, abandonned reserved capacity, review of capacity potential, market evolution, etc.

Elia notes following attention points regarding the revaluation of studies:

- One should be aware that a revaluation could lead to a reduction of the need for flexibility, improving the situation for the Grid User, but could also lead to an increase of the need for flexibility. As a result, the revaluation process would represent an uncertainty for the Grid User, while the objective is precisely to give as much guarantees as possible.
- A possible approach could be to adapt the conditions of the flexibility only in case those are more favorable to the Grid User. Elia believes this would not be a balanced proposal as the revaluation can only be detrimental to tariff payers and can only be positive for the concerned Grid Users. Elia is already compensating beyond the cap, meaning part of the risk is borne by the tariffs. In addition, if a revaluation would lead to a decreased need of flexibility, the real-time activations, regardless of the fact that the revaluation has taken place or not, will in practice be reduced, providing benefits to the Grid User.
- In addition, if a revaluation of the studies was to be implemented, this revaluation should be performed for each connection, possibly even those without a flexible access that might need one because evolutions on the situation of the grid, on a regular basis. This would result in a significant increase of the amount of studies to be realized, at the detriment of the efficient and timely realization of the initial EOS/EDS studies during the connection request process.

However, Elia understands that this is an important aspect for the Grid Users and is open to discuss it. Several options could be considered for further analysis, for illustration purposes:

- Provide the possibility to Grid Users to request Elia, once for each grid connection study with a flexible access, to perform an update of the timing of the identified phases and the volume of each phase. This would apply only if the reserved / allocated capacity is still valid. The new reference context would be taken into consideration, but the order of the capacity reservation would be respected. It should be noted that, if the revaluation leads to an increase of the need for flexibility, the latest result will be taken into account.

- Provide automatically an update of the study when another Grid User with the same technology, in the same local zone of network influence and having a similar PTDF for the critical network element and contingencies leading to the flexibility, receives an EDS with lower flexibility levels.
- Provide, in addition to the contractual values, a best-estimate calculation of the flexibility levels in the EDS. This estimation would be non-binding, as it implies that Elia will have to arbitrarily forecast which reserved / allocated capacities will eventually result in a connection and according to which timing.

Market parties are invited to provide their needs as an answer to the public consultation in order for Elia to be able to make a proposal, in which following elements will be taken into account:

- The expected impact of the proposed capacity reservation process described in section 4 on the added value of a revaluation / best-estimate calculation;
- The expected impact of the operational principles described in section 7 on the added value of a revaluation;
- The impact of the revaluation / best-estimate calculation on the efficient and timely realization of the initial EOS/EDS studies during the connection request process.

7 Clarification of operational principles

7.1 Introduction

This section details the principles related to the operational use of the available flexibility from the connection with flexible access i.e. the principles of activation of this flexibility and the associated operational needs as well as the way Elia considers it through the different processes related to congestion management. As stated in the introduction, the principles explained in this section consider that only the current means are available to solve operational security issues i.e. the development of additional possible products to solve these issues is not in the scope of this section. Also, these principles are valid considering the current framework related to congestion management i.e not considering the evolutions that will be introduced in the next years by the regional operational security coordination (ROSC) processes or by the next steps of the iCAROS project (phase 2 of iCAROS project). Finally, considering the scope of the study, this section mainly concerns the operational processes related to the federal grid. Nevertheless, and in order to provide a full and coherent picture, Elia also provides for information some clarifications about the operational processes performed to safeguard the operational security on local transmission grids.

The section is divided into three parts:

- The first part focuses on the principles for the activation of the flexibility from connections with flexible access as well as the description of the operational security issues for which this flexibility is required;
- The second part explains the integration of the flexibility from connections with flexible access into the congestion management processes performed to ensure grid operational security at federal grid level, from week-ahead process to real-time operation;
- The third part gives information about the integration of the flexibility from connections with flexible access into the congestion management processes performed to ensure grid operational security at local transmission grid level, in the week-ahead process and in real-time operation

7.2 Principles for activations and operational needs for connections with flexible access

Principles for activation

When an access is granted to a Grid User, a possibility of a direct request to limit the active power produced/taken-off is made available. Technically, this means that Elia

must be able to send setpoints directly to the unit[42] limiting injection/offtake via a RTU (Remote Terminal Unit) or any other solution proposed by Elia.
Two types of modulation process are possible:

- Local modulation for grid constraints related to distribution transformers (between TSO grid and DSO grid) for which a modulation signal is sent to the DSO that sends in turn a modulation signal to DSO Grid Users;
- Upstream modulation for grid constraints related to high-voltage grid elements in the TSO grid for which a modulation of TSO or DSO Grid Users (via the DSO) can be requested.

The processes described in this section only concern the latter type of modulation which applies to Grid Users directly connected to TSO grid.

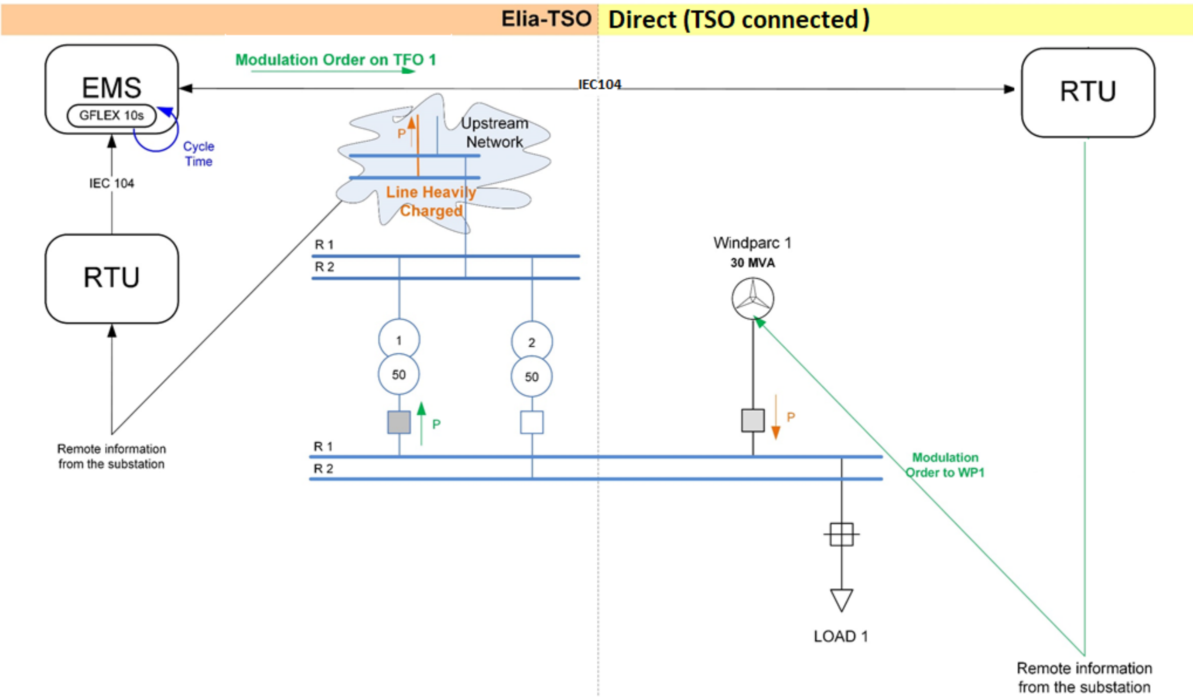


Figure 21 : Operating principle of upstream modulation of a connection with flexible access directly connected to the TSO grid

The operating principle of the modulation is illustrated on the Figure 21. Basically, Elia uses its Energy Management System (EMS) to monitor the real-time measurements of the loading of grid elements to identify if an operational security issue (as defined further) is detected and if a limitation of the injection/offtake for the connection with flexible

42 A the level of its Access Point - See also section 6.4.3 in case multiple units are connected behind the same Access Point

access is necessary. Practically, Elia computes an active power setpoint sent to the TSO-connected unit depending on the grid congestion states. This setpoint is computed by two processes:

- The first process is updated every 5 minutes and considers the line congestion in N and N-1 states (as described further). This process is resulting from a security assessment that is performed based on real-time measurements received by the EMS.
- The second process is updated every 10 seconds and considers only the congestion in N state (transformers and lines). This process is resulting from the comparison of the actual loading of the elements and their loading limits in the EMS.

The results of these two processes are merged to send the most restrictive setpoint to the unit every 10 seconds. The unit is then expected to respect the limitation in injection/offtake induced by the setpoint within 5 min.

These setpoints:

- Are equal to the maximum technical power in injection/offtake when no grid operational security issues are detected. This means that the active power injection/offtake of the unit is not constrained by Elia.
- Are different than the maximum technical power in injection/offtake if a grid operational security issue is detected. This means that the active power injection/offtake of the unit is modulated by Elia.

Activation principle in case of multiple connections with flexible access

In case several connections with flexible access can contribute to solve a specific congestion, the following rules apply:

- As a first step, the most efficient units are identified based on a minimum expected impact (PTDF) of the modulation on the congestion.
- Among these units, the activation is performed based on the type of technology, according to the following order:
    - Storage
    - Grey production
    - Green production
- Within each type of technology a LIFO-principle (Last In First Out) is used i.e. the last unit connected to the grid is to be modulated first.

Activation on connections with flexible access first considers the flexible power. However, in case this is insufficient a modulation of the permanent power may be performed. While the activation modalities are identical to the ones of a modulation of the flexible power, the latter is however always remunerated according to the principles described in section 6.

Operational needs - Operational security issues

The main use of the flexibility from connections with flexible access is to **automatically** solve **real-time** congestion issues detected on monitored grid elements. These monitored grid elements are the congested grid elements identified during the grid connection study that led to the need of a flexible access and possible additional grid elements with identified congestion caused by the connection with flexible access due to evolutions of the grid in comparison to the assumptions in the grid connection study. The corresponding setpoints are sent automatically depending on the loading of these grid elements monitored by Elia's EMS as explained previously.

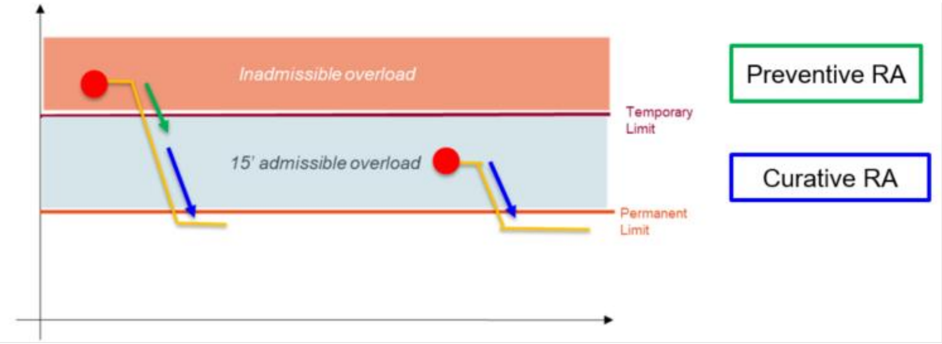
Two situations leading to a modulation of these connections are:

- An overload is detected in real-time on one of the monitored grid elements beyond the thermal **permanent limit** (following or not a contingency of another grid element) so that a modulation in injection/offtake is necessary as a curative remedial action;
- An overload is identified on one of the monitored grid elements beyond the thermal **temporary limit** if a contingency of another grid element would take place ("N-1 state") so that a modulation in injection/offtake is necessary as a preventive remedial action.

Note: preventive and curative Remedial Actions (RA):

As defined in the Rules for Coordination and Congestion Management, Elia can take preventive and curative remedial actions to solve an operational security issue.

- Preventive RAs are applied in case of **inadmissible overload** beyond the temporary limit of a grid element i.e. the maximum active power that can flow though the grid element during a maximum period of 15 min without damaging it.
- Curative RAs are applied in case of a **transitory admissible overload** (as defined in the SOGL) beyond the permanent limit of a grid element (i.e. the maximum active power that can flow though the grid element permanently without damaging it), occurring after the contingency of another grid element or without contingency. As an overload beyond the permanent limit cannot exceed 15 min before damaging the grid element, the curative RA should solve the congestion in 15 min. Note that not all grid elements can tolerate a transitory admissible overload i.e. these grid elements have only one thermal limit that cannot be exceeded at any time.



Preventive RAs are also used by Elia to solve a **transitory admissible overload** in case no curative RAs are available.

Elia also has the possibility to send a **manual setpoint** to the unit for some specific and non-frequent operational security issues, mainly related to:

- Voltage management issues if no other reactive power management solution is available;
- Congestions detected on non-monitored grid elements if no other solutions are available;

The need of manual activation via a manual setpoint for connections with flexible access for these specific issues is however limited to **operational security processes at local transmission grid level** (as further detailed in Section 7.4) due to the fact that alternatives to solve these operational security issues are often not available at this level (as the major part of units connected at local transmission grid level are not subject to redispatching and reactive power management obligations).

Elia should ensure operational security at all times. Therefore, in case the connection with flexible access does not react properly to the setpoint, Elia will have to take the necessary actions, which could go as far as the disconnection of the GU by opening the circuit breaker.

Differences with redispatching process

The operational use of the flexibility from connections with flexible access differs from the use of redispatching activations as defined in the Scheduling Agent (SA) contract[43].

A major difference is the communication of the signal by Elia:

- For redispatching: Elia sends a requested volume to the Scheduling Agent (via an activation request message sent manually by Elia's operator) which has to transfer the activation request to the concerned unit.
- For connection with flexible access: a setpoint is sent directly to the unit[42]. This allows a faster reaction and the possibility to consider this as a curative remedial action (as defined previously).

Another difference comes from the reaction expected from the unit after the reception of the activation request/setpoint:

- For redispatching: an activation profile is defined in the Scheduling Agent contract that imposes the delivery of the requested volume within a full activation time defined in the redispatching bid (the default value being 12,5min to be aligned with the requirements defined for the mFRR balancing product)
- For connection with flexible access: a reaction to respect the setpoint (if necessary) is expected within 5 min as described previously.

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[43] In the first phase of the iCAROS project, this contractual framework is limited to production and storage units with a maximum technical power >= 25MW

The operational use of the flexibility from connections with flexible access and redispatching means is detailed in the next sections for relevant operational processes.

7.3 Connection with flexible access in the operational processes related to capacity calculations and congestion management at federal grid level

This section explains how the flexibility from a connection with flexible access is considered in the various operational processes performed in the framework of capacity calculation and congestion management processes at federal grid level. The analyzed processes and associated timings are shown on the Figure 22.

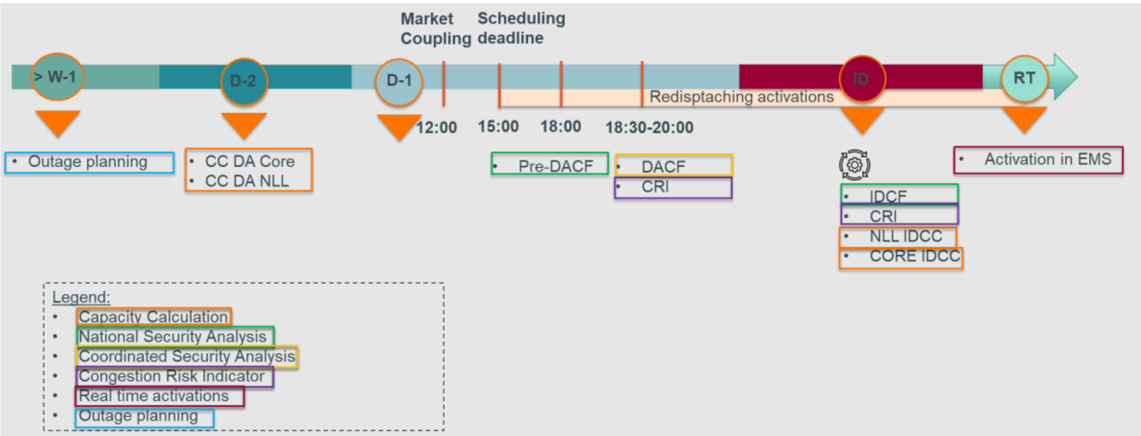

Figure 22 : Operational processes performed in the framework of capacity calculation and congestion management

7.3.1 Week-ahead process

The week-ahead process includes a security analysis performed by Elia for the 7 days of the next week considering multiple scenarios.

In the week-ahead process, the connections with flexible access are modeled like any other unit in the grid model i.e. the production of the different units is based on a reference day and on scenarios (high import/export, high/low offshore wind, HVDC flows).

In case a congestion is detected during the week ahead process, Elia defines one or several remedial actions to alleviate the congestion. Depending on the overloaded element and on the previous activations of the connection with flexible access (i.e. whether or not the cap is reached), Elia considers the following order to prepare remedial actions:

Order	Congestion on non-monitored grid elements	Congestion on monitored grid elements – before cap is reached	Congestion on monitored grid elements – after cap is reached
1	Internal Elia's RAs		
2	May-Not-Run activations (remunerated) on units with a SA contract if probability of congestion is deemed high with regard to Elia available forecast.	Flexibility from connections with flexible access (not remunerated and activated in real-time) – Limited to the available flexible power	May-Not-Run activations (remunerated) on units with a SA contract if probability of congestion is deemed high with regard to Elia available forecast.
3		May-Not-Run activations on units with a SA contract and firm access if probability of congestion is deemed high with regard to Elia available forecast.	

Table 8 : Activation order of remedial actions – Week-ahead process

As shown on the table:

- Internal Elia's RAs (including e.g.update of Elia grid element outage planning, topological actions and/or tap changes of phase-shifting transformers) as defined in the Rules for Coordination and Congestion Management are considered as first possible remedial actions to solve a congestion, taking into account that a limited number of these remedial actions can be used to solve a congestion for practical reasons (each RA requiring an action from an operator);
- During week-ahead processes, the flexibility from connections with flexible access is considered in priority to solve congestions on monitored grid elements requiring preventive or curative RAs **only** if the cap on the connection with flexible access is not yet reached, in line with the principles described in Section 6. The use of this flexibility is limited to the available flexible power of the unit i.e. modulation of the permanent power is not considered because an additional need of modulation can be handled via redispatching activation. Once the cap is reached, this flexibility is considered as coming from a connection with firm access and is to be activated via May-Not-Run process.
- If the use of the flexibility from a connection with flexible access is considered as a remedial action during the week-ahead process, it does not mean that any activation request is sent to the Grid User at the end of the process. Indeed, the actual activation signal remains a real-time setpoint as described in the previous section. But the very decision to take action according to the priorities in the table

above influences the probability of activation of the flexibility from the connection(s) with flexible access in real time.

7.3.2 Capacity calculation (CC)

Capacity calculation processes take place in day-ahead (DA CC for the Core region and DA CC for Nemolink) and in intraday (NLL IDCC for NemoLink, and IDCC for Core[44] and aim at computing the cross-borders capacities available for market trades within a region. The following inputs are used for these capacity calculations processes[45]:

- The D+2 congestion forecast (D2CF) is the main input for DA CC for Core region and on BE-UK border (on NemoLink interconnector (NLL));
- The Day-ahead Congestion Forecast (DACF) and Intraday Congestion Forecast (IDCF) are the main inputs for IDCC;

In DACC, the connections with flexible access are modeled like any other unit in the D2CF i.e. the best forecast of the net position of Belgium (delivered by a central net position forecast tool applied in DACC) is transformed into a production profile for each unit and load, and their contribution to the Generation and Load Shift Keys (GLSK) is defined. During the validation step of the process, each TSO is tasked to verify if the resulting cross-zonal capacities can be secured should the market use these capacities. In essence, this is mimicking the operational security analysis process that takes place after the market coupling, with as key difference that the validation step does not lead to an activation of remedial actions. Only if all available non-costly and costly remedial actions are insufficient to secure the (virtual) cross-zonal capacities, the TSO is allowed to reduce the cross-zonal capacities (last resort measure) provided to the DA market. The connections with flexible access are treated with the same rules as connections with firm access in this validation step. Concretely, all units with a power larger than or equal to 25MW are considered as remedial actions during the validation step. As the way this flexibility would be eventually activated (via redispatching or modulation) and the related price are not considered in the DACC process, the connections with flexible access are

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[44] Core is implementing a series of capacity calculation processes in intraday, with the first processes live since end May. In Figure , a simplified representation is made by generally referring to Core IDCC as container for all these processes

[45] More information on the IGMs building process is available on the following study: https://www.elia.be/-/media/project/elia/elia-site/grid-data/congestion-management/20221227_congestion-management-incentive-2022---final-report_23_12_2022.pdf

considered in the same way as connections with permanent access in the DA CC process[46].

In IDCC, the grid models that are used as inputs already include the results of the last executed security analysis as described in section 0. This means that the flexibility of connections with flexible access, similarly to the requested redispatching activations, is considered in IDCC to avoid reducing the available cross-zonal capacities whilst there are solutions to solve congestions identified in security analysis. This is fully in line with the ‘reducing cross-zonal capacity is a last resort measure requirement which is equally applicable to IDCC as it is to DACC.

7.3.3 National and Coordinated security analysis

According to article 2 (50) of the SOGL, Operational security analysis “means the entire scope of the computer based, manual and automatic activities performed in order to assess the operational security of the transmission system and to evaluate the remedial actions needed to maintain operational security”. These security analysis processes are executed by Elia according to the modalities described in Rules for Coordination and Congestion Management with the aim to detect potential congestions on the grid and foresee the necessary remedial actions to solve them.

Operational security analyses are performed as from day-ahead after reception of the schedules from Scheduling Agents and several times in intraday. They are based on the following Individual Grid Models (IGMs)[45] created by Elia:

- The pre-Day-ahead Congestion Forecast (pre-DACF) is the main input for the first national security analysis performed in day-ahead for the day D
- The Day-ahead Congestion Forecast (DACF) is the main input for the coordinated security analyses performed in day-ahead for the day D
- The Intraday Congestion Forecast (IDCF) is the main input for the national security analysis performed in intraday for the remaining hours of day D

The connections with flexible access are modeled as the other units in the IGMs to be used during security analyses i.e. based on the schedules provided by the Scheduling Agents (for technical units included in a SA contract) or an active power reference based on forecasts (for technical units not included in a SA contract). The congestion detection process is then not impacted by the presence of connections with flexible access.

In case a congestion is detected during the security analysis, Elia defines one or several (preventive or curative) remedial actions to alleviate the congestion. Depending on the overloaded element and on the previous activations of the connection with flexible

[46] For more information about the DACC process, please refer to Core CCR processes explained (entsoe.eu).

access (i.e. whether or not the cap is reached), Elia considers the following order to prepare remedial actions:

Order	Congestion on non-monitored grid elements	Congestion on monitored grid elements – before cap is reached	Congestion on monitored grid elements – after cap is reached
1	Internal Elia's RAs		
2	Redispatching activations according to technico-economical merit-order on units with a SA contract	Flexibility from connections with flexible access as preventive and curative RA (not remunerated) – Limited to the available flexible power	Flexibility from connections with flexible access as curative RA (remunerated and limited to the available flexible power) and redispatching activations as preventive RA according to a common technico-economic merit-order on connections with firm access and on connections with flexible access.
3		Redispatching activations as preventive RAs according to technico-economical merit-order	
4	Cancellation or restitution of planned outages of grid elements		

Table 9 : Activation order of remedial actions – national and coordinated security analysis

As shown on the table:

- Internal Elia's RAs (including e.g. not performing one or some conditional outage(s), topological actions and/or tap changes of phase-shifting transformers) as defined in the Rules for Coordination and Congestion Management are considered as first possible remedial actions to solve a congestion, taking into account that a limited number of these remedial actions can be used to solve a congestion for practical reasons (each RA requiring an action from an operator)
- During security analysis processes, the flexibility from connections with flexible access is considered in priority to solve congestions on monitored grid elements requiring preventive or curative RAs **only** if the cap on the connection with flexible access is not yet reached, in line with the principles described in Section 6. The use of this flexibility is limited to the available flexible power of the unit i.e. modulation of the permanent power is not considered because an additional need of modulation can be handled via redispatching activation. Once the cap is reached, this flexibility is considered in a common merit-order with the

redispatching activations i.e. considering an identical price for the modulation of the connection with flexible access and for redispatching as stated in section 6.4.

- If the use of the flexibility from a connection with flexible access is considered as a remedial action during the security analysis process, it does not mean that any activation request is sent to the Grid User at the end of the process. Indeed, the actual activation signal remains a real-time setpoint as described in the previous section. However, a risk of being modulated in real-time can be shared with the market parties as described further in this section.
- Considering that the flexibility from connections with flexible access can be activated as a curative RA (contrary to redispatching), having this flexibility available even after the cap is reached represents a high added value for an efficient congestion management process as it possibly allows to avoid costly preventive RAs to solve congestions that would only appear in case of N-1 situation.
- Cancellation or restitution of planned outages of grid elements is considered a last resort measure if no other means are available to solve the detected operational security issue(s).

The remedial actions resulting from the security analysis processes are integrated in new versions of grid models (DACF, IDCF) that are used for the next operational processes such as e.g. the next intraday capacity calculation.

Information about the risk of modulation

Once a congestion has been detected during an operational security analysis and the modulation of a connection with flexible access is considered as a necessary preventive RA to solve the congestion, Elia informs the concerned market parties about the risk of being modulated in real-time. Elia proposes to inform the BRP, the SA and the BSP of the unit as soon as the risk of being modulated preventively is identified. This information should allow market parties to anticipate by taking appropriate actions, e.g. for the BSP to reallocate the balancing energy bids to other Delivery Points, in the knowledge that the balancing bids which include a Delivery Point for which there is a risk of modulation will not (always) be filtered by Elia (see also section 6.4.4 and 7.3.4).

When the modulation of a connection with flexible access is considered as a necessary curative RA to solve the congestion, Elia does not inform the market parties as the risk of being effectively modulated in case of a contingency of a grid element is low.

7.3.4 Congestion Risk Indicator (CRI) computation process

The CRI computation process is executed a first time in day-ahead and 3 times in intraday and aims at determining the risk of congestion in the Belgian electrical zones[47]. The main characteristics of the CRI are defined in the table below:

Congestion Risk Indicator	
Geographical granularity	Electrical zone
Time granularity	Hour
Direction	Upward, downward or both
Level	Low, medium or high

Table 10 : CRI main characteristics

The CRI computation is a two-steps process as illustrated on the Figure Figure .

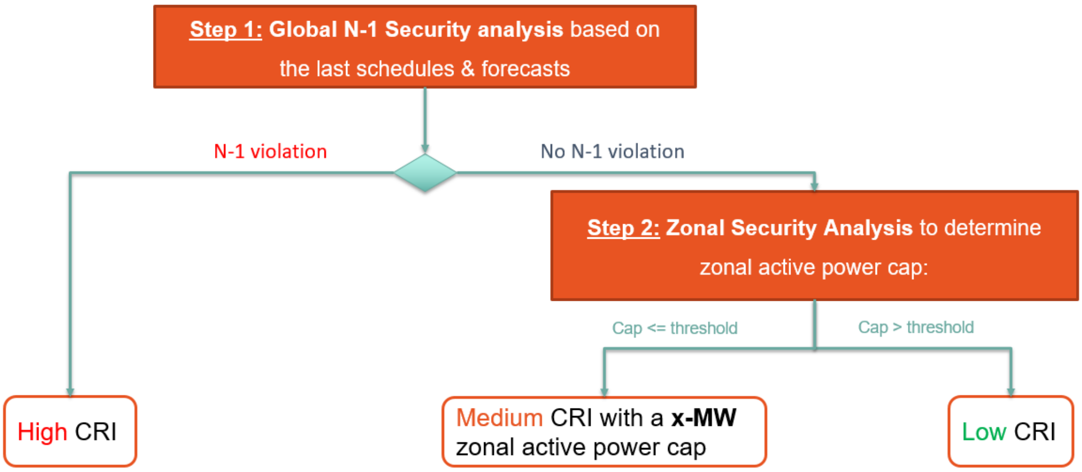

Figure 23 : CRI computation process

Connections with flexible access are modeled similarly to other units i.e. based on the schedules provided by the Scheduling Agents (for technical units included in a SA contract) or an active power reference based on forecasts (for technical units not included in a SA contract).

[47] More information on the determination and purposes of CRI levels is available on the Rules for Coordination and Congestion Management: https://www.elia.be/-/media/project/elia/elia-site/electricity-market-and-system/system-services/alleviating-congestion-risks/20240402_rules-for-coordination-and-congestion-management-2024_en.pdf

The flexibility from connections with flexible access is considered in the CRI computation process as follows:

- Before the cap on the connection with flexible access is reached, its flexibility is considered in the step 1 (global N-1 security analysis) of the CRI computation process. Three situations are possible:

  1. The security analysis identifies a N-1 violation on a grid element that is **monitored** in the context of a connection withflexible access but **not monitored by the CRI computation**. In this case, this N-1 violation is not considered as a constraint in the determination of the CRI level and the unit injection/offtake is set to its minimum injection/offtake power, considering the available flexible power of the unit.
  2. The security analysis identifies a N-1 violation on a grid element that is **not monitored** in the context of a connection with flexible access **but well monitored** by the CRI computation. In this case, the determination of the CRI level follows the normal process i.e. CRI level is High and possible redispatching activations are requested.
  3. The security analysis identifies a N-1 violation on a grid element that is **monitored** in the context of a connection with flexible access **and also** monitored by the CRI computation. In this case, the injection/offtake of the connection with a flexible access is set to its minimum injection/offtake power, considering the available flexible power of the unit.
     1. If the N-1 violation is solved by modulating the connection with flexible access, the CRI computation process continues to step 2 (zonal security analysis)
     2. If the N-1 violation is not solved by modulating the connection with flexible access, the CRI level is considered as High.

  The second step of the CRI computation process (zonal security analysis) is not impacted by the presence of a connection with flexible access. This means that the possibility to modulate the connections with flexible access is not considered as a mean to increase the available margin for balancing activations in an electrical zone (i.e. the zonal active power cap).

- After the cap on the connection with flexible access is reached, the CRI computation follows the normal process as described in Figure .

7.3.5 Real-time activation process

As described in the section 7.2, the modulation of a connection with flexible access always occurs in real-time via a setpoint sent by Elia. This setpoint is sent if:

- A congestion, as identified during the security analyses, and for which the flexibility of the connection with flexible access was considered as a needed preventive or curative RA (according to the process described in Section 0), is actually detected in real-time.

- Unexpected overloads are detected in real-time on monitored grid elements. As the modulation of the connection with flexible access is a fast process, having this flexibility available even after the cap is reached represents a high added value to safeguard the operational security in case of unexpected (and rather exceptional) congestions appearing in real-time.

7.4 Connection with flexible access in the operational processes for congestion management at local transmission grid level

This section explains how the flexibility from a connection with flexible access is considered in the various operational processes related to security analysis for the local transmission system level. As stated in the introduction, this section gives an overview of the current processes performed to solve operational security issues and does not cover the possible evolutions that could take place following the implementation of the next phase(s) of the iCAROS project. Concretely, the use of redispatching as a possible remedial action at the local transmission system is very limited as the majority of the units connected at this level are not (yet) subject to scheduling and redispatching obligations. Apart from internal Elia' RA measures, Elia is thus relying mostly on the flexibility of connections with flexible access to safeguard the operational security at its local transmission system, even after the cap is reached.

7.4.1 Week-ahead process

During the outage planning process, maintenance and project works are planned for which an outage of one or more grid elements is required. On specific, pre-defined moments operational security analyses are performed to maintain operational security on the grid in N & N-1 state.

In week-ahead, the last security analysis of the outage planning process is performed. During this analysis, a final check is performed on operational security based on the latest available information consisting in forecasts of load and generation, while taking into account the scheduled unavailabilities of technical units covered by an OPA contract and grid elements.

In case a congestion is detected in N or N-1 situation during the week ahead process, Elia defines one or multiple remedial actions to alleviate the congestion. Depending on the overloaded element, Elia considers the following order in the preparation of remedial actions:

Order	Congestion on monitored grid elements	Congestion on non-monitored grid elements or other operational security issues
1	Internal Elia RA's	
2	Automatic activation of flexibility on connections with flexible access for which the cap is not yet reached	-
3	May-Not-Run/Must-Run activations (if probability of congestion is deemed high with regard to Elia available forecast) or redispatching activations on units with a SA contract	
4	Automatic activation of flexibility on connections with flexible access beyond the cap	Manual activation of flexibility on connections with flexible access, without an SA agreement

Table 11 : Activation order of remedial actions – week-ahead proces

As shown in the table:

- In case a congestion is detected on a grid element in N or N-1 situation, Elia first tries to solve the congestion by means of internal Elia's RAs (including e.g.update of Elia grid element outage planning, topological actions, etc.). Depending on the type of actions, as well as the lead time to activate, these actions shall be foreseen as preventive or curative remedial actions.
- During week-ahead processes, the flexibility from connection(s) with flexible access is considered in priority to solve congestions **on grid elements monitored in real-time** requiring preventive or curative RAs, **only** if the cap on the connection with flexible access is not yet reached (according to the principles described in Section 6). While the actual activations will take place in real-time based on real-time measurements, the positive impact on the congestion of these automatic activation(s) is taken into account in the security analysis.
- May-not-run/must-run or redispatching on technical units with a SA contract are used to solve congestions that are detected on **both non-monitored and monitored grid elements for which the activation of flexibility on connection(s) with flexible access was insufficient to solve the congestion**.
    - May-not-run or must-run are requested at the latest 5 working days in advance as defined in the SA contract and according to the Rules for Coordination and Congestion Management.
    - In case redispatching is selected as preferred solution, it will be activated close to real-time where the required volume will be analyzed taking into account the latest information at that moment.

- Automatic activation of the connection(s) with flexible access above their cap are considered only for congested elements that are **monitored in real-time** by the EMS and in case other means described in the previous steps are insufficient to solve the congestion.
- Manual activations of the connection(s) with flexible access via the EMS can be used to solve congestions or other operational security issues on grid element(s) **not monitored in real-time**, but for which the connection with flexible access could resolve the issue. This step is only applicable for technical units without an SA agreement, not being able to provide redispatching bids, nor accessible for may-not-run/must-run, which will always be activated via EMS in real-time.

7.4.2 Real-time activation process

During the week-ahead process the necessary remedial actions are listed and/or selected to maintain operational security during real-time operations in N & N-1 state.

Between week-ahead and real-time operations additional security analyses related to the local transmission grid can take place, especially in case redispatching activation was listed as remedial action based on previous security analyses. These analyses are performed with the latest available information in order to confirm the need and amplitude of the listed remedial actions.

Internal Elia remedial actions are implemented before real-time when listed as preventive action. Those listed as curative action are only activated after occurrence of the respective N-1. Additional internal Elia's RAs can always be listed or activated in real-time operations.

In addition to internal Elia's RAs, activation of connection(s) with flexible access for which congestion is detected in N or N-1 state on at least one of the **monitored grid elements** will automatically be activated via EMS. These activations take place in real-time based on real-time measurement where a setpoint is sent directly to the connection with flexible access as described in section 7.2, where:

- Preventive actions are performed in N state to keep grid elements always below their permanent limit or below their temporary limit for each simulated N-1 situation
- Curative actions are activated after occurrence of N-1 to bring grid elements again below their permanent limit within a pre-defined period of time

If above remedial actions are not sufficient to solve a congestion, redispatching activations on technical units with a SA contract are considered (under the condition it is available and sufficiently effective to solve the congestion).

Despite the latter, automatic activation of connection(s) with flexible access may still occur, beyond the cap, for one of the following reasons;

- Congestions on monitored grid elements which were not forecasted in the previous security analyses
- No redispatching activations available or insufficient to solve the congestion

- Cases where the automatic activation is foreseen to provide a curative activation after N-1 where the congestion remains below the temporary limit of the concerned monitored grid element. For the latter case, no redispatching will be activated in advance since there is only a risk of activation of flexibility when the N-1 would occur for which the curative activation on connection(s) with flexible access would provide the most optimal solution.

Manual activation of connection(s) with flexible access may be used for Technical Facilities without a SA contract, not being obliged to provide redispatching bids, nor accessible for May-Not-Run/Must-Run. These units can thus only be activated via EMS in real-time. Manual activations will only be used to solve congestion or other operational security issues on grid element(s) **not monitored in real-time**, for which the connection with flexible access could resolve the congestion.

Restitution or cancellation of outages in real-time operations is considered a last resort measure if no other means are available or do not suffice to solve the detected operational security issue.

The following table summarizes all mentioned above:

Order	Congestion on monitored grid elements	Congestion on non-monitored grid elements or other operational security issues
1	Internal Elia RA	
2	Automatic activation of the flexibility on connections with flexible access as preventive or curative RA, for which the cap is not yet reached.	-
3	Redispatching on technical units with a SA contract	
4	Automatic activation of the flexibility on connections with flexible access as preventive or curative RA for congestion(s) not detected in previous security analyses or as curative RA only for connections that have surpassed the cap	Manual activation of the flexibility on connections with flexible access, without a SA contract, as preventive or curative RA
5	Cancellation or restitution of outages of grid elements	

Table 12 : Activation order of remedial actions – RT activations

8 Reporting & Transparency

8.1 Introduction

Elia is currently performing a reporting concerning Gflex activations towards the CWAPE. In addition, the CREG has requested Elia to ensure transparency of Gflex activations for the Grid Users connected to the federal grid[48]. In this section, Elia proposes to define:

- A common reporting approach towards the different regulators;
- A common reporting approach towards the Grid Users that have a connection with flexible access;
- An approach for publication of aggregated information related to Gflex activations on Elia's website.

As extensively described in section 6.4.2, there are 2 different objectives when quantifying the use of flexibility in operations, and in some cases each of them can lead to a dedicated baselining approach. These 2 objectives are the following:

- Measure the use of flexibility within the cap;
- Determine the volume to compensate beyond the cap.

The approach to quantifiy the flexibility for those 2 objectives is described in section 6.4.2 for different technologies. The reporting and publications will be fully in line with those approaches.

In this section, it is assumed that there is only one DP behind the access point. The outcome of the discussion initiated in section 6.4.3 on how Gflex is activated when there are several DPs behind the access point might impact how the information is reported and published.

The data used as input to compute the values reported and published will be 15 minutes averaged data. An exception is made for technologies that can change multiple times from injection to load and the other way around, for which '~second values' data will be used.

Note: as explained in section 6.4.2, it is important that the Grid User sets up the necessary real time data exchange, which is currently not always the case. If the data is not available, Elia will not be able to apply the guarantees on the use of flexibility and will not be able to report and publish the data.

48 See « Projet de décision sur les objectifs à atteindre par la SA Elia Transmission Belgium en 2024 dans le cadre de l'incitant à la promotion de l'équilibre du système visé à l'article 27 de la méthodologie tarifaire » - https://www.creg.be/fr/consultations-publiques/prd658e/84

8.2 Timing of reporting and publication

The current reporting towards the CWAPE is done on a yearly basis and is delivered end of march covering the entire previous year.

Elia proposes to report and publish the information according to the modalities described in this section on a monthly basis as of December 2024. This means that each month, the data from previous month will be reported and published (data fom December 2024 in January 2025, data from January 2025 in February 2025, etc.) As requested by the CREG, the data reported and published in December 2024 will include the Gflex activation as of January 2024.

8.3 Reporting towards Grid Users

Elia proposes to provide to each Grid User, for each of its connections with a flexible access and for each global modulation period, the following information:

1. Start date & time of the flexibility activation;
2. End date & time of the flexibility activation;
3. Substation where the unit with flexible access is connected;
4. Type of the unit (Wind, solar, conventional production, electrical storage system, load,…);
5. Minimum setpoint value during the global modulation period [in MW]. This allows to identify, in addition to the volumes listed below, how far the instantaneous setpoint went during the modulation period;
6. Modulated energy within the flexible power during the global modulation period [MWh];
7. Modulated energy within the permanent power during the global modulation period [MWh];
8. Modulated energy within the cap during the global modulation period [MWh];
9. Modulated energy beyond the cap during the global modulation period [MWh];
10. Remaining flexible energy before the cap is reached in the current year [MWh];
11. Modulated energy beyond the cap in the current year [MWh].

For each connection with flexible access we will provide a table containing 1 line with the values 1 to 11 for each global modulation period and a table containing values 6 to 11 aggregated per month.

For the specific case of the distribution transformers, Elia proposes to provide the following information for each global modulation period:

1. Start date & time of the flexibility activation;
2. End date & time of the flexibility activation;
3. Substation where the distribution transformer is connected;
4. Minimum, maximum and average values of the setpoint during the global modulation period [MW];
5. Minimum, maximum and average values of the “detla MW” during the global modulation period [MW]. The “delta MW” is the difference between:

- ○ The maximum allowable infeed to avoid congestions on the upstream grid. This value is calculated based on the measurements on the CNEs as described in section 7;
- ○ The maximum backfeed injection at the level of the distribution transformer.

The values will be positive when the congestions on the upstream Elia grid are more constraining than the maximum backfeed injection of the transformer.

6. Modulated energy during the global modulation period [MWh]. The calculation will assume permanent full injection of the distribution transformer in the absence of Gflex setpoint;

For each concerned distribution transformer we will provide a table containing 1 line with the values 1 to 6 for each global modulation period and a table containing value 6 aggregated per month.

It’s to be noted that the reporting of the activations of individual Grid Users connected to the DSO grid as a result of the Gflex activation at the level of the distribution transformer is the responsibility of the DSO.

8.4 Reporting towards regulators

Elia proposes to provide to the regulators the data for all Grid Users connected to the grid for which they are competent.

8.5 Publications on Elia’s website

For confidentiality reasons, the data published on Elia’s website will be aggregated. Elia proposes to aggregate the data per technology.

In a second stage, depending on the needs of market parties and of regulators, an aggregation per geographical zone could be considered, provided that confidentiality can be guaranteed. This however requires additional implementation and will hence not be ready by December 2024.

Elia proposes to publish following aggregated information per technology on its website:

1. Modulated energy within the flexible power during the month [MWh];
2. Modulated energy within the permanent power during month [MWh];
3. Modulated energy within the cap during the month [MWh];
4. Modulated energy beyond the cap during the month [MWh].

For the specific case of the distribution transformers, Elia proposes to provide aggregated data on the modulated energy for each month [MWh].

9 Target Model for integrating Grid User flexibility in optimal grid planning and operation

The design of the future power grid, reflected in the different Network Development Plans, aims at hosting the expected Grid Users, and facilitating their required power flows, taking into account for example (but not limited to) the increased penetration of renewables and the potential of demand electrification. Future scenarios for the power system (including demand and generation estimations based on governmental ambitions and policies, capacity potentials, stakeholder information, etc.) lie at the basis of developing the power system and take into account relevant hypotheses on capacity potentials of different technologies and in different regions of the grid. Today, grid investments ("CAPEX") are consequently proposed to solve the identified congestions arising in those future scenarios. The grid is therefore developed in order to enable a firm access to all Grid Users at all time.

The massive increase in connection requests for renewables, electrified process and storage (that are the result of the acceleration of the energy transition) increase the need for more grid reinforcements and bring more uncertainties, which are hence increasing challenge to develop a robust, fit for purpose grid at the lowest cost.

Elia therefore intends to evolve and improve the current approach by combining in the most-optimal way grid reinforcements solutions whith other solutions such as flexibility of grid-users, in order to increase in efficiency and reduce costs for society.

This goal of this section is therefore to describe Elia's Target Model on how Grid User flexibility could be used for congestion management purposes in the future – from Long Term Grid Planning to Network Operations.:

- The first subsection is dedicated to the fundamental principles of the Target Model.
- The second subsection describes how long-term grid planning would evolve based on the Target Model
- The third subsection describes how Grid User connection process would evolve based on the Target Model
- The fourth subsection highlights the importance of Development Plans and Hosting Capacity in the long-term grid planning and Grid User connection processes.
- The fifth subsection provides an insight on the future design and product evolutions that might be needed with this new Target Model.

9.1 Key principles supporting the proposed Target Model

The Target Model on the consideration of Grid User flexibility for congestion management purpose is based on the following principles[49]:

1. The power infrastructure, and by extension the power system as a whole, plays a key role in society in general, but also for the energy transition in particular. The first and most important objective for Elia is to **provide a robust and fit-for-purpose power grid to Belgian society**, striving for a **techno-economical optimum for society as a whole**.
2. To this end, and in order to meet the European and Belgian objectives of market integration, integration of renewables and electrification of demand, when developing the power system an adequate trade-off between “traditional” infrastructure solutions (i.e. building power lines, cables, transformers, etc.), and so-called “non-wire” solutions (i.e. flexibility solutions) has to be pursued, as anchored in European Legislation[50].
3. This trade-off, taken at the long-term grid development stage, is to be translated in a cost-benefit analysis, where both **grid investments** and **Grid Users' flexibility are means to pursue these long-term solutions** in the **interest of society**. Due care should be taken that – by design – this trade-off does not create unacceptable levels of market distortion, keeps a level playing field, and allows for adequate investment security for all concerned parties.
4. As investments in the **grid infrastructure are typically socialized** (costs are translated into grid tariffs), also the **cost of using flexibility** – when applied as an alternative to grid investments and therefore after a temporary period – **should be socialized** in order to allow for such a trade-off to take place. In other words, some kind of compensation(this could be a tariff reduction, an activation payment, a reservation payment, or anything of the like) to the flexibility provider should be foreseen.
5. Similarly, **at the operational stage**, the decisions taken by the TSO should aim for a **technico-economic optimum in the interest of society**, potentially taking into account additional objectives such as maximally limiting curtailment actions on renewable energy sources, or maximally avoiding load curtailment.
6. This principle leads **to the introduction of more frequent redispatch activations and higher costs for the TSO**, which are baked into the principles of developing and operating the power system, and as such need to be discussed with and **accepted by the regulator CREG**. Care is to be taken that TSO operations remain practically feasible, striving for simplification and pragmatism, given the highly complex context, short decision periods and the multitude of uncertainties and possible parameters.
7. The level of flexibility to be taken into account for grid development should **respect technical capabilities of the underlying capacities**. The approach can therefore be customized based on the type of Grid Users, with for example

[49] Most of these principles were already introduced during the 3 workshops take took place in Q1-Q2-2024

[50] Directive (EU) 2023/1791, article 3 §1 and §5

for demand facilities a voluntary provision of such flexibility, and for pure generation and storage assets (such as an OCGT or an electrical storage system) a mandatory provision of such flexibility. However, in all cases **flexibility that is counted upon at the stage of long-term grid planning should also be available at the operational stage with a reasonable level of certainty** for the TSO to fulfill its mission of safe and reliable system operation.

8. Additionally, **bounds should be set and agreed to the usage of such flexibility in this long-term trade-off** by the TSO, and more in general for the elaboration of connection proposals to Grid Users, in order to safeguard a "harmonious" development of the power system.
9. **Different "products"** can be defined in order to provide this flexibility of Grid Users to the TSO with different characteristics, where specific products can be fine-tuned to the context of certain types of Grid Users while taking into account the operational needs. Options can for example range from products activated pre-day-ahead market coupling without an activation remuneration, but with a reduced grid tariff/reservation remuneration; products activated near-real-time with an activation remuneration and with BRP perimeter correction, products only activated curatively after a grid incident with a reservation remuneration, etc.
10. As already explained in detail in section 5, one of the biggest challenges of the power system today is the **difference in time** required to **develop new grid infrastructure** and to **develop new renewable or demand electrification projects**. If a specific Grid User connection request requires infrastructure development, and if the Grid User **voluntarily** decides to request a grid connection before such infrastructure development can be realistically realized, the option of a **temporary solution** should be offered by the TSO to the Grid User to receive an **early connection** to the grid, however with a temporary period in which the **Grid User guarantees the availability of the required flexibility** to mitigate identified congestions, and the **Grid User bears the associated costs** for mitigating those congestions caused.
11. Also, in the case of such temporary solutions, the resulting risk for the Grid User should be bound. This can be achieved by for example determining a maximal flex volume or a pre-paid compensation beforehand (e.g. in the connection contract).
12. Regional and federal network development plans as well as the establishment of future scenarios for the power system (including demand and generation estimations based on governmental ambitions and policies, capacity potentials, …) are of paramount importance as these key decisions will impact connection request and connection agreement. Involvement of stakeholders (existing or potential future Grid Users) at this stage of the power system development process is key.

9.2 Long-term grid planning design principles utilizing flexibility solutions

As explained above the design of the future power grid aims at hosting the expected Grid Users, and facilitating their required power flowsAnd is based on future scenarios for the power system.

Today, grid investments (“CAPEX”) are consequently **proposed** to **solve the identified congestions** arising in those future scenarios. In other words, the grid is not only developed to host already known Grid User projects, but also to host the defined capacity potentials on a given time horizon[51]. Given the intrinsic uncertainties regarding the future energy scenarios, including for example also the expected realization date of the considered potential, this approach leads to a certain **stranded asset risk**[52] – borne by society – which is to be weighed against the **risk of insufficient grid hosting capacity** impacting a.o. the country’s economic development.

In order to keep this risk of **stranded asset risk** under control, several strategies and approaches are currently implemented:

- Cost-Benefit-Analysis (CBA) on interconnection projects and on internal backbone at 400kV and some cross-border 220kV grid element are performed inline with the “ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects” consulted by ACER, EU member stated and approved by the EU Commission. In case the CBA doesn’t justify the realization of a project, operational constraints could be present but are either taken into account by the market clearing process which used the Flow-based domain as constraints or are solved by the coordinated redispatching and countertrading and associated cost sharing keys (e.g. in case of high loopflows)
- “Conditional projects” are prepared but only launched when their needs are confirmed. This approach greatly reduces the risk of stranded assets but could lead to a minimum leadtime or to a temporary period for the connection of Grid Users. In the latter, during this temporary period, the management of potential congestion, caused by new Grid Users choosing to connect prior to the reinforcement of the grid, is ensured by flexibility means contracted with the new Grid Users through a connection with flexible access.

[51] To give a concrete example: at the time of a long-term grid study in a particular region, the optimal grid solution would be sought, and the relevant infrastructure projects planned to host an increased volume of onshore wind turbines in a wind-rich region with lots of spatial opportunities for new wind projects, consistent with national ambitions, and even if concrete generation projects aren’t launched yet.

[52] We may invest too soon or at the wrong location

In the future, in addition to **grid reinforcement** (“CAPEX solutions”) and the congestion management schemes mentionned above, the Target Model expects to rely on **remunerated Grid User Flexibility** (“OPEX solutions”) for solving congestions. Through a trade-off between those two types of solutions, both **the total cost for and the risks borne by society can be further optimized**.

This approach has the following benefits:

1. As mentioned above, grid infrastructure development is anticipated based on future scenarios including capacity potentials, which are elaborated accounting for their probability of realization. Defining these future scenarios entails a trade-off between the risk of insufficient hosting capacity versus the risk on stranded assets. Grid User flexibility supports mitigating these risks;
2. When needed, grid infrastructure development plans are revised taken into account the existing and reserved capacities known at that time as well as updated future scenarios which including updated capacity potentials. A new trade-off can then be performed where new investments are compared to remunerated[53] Grid User flexibility to optimize the total cost for society by “cutting the tail” of the investments.
3. The required flexibility of Grid Users for congestion purposes, identified at the time of the connection request could decrease over time in case new grid investments are realized, or other contextual changes materialize (e.g. increased or reduced electrical demand or generation in a region). This could simply lead to less operational activations of such flexibility for congestion reasons.
4. ~~4.~~ Additionnaly, a Grid User will never be forced to provide additional flexibility for congestion purposes compared to what is described in its connection agreement or what is required following any other relevant rules and obligations (e.g. SA obligations, Code of Conduct). However, in the context of long-term grid design, additional flexibility for congestion might be proven beneficial for the system; in this case, existing Grid Users that indicate their willingness to provide voluntary congestion flexibility can be “activated” and shall be remunerated for the higher flexibility volumes that would come together with a decision to favor OPEX

[53] The Grid Users can be remunerated for example by a remuneration of the effective activations and/or by paying a reduced grid access tariff.

solution (remunerated Grid User Flexibility) versus CAPEX solution (Grid reinforcement).

The proposed Target Model where grid investments are only triggered by a **positive Cost-Benefit-Analysis (CBA**) (where the expected (societal) costs of utilizing Grid User flexibility are higher than the expected cost of reinforcing the grid) would however not fully reach the objective of the system development. The goal of the system development is to provide a public infrastructure, for Grid User to be connected and to be able to consume or produce energy and for national and regional objective in terms of energy mix to be reached in terms of produced and consumed energy (i.e. not only in terms of connected capacity). Therefore a second criteria is introduced; A **max bound on volume of flexibility** is introduced to trigger grid investment when the expected usage of Grid User flexibility surpasses pre-defined maximum bounds.

Those bounds can be defined at global system level (e.g. no more than 5% curtailment of the produced energy for onshore wind at Belgian level,in line with the Clean Energy Package) but also at Grid User level (e.g. no more than X% curtailment for a given onshore wind farm) to limit the impact on the business case of a the concerned Grid User. These bounds should be defined by a maximum % of annual energy modulated for congestion management and shall be different depending on the categories of Grid User (RES, Storage, Demand facilities with intrinsic low flexibility capabilities (e.g. uninterruptible industrial processes, e-boilers coupled to industrial processes, …), Demand facilities with high flexibility capabilities (e.g. electrolyzers, e-mobility, e-boilers, etc.), other type of generation).

9.3 Impact on Grid User connection request principles

If a Grid User requires a modification of an existing connection to the transmission system, or a new connection altogether, the process described in the relevant Grid Codes/Technical reglement is to be followed. Both modifications of existing connections and new grid connections will be further referred to as “connection requests”.

When the TSO receives such a connection request, an analysis of the impact on the power system is conducted. In order to perform this assessment, the **Grid User communicates to Elia whether** or not a **connection with flexible access**[54] would **be acceptable** for the Grid User.

Following the connection assessment, the grid connection point(s) is/are determined in line with the methodology explained in section 5. Different cases can arise depending on

54 We mean congestion flexibility offered by the Grid User outside of products and processes with mandatory participation (such as iCAROS for specific generation units for example).

the grid hosting capacity at those connection points and the willingness (or not) of the Grid User to accept a connection with flexible access:

1) If **sufficient firm hosting capacity is available** at an **existing** or planned **substation**
   a) The connection to this substation, potentially after realization of the substation or the connection bay if not existing already is proposed **[Connection with firm access]**.
2) If **sufficient firm hosting capacity will be available** at an **existing** or planned **substation** only **after realization** of one or more **grid projects already approved** in an **existing Grid Development Plan** and this in line with the methodology explained in section 5 and in line **within the capacity potential** of the concerned technology[55] and in the concerned region as defined in the **latest approved Grid Development Plan**,
   a) The connection to this substation and **after** realization of the required grid projects is proposed – in case a connection with flexible access is not acceptable for the Grid User **[Connection with firm access]**.
   b) The early connection to this substation, potentially after realization of the substation if not existing already, but before realization of the required grid projects, can be proposed **if the Grid User** agrees and under the condition that required flexibility costs are borne by the Grid User during this **temporary period (until realization of the required grid project(s)) [Connection with flexible access with a temporary period]** This flexible access would be at Grid User's cost during the temporary period and subject to a cap as explained in section 6.
3) If **insufficient firm hosting capacity is** or **will be available** even when **all grid projects already approved** in an existing Grid Development Plan are realized:
   a) If the Grid User communicated the willingness to accept a connection with voluntary permanent flexibility and if Elia ancticipated capacity potential in that concerned region for that concerned technology that covers this connection request, and decided (upon CBA) not to invest in grid reinforcement but rather to

[55] In general, this would also result in the required congestion flexibility volumes to fall within the predefined bounds, given the accounting of this potential for the Network Development Plans. However, in case of important contextual changes this might not be the case, and rather case 3b would apply.

count on flexibility of Grid Users[56], then Elia would propose a connection to an existing or planned substation with a contract with remunerated flexible access (with cost borne by society) **[Connection with flexible access with remunerated activations]**

b) If the Grid User communicated the willingness to accept a connection with voluntary permanent flexibility and if Elia didn't anticipate a capacity potential in that concerned region for that concerned technology that covers this connection request, or if Elia anticipate less capacity potential than the requested power, then a long-term grid development study needs to be performed in order to determine the potentially required grid infrastructure investments, and those grid infrastructure investments need to be approved through a subsequent Grid Development Plan. As this is timing-wise not possible in the timeframe of a connection request, the time needed to perform such potential grid investments is not known yet at the time of the connection request. In this case, only an early connection to a substation, potentially after realization of the substation if not existing already, can be proposed **on request of the Grid User** and with required flexibility costs borne by the Grid User during a **temporary period**. Given that the potentially required grid projects are not known yet, a standard duration will have to be applied for this period (as explained in section 6), accounting for the time needed to perform the grid studies, obtain approval in the Grid Development Plan, and realize the infrastructure project(s). Similarly the need of securing the voluntary permanent flexibility of the Grid User will only become clear after the aforementioned long-term grid development study, and therefore initially connection with flexible access with a temporary period will be granted, however with the option of evolving to connection with flexible access with remunerated activations at a later stage. **[connection with flexible access with a temporary period and with the option of at a later stage transiting to a connection with flexible access with remunerated activations or to a connection with firm access]**

[56] In some situation, we might count on flexibility of other Grid Users instead of the connecting one.

c) If the Grid User requires a connection with firm access, a long-term grid development study needs to be performed in order to determine the required grid infrastructure investments, and those grid infrastructure investments need to be approved through a subsequent Grid Development Plan. As this is timing-wise not possible in the timeframe of a connection request, the time needed to perform such grid investments is not known yet at the time of the connection request. In this case, only an early connection to a substation, potentially after realization of the substation if not existing already, can be proposed **on request of the Grid User** (provided he has the needed flexibility capabilities) and with the required flexibility costs borne by the Grid User during a **temporary period**. Given that the required grid projects are not known yet, a standard duration will have to be applied for this period, accounting for the time needed to perform the grid studies, obtain approval in the Grid Development Plan, and realize the infrastructure project(s) [**Connection with flexible access with a temporary period**]

Those different cases are summarized on Figure 24.

In practice, in the context of the orientation study of a grid connection request, different potential connection points could be identified, depending on each particular situation. In this case, multiple options could be proposed to, and discussed with the Grid User.

Important to note is that **at the stage of a connection request**, a **connection with flexible access with remunerated** activations **will only be proposed to the Grid User** when it is **required** due to **a lack of sufficient firm hosting capacity available or planned** (case 3). However, as mentioned before, the outcome of a long-term grid study might be that additional congestion flexibility in a region would be beneficial for the power system. Therefore, Grid Users that have indicated their willingness to be connected under a permanent flexibility regime can be contacted at that point in time, potentially leading to a revision of their connection with firm access to a connection with flexible access with remunerated activations.

As described in cases 2b and 3b/c, in some situations the Grid User can request an early connection before (identification and/or) realization of the required grid infrastructure. As explained in section 3, the **temporary flexibility** needed in this context shall be associated to the connection contract and therefore be **borne by the Grid User**. This approach is in **the interest of the Grid User** – as he **can connect earlier** – and in the **interest of society** – as these **costs are not socialized**.

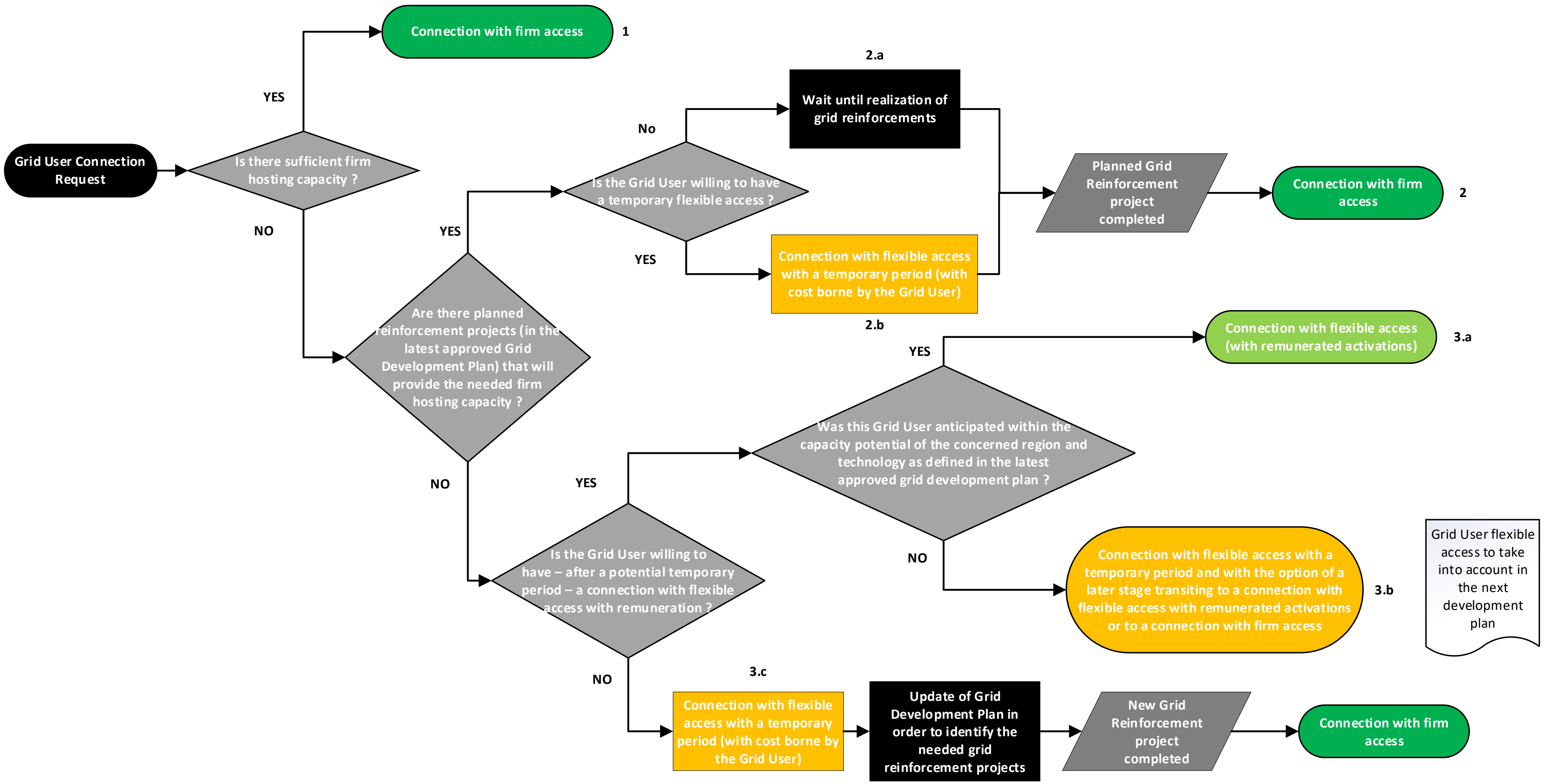

Figure 24 : Flowchart for connection process with application of the Target Model

9.4 The importance of Development Plans and Hosting Capacity Maps

As mentioned in the section above, the reference context (reference grid described by the regional and federal network development plans as well as the considered future scenarios for the power system (including demand and generation estimations based on governmental ambitions and policies, capacity potentials, …) are the key decisions impacting connection request and connection agreement of new Grid Users. For the establishment of these deliverables, consultation of stakeholders is of paramount importance.

In preparation of the Federal Development Plan 2024-2034 and subsequent regional network development plans, Elia established in 2021 the “Task Force Scenarios” as a consultative body for the development of future scenarios used in power system analysis. The Task Force aimed at co-creating storylines & scenarios for electrical demand and supply, both qualitatively & quantitatively for the use in studies performed by Elia. The final deliverable of this scenario creation process is the publication of a Belgian scenario report that serves as input for the above-mentioned studies. The “Belgian Electricity Scenario report” was ultimately published in the beginning of 2022.

Given the broad positive stakeholder feedback, Elia is committed to undertake such a scenario co-creation trajectory to construct the scenarios for each upcoming update of the Federal Development plan.

Using these scenarios as a basis, Elia elaborates the Federal Development Plan in close alignment with the Collaboration Committee (official members: FOD/SPF, Federal Planning Bureau but the CREG and Cabinet of Energy are also invited). After official advice from the CREG and the Minister of Marine Environment, and a general public consultation[57], a final proposal is ultimately submitted to the federal Minister of Energy for Final Approval. This cycle is repeated every 4 years.

In addition, since 2023 Elia publishes hosting capacity maps to pre-inform Grid Users on a first, high-level view on grid hosting capacities on top of already reserved/allocated capacities.

The methodology for the computation of these maps is a simplified version of the methodology of the connection study described in section 5, as for example it neglects some phenomena such as voltage limits, short-circuit power, stability phenomena,

[57] Please note that this is a summary of the process for illustrative purposes. The entire process involves more official steps than mentioned here and can be consulted in the last version of the FDP: [Federaal Ontwikkelingsplan 2024 - 2034 (elia.be)]

permits, technical feasibility, optimizations of the network and its operating topology, and adaptation of the network development plans in the interests of the community.

These maps are updated every year.

9.5 Congestion Flexibility product types

The design described in the present note addresses the main questions and needs related to connections with flexible access based on the existing "Gflex" product implying an activation of flexibility with real time setpoints.

In a next phase, Elia will have to map the needs for congestion management as a whole (from a Grid User perspective and from an operational perspective) with the potential existing and future solutions that are available in different timeframes in order to provide a complete framework on what product would best fit for what type of congestion need and in which timeframe of activation. This is necessary for the following reasons:

- RT "instantaneous" activations are often not fit-for-purpose for most demand facilities while redispatching products are foreseen to be completed for units of type B and for demand[58].
- Evolutions of EU Market coupling and congestion management regulations (such as Core ROSC) will also impact the congestion management. For example, Core ROSC may imply or force activations that are far from the Real Time timeframe (rather between DA and ID); and the impact on this for connections with flexible access located in EHV[59] grid or related to CNEs in EHV must be analyzed.

While defining new products, the following aspects need to be considered:

- The needs and constraints from a Grid-User's point of view (such as necessary delay or specific timeframe to activate…)
- The needs and constraints from a grid / TSO point of view (such as the timing of identification of a congestion risk, and the type of congestions, the voltage level)
- The regulatory framework
- The need to avoid market distortion and/or gaming opportunities.
- The implementation and operational feasibility
- The need to preserve liquidity in electricity markets – such as balancing and adequacy.
- The possibility to create a "transfer of flexibility obligations" or a "secondary market" for Grid Users willing to take over (and against remuneration) the

[58] iCAROS phase 2 and 3

[59] Extra High Voltage Grid

flexibility necessary for a temporary period for Grid Users coming before a grid reinforcement and with limited or without flexibility capabilities.
- The different possibilities of remuneration scheme (e.g. remuneration of activations, discount on access tariff…)

All the above-listed questions have arised during analysis made by Elia in order to propose the current design note and during discussions with Market Parties. Elia will continue gathering all the questions that need to be addressed in a further step (including the feedback of the public consultation of the present design note) to continue to improve the vision on Grid User Flexibility for congestion management. Elia will therefore foresee additional workshops with Market Parties in Q3-Q4-2024, presenting its view on the need for future product and proposing a roadmap to address those needs for evolution.

10 Conclusions and next steps

The present note describes a proposed design on how connection with flexible access based on the current “Gflex product” – with RT activation and open to all technologies (production, storage and demand) which have the capability to react to real-time activations of flexibility for congestion management purpose - should evolve in the mid/short term in order to bring the necessary clarifications and guarantees to the Grid Users. The present design covers a significant part of the identified Grid User needs and concerns and enables an implementation from grid studies to operations in the mid/short term.

The public consultation of the present design note will take place from 31/05/2024 to 05/07/2024. Based on this proposed design, Elia will perform a gap-anaysis of the existing federal regulatory framework in order to identify which regulated document needs to evolve (e.g. Code of Conduct, Coordination Rules for Congestion Management, Connection contract,…) and how.

After having treated the feedback from Market Parties related to the public consultation, Elia will analyze to what extend the proposed design should evolve and adapt the above-mentioned gap-analysis accordingly. Elia will also prepare a proposition of amendment of the Code of Conduct and an implementation plan and submit these to the CREG by the Q3-Q4 2024.

Based on this proposition, the CREG will prepare a decision project for the amendment of the Code of Conduct and launch a public consultation in Q4-2024.

In parallel, Elia will foresee additional workshops in order to gather the needs for further evolutions (for example specific needs for "slow" demand facilities, contextual european and regional evolutions that might impact operational processes…) and proposes a roadmap for all those identified necessary evolutions.