ELIA TRANSMISSION BELGIUM

Technical report for connection studies proposing flexible access: content description and justification.

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1 Introduction

As the result of a connection study, a (candidate) Grid Users' connection request could lead to a proposal of connection with flexible access. In this context, technical reports are shared with the CREG and to the (candidate) Grid User.

The present document aims at describing the content and the purpose of the two versions of these technical reports and at explaining why some information are only shared with the CREG.

The document is structured as follows:

- Section 2 & 3 describe the information provided in the context of the connection study report as well as the content of the technical report for the (candidate) Grid User and explains that this information allows the (candidate) Grid User to take decision concerning the future of his project;
- Section 4 describes the confidential version of the technical report, explains that this information allows the CREG to judge on the correct application by Elia of the criteria for connection studies indicated in article 22 of the Code of Conduct and contains a justification on why some information can only be shared with CREG, and not with the Grid Users;
- Section 5 provides a conclusion.

Elia is open for comments on this document until 05/12/2024. Elia will consider the received inputs and will share its conclusion with CREG about the need to adapt the technical reports.

2 Connection study report for the (candidate) Grid User

This section details the information provided by Elia to the (candidate) Grid User concerning the different possible connections for his request.

- Connection points in the vicinity of the (candidate) Grid User: this section explains which substation and voltage levels are currently available, will be available in the future and/or will be dismantled in the future. This section concludes with the different considered connection options.
- For each of the considered connection options:
    - a description of this option is provided, explaining where part A is located and what would be the technical solution for the part B (type of connection cable, length, voltage level, capacity)
    - the need for flexibility (or not) in different phases of the evolution of the grid. This section is partly redundant with the content of the technical report for the connection with flexible access (see next section for details) but contains additionally a description of each phase which affects the connection option.
    - The specific technical capability to be implemented to be granted a “Final Operational Notification”, this includes for example the needs for real-time measurement, communication, remote control such as Gflex requirement, …
    - An indication of the costs for connection to the grid which are to be borne by the (candidate) Grid User. These costs, in line with the regulatory framework, are split between part A, part B and in case needed part Z costs, splits between one shot cost and annual costs and between CAPEX and OPEX costs.
    - The expected commissioning lead time needed for the connection infrastructure after the ordering of the connection.

3 Technical report for the (candidate) Grid User

The content of the technical report shared with the (candidate) Grid User was presented to the Market Parties during the 10/10/2024 workshop.

3.1 Content

The technical report contains the following information:

1) A summary of the connection request
    - Type of installation
    - New connection or significant modernization of an existing installation
    - Existing connection capacities for injection and offtake
    - Requested connection capacities for injection and offtake
    - Maximum active power that the grid user will inject into the Elia grid via his (future) connection. The ratio between the “Maximum active power” and the “Requested connection capacity for injection” is the minimum cos(phi) for this maximum active power.
    - Requested connection date
    - Connection date expected by Elia: This date primarily takes into account the time required to complete the connection. If the request is for an orientation study, the time required to complete the detailed study and other formalities is also taken into account. If the (candidate) Grid User can only be connected after Elia has made an investment in the grid, e.g. the construction of a new substation to which the (candidate) Grid User will be connected, the date of Elia's infrastructure project is mentioned if it is decisive for the time required to complete the connection.
2) A geographic localization of the grid user installation on a geographic map of the existing transmission grid.
3) In case of an **orientation study**, the **considered connection options** with, for each option, the **relevant substation** and connection voltage and the **type of access;**
4) In case of an **orientation study**, the **retained connection options** and the **justification** for **not retaining** the other considered connection options;
5) For each retained connection option, the indication of the **relevant phases until commissioning** of the **necessary grid reinforcements** foreseen in the portfolio of Elia’s infrastructure projects having at least a status “in study”. The latest published development plans, or any publicly communicated update of the timing of the projects at the date of the study are considered.
6) The **firm** and the **flexible power** for the **different phases and for the injection and withdrawn capacities;**
7) An **estimation** of **the yearly average activated flexibility** in term of **energy** (volume) and in terms of **time** for the **different phases;**

8) An **indicative description** of the **market conditions** which can be expected at the time flexibility is expected to be activated. These market conditions are described based on indicators (or a combination of these indicators) that are publicly accessible to the (candidate) Grid User to recognize and maybe anticipate these situations. A non-exhaustive list of these indicators is: season, temperature, Belgian or European wind production, solar production, import/export, Belgian consumption, …

   Finally, a description of the reference context is also provided[1].

The information regarding item for 4) and 5) are presented in the form of a table for each phase as shown in the next example.

[1] The provision of a description of the reference context is provided for reports sent to Grid Users and CREG from now on.

3.2 Practical example

The table below shows a fictive example for the connection of a 200 MW storage.

Type d'étude	
N° d'étude	xxxx
Type d'installation	
Nom du client	
Installation existante ?	NON
Capacité de raccordement pour l' Injection existante (MVA)	
Capacité de raccordement pour le Prélèvement existante (MVA)	
Capacité de raccordement pour l' Injection demandée (MVA)	
Capacité de raccordement pour le Prélèvement demandée (MVA)	
Puissance d'injection maximale demandée (MW)	
Puissance de prélèvement maximal demandée (MW)	
Date de la demande	
Date souhaitée de mise en service pour l'utilisateur réseau	
Date de mise en service estimée par Elia	
EOS réalisée avant l'EDS	NON
[redacted]	

-Explication supplémentaire si la demande finale de l'utilisateur du réseau diffère du formulaire de demande (par exemple, puissance ajustée ou ...)

-explication rapport MW <> MVA (exigences FTR ou cos phi minimale demandé par client est 'ok'?

-délai de mis en service --> determiné par raccordement ou investissement d'Elia dans une partie Z?

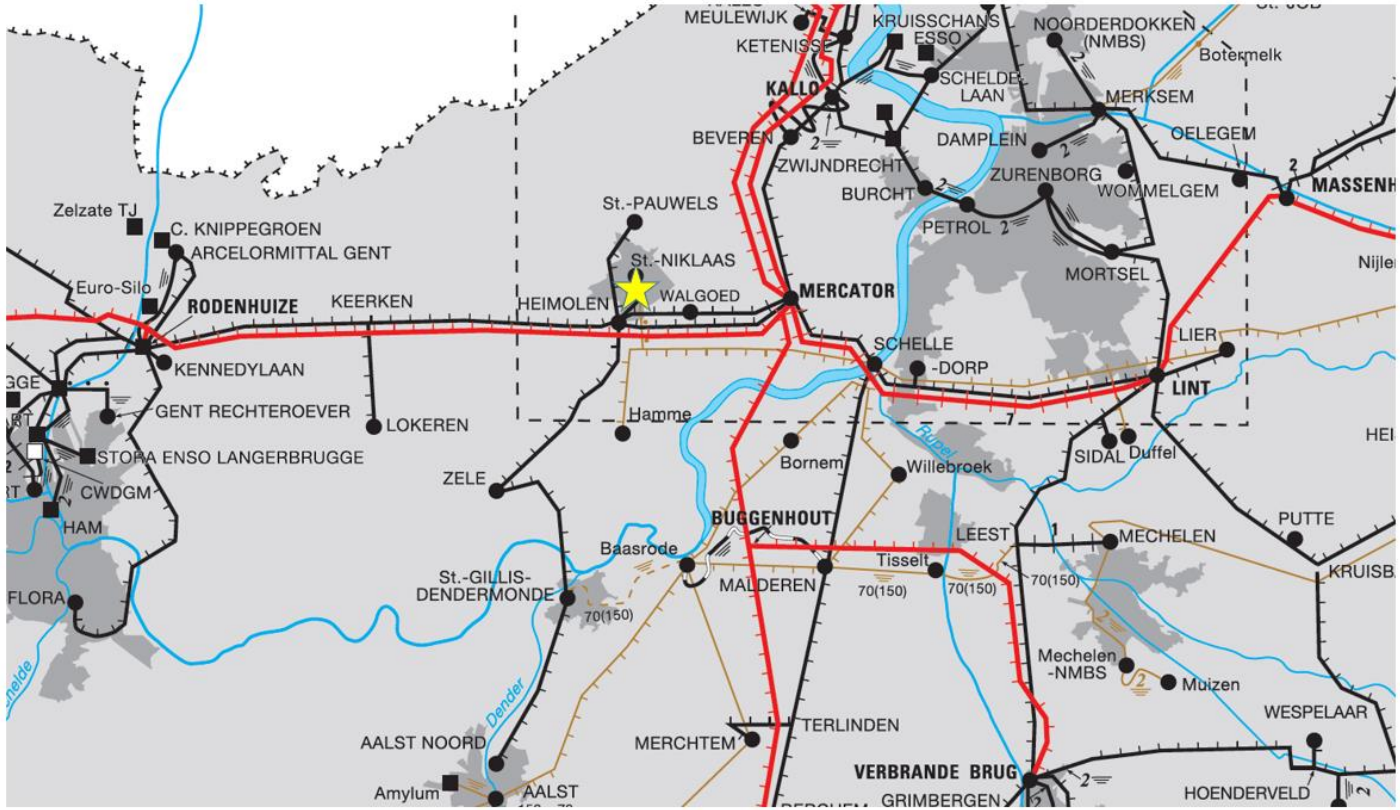

Table 1 : description of the investigated options and of the phases for option 1

Connection option	Type of access	**Aansluitingspunt**	**Toelichting**
Option 1	FLEX	*XXXXX150*	*Connection on XXXXX150 kV substation*
Option 2	FLEX	*XXXXX150*	*...*
FIRM option	FIRM	*XXXXX380*	*Option not retained due to the length of the connection cable which is not viable from a techno-economic point of view*

Phase	**Period**	**Description**
Phase 1	20XX-20XX	Before commissioning of Project XXXX
Phase 2	20XX-20XX	After commissioning of Project XXXX but before commissioning of Project YYYYY
Phase 3		
Phase 4		
Final phase	>= 20XX	After commissioning of Project YYYY

…

Table 2 : Firm and flexible power and needed flexibility for the different phases (option 1 only)

Injection profile / **Injection profile**		**Option 1**		
		Phase 1	**Phase 2**	**Final phase**
Injection	Flexible power (MW)	200	200	0
	Firm power (MW)	0	0	200
	% preventive flexibility (time)	40	30	0
	% curative flexibility (time)	5	2	0
	% flex (active power)	20	5	0
	MWh flex/year (active power)	15.000	5.000	0
	Description of Market conditions	Congestion occurs and needed modulation in case of offshore wind production, and import from UK	Congestion and needed modulation occurs in case of offshore wind production, and import from UK	-

OFFTAKE	Flexible power (MW)	150	0	0
	Firm power (MW)	50	200	200
	% preventive flexibility (time)	20	0	0
	% curative flexibility. (time)	2	0	0
	% flex. (active power)	10	0	0
	MWh flex./year (active power)	5.000	0	0
	Description of Market conditions	Congestion and needed modulation occurs in case of important consumption and limited production in XXX 150 kV zone		

3.3 Added value of this information for the (candidate) Grid User

The connection study report and the technical report for flexible access provide important information about the connection cost, the connection timing, the associated risk in terms of permitting, the expected flexibility volume and the related context (e.g. following an outage on the grid and/or in specific market situations).

Additionally, the information provided is enabling the application of the guarantees as proposed by Elia in the Code of Conduct, and is in line with the article 8§2 of the Electricity law[2].

- The table with the different phases indicates the **duration of the temporary period** and the duration of **each phase**
    - The (candidate) Grid User therefore knows how long activations will occur in priority compared to costly remedial actions and at its charge;
- For each phase, the **estimated yearly average activated energy** is mentioned.
    - The (candidate) Grid User is then able to evaluate the yearly not off-taken and/or not injected energy as well as the related charged costs for the BRP perimeter correction costs (capped imbalance price) and take it into account in its business case.

With this set of information, the (candidate) Grid User can evaluate the expected cost (including the consequences of the flexibility) and revenue of its project and decide if this connection variant fits its need.

[2] Which states that Elia has to provide to the grid users the needed information for an efficient access to the grid.

4 Technical report sent to the CREG (confidential version)

The confidential version of the technical report sent to the CREG contains additional information in order for the CREG to judge on the correct application by Elia of the criteria for connection studies indicated in article 22 of the Code of Conduct. The following subsections describe this additional set of information and contains a justification why this information cannot be shared with (candidate) Grid Users.

4.1 List of considered EDS in the zone of influence

As explained in the methodology for connection studies, the reference context is updated to reflect the most recent information related to the installed and reserved capacities in the zone of influence of the connection study.

The list of the additional considered capacities is communicated to the CREG in the form of a table and contains:

- The EDS reference number
- The name of the (candidate) Grid User
- The concerned substation and voltage level
- The concerned electrical zone
- The type of installation (Wind, PV, Other production, storage, consumption, mixed site)
- The connection capacity for injection and/or offtake (MVA)
- The date of the connection study request, connection study order, capacity reservation and capacity allocation
- The date of the (planned) commissioning
- Additional comments.

This information allows the CREG to ensure that the grid study is consistent with contractual engagement Elia and DSOs have already made to other Grid Users or candidate Grid Users with either firm or flex access in line with Art. 22 § 1er 4° of the code of conduct.

This set of information may not be, according to Art. 8 §3 of the Electricity Law, communicated to the (candidate) Grid User and is therefore only included in the confidential part of the report.

4.2 Detailed description and load flow results per phase and connection variant

4.2.1 Detailed description of the phase & results

For each phase, a detailed description of the grid structure is provided with the related single-line-diagram (SLD).

An example of description is provided below.

Table 3 : example of detailed description

Phase description	Before commissioning of project XXX
Period	20XX-20YYY
Grid structure description	*Description of grid structure*

This information allows the CREG to ensure that the proposed Grid structure is aligned with the latest timing of the projects at the date of the study and to compare infrastructure considered in different comparable connection requests to ensure non-discrimination of the connection request.

For each connection option, the identified Critical Network Elements (CNEs) with their permanent and temporary season rating, as well as the presence of dynamic line rating on the CNE are listed. An example is provided below.

Table 4 : example of list of CNEs

Option 1								
INJECTION								
Flexible power (MW)	200	MW	Congestion on the 380 kV XXX-YYY axis occurs in case of offshore wind production and import from the UK					
Firm power (MW)	0	MW						
% preventive flexibility (time)	30	%						
% curative flexibility (time)	5	%						
% flex. (active energy)	20	%						
MWh flex. (active energy)	15.000	MWh						
			Nominal rating (MVA)	Max perm seasonal rating (MVA)	Min perm seasonal rating (MVA)	Max temp seasonal rating (MVA)	Min temp seasonal rating (MVA)	DLR
CNE 1	DI 380.XX		-	-	-	-	-	Y/N
CNE 2	DI 380.YY		-	-	-	-	-	Y/N
CNE 3	...		-	-	-	-	-	Y/N

This information allows the CREG to ensure that all means such as temporary rating, season dependent ratings or dynamic line ratings have been considered to evaluate the impact of the connection request. It also allows the CREG to compare constraints observed (CNEs) in different comparable connection requests to ensure non-discrimination of the connection request.

4.2.2 Load flow results : worst CNEC per considered situation

For each phase and for each connection option, more detailed Load Flow results are provided in order for the CREG to verify the correct computation of the flex power, flex time and flex energy based on the results of the N and N-1 load flow results.

Relevant load flow results are provided for each of the situations per year (each of the clusters) with the worst CNEC (Critical Network Element and Contingency) per situation and which impact the preventive and curative activation of flexibility. The permanent and temporary rating of the CNE in this situation is provided, as well as the remaining available capacity on this CNE in absence of the installation of the candidate grid user.

Additionally, the PTDF of the installation of the candidate grid user on this CNE for the considered contingency is provided. This information, together with the market data (see section 4.3 for details) allows the CREG to verify:

- the correct and non-discriminatory consideration of the situations per year in the study
- the correct and non-discriminatory computation of the flex power for the connection request
- and the correct and non-discriminatory consideration of the impact of grid user on the considered contingency.

Table 5 : example of worst CNEC per Point in Time

Cluster	Representation [%]	Option 1						
		INJECTIE						
		Type afregeling	CNE	C	Ssea_CNE	Ssea_temp_CNE	PTDF,CNEC	Remaining capacity (MW)
1	X%	Preventief						
1	X%	Curatief						
2	Y%	Preventief						
2	Y%	Curatief						
3	Z%	Preventief	DI 380.XX	DI 380.YY	--	--	--	X
3	Z%	Curatief						
12		Preventief	DI 380.YY	DI 380.XX	--	--	--	Y
12		Curatief						

It is important to recall that the selection of the considered situations is based on a clustering algorithm. For a given year of 8.760 hours, these hours are grouped into clusters. The description of these clusters as well as the time representativity of each of these cluster is provided (see Section 4.3 for details).

The grid calculations are then performed based on the hour representing the centroid of each of these clusters, and not on the 8.760 hours. The provision of results for a sequential time series of the 8.760 hours is therefore not possible. Therefore, information such as the expected duration of the applied modulation cannot be provided.

Furthermore, sharing the information provided to the CREG with the (candidate) Grid User would be problematic given that he would receive privileged information. This while the network operator should prevent disseminating commercially sensitive information about its activities in a discriminatory manner as per Art. 9quater of the Electricity law.

As an example, with such information at its disposal for 2 sequential connection study results of a similar connection request (e.g. an EOS and later an EDS, two sequential EOS, an EDS and a re-computation of flexibility volume, …) the (candidate) Grid User could deduce at

- which location (relatively to the CNEC)
- of which type (demand, production or storage),
- and for how many MW,

another connection capacity has been reserved or released in the meantime, which could give him a strategic advantage, possibly with respect to a competitor, and which would not be in line with the Belgian legislative context as mentioned above.

Finally, the knowledge of the CNEC could lead to strategic bidding behavior after the connection of the unit to the grid due to an increasing possibility for the (candidate) Grid User to anticipate the occurrence of a congestion. This strategic bidding behavior is also referred to as INC-DEC gaming, and has been demonstrated in the technical literature and has been/is observed in practice.

While it is not the goal of the document to provide a detailed description of such strategic approach, the following example allows grasping the issue. In case of outage on one of those indicated grid elements (due to planned outage in the context of an infrastructure project, repair or maintenance) the (candidate) Grid User could anticipate the occurrence of a congestion and the related activation of its unit to solve the issue. By being able to anticipate the activation, the (candidate) Grid User could adapt its bidding behavior in the (day-ahead/intraday) market i.e. selling more energy at a lower price (even lower than its marginal price) to make sure it is selected in the market as it anticipates this energy will anyway not be produced due to the expected downward activation to solve the expected congestion. This behavior leads to market distortion with multiple consequences such as a distortion of the (day-ahead/intraday) market price, an aggravation of the congestion and a perverse investment incentive as investments in congested areas might be stimulated due to a higher margin for the unit in case of strategic bidding behavior.

4.3 Market conditions per phase

The last provided information are the simulated market conditions per phase provided in order for the CREG to verify correct implementation by Elia of the reference context in the market and grid model as well as the adequate and accurate enough description of the market conditions which can be expected at the time flexibility is expected to be active as mentioned in section 3.1.

This information is provided in a table format with the Belgian net position, total Belgian load consumption, wind onshore, wind offshore, total photovoltaic production, aggregated storage position, export/import on BE-FR border, export/import on BE-NL border, export/import on BE-DE border and export/import on BE-UK border for each of the situations (each representing a cluster).

As mentioned above, for each of the situations, obtained by clustering technique, the time representativity is provided. An example of the table is provided next page.

Once again, sharing this information with the (candidate) Grid Users would be in breach with article 9quater of the Electricity law.

Providing the market conditions in addition to the load flow results (worst CNEC per Point in Time) would accentuate the risk of strategic bidding behavior and market distortion mentioned above. Additionally, the fact that such information would be only available to a given grid user would be a discrimination concern.

Table 6 : Market conditions (100 considered situations representing clusters)

Cluster	Representation (%)	BE_Balance	BE_Load	BE_Onshore	BE_Offshore	BE_Solar	BE_Storage	BE==>FR	BE==>NL	BE==>DE	BE==>UK
1	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-
...											
...											
100	-	-	-	-	-	-	-	-	-	-	-

5 Conclusion

With this present note, Elia highlighted that the content of the connection study report, of the technical report enables the candidate to properly evaluate the impact of the connection solution, including the flexible access component of this on their Business Case.

The additional content provided to the CREG in the confidential version of the report is also described and Elia highlighted that such information allows the CREG to take an informed decision on the proposal by Elia for a flexible connection, taking into account the correct application of the criteria for connection studies indicated in article 22 of the Code of Conduct.

Elia also justified that it cannot provide this additional content to the (candidate) Grid Users for following different reasons:

- Some information is confidential and cannot be shared with other Grid Users.
- Some privileged information would only be available for the (candidate) Grid User, which would give him an advantage compared to its competitor and give the opportunity of strategic behavior.

Finally, Elia reminds that it committed to:

1. Increase the transparency regarding the considered scenario and growth potential thanks to publishing the grid study methodology by end of year;
2. Discuss openly the scenarios considered in the future, starting in the context of the Taskforce Scenario that will take place in 2025;
3. Setup a transparent process to be followed when revising the grid study methodology on regular basis.

Elia believes that these different elements, taken together, provide a valid answer to the different challenges that have been raised on its approach. Elia sees such multi-dimensional approach as more appropriate than providing in isolation additional information in the technical report to the grid user. Such approach would indeed lead to the confidentiality and gaming issue highlighted above, without providing an adequate answer to the 3 points mentioned above.