WG Belgian Grid & TF Implementation Network Codes: Special workshop

Chateau du Lac, Genval

06/09/2016

Agenda

Welcome coffee	8h30 – 9h00
General introduction	9h00 – 9h10
Evaluation of the process for NC implementation	9h10 – 10h00
Coffee Break	10h00 – 10h30
Intermediate wrap-up from the perspective of “significant grid users”	10h30 – 12h30
Lunch	12h30 – 13h30
Results of the inquiry for non-NC driven changes to the “Federal Grid Code”	13h30 – 15h00

General introduction

Main goals of today's workshop:

➔ In general, take some extra time to discuss the ongoing work in the Elia Users' Group with respect to the implementation of the EU network codes in Belgium

➔ Upon explicit request by Users' Group members discuss some aspects of both process and content

Additionally,

➔ Show the results of the inquiry for (non-NC driven) changes to the Federal Grid Code

From an Elia perspective, today's workshop is in first place meant to gather your feedback and openly discuss.

Evaluation of the process for NC implementation

About the process for NC implementation

Some observations about the process

- Supported by the FOD, via the Users' Group Elia has set up a process to **extensively involve stakeholders** in implementing the EU network codes in Belgium
  - Information and feedback via the "normal" working groups of the Users' Group
  - Linking to "existing practice" via the "normal" working groups wherever possible (→ mainly for market-related matters)
  - Discussion in a dedicated "TF Implementation Network Codes" whenever deemed useful with Elia proposals and time/forum for extensive feedback by stakeholders
- Upon request, the process is complemented with meetings with dedicated stakeholders (e.g. CDS) whenever deemed useful.
- A **transparent process**, supported by the public website of the Users' Group
- A **two-phase philosophy** is followed: first discuss the content ("what do we want"?) before discussing how to formalise it ("where do we write it down?").

About the process for NC implementation

Main activities so far:

- **First iteration on the topic "Significant Grid Users"**, resulting in a proposal from the grid operators as well as an alternative proposal from the Belgian Generator Associations (BGA).
- Many meetings on various **specific technical topics** to define more concrete implementation proposals. Topics dealt with/planned:

Connection & compliance process
Reactive power management & voltage
Robustness & Fault Ride Through
Power Quality
Frequency Stability & Management
Short-circuit power
Protection & control/connection
Information exchange
Modernization of a connection point

⇒ *Note:* As it is transversal and also linked to the expertise of WG Belgian Grid, The topic of modernization is to be first discussed in each specific technical topic ("micro") and based on those outcomes is then to be discussed in aggregated way in WG Belgian Grid.

➔ Once the discussions on the specific technical topics have reached an end, a **second iteration on the topic "Significant Grid Users"** will take place to evaluate and when necessary re-calibrate the parameters for defining significant grid users.

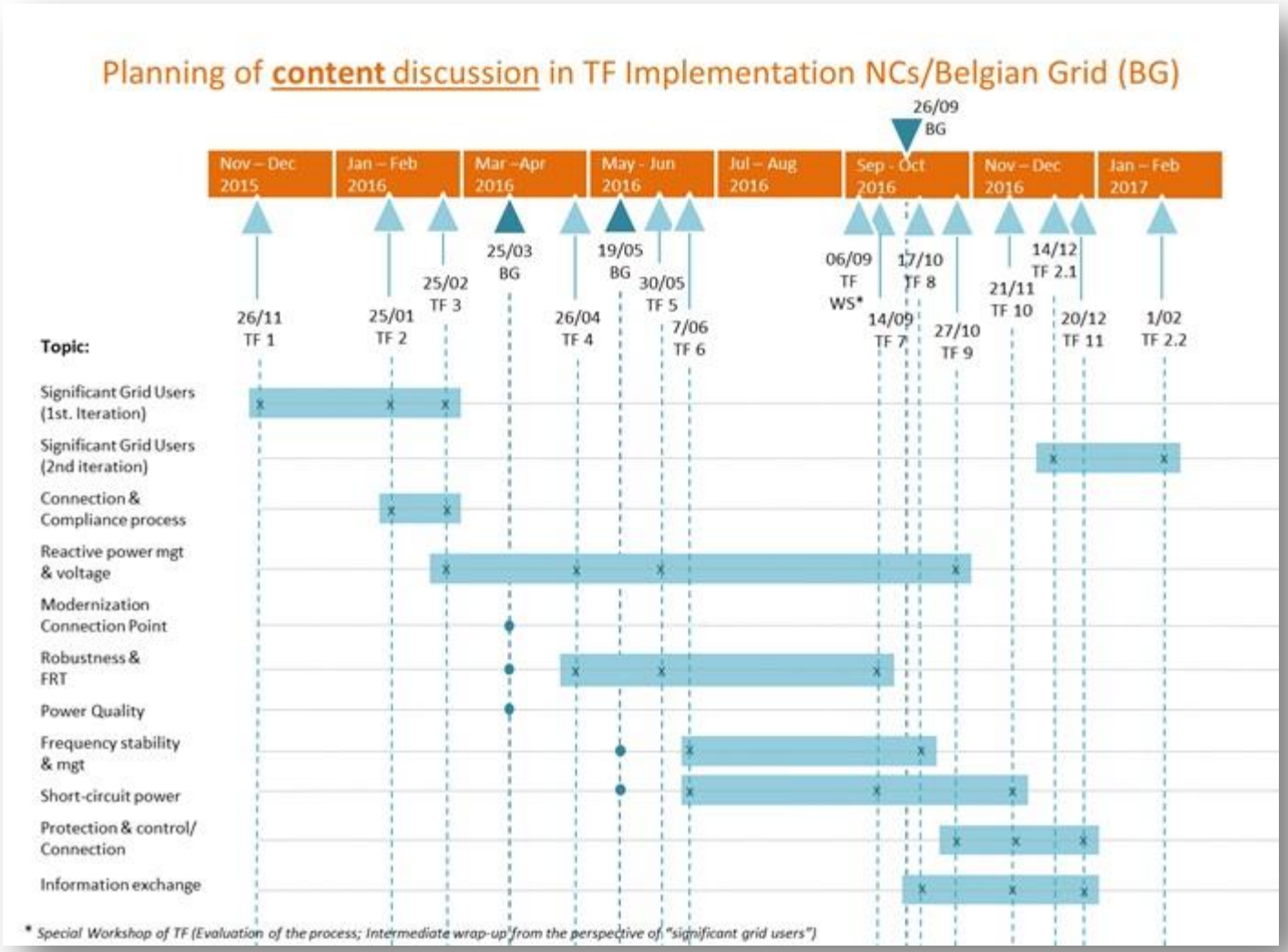
About the process for NC implementation

The **main focus** so far has been on the **Connection Network Codes** (RfG, DCC(,HVDC)).

For the other codes, the approach discussed can be summarized as follows:

- **CACM / FCA:** Main activities take place beyond the national level. The Users' Group serves as a forum for feedback from Elia to the stakeholders *and* vice versa.
- **Electricity Balancing**: The network code is still gaining maturity, hence no detailed work plan has been presented. Nevertheless, the Belgian evolutions in this field to a large extent anticipate already on a later implementation.
- **System Operation Guideline and NC Emergency & Restoration:** A detailed analysis of the topics requiring stakeholders involvement or stakeholders being informed has been presented in the WG System Operation:
  - Elia will inform stakeholders on various aspects, in particalur those implementation aspects taking place beyond the national level
  - For some topics (e.g. linked to E&R), the WG System Operation will serve as discussion forum
  - For other aspects, the discussion is (to be) picked up by the discussions triggered by the connection code topics (e.g. reactive power management & voltage) or a new group has been formed (e.g. information exchange)

About the process for NC implementation



About the process for NC implementation

Your feedback is welcomed!

- How do you evaluate the process so far?
- Have you been sufficiently involved?
- What could be improved? Do you have concrete suggestions or alternatives?
- Which aspects are considered good and should be kept or even reinforced?

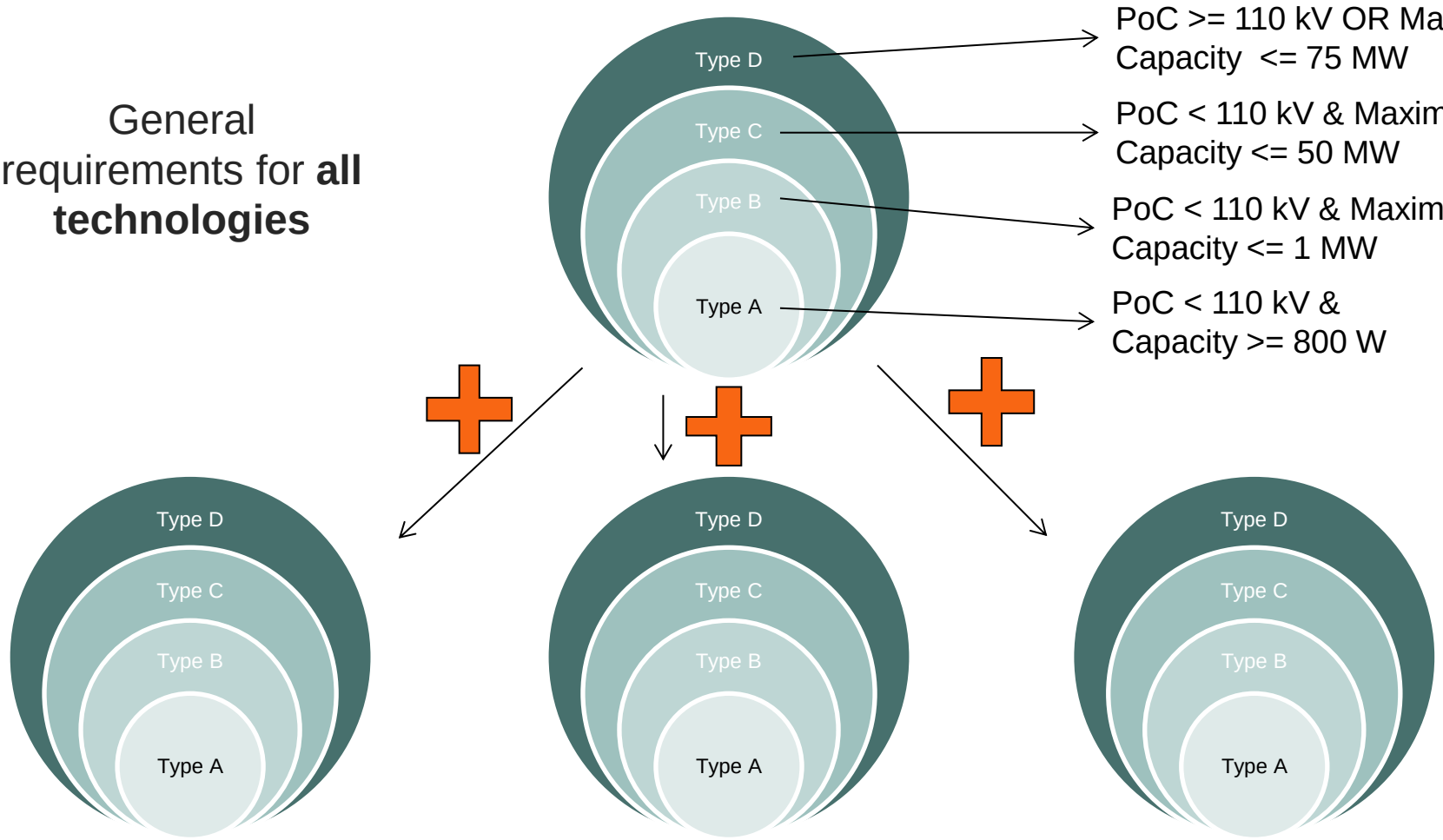
Intermediate wrap-up from the perspective of “significant grid users”

Agenda

- **Recall of scope of the topic**
- **Recall of the proposed methodology and timing**
- **Actions items performed to reach proposal**
- **Working proposal taking into account arguments from stakeholders**
- **First inputs from ongoing and closed technical topics**
  - “Connection & Compliance processes”
  - “Voltage Control & Reactive Power management”
  - “Robustness & Fault Ride Through”
  - “Short-circuit power”
  - “Frequency stability & Management”
- **Feedback from other countries**
- **Wrap up of first inputs**
- **Next Steps**

Recall - Scope for Power Generating Modules (including embedded generation)

General requirements for **all technologies**



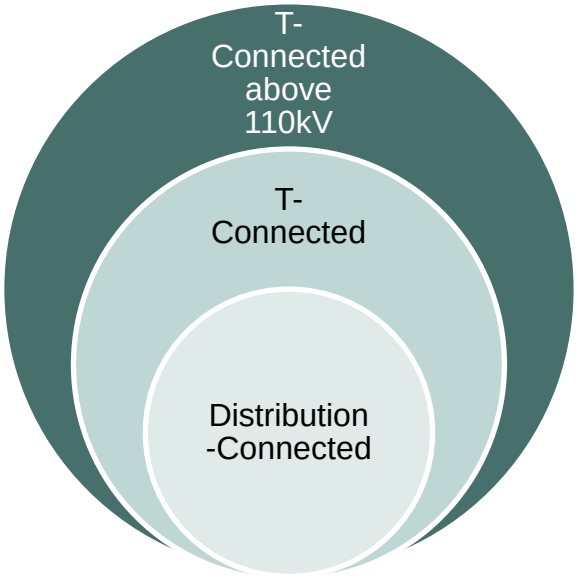
Additional requirements for *Synchronously connected* units

Additional requirements for *Non - synchronously connected* units

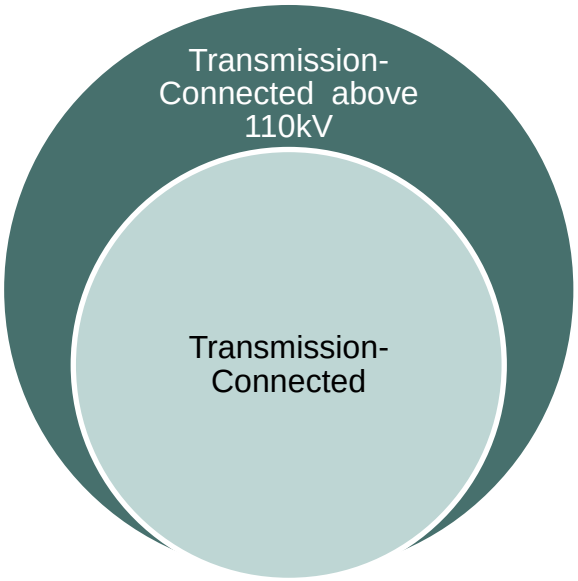
Additional requirements for AC *connected offshore* units

Recall - Scope for Demand Facilities and Distribution Systems (Closed & Public)

Requirements at point of Connection for Distribution Facilities or Distribution System including Closed Distribution Systems

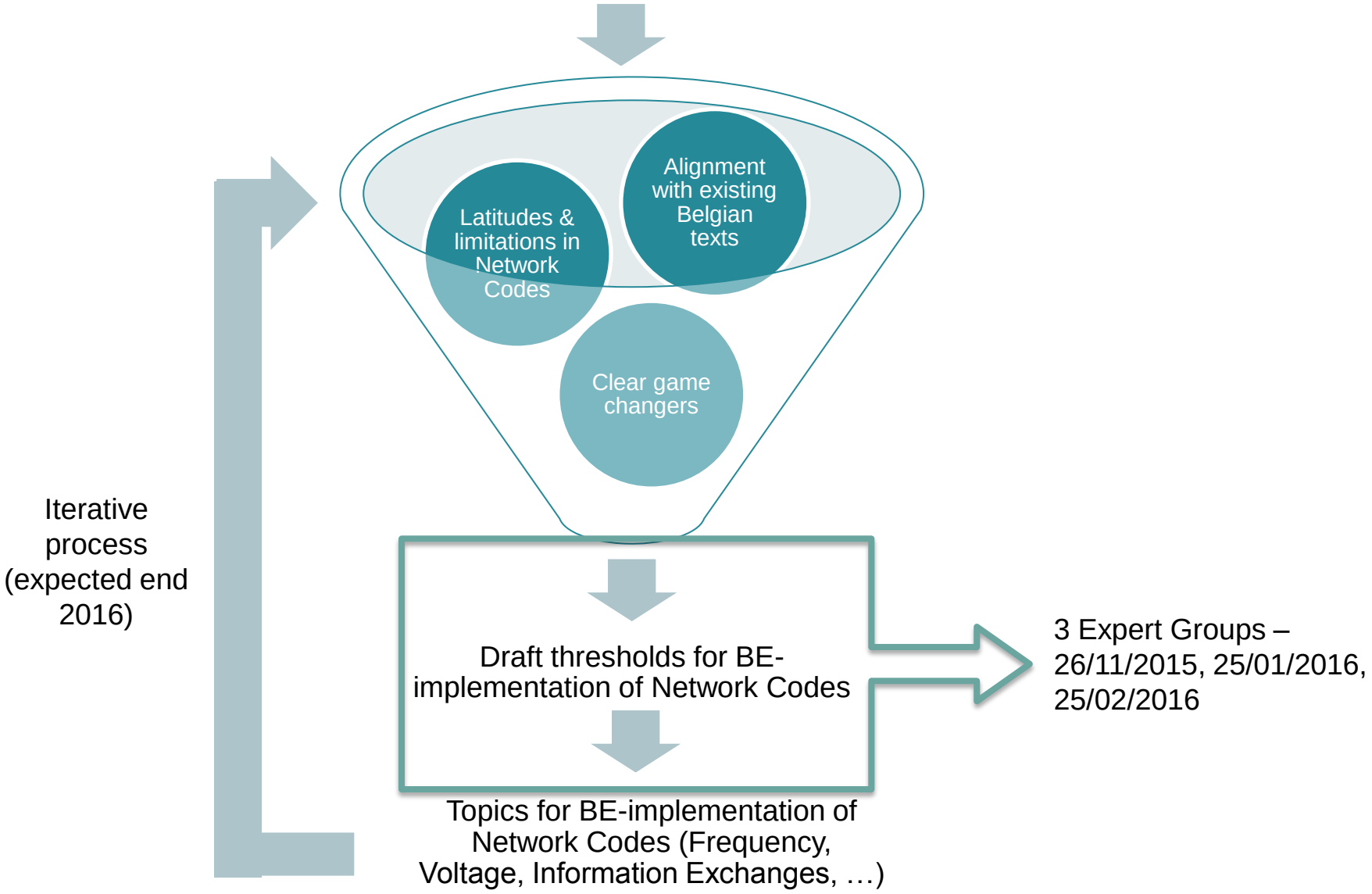


Requirements at point of Connection for Demand Facility



Additional requirements for Demand Units used by a Demand Facility or Closed Distribution System IF demand response services is provided

Recall - Overview of proposed methodology



Actions items performed to reach first proposal

Design & Validation of Process Methodology

Overview of the categorization impact on all NCs (Connection/Operation/ Market)

Synthesis of categories in existing Belgian legal/technical texts

Mapping of requirements between NC & Existing Belgian legislation

Status and expected Generation Mix/Size in Belgium (today & 2025)

Clarification of the definitions of Power Generating Module from NCs

Main argumentation for threshold between A/B

- Combined Synergrid work (Controllability, Observability, …)
- Focus on Fault Ride Through

Main argumentation for threshold between B/C

- Robust and Efficient Voltage Support
- Robust compliance verification
- Synthetic Inertia

Main argumentation for threshold between C/D

- Focus on Fault Ride Through

Working proposal taking into account arguments from stakeholders to be used for other topics

Working proposal taking into account arguments received (1/5)

- **Goal of NC and its implementation is to, cost-effectively, be able to …**
  - maintain, preserve and restore the security of the power systems
  - with a high level of reliability and quality

- **… in order to**
  - facilitate the functioning of the EU-internal electricity market now and in the future.

- **Therefore**
  - Coherence between Belgian requirements and requirements in other countries in CE should be taken into account.
  - Ancillary services should be procured via market based mechanisms but availability and technical capabilities should be defined to protect the power system
  - Connection code implementation for new users only.
  - Co-generation power plants for which Electricity, Heat and industrial processes are strongly linked are not required to modulate active power on external demand.

Working proposal taking into account arguments received (2/5)

- **The threshold A-B is set at 250kW with the following points of attention**

Fault Ride Through	• Important for grid robustness • But a stringent requested profile for type B units would lead to high additional costs for some unit owner.
Remote Control and observability	• Needed to manage DSO grids • Needed to meet the NC DCC requirements at the T/D interface. • But no unjustified retroactive cost for existing users (GL OS).
Redundant communication	• Applies to “Identified Significant Grid Users” (NC E&R) • Careful identification of these users.

Working proposal taking into account arguments received (3/5)

- **The threshold B-C is set at 25MW with the following points of attention**

Existing requirements for “regulating units”	• Current rules in BE for aggregated capacities at the CP and not per unit • Regulating Units for aggregated capacities above 25MW. • Could be a driver to decrease the threshold between type B-C.
Reliability of voltage control	• AVR, PSS, OEL, UEL are of major importance when largely used • Currently requested in BE from 25MW. • Extension of these requirements of the NC to Type C to be considered.
Synthetic inertia	• if requested, has an impact on PPM’s costs • if requested, could be driver for increasing the threshold between type B-C.
Compliance tests and simulations	• Voltage control, verification by simulation and eventually tests are of major importance • Could be a driver for reducing the threshold between type B/C.

Working proposal taking into account arguments from stakeholders (4/5)

- **The threshold C-D at 75MW or at 25MW for units connected above 110kV with the following points of attention**

Derogation from NC V≥110kV	• For large units and for units connected to the EHV grid, Fault Ride Through is of major importance for the stability of the grid. • Derogation for (embedded) units below 25MW connected above 110kV • Avoids a potentially cost and administrative burden
75 MW	• Less stringent requirement allowed by the NC.

- **The T/D interface is considered at the existing border between Elia and the distribution systems (including Transmission-connected CDS).**

Public & Closed Distribution Systems	• Specificities of both public and closed distribution systems should be considered

Working proposal taking into account arguments from stakeholders (5/5)

- **The following aspects have not been considered for the working proposal:**

upper limits foreseen in the NC's	• A Belgian power system efficiently operated and well developed… • … does not means that the less stringent requirements from the NC should apply.
All market-based	• NCs are based on connection and operation requirements… • … And this approach can not be replaced by a full market-based approach.
Significant cost increase between types	• Cost increase between types are acknowledged … • … but these highly depend on the hypothesis taken (type of unit, strength of the requirement for a given type, standardization of equipment's and certification …)
CBA's	• TSO have to motivate the proposals submitted to the Competent Authority… • …CBA's are not foreseen for non-exhaustive & non-mandatory requirements
MVAr from Embedded Generation	• These units influence the local voltages … • …But also help maintaining the global reactive power balance of Belgium.

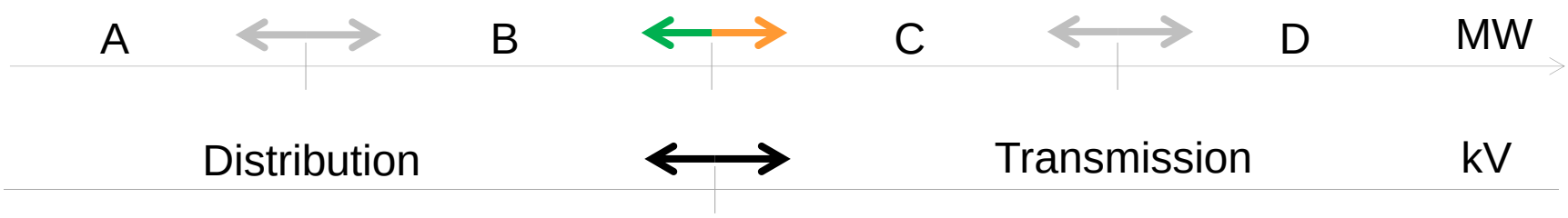
Approach for the wrap-up of the first inputs from technical topics

For each ongoing or finalized topic a first wrap-up is proposed

- This is a first view on the impact between technical topics and the topic Significant Grid Users
- This wrap-up is based on the system impact of the threshold for this topics. A graphical representation is proposed for each topic, when shifting the threshold in the direction of the arrow:

→	A negative total system impact is not identified, even if some users could be negatively impacted.
→	A negative total system impact is identified, Or A very high additional cost is identified for some identified users.
→	This threshold has a negligible impact for the topic.
→	No system impact assessment is yet performed as the topic is still ongoing

- Example:



First input from topic “Connection & Compliance processes”

- The limit A-B is important but not critical in regards to the compliance test and simulation
  - No test and simulation are foreseen for type A units
  - (Partial) replacement of simulation and test by equipment certificate is possible for type B units

- Technical content of the compliance simulation and testing and partial replacement by equipment certificate is to be dealt in each technical topic.

- The limit C-D is important but not critical for the application of the process
  - EON (Energisation Operational Notification), ION, FON, LON is for D units.
  - But current process for connection to the Belgian transmission grid is similar (i.e. without LON) to the NC process.

- Derogation proposed by Elia for the type D above 110kV (i.e. type D is either for units [above 75MW] or [above 110kV and above 25MW]), is avoiding unacceptable administrative burden.

First input from topic “Voltage Control & Reactive Power management” (1/2)

- Final conclusions are not yet reached in this topic, especially for the requirements of type A and B units for which the identified system needs are deemed very demanding for those power units.
  - The evolution of energy mix is expected to greatly reduce the number of C&D type units.
  - The limit A-B is important for the topic “Voltage Control & Reactive Power management” with regards to the transmission system
    - as reactive power delivered by type A units is generated electrically far from the transmission power system.
    - and because only type B (&C&D) units support the system after incident.

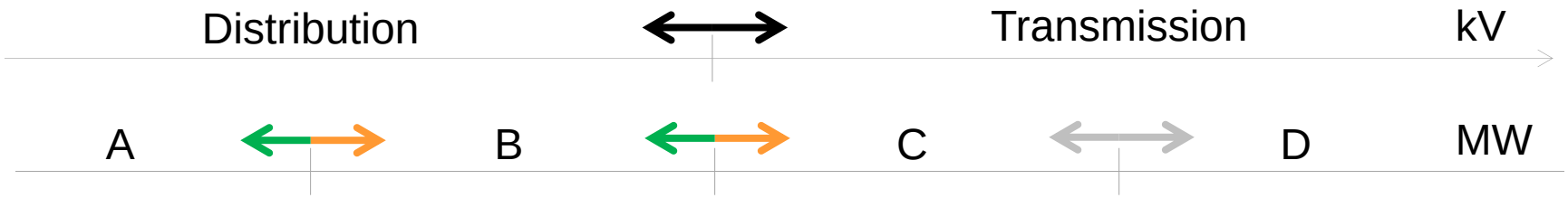
- The limit B-C is decisive for the topic “Voltage Control & Reactive Power management”
  - It is already clear that an increase of this threshold would most likely increase the requirements for reactive power of type A & B units or lower the threshold A-B

First input from topic “Voltage Control & Reactive Power management” (2/2)

- The identified system needs show that units could operate close to their limits and therefore the recommendations of the topic Significant Grid Users to generalize over-excitation limiters and under-excitation limiters to type C units is deemed appropriate.

- Requirements for demand units are still to be defined in the context of this topic and so far conducted studies are based on the current behavior of the Belgian loads as per the current Belgian grid code.

- It is already clear that the requirements for DSO connections to transmission grid are linked with the requirements of the A & B type units and DS-connected demand users.



First input from topic “Robustness & Fault Ride Through”

- The limit A-B and the current requirement for FRT in Belgium are key to define the total amount of generation that can trip as the consequence of a single fault. The proposed value lead to a high total generation loss (between 900MW to 1600MW additional generation loss for major 380kV busbar fault) but the system remains stable.

- Proposed requirements in terms of remaining voltage for type B units are the less stringent allowed by the NC. This is inline with the recommendations of the topic Significant Grid Users.

- Most units connected in 150kV, 220kV and 380kV are electrically very close from a fault occurring on a 380kV major busbar. A FRT for type D (0V remaining voltage) is therefore needed for these units. This is inline with the proposal made for the limit C-D.

First input from topic “Frequency stability & Management”

- The topic has just started in June. So far the proposed limits are deemed realistic to find an acceptable solution.

- The limit B-C is decisive for the topic “Frequency stability & Management” in particular related to the provision of inertia that limits the rate of change of frequency seen by all units to an acceptable value
  - This need for inertia at European level still need to be defined
  - If the need is stringent,
    - either more stringent requirements for all units A, B, C & D in terms of ROCOF withstand capability should be proposed
    - or a lowering of the limit B-C would be needed in order to foster more synthetic inertia on PPM.

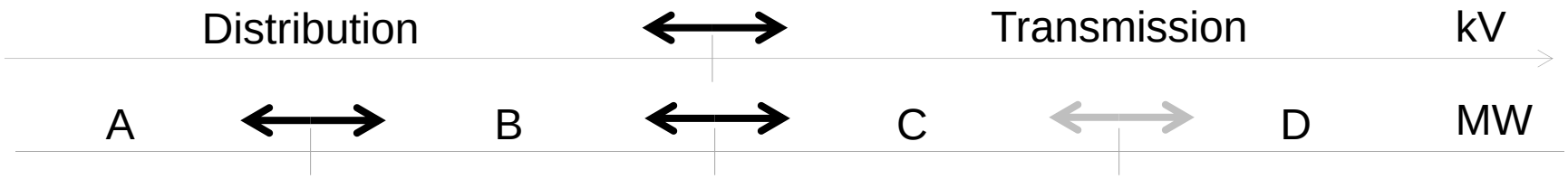
First input from topic “Short-circuit power”

- The topic has just started in June. So far the proposed limits are deemed realistic to find an acceptable solution.

- The limit A-B is important for the provision of fast-fault current for both symmetric and asymmetric faults from PPM (B, C & D) if requested by the network operator. The needs are still to be defined in the context of this topic.

- The limit B-C is important for the exchange of simulation models and for the communication of minimum and maximum short-circuit power.

- The limit transmission/distribution is important for the communication of short-circuit current injection from demand user and DSO connection (incl. CDS).



Feedback from other countries in Continental Europe

- Current status from Germany: Public consultation until Sept 12th 2016 and workshop on Sept 22nd 2016.
  - Type D: V ≥ 110kV or S ≥ 50 MVA
  - Type C: S ≥ 40 MVA
  - Type B: S ≥ 100 kVA

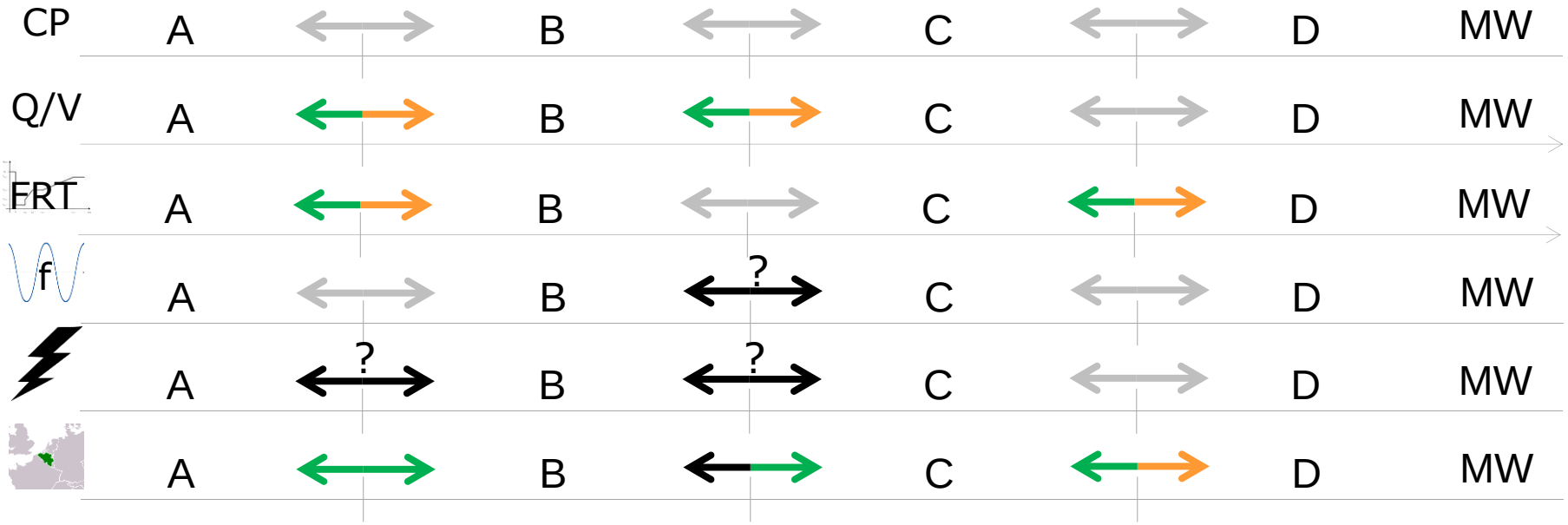
Note:
~= 34MW with a cos(phi)=0.85

- Current status from France, draft values from the French regulator
  - Type D: ??
  - Type C: ??
  - Type B: S ≥ 1 MW;

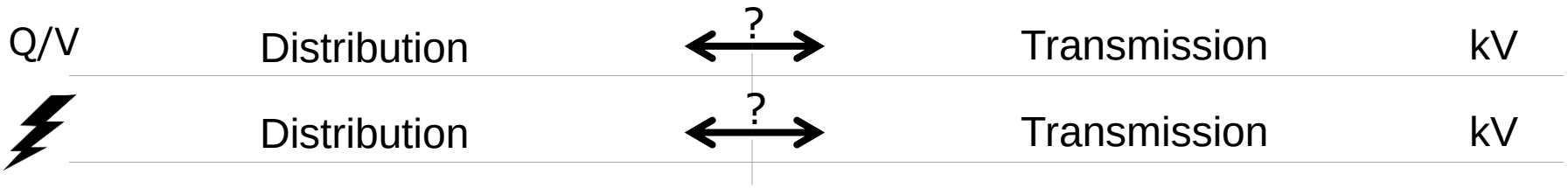
- Current status from TenneT for the Nederlands
  - First discussions with stakeholders in June 2016 where the process was described.
  - Next meeting Sept 22nd 2016 with possibly first ideas on preferred thresholds.

Wrap up of first inputs

- Status of the limits shifting possibilities for categories A-B-C-D



- Status of the limits shifting possibilities for limit transmission-distribution



Note that this is illustrative and details should be considered to weighted the different aspects

Next Steps

- **Fall 2016**
  - Final input to be received from topic “Robustness & Fault Ride Through”
  - Final input to be received from topic “Frequency Stability & Management ”
  - Final input to be received from topic “Voltage Control & Reactive Power Management”
  - Input to be received from topic “Information Exchange”
  - Input to be received from topic “Protection & Control”
  - Coordination with neighboring TSOs

- **Winter 2016 – 2017**
  - Wrap up and second iteration of topic "Significant Grid Users“

Results of the inquiry for non-NC driven changes to the “Federal Grid Code”

Introduction

- NC implementation will require amending the Federal Grid Code
- This opportunity could be used to also amend the Federal Grid Code on other (non-NC driven) aspects

➔ In May, Elia launched an inquiry for non-NC driven changes to Federal Grid Code

➔ At the end of the process, the results will be handed over to the FOD in all transparency with the Users' Group.

➔ This inquiry is to be considered as a first step.

Contributions

- Several stakeholders have prepared their list of ideas and provided their input to Elia.
- Elia has “inventorized” the ideas of the stakeholders and Elia’s own list of ideas.
- Elia tried to represent the stakeholders’ ideas and to accurately translate whenever necessary. However, **for more precise information and for any context and disclaimers provided by stakeholders (and Elia) please refer to the original letters and notes**.
- Besides the list provided by Elia, three stakeholder associations have responded to the inquiry:
  - DSOs (Synergrid)
  - FEBEG
  - FEBELIEC

Contributions

Some observations

Overall, the received lists are:

- **For several items focusing on larger themes** and leaving some margin for further debate and how to realize.
- Sometimes very specific aspects are mentioned.
- There are clear **similarities** between the themes mentioned on different lists (which however does not imply an immediate consensus).
- Size of the lists vary, but are generally **not too lengthy, but overall a broad scope** is covered:
  - FEBEG: 17 items (distinction priority – others)
  - FEBELIEC: 16 items (no prioritization)
  - DSOs: 9 items (no prioritization)
  - Elia: 26 items (distinction priority – others)

Overview ideas

FEBEG	DSO	Febeliec	Elia	
1) Definitions	1) Definitions	1) Market Access	1) Definitions	18) Shared connection
2) Storage	2) Dinstinguish network users and DSO	2) Demand Side Flexibility and Demand Side Response	2) Technology neutrality for provision of ancillary services	19) Emergency plans
3) Access	3) Supplier	3) Definitions and overall structure of the Federal Grid Code	3) Demand response	20) Ancillary services
4) Capacity reservation	4) Flexible access	4) European Network Codes	4) Market model	21) CIPU
5) Grid losses	5) Federal & regional grid code	5) Roles and responsibilities	5) Closed Distribution Systems (CDS)	22) Reserve dimensioning
6) Roles	6) Art. 61-78 (NC RfG related)	6) Closed Distribution Systems	6) Storage	23) MVAR sourcing
7) Congestion management	7) Art. 369 – 387 (SOK related)	7) Technology neutrality	7) HVDC	24) Varia
8) Closed distribution system	8) Separated framework for regulated services	8) Storage	8) Offshore	25) Outdated concepts
9) Information flows	9) Manager of the measuring device	9) Grid loss procurement	9) Safety	26) Errata
10) Demand response		10) Grid connection	10) ID production programs	
11) Ancillary services		11) Technical requirements and specifications	11) TSO - DSO	
12) Balancing obligation		12) Data exchange	12) Metering	
13) Black-out & restoration		13) Sub-metering	13) Losses procurement	
14) Metering services		14) Priority Dispatch for certain production types	14) Capacity reservation	
15) Elia operational services		15) Flexible access	15) Connection requirement framework	
16) Preferential customers restoration		16) Merit order based balancing	16) Connection requirements	
17) Article 71			17) Coherent evolution of old connections	

FEBEG ideas – Priority suggestions

ID	Short name	Description
FBG 1	Definitions	Flexibility,…
FBG 2	Storage	Need to define storage (generation or demand?)
FBG 3	Access	Need for clarifications and modifications to adapt to new circumstances
FBG 4	Capacity reservation	i.e. implementation of procedure agreed upon in the Elia Users Group
FBG 5	Grid losses	evolution away from compensation in kind to other mechanism, e.g. tendering
FBG 6	Roles	role of FSP, but also role of supplier (access contract, ToE, …)
FBG 7	Congestion management	it should be ensured that the federal grid code doesn't block any evolution as regard congestion management, e.g. discussions as regards 'red zones' or compensation for 'flexible access'
FBG 8	Closed Distribution Systems	reevaluate and update (reorganization, removal of all inconsistencies, …) articles with regard to Closed Distribution Systems
FBG 9	Information flows	reevaluate and update articles as regards information flows and ensure that Federal Grid Code doesn't prevent evolution towards 'near real-time balancing publication'
FBG 10	Demand response	-FGC focuses on CIPU units while also non-CIPU units can deliver services to Elia -All consistencies in this respect should be removed ensuring a level playing field
FBG 11	Ancillary services	-FGC foresees that CREG has to make a report on the procured ancillary services, which is not possible with the short-term sourcing in place -FGC determines the order of activation of ancillary services which causes problems for building bid ladder for all R3 products (contracted and non-contracted)

FEBEG ideas – Other (non-priority) suggestions

ID	Short name	Description
FBG 12	Balancing obligation	Balancing obligation and more particularly obligation to submit in day-ahead a balanced program
FBG 13	Black-out & restoration	Reevaluation rules for black-out and restoration, especially with regard to financial aspects
FBG 14	Metering services	Allow commercial parties – like for example in the Netherlands – to become active in the business of metering services (no exclusivity of Elia on installing and operating metering services)
FBG 15	Elia operational services	Clarifications on operational services (maintenance, spare parts, …) offered by Elia for installations belonging to grid users
FBG 16	Preferential customers restoration	A list of preferential customers in the restoration process exists, but should this list not need a legal basis?
FBG 17	Article 71	Article 71 (U,Q diagram) is not possible without on load tap changer on trafo

DSO's ideas

ID	Short name	Description
DSO1	Definitions	As a result of the **NCs**, but these should also be actualised and preferably **harmonised with the regional grid codes**. The expression "**local transmission network**" is not defined in the FGC (FTR). The best solution is to add a **definition** that is **valid for all three regions** (PVN in Flanders, RTL in Wallonia and RTR in Brussels)
DSO2	Distinguish Network users and DSOs	In the current version, a network user is defined as a connected consumer or supplier (supplier is perhaps also not a correct word in this context), and under the consumer category is also included "distributeur", which is not further defined. Thereby, it is unclear whether DSOs also fall in this category. If yes, all obligations of network users/consumers would also apply on DSOs, which is not always pragmatic. **It should be checked which of the current obligations for the network users should be withheld in a specific chapter applicable to DSOs.** In that specific chapter reference should be made to the obligation of concluding a SOK/CDC (collaboration agreement) between TSO and DSO and listing all the elements (without details) which need to be described in the SOK/CDC.
DSO3	Supplier	The word "supplier" ("leverancier") has a different meaning in the FGC and in the regional (flemish) TRDE
DSO4	Flexible access	Incorporation of flexible access (as it is already the case in the flemish codes TRDE and TRPVN)
DSO5	Federal & regional GC	Attune federal and regional grid codes to each other where opportune
DSO6	Articles 61 to 78	Articles 61 to 78 concerning additional prescriptions for the connection of production units to be modified to be in line with NC RfG

DSO's ideas

ID	Short name	Description
DSO7	Articles 369 to 387	"Title VI – Specific provisions between the operator of the transmission network and the operator of the distribution network or the local transmission network in the control area", **the articles 369 to 387 should be completely reviewed in both content and structure.** Replace Section II with an article which refers to the legal clause prescribing that there must be a **SOK/CDC** which at least covers the listed aspects (cf. article VI.2.1.10 in the Flemish GC), as an alternative to a large number of the existing articles of Title VI.
DSO8	Separate framework for regulated services	Separate framework to provide for regulated services to be supplied by the DSO to the TSO (e.g. ancillary services such as congestion management and voltage management). **Regulated network related services would preferably be detached from the commercial market services**
DSO9	Manager of the measuring device	**In the FGC is no explicit determination of who is the manager of the measuring device**. Therefore, it seems opportune to aspire to coherence with the regional GC's, where it is clearly defined that **the operator of the distribution/local transport network is the only authorized agent to put at disposal the measuring device**, install it, adapt it, maintain it, replace it, remove it and exploit it

FEBELIEC ideas

ID	Short name	Description
FBL 1	Market Access	After 20 years of liberalization, the market still does not function optimally. For end consumers, direct market access remains one of the key challenges. Access rules and regulation are very often considered to have a considerable impact on this. Wherever the **Federal Grid Code** can address these concerns, these **should be addressed to facilitate full participation of all grid users to the market.**
FBL 2	Demand Side Flexibility and Demand Side Response	The value of a more responsive demand side, with impact on the elasticity of the demand curve by offering more flexibility to the system, has been shown in Belgium, in products such as ICH, SDR, participation in an increasing number of balancing products, but a **general level playing field should be created** between all sources of flexibility (flexible generation, demand side flexibility, storage) and within all timeframes (so not limited to the balancing market, but also to the intraday, day ahead and forward markets as well as the near real-time markets). **The Federal Grid Code should be adapted to reflect neutrality towards sources of flexibility.**
FBL 3	Definitions and overall structure of the Federal Grid Code	These should undergo an **update and reality check and be aligned within Belgium and with the European level**. E.g. definition of demand response, which is different in all documents and not always reflects the full potential of demand response. A harmonization to for example the ACER or CEER definition would be an improvement.
FBL 4	European Network Codes	The Federal Grid Code should be adapted to **reflect the requirements and obligations from** these **codes**. The question remains how this should be done, **by references** to these Network Codes **or by incorporating** (parts of) these Network Codes in the Federal Grid Code. Important is to take into account the readability of the Federal Grid Code as a comprehensive document, not only an inventory of references to other documents.

FEBELIEC ideas

ID	Short name	Description
FBL 5	Roles and responsibilities	The **roles** as currently defined within the Federal Grid Code will need to **undergo a reality check and need to be made future-proof**, with new roles added (e.g. Flexibility Service Provider, with sub-categories Balancing Service Provider, ESCO, Aggregator). Nevertheless, Febeliec wants to **stress the central role of the BRP** within the electricity system and does not want to put this role or its content into question, other than reinforcing the responsibilities of the BRP. Also, the notion of ARP should be aligned with the European terminology, namely BRP.
FBL 6	Closed Distribution Systems	The transposition and implementation of European Legislation has created the notion of CDS as compared to Grid Users with an internal industrial grid. **This new reality needs to be reflected and embedded within the Federal (and regional) grid code(s),** while at the same time leaving sufficient flexibility to make this concept future-proof.
FBL 7	Technology neutrality	The Federal Grid Code should be made technology neutral (also linked to the above point on sources of flexibility and the limitation of certain products and market segments to e.g. CIPU units)
FBL 8	Storage	The specific situation of storage, which has characteristics of both a generation and demand unit, should be addressed and implemented in the Federal Grid Code (and other documents).
FBL 9	Grid loss procurement	The **compensation of grid losses** in kind instead of via a grid tariff should **be opened for an in-depth debate**, taking into account the impact but also the best practices on the regional level as well as in other countries.
FBL 10	Grid connection	Remove the ambiguity that could still exist (e.g. from definitions), and **align** this **with the European Network Codes**. This also relates to connection and compliance processes.
FBL 11	Technical requirements and specifications	Alignment of technical requirements and specifications related to those coming from Euronorm, European Network Codes, Synergrid Prescriptions, … This goes beyond the scope of the Federal Grid Code but should be addressed at some point.

FEBELIEC ideas

ID	Short name	Description
FBL 12	Data exchange	Direct market participation for end consumers, including CDS operators, rightly requires them to also participate in the technical and administrative treatment of trades and operations. Febeliec insists on the **need of a balance between these additional obligations and the real market needs, and calls for a pragmatic approach** by grid operators, regulators and legislators. This will facilitate market access for end consumers, improve liquidity in the market and therefore benefit the society as a whole.
FBL 13	Sub-metering	The solutions proposed by Elia for sub-metering and its pragmatic approach of this issue should allow most, if not all, end consumers on the transmission grid to find an acceptable solution for their metering issues. Febeliec would appreciate it if these solutions could be consolidated in the Federal Grid Code. In general, and in particular for distribution grids, Febeliec is convinced that participation in the electricity market unavoidably requires a smart meter. **We therefore insist on the need to allow all end consumers to request their grid operator to install them a smart meter, the need to require prosumers to install a smart meter and the necessity to gradually replace existing analogue meters by smart meters.**
FBL 14	Priority Dispatch for certain production types	This is by Febeliec considered to be an important market distortion that hinders the correct Energy Only Market functioning. **Febeliec insists on eliminating this priority dispatch as soon as possible.**
FBL 15	Flexible access	To be considered a facility offered to grid users to connect to the grid where this on normal criteria would not be possible. **Constraints on access should not be compensated for.** Demand side in general is not interested in this kind of sub-optimal solution.
FBL 16	Merit order based balancing	With an increasing share of end consumers participating in balancing products (which is as such a good thing, as it leads to more competition and lower system costs), **the balancing rules should be adapted** in order to reflect the impact of this new context on the merit order for balancing product activation.

Elia's ideas

ID	Short name	Description	Priority?
Elia 1	Definitions	Overall, the definitions use by the Federal Grid Code should be as much as possible aligned with the overall legal, contractual and regulatory framework and where needed new definitions should be considered, e.g. demand response, local production unit, …	Yes
Elia 2	Technology neutrality for provision of ancillary services	For aspects linked to the provision of ancillary services a more technology-neutral approach than today's generation-oriented approach should be adopted. For instance, with respect to ancillary services a more service-oriented approach rather than technology-oriented approach could be envisaged (e.g. R1-load). Also, exceptions targeting specific technologies should be reconsidered and where possible be removed.	Yes
Elia 3	Demand response	Notwithstanding the need to become more technology-neutral on some aspects as described above, the concept of demand response may need to be introduced, for instance, with respect to the provision of ancillary services.	Yes
Elia 4	Market model	The Federal Grid Code should not act as a barrier for several ongoing and upcoming evolutions linked to the roles and responsibilities in the provision of ancillary services (e.g. the FSP/BSP-concept) and the balance responsibility. Also other interactions between different market roles should be carefully assessed and possibly updated (e.g. the interaction between BRPs responsible for offtake and injection and BRPs linked to activations of flexibility. However, careful alignment with other documents in the legal/contractual/regulatory framework is needed in order not to become blocking.	Yes

Elia's ideas

ID	Short name	Description	Priority?
Elia 5	Closed Distribution Systems (CDS)	The concept of CDS should be introduced into the Federal Grid Code in order to determine and/or clarify, amongst others, the contractual relationship with the transmission system operator and the relation (or aspects thereof) with other market roles such as the BRP, the information exchanges to be covered by a CDS operator, testing requirements and keeping a register of conformity with respect to its grid users,…	Yes
Elia 6	Storage	With respect to storage facilities it should be considered to define (a framework for) the connection requirements for such installations and thereby anticipate a potential technological evolution.	
Elia 7	HVDC	The Federal Grid Code should be made future-proof with respect to the introduction of HVDC technology in the Belgian framework. The Federal Grid Code should not act as a barrier with respect to, for instance, the provision of services by HVDC installations or their integration in the market framework across all timeframes.	Yes
Elia 8	Offshore	In general, the Federal Grid Code may not act as a barrier for the upcoming evolutions with respect to offshore grids and offshore grid users. Not only aspects related to the connection to the main grid, but also market-related aspects should be taken into account (e.g. storm risk, ramping rates…).	
Elia 9	Safety	Where necessary, and taking due account of the Act on wellbeing on the workplace, the Federal Grid Code should be clarified to ensure that a clear framework is available for determining the applicable safety rules for employees of the transmission system operator (and its subcontractors) when accessing the transmission installations located on the grid users' premises.	Yes

Elia's ideas

ID	Short name	Description	Priority?
Elia 10	ID production programs	Consider improving the quality of intraday production programs by ensuring a better follow-up by/information from BRPs after having submitted the day ahead programs.	Yes
Elia 11	TSO – DSO	The Federal Grid Code should be brought up-to-date with respect to the framework governing the relationship between the transmission system operator and the distribution system operators, e.g. taking into account the already existing collaboration agreement. Additionally, it should be assessed whether some detailed aspects need to be revised, e.g. with respect to defining the techno-economic optimum, connection and reinforcement requirements and delays and the relationship between different grid operators.	
Elia 12	Metering	With respect to metering, the Federal Grid Code should be made future-proof providing a solid framework allowing also recent evolutions (e.g. dealing with the metering installations at CIPU units and submetering which are not covered by the connection contract but rather by ancillary services contracts).	Yes
Elia 13	Losses procurement	The Federal Grid Code should allow considering other sourcing mechanisms for procuring grid losses than the one currently in place.	
Elia 14	Capacity reservation	The Elia Users' Group has approved in December 2012 a position on the need for reviewing the mechanism for capacity reservation at the Elia grid for new production units. This position is based on the experience gained with current legislation, from generators and transmission operator, and the industrial realities met by projects developers. For this purpose Art. 94-113 should be partially redrafted: update capacity reservation for new production units.	Yes

Elia's ideas

ID	Short name	Description	Priority?
Elia 15	Connection requirement framework	In general it could be considered to provide a more solid legal and/or regulatory basis for the connection requirements applicable for grid users connected to the Elia grid.	
Elia 16	Connection requirements	Next to the necessary implementations following the European Network Code, also requirements linked to aspects not (entirely) arranged by the European Network Codes must be kept up-to-date and must be clarified where needed. Also and to the extent not already adequately covered by the European Network Codes, obligations on informing the transmission system operator on the evolution of installed generation capacity (also for small volumes, e.g. 1 MW) should be considered.	Yes
Elia 17	Coherent evolution of old connections	In order to facilitate an optimal long term techno-economic grid development in the interest of all grid users, Elia proposes to introduce in the Federal Grid Code a framework which aims to promote, whenever necessary, a harmonized evolution of some old existing connections in coherence with the needs of the grid. Such framework should take into account the characteristics of the concerned connections, respect the applicable tariff framework, be applied in dialogue with between the network operator and the grid user and deliver an appropriate solution for the grid user.	Yes
Elia 18	Shared connection	The Federal Grid Code could consider the introduction of the concept of "shared connection", i.e. a connection to the Elia grid used by multiple (but not unlimited) legal parties, each of them having an individual connection contract or collaboration agreement with Elia and possibly located on different geographical sites. Also the 'capacity transfer' which is at the basis of a shared connection should be covered.	Yes

Elia's ideas

ID	Short name	Description	Priority?
Elia 19	Emergency plans	The Federal Grid Code should be brought further up-to-date with respect to emergency plan and also address implementation aspects linked to the European Network Code on Emergency & Restoration. This could, for instance, include reconsidering and/or further clarifying definitions, priority loads in load shedding plans, shedding plans in case of so-called incompressibility, principle of operational rules for shedding……	Yes
Elia 20	Ancillary services	The framework for ancillary services provided by the Federal Grid Code should be reconsidered, taking into the upcoming European Network Code on Electricity Balancing. This may require re-defining such services, reconsidering the merit order, considering the participation of all technologies, etc. Also for concepts like reactive balancing by Balance Responsible Parties the Federal Grid Code should not act as a barrier.	Yes
Elia 21	CIPU	The current CIPU-concept covering aspects of congestion management, balancing and revision planning should be assessed with respect to its contractual architecture and where appropriate also the underlying principles.	
Elia 22	Reserve dimensioning	The Federal Grid Code should be made future-proof with respect to ongoing evolutions (e.g. shorter-term sourcing) in reserve dimensioning (and procurement) and may not act as a barrier, for instance with respect to the approval framework and the link between the volume needed and the volume actually procured (e.g. in a context of cross-border reserve sharing).	Yes
Elia 23	MVAR sourcing	The sourcing framework for MVAR should be clarified. In this respect it should be considered how neutrality between different types of grid users could be envisaged and also, though closely linked to the European Network Codes, which requirements are put at the point of connection with the grid.	Yes

Elia's ideas

ID	Short name	Description	Priority?
Elia 24	Varia	Several more punctual aspects could be thought of as well of which some aspects have higher priority than others: • Change wording ARP to BRP. • Setting the period for availability of planning data to be provided by the grid user from 7 to 10 years for better alignment with the required development plans of the transmission system operator • Related to the Access contract: avoid yearly renewal, reconsider the 24/24h availability obligation, clarify the link between the ACH register and the ACH-contract • Ensure that every grid user or a designated third party could make a connection request. • Remove all aspects arranged by FCA/CACM network codes, but ensure that no vacuum is created for any aspect that requires a complementary national framework. • Reformulation of TSO obligations if connection installations are located on terrains not owned by the TSO (*priority*) • Release the 5 year information limit for existing connections mentioned in Art. 138 (*priority*) • Bring articles related to confidentiality up to date. • Check Federal Grid Code conformity with the "Wellbeing on workplace Law" (NL: Welzijnswet) *(priority)* • Implement that all-in contracts are ipso jure replaced by approved contracts (Art. 138 (or 141)). • Check conformity of "behoud noodzakelijke transportcapaciteit (Art. 100) with the third EU package.	Various

Elia's ideas

ID	Short name	Description	Priority?
Elia 25	Outdated concepts	The Federal Grid Code should be 'cleaned' for all outdated concepts which are no longer needed in the current (and future) context, e.g. power subscriptions in the context of transmission tariffs.	
Elia 26	Errata	At various places in the current Federal Grid Code minor textual corrections would prove useful.	

Many thanks for your attention!

ELIA SYSTEM OPERATOR
Boulevard de l'Empereur 20
1000 Brussels

+32 2 546 70 11
info@ elia.be

www.elia.be
An Elia Group company

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Appendices: intermediate wrap-up from the perspective of “significant grid users”

The following slides contain appendices to the section intermediate wrap-up from the perspective of “significant grid users” and have been presented during previous Task Forces Implementation NCs:

- Working proposal taking into account arguments from stakeholders
  - Presented during TF impl NCs meeting 25/02/2016 (Session 3 Significant Grid Users)
- What should a type B generating units do (*in addition to A generating units*)?
  - Presented during TF impl NCs meeting 26/11/2016 (Session 1 Significant Grid Users)
- What should a type C generating units do (*in addition to B generating units*)?
  - Presented during TF impl NCs meeting 26/11/2016 (Session 1 Significant Grid Users)
- What should a type D generating units do (*in addition to C generating units*)?
  - Presented during TF impl NCs meeting 26/11/2016 (Session 1 Significant Grid Users)

Working proposal taking into account arguments from stakeholders (1/6)

- **General Aspects**
  - The aim of the NCs requirements is to, cost-effectively, be able to maintain, preserve and restore the security of the power systems with a high level of reliability and quality in order to facilitate the functioning of the EU-internal electricity market now and in the future. This doesn't mean minimizing the cost for each individual user but to source the needed functionalities at minimum qualitative marginal cost.
  - Coherence between Belgian requirements and requirements in other countries in CE should be taken into account once information is known (see later in this presentation).
  - Ancillary services should be procured via market based mechanisms but the necessary functional capabilities should be requested to ensure a secure power system and to protect the power system from failure of the market response. Additional requirements present in ancillary contract should be independent from type.
  - In line with the NC RfG, active power should be used as a threshold and not apparent power.
  - It is to be recalled that, concerning the capability to modulate the active power output (including in the case of frequency control), the requirements of NC RfG shall not apply CHP of type A, B & C and where heat demand is strong linked to an industrial process and where heat and electricity are strongly linked (see Article 6(4) for details).
  - The cases of a substantial modernization of existing units should be analyzed carefully .
  - This is a first step of the process. Finalization of thresholds will be conducted after the completion of the other topics.
  - It is proposed to apply of the connection code to new users only at the date of entry into force of the code.

Working proposal taking into account arguments from stakeholders (2/6)

- **The limit A/B [at 250kW] with the following points of attention**
  - LVRT (Low Voltage Ride Through) capability is needed to ensure system robustness to faults. However, the requested LVRT profile for type B units should take into account the fact that:
    - Some units have low inertia and when connected to grids having low short-circuit power, these units could have difficulties to meet a stringent (i.e. long and deep) fault-ride-through profiles.
    - Stringent fault-ride-through profiles then could lead to additional costs for the some units owner.
  - Capability to remote control new type B units is needed to manage DSO grids and to meet the NC DCC requirements at the T/D interface.
  - Observability of type B units (new and existing) is needed. However, while implementing the requirements related to Operational Security, unjustified retroactive cost should be avoided for existing users.
  - “Identified Significant Grid Users” in the context of the NC E&R should be carefully selected taking into account cost of redundant communication channels.

Working proposal taking into account arguments from stakeholders (3/6)

- **Limit B/C [at 25MW] with the following points of attention**
  - Taking into account the fact that, for SPGM, the aggregated installed capacities per site will not be considered to categorize units in type A/B/C/D (except in the case of indivisible set of installations), the threshold for type C, imposing very similar requirements as the existing requirements for “regulating units” (25MW in the Belgian Technical Reglement) may be needed to be set at a lower value than 25MW.
  - Reliability of voltage control is of major importance when largely used. For this reason, it is to be considered that type C units should also comply with the type D requirements related to AVR, PSS, OEL, UEL. This is inline with current practices in BE and should be further investigated in topic on voltage control.
  - Therefore, further topics should take into account the possibility to maintain or slightly adapt (reduce or increase) the value for this threshold if needed. The main topics of attention are
    - Synthetic inertia, if requested, has an impact on PPM’s costs and could become a driver for increasing the threshold between type B/C.
    - Voltage control, compliance verification by simulation and eventually tests are of major importance to securely operate the power system and could become a driver for reducing the threshold between type B/C.

Working proposal taking into account arguments from stakeholders (4/6)

- **Limit C/D [at 75MW or at 25MW for units connected above 110kV] with the following points of attention**
  - For large PGMs and for units connected to the EHV grid, Fault Ride Through is of major importance for the stability of the grid. The main argument for the NC's-"110kV categorization" is the electrical proximities between each of these units (including units connected to neighboring grids)
  - However, it is proposed to derogate from the NC RfG (which states that all units connected above 110kV should be of type D)
    - Small units of size similar to type A & B and connected within an industrial grids at a voltage below 110kV but for which the industrial grid is connected to the transmission system above 110kV should not be considered as of type D even though their connection point is above 110kV to avoid a potentially high cost burden for these units.
    - Units of size similar to type C when connected above 110kV should remain type D as requested by the NC RfG. This requirement is realistic as, in relation to FRT, the stability of these units is eased by the high short-circuit power ratio and by the fact the FRT profile is defined at the connection point.

Working proposal taking into account arguments from stakeholders (5/6)

- **The T/D interface is considered at the existing border between Elia and the distribution systems (including Transmission-connected CDS).**
  - This limit will need to be confirmed by the topics dealing with the requirements at the T/D interface.
  - It needs to be emphasis that the requirements for the transmission-connected distribution facilities must take into account specificities of both public and closed distribution systems

Working proposal taking into account arguments from stakeholders (6/6)

- **The following aspects have not been considered for the working proposal:**
  - upper limits foreseen in the NC's: Nothing in the characteristics of the Belgian power system leads to the straightforward conclusion that the upper limits foreseen in the NC's for the different types of grid users should be used. The Belgian power system is indeed efficiently operated thanks to well balanced contribution of all actors to the operating capabilities of the system as a whole.
  - Approach taken by NC's: The NCs are based on connection and operation requirements and propose ranges in order to cost-efficiently meet a secure power system over time. Arguments being in conflict with the NCs approach should not be considered at this stage of the process.
  - Significant cost increase between types: Cost increase between types are acknowledged but these highly depend on the hypothesis taken (type of unit, strength of the requirement for a given type, standardization of equipment's and certification …). Furthermore, current regulation in Belgium should be used as basis for cost analysis rather that comparison between types.
  - CBA's: The NC's do not foresee the need for CBA's to be conducted when implementing the requirements of the NC's for new users. However, justifications will be provided to support the regulatory approval process.
  - Provision of MVAr from local generation: It needs to be emphasis that these MVArs are needed and are valuable for the power system to control local voltages but also to maintain the reactive power balance of Belgium.

What should a type B generating units do (*in addition to A generating units*)? 1/3

Network Codes		Belgium	
What?	Which doc?	Existing threshold in BE	Which doc?
Remote control of active power	NC RfG – PGM – Art. 11.2	250kVA 1MVA or lower	Walloon Grid Code Flemish Grid Code
Low Voltage Ride Through	NC RfG – PGM – Art. 11.3	1MVA	Synergrid C10/11
Conditions for reconnection after tripping	NC RfG – PGM – Art. 11.4	10kVA	Synergrid C10/11
Authorization for reconnection during restoration	NC RfG – PGM – Art. 11.4	Connection in Local Transmission or Transmission (ie. 5MVA, 15MVA or 25MVA)	SOK (within clearing of Feeders) Walloon Grid Code Flemish Grid Code
Details of control schemes and settings	NC RfG – PGM – Art. 11.5	Connection in Local Transmission or Transmission (ie. 5MVA, 15MVA or 25MVA)	Annex of Orientation Study for Federal and Regional Grid Codes
Details of electrical protection schemes and settings	NC RfG – PGM – Art. 11.5	0kV	RGIE Synergrid C10/11
Operational notification procedure for connection & compliance verification – equipment certificate & detailed data	NC RfG – PGM – Art. 28.1, 29.1, 29.2, 29.3, 29.4, 29.5	0kV with equipment certificate Connection to MV (no simulation) (i.e. 56kV or 250kVA)	Synergrid C10/26 Federal Grid Code Walloon Grid Code Flemish Grid Code
System state monitoring, frequency, voltage, Scc, stability, congestion management, protection, SA, Notification in case of non-compliance and modification.	NC OS & NC OP&S		

What should a type B generating units do (*in addition to A generating units*) 2/3

Network Codes		Belgium	
What?	Which doc?	Existing threshold in BE	Which doc?
Data exchange for DS-connected users directly between user and TSO if economically and efficient	NC OS	Not Existing	/
Reactive Power Capability to be defined by RNO	NC RfG – PPM– Art. 17.2	1MVA	Synergrid C10/11
Can request Fast current injection	NC RfG – PPM– Art. 17.2	Belgian Offshore Grid (i.e. above 75MW)	Annex for wind generation of Federal Grid Code
Low Voltage Ride Through – Post fault active power recovery	NC RfG – PPM– Art. 17.3	- 1MVA for LVRT - Belgian Offshore Grid (i.e. above 75MW) for post fault active power recovery	- Synergrid C10/11 - Annex for wind generation of Federal Grid Code
Limited Frequency Sensitive Mode – Over-Frequency – Test or Equipment Certificate	NC RfG – PPM– Art. 43.1, 43.2, 43.3	0kVA with Equipment certificate	Synergrid C10/26
Limited Frequency Sensitive Mode – Over-Frequency – Simulation or Equipment Certificate	NC RfG – PPM– Art. 50.1, 50.2	0kVA with Equipment certificate	Synergrid C10/26
Fast current injection – Simulation or Equipment Certificate – if requested	NC RfG – PPM– Art. 50.1, 50.3	Belgian Offshore Grid (i.e. above 75MW)	Annex for wind generation of Federal Grid Code
Low Voltage Ride Through – Post fault active power recovery – Simulation or Equipment Certificate	NC RfG – PPM– Art. 50.1, 50.4, 50.5	Belgian Offshore Grid (i.e. above 75MW)	Annex for wind generation of Federal Grid Code

What should a type B generating units do (*in addition to A generating units*)? 3/3

Network Codes		Belgium	
What?	Which doc?	Existing threshold in BE	Which doc?
Reactive Power Capability to be defined by RNO	NC RfG – SPGM– Art. 14.2	1MVA	Synergrid C10/11
AVR controlling alternator terminal at constant value	NC RfG – SPGM– Art. 14.2	Not Existing. More advanced voltage control from 25MW	/
Low Voltage Ride Through – Post fault active power recovery	NC RfG – SPGM – Art. 14.3	- 1MVA for LVRT - Not Existing for post fault active power recovery	Synergrid C10/11
Limited Frequency Sensitive Mode – Over-Frequency – Test or Equipment Certificate	NC RfG – SPGM – Art. 40.1, 40.2	0kVA with Equipment certificate	??
Limited Frequency Sensitive Mode – Over-Frequency – Simulation or Equipment Certificate	NC RfG – SPGM – Art. 47.1, 47.2	0kVA with Equipment certificate	??
Low Voltage Ride Through – Post fault active power recovery – Simulation or Equipment Certificate	NC RfG – SPGM – Art. 47.1, 47.3, 47.4	Not Existing	/

What should a type C generating units do (*in addition to B generating units*)? 1/5

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Capability of participating to frequency restoration reserve and restoration reserve	NC RfG – PGM – Art. 12.2	**CIPU** (Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations) **except Nuclear, WKK & Wind**	CIPU, Federal Grid Code Walloon Grid Code Flemish Grid Code
Limited Frequency Sensitive Mode – under-frequency	NC RfG – PGM – Art. 12.2	Not Existing	/
Voltage deviation protection devices	NC RfG – PGM – Art. 12.3	0 kVA	Synergrid C10/11
Frequency, Voltage and Power quality withstand capability	NC RfG – PGM – Art. 12.4	0 kVA	Synergrid C10/11
Can be requested to provide black start offer inline with black start tender	NC RfG – PGM – Art. 12.5	**CIPU** (Connection in Local Transmission or Transmission (ie. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	CIPU, Federal Grid Code Walloon Grid Code Flemish Grid Code
Instability protection, fault recording & dynamic models	NC RfG – PGM – Art. 12.6	Connection in Local Transmission or Transmission (ie. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code

What should a type C generating units do (*in addition to B generating units*)? 2/5

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Reactive Power Capability to be defined by RNO inline with limits defined in NC	NC RfG – SPGM – Art. 15.2	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code
Can be requested to provide synthetic inertia	NC RfG – PPM – Art. 18.2	Not Existing	/
Reactive Power Capability to be defined by RNO inline with limits defined in NC	NC RfG – PPM – Art. 18.3	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Annex for wind generation of Federal Grid Code and Regional Grid Codes
Operational notification procedure for connection & compliance verification – simulations and test	NC RfG – PGM – Art. 28.1, 29.1, 29.2, 29.3, 29.4, 29.5	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code
Tests – modulation of active power	NC RfG – SPGM – Art. 41.1, 41.2	Not Existing except for R3 contracts	AS production contracts
Tests – Frequency Sensitive Mode	NC RfG – SPGM – Art. 41.1, 41.3	Not Existing except for R1 contracts	AS production contracts
Tests – Frequency Restoration Control	NC RfG – SPGM – Art. 41.1, 41.4	Not Existing except for R2 contracts	AS production contracts

What should a type C generating units do (*in addition to B generating units*)? 3/5

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Test - Black-start, if requested	NC RfG – SPGM – Art. 41.1, 41.5	All black-start units	AS production contracts
Test - Tripping to houseload	NC RfG – SPGM – Art. 41.1, 41.6	Not Existing	/
Tests - Reactive Power Capability	NC RfG – SPGM – Art. 41.1, 41.7	Not Existing (only ex-post verification in MVAr Contract)	/
Simulation – Limited Frequency Sensitive Mode – Under-frequency	NC RfG – SPGM – Art. 48.1, 48.2	Not Existing	/
Simulation – Frequency Sensitive Mode	NC RfG – SPGM – Art. 48.1, 48.3	Not Existing	/
Simulation – Tripping to houseload	NC RfG – SPGM – Art. 48.1, 48.4	Not Existing	/
Simulation - Reactive Power Capability	NC RfG – SPGM – Art. 48.1, 48.5	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code
Operational notification procedure for connection & compliance verification – simulations and test	NC RfG – PGM – Art. 28.1, 29.1, 29.2, 29.3, 29.4, 29.5	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code

What should a type C generating units do (*in addition to B generating units*)? 4/5

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Tests – modulation of active power	NC RfG – PPM – Art. 44.1, 44.2	Not Existing except for R3 contracts	AS production contracts
Tests – Limited Frequency Sensitive Mode – Under-frequency	NC RfG – PPM – Art. 44.1, 44.3	Not Existing	/
Tests – Frequency Sensitive Mode	NC RfG – PPM – Art. 44.1, 44.4	Not Existing except for R1 contracts (if any for PPM)	AS production contracts
Tests – Frequency Restoration Control	NC RfG – PPM – Art. 44.1, 44.5	Not Existing except for R2 contracts (if any for PPM)	AS production contracts
Tests - Reactive Power Capability	NC RfG – PPM – Art. 44.1, 44.6	Not Existing (only ex-post verification in MVAr Contract)	/
Test - Voltage control, if selected	NC RfG – PPM – Art. 44.1, 44.7, 44.10	Not Existing (only ex-post verification in MVAr Contract) **except pilot test** for 1 Wind Farm in BE	/
Test - Reactive power control, if selected	NC RfG – PPM – Art. 44.1, 44.8, 44.10	Not Existing (only ex-post verification in MVAr Contract)	/
Test - Power factor control test, if selected	NC RfG – PPM – Art. 44.1, 44.9, 44.10	Not Existing	/

What should a type C generating units do (*in addition to B generating units*)? 5/5

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Simulation – Limited Frequency Sensitive Mode – Under-frequency	NC RfG – PPM – Art. 51.1, 51.2	Not Existing	/
Simulation – Frequency Sensitive Mode	NC RfG – PPM – Art. 51.1, 51.3	Not Existing	/
Simulation – Tripping to houseload	NC RfG – PPM – Art. 51.1, 51.4	Not Existing	/
Simulation - Synthetic Inertia, , if requested	NC RfG – PPM – Art. 51.1, 51.5	Not Existing	/
Simulation - Reactive Power Capability	NC RfG – PPM – Art. 51.1, 51.6	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation (with simulations)	Federal Grid Code Walloon Grid Code Flemish Grid Code
Simulation – Power Oscillation Damper	NC RfG – PPM – Art. 51.1, 51.7, 44.10	Belgian Offshore Grid (i.e. above 75MW)	Annex for wind generation of Federal Grid Code, Walloon Grid Code, Flemish Grid Code

What should a type D generating units do (*in addition to C generating units*)? 1/2

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Voltage withstand capability	NC RfG – PGM – Art. 13.2	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code
Fault-Ride Through capability	NC RfG – PGM – Art. 13.3	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code
Synchrocheck / Synchrocoupler	NC RfG – PGM – Art. 13.4	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code
AVR, UEL, OEL, PSS	NC RfG – SPGM – Art. 16.2	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code

What should a type D generating units do (*in addition to C generating units*)? 2/2

Network Codes		Belgium	
What?	Which doc?	Threshold in BE	Which doc?
Energization Operational Notification	NC RfG – PGM – Art. 30.1, 31.1, 31.2	Not explicit	/
Interim Operational Notification	NC RfG – PGM – Art. 30.1, 32.1, 32.2, 32.3, 32.4, 32.5	Connection in Local Transmission or Transmission Simplified below 25MVA 5years/15years in local transmissions	Federal Grid Code Walloon Grid Code Flemish Grid Code
Final Operational Notification	NC RfG – PGM – Art. 30.1, 33.1, 33.2, 33.3, 33.4, 33.5, 33.6	Connection in Local Transmission or Transmission Simplified below 25MVA	Federal Grid Code Walloon Grid Code Flemish Grid Code
Simulation – POD & PSS	NC RfG – SPGM – Art. 49.2	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code
Simulation – Fault Ride Through	NC RfG – SPGM – Art. 49.3	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code
Simulation – Fault Ride Through	NC RfG – PPM – Art. 52.3	Connection in Local Transmission or Transmission (i.e. 5MVA, 15MVA or 25MVA) & Local Generation	Federal Grid Code Walloon Grid Code Flemish Grid Code