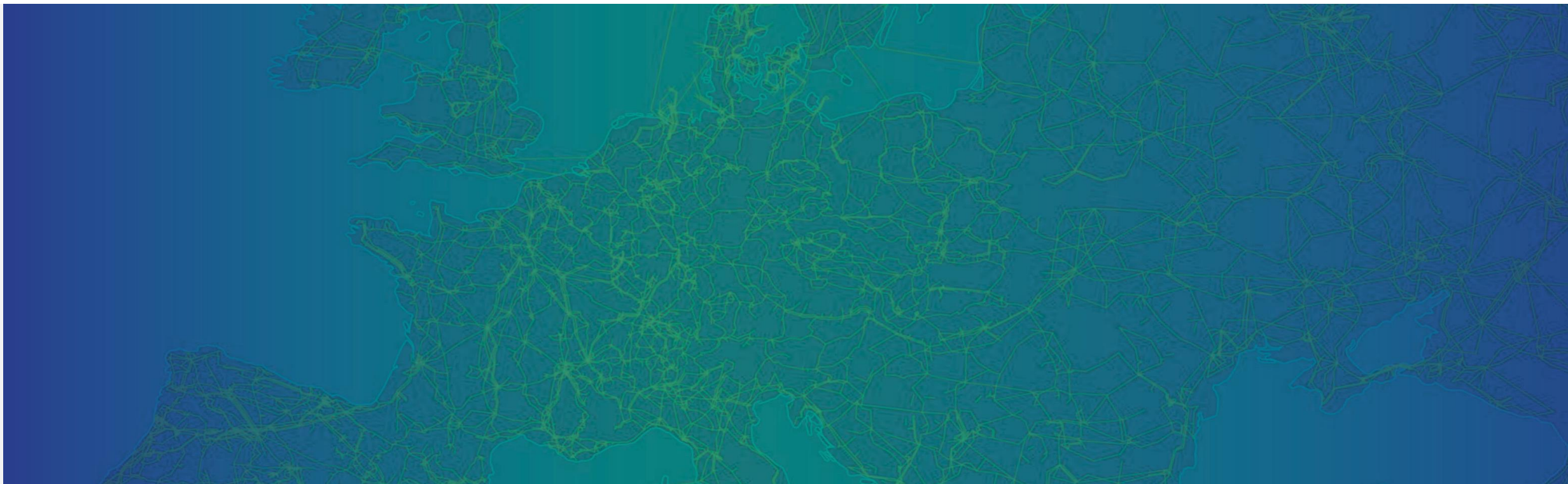


ENTSO-E CNC Implementation Monitoring Report 2020

09 March 2021



Introduction and background

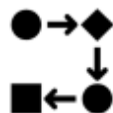
- In its second edition, the 2020 IMR analyses and provides an overview of the national implementation status of NC RfG, NC DC and NC HVDC.
- The report focuses on the status of the implementation of the non-exhaustive requirements of the Connection Network Codes, specifying whether a requirement has been implemented or not and how it has been implemented.
- The numerical values/ranges for certain non-exhaustive requirements are taken into account in the Monitoring Excel File which is published together with the report ([link here](#)).

Highlights of the second edition of the CNC Monitoring Report



Improved Analytics

- Implementation of non-exhaustive requirements by the Member States with dedicated figures
- Detailed graphical country-wise comparison of general and site specific implementations



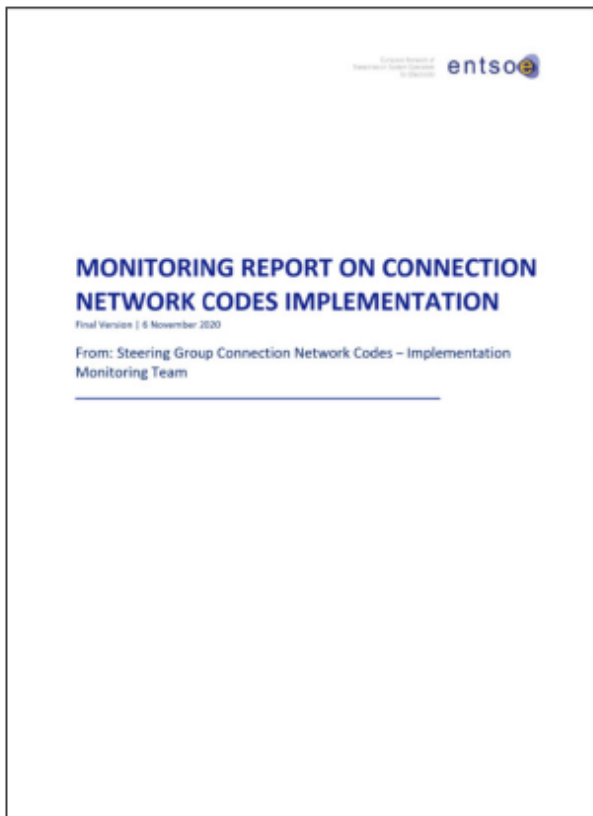
Improved process and structure

- Improved Monitoring Excel Tool to gather data of non-exhaustive requirements
- Introduction with guidance chapter how to interpret results
- Improved figures and design for better readability and visualisation of results
- Full set of values as complement of the report



Special feature

- Complete FRT assessment with supportive markings for compliance verification



Structure of the report

The IMR chapters are clustered according to the three CNCs: NC RfG, NC DCC and NC HVDC. Each CNC is separated into four main topics, for which the implementation of the non-exhaustive requirements has been analyzed:

- Frequency Issues,
- Voltage Issues,
- System Restoration Issues and
- Instrumentation, Simulation Models and Protection Issues

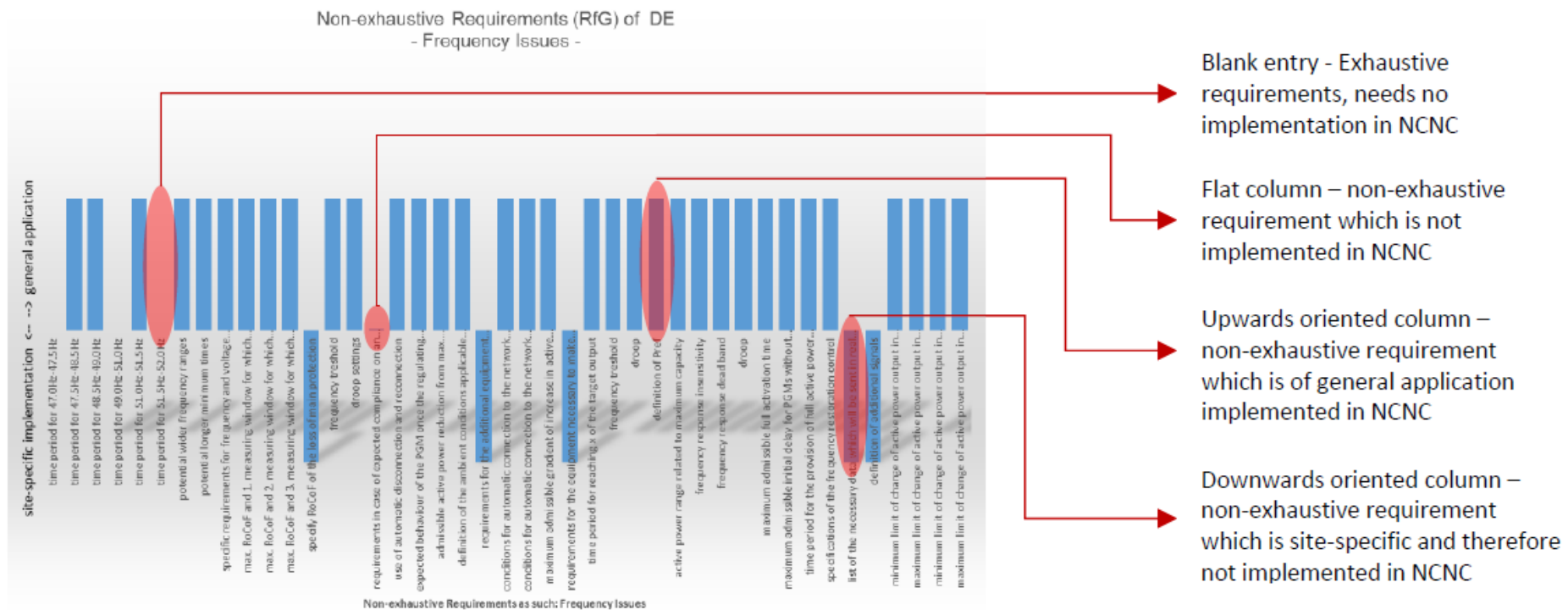
The non-exhaustive requirements have been categorized based on three types

- General – requirement specified through a range of values to be applied uniformly
- Site-specific – requirement specified at a later stage on a project base
- Not-implemented – requirement not taken into consideration at national level.

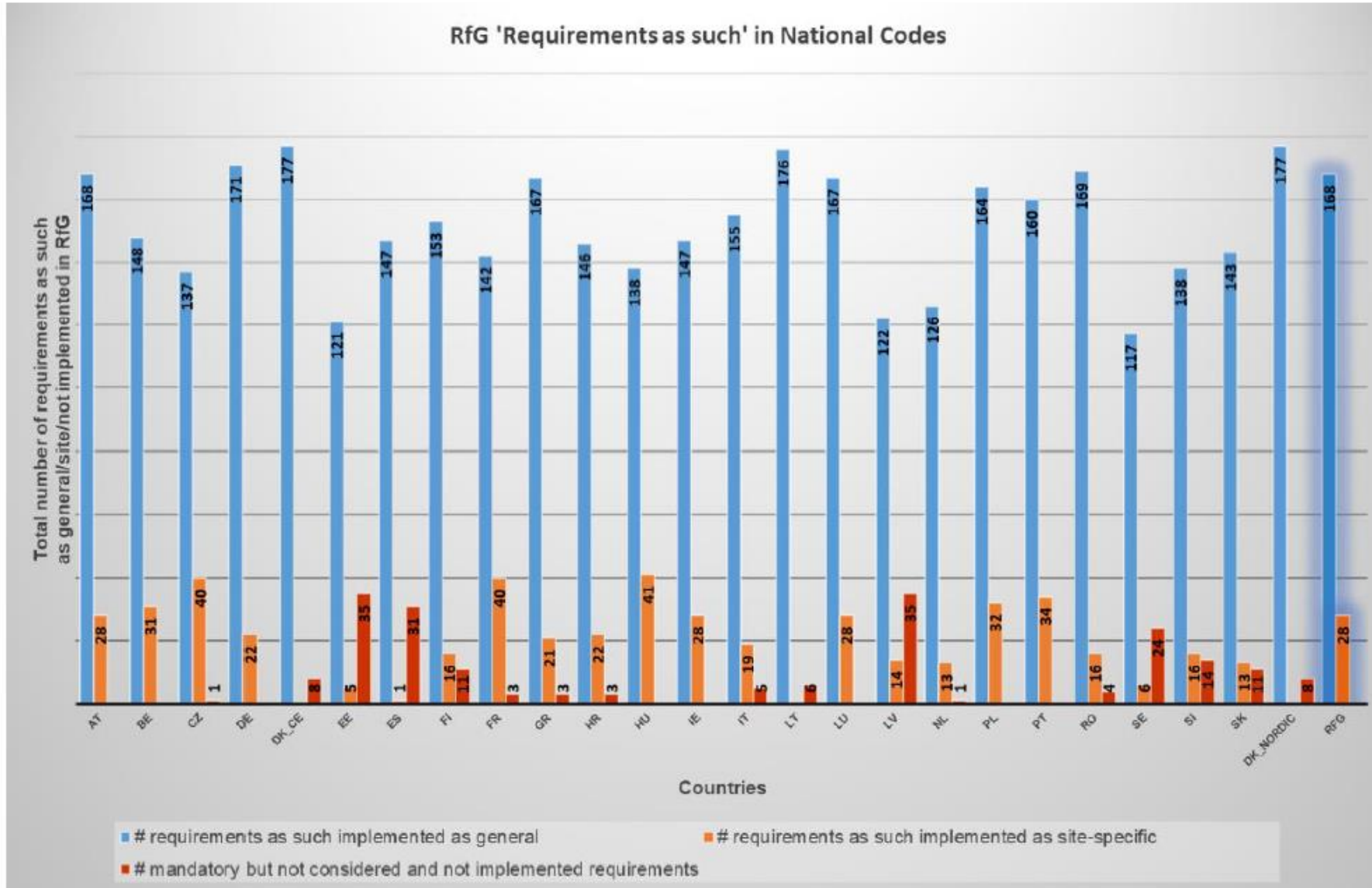
Graphical setting

A set of graphs has been plotted for each Member State to demonstrate the implementation of non-exhaustive requirements for each of the following categories.

The graphical analysis reflects whether a non-exhaustive requirement as such has been implemented as of general or site-specific application. In addition, the graphs illustrate the specific countries' approach to non-exhaustive requirements as defined by the CNCs and also reveals where specific requirements have not been implemented.

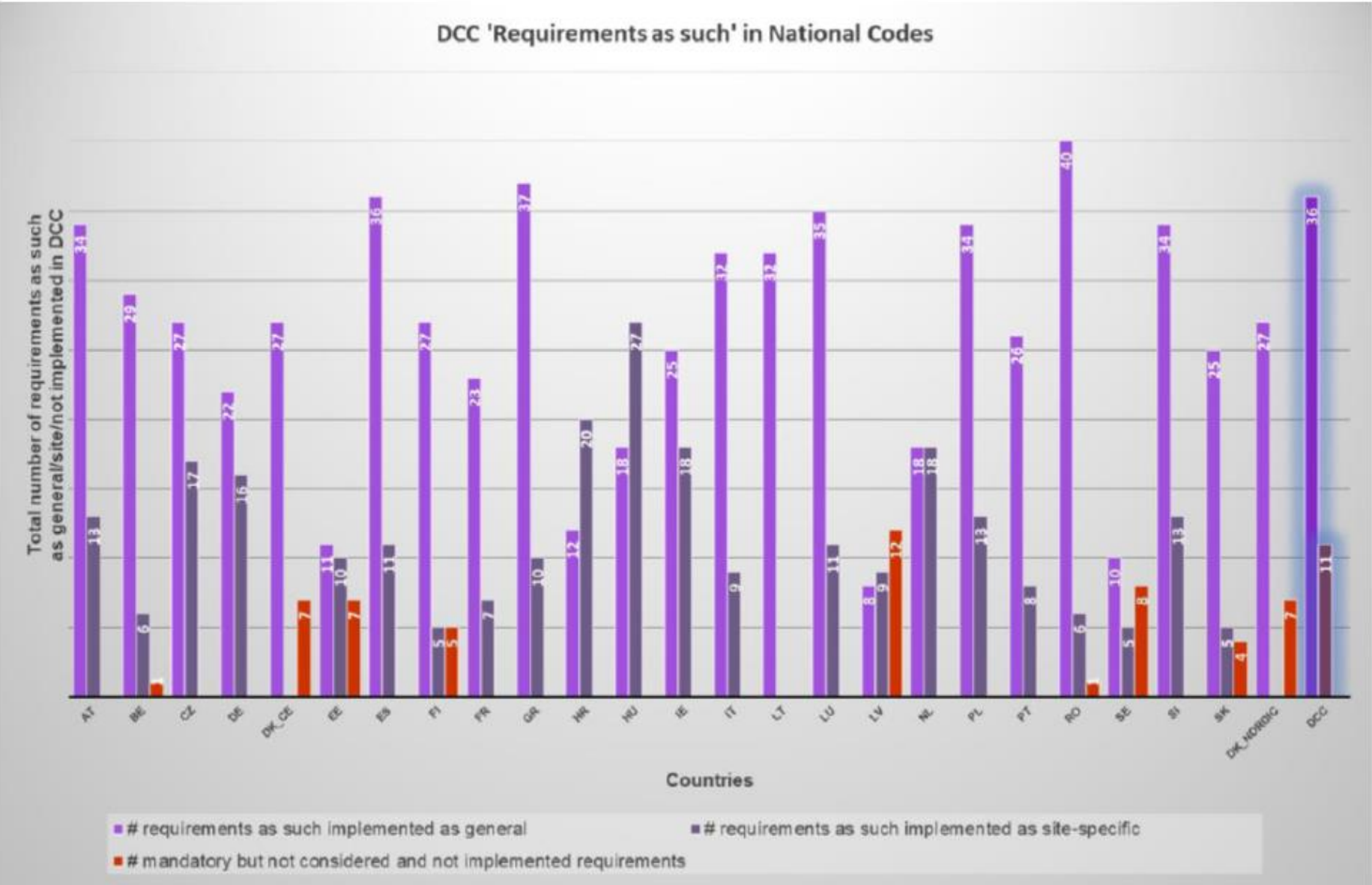


Overview of the NC RfG implementation among the EU member countries



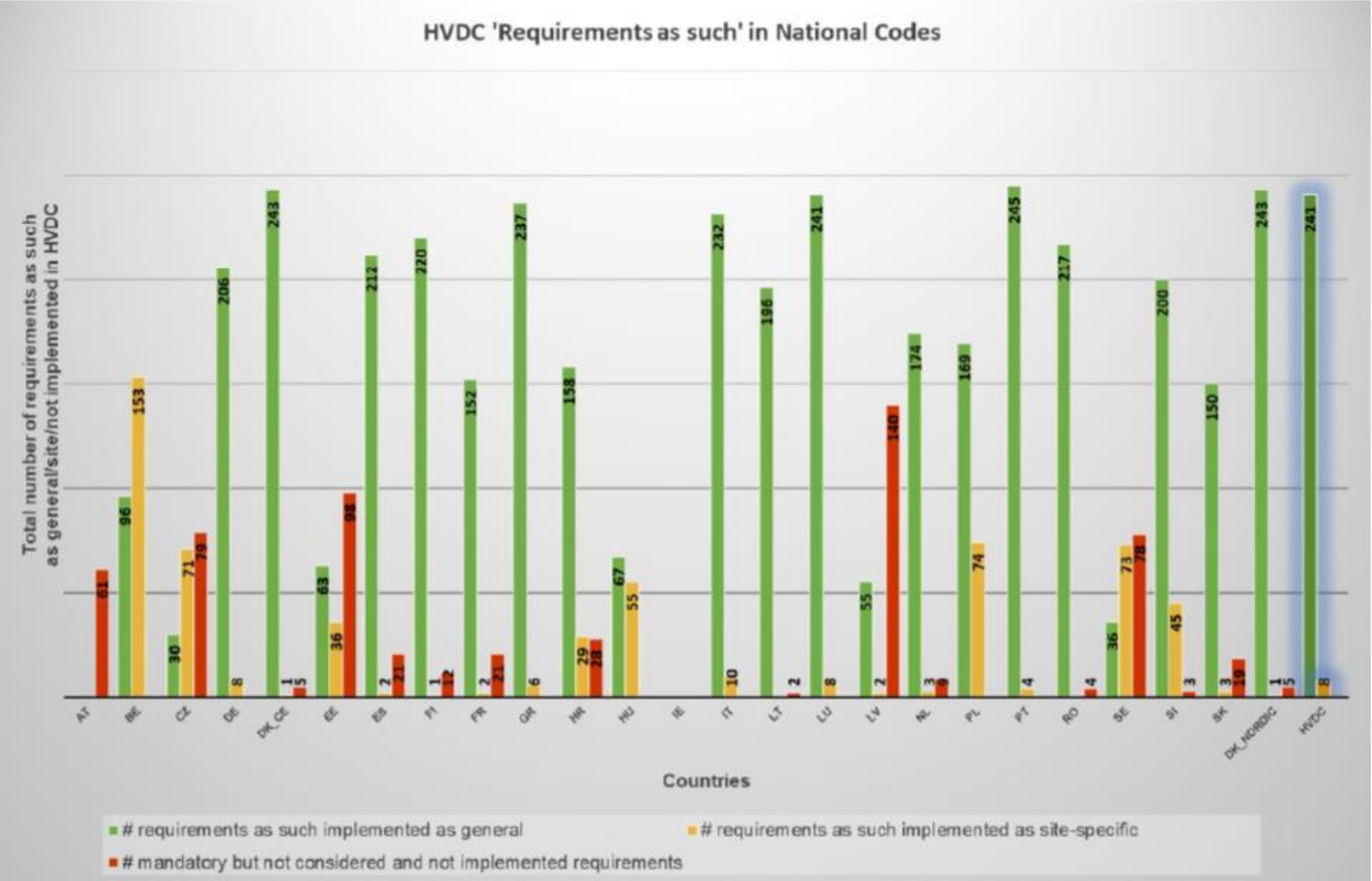
Number of implemented non-exhaustive requirements in NC RfG – Reference: total number of to be implemented RfG non-exhaustive requirements as such (168 General, 28 site-specific)

Overview of the NC DC implementation among the EU member countries



Number of implemented non-exhaustive requirements in NC DC – Reference: total number of to be implemented non-exhaustive requirements as such (36 General, 11 site-specific)

Overview of the NC HVDC implementation among the EU member countries



Number of implemented non-exhaustive requirements in NC HVDC – Reference: total number of to be implemented non-exhaustive requirements as included in the code (241 general, 8 site specific)

Overview of the NC RfG Type threshold implementation among the EU member countries – A/B

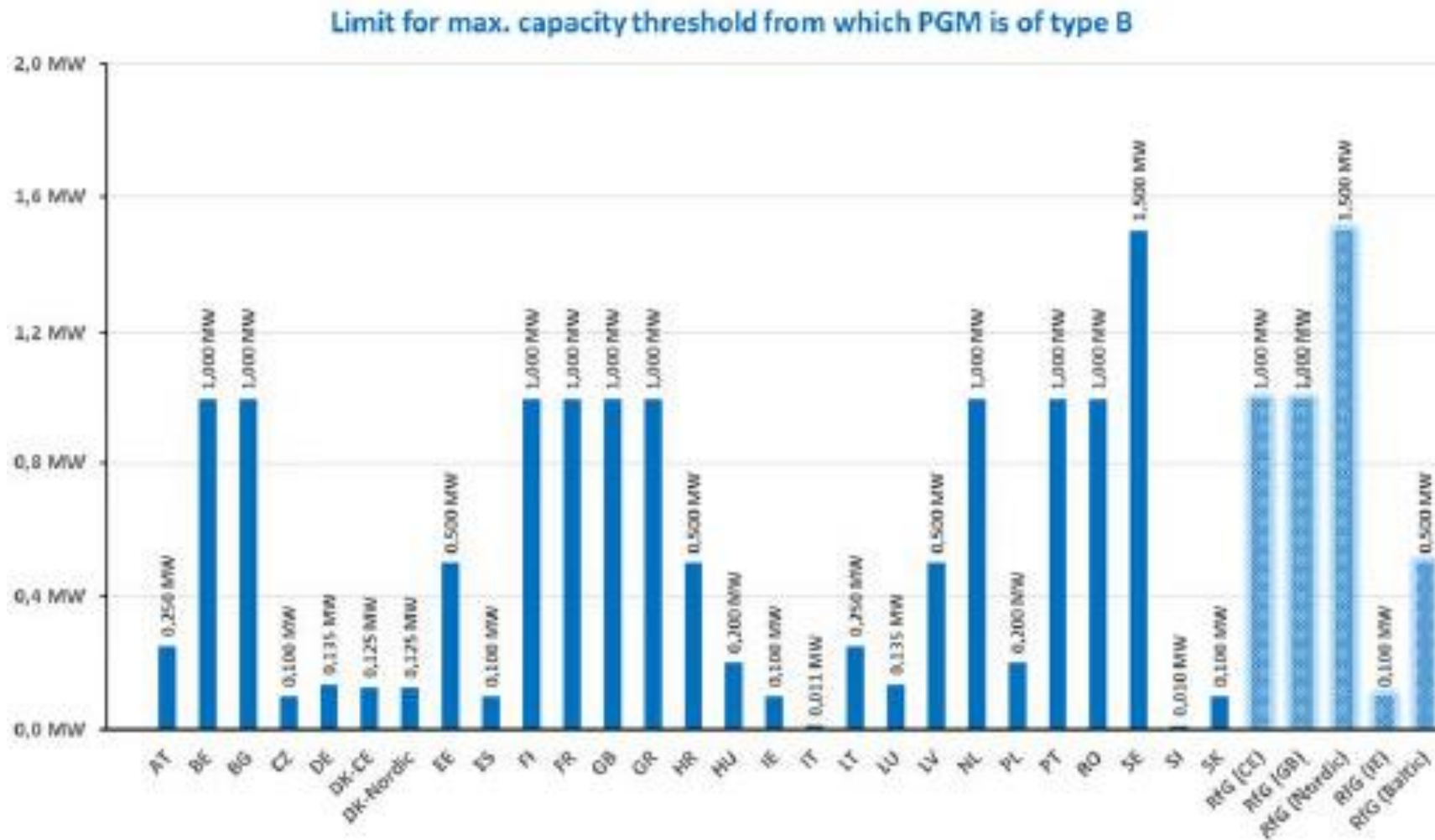


Figure 2: Limit for max. capacity threshold from which PGM is of type B

Overview of the NC RfG Type threshold implementation among the EU member countries – B/C

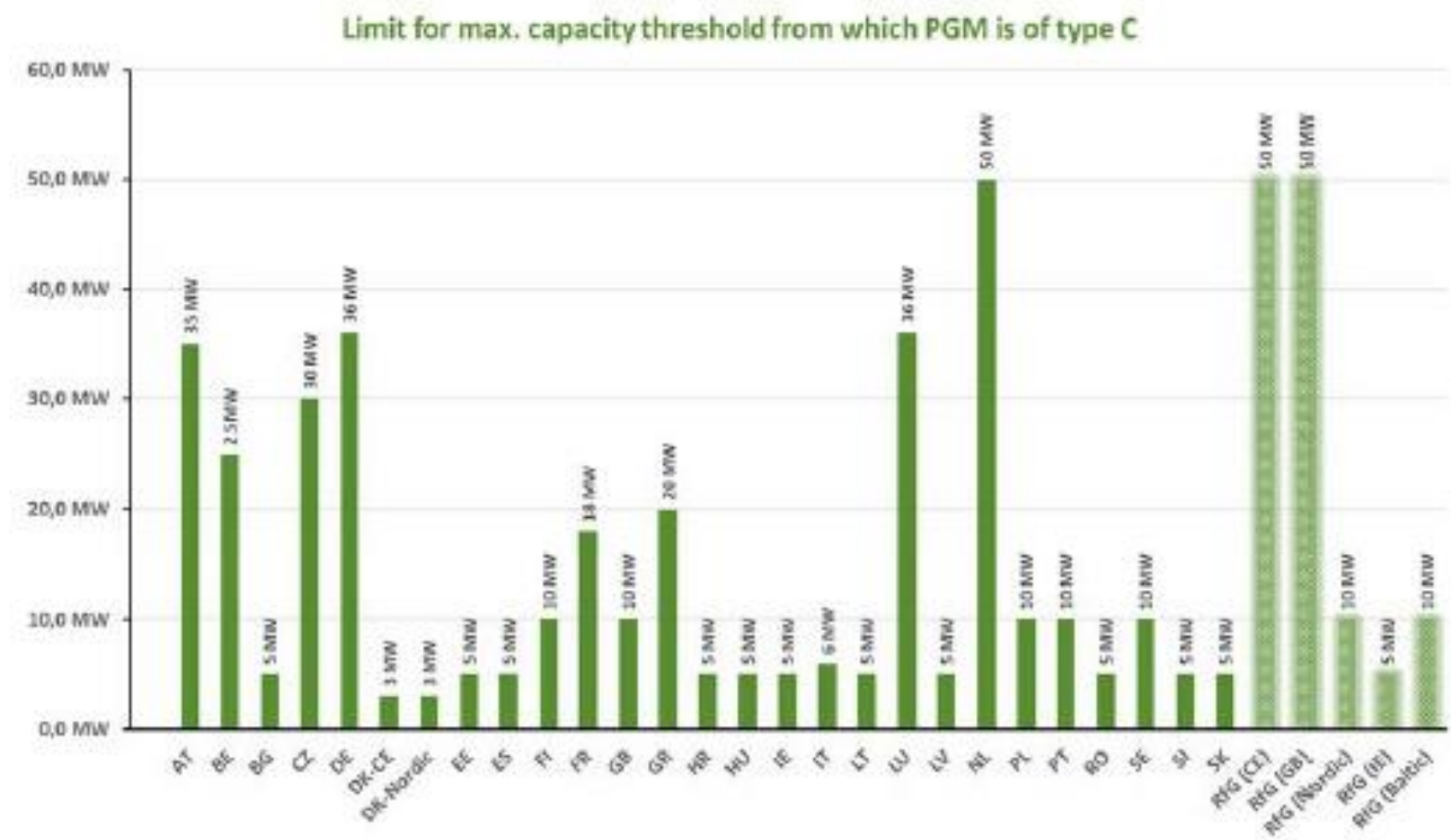


Figure 3: Limit for max. capacity threshold from which PGM is of type C

Overview of the NC RfG Type threshold implementation among the EU member countries – C/D

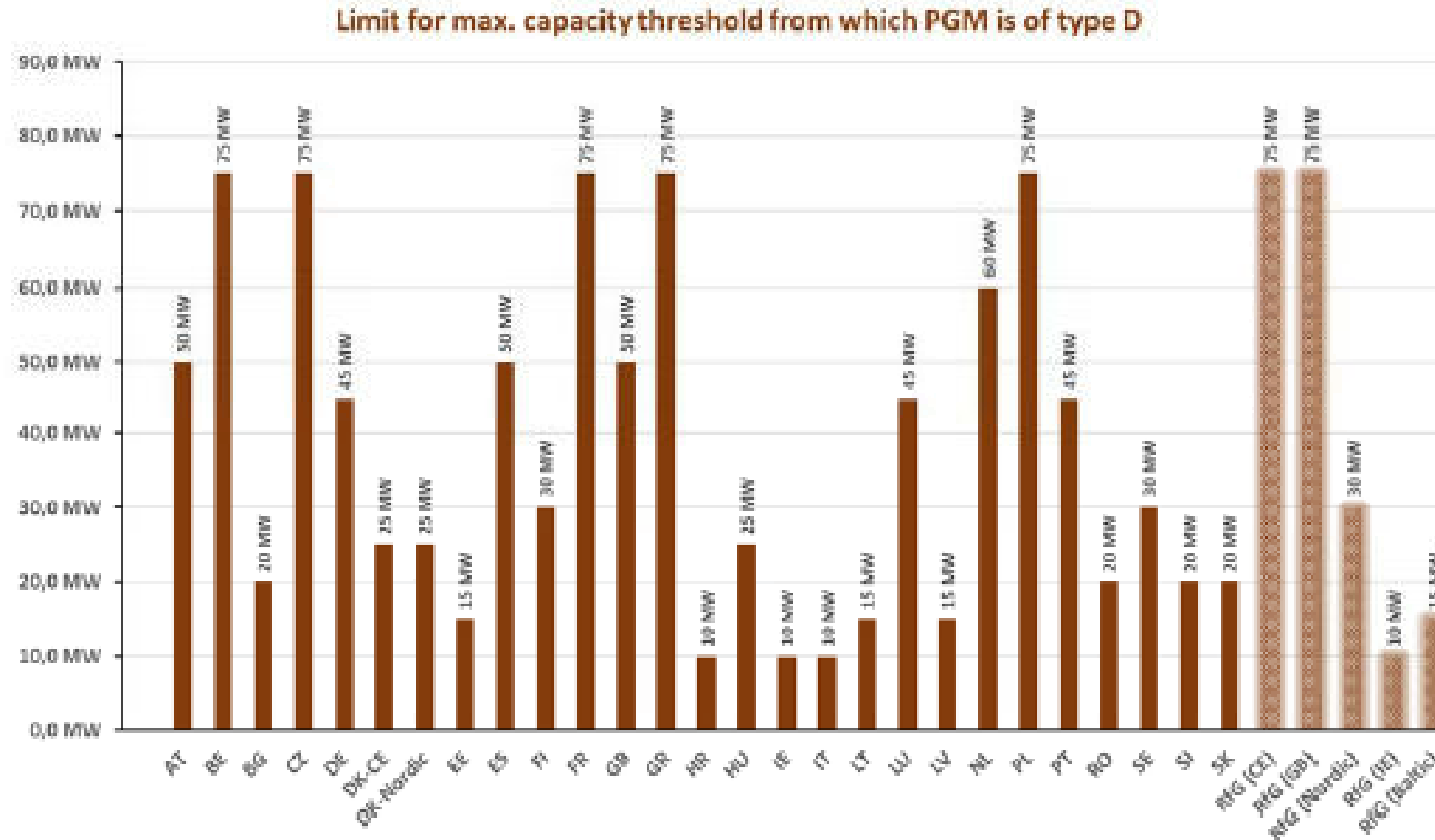
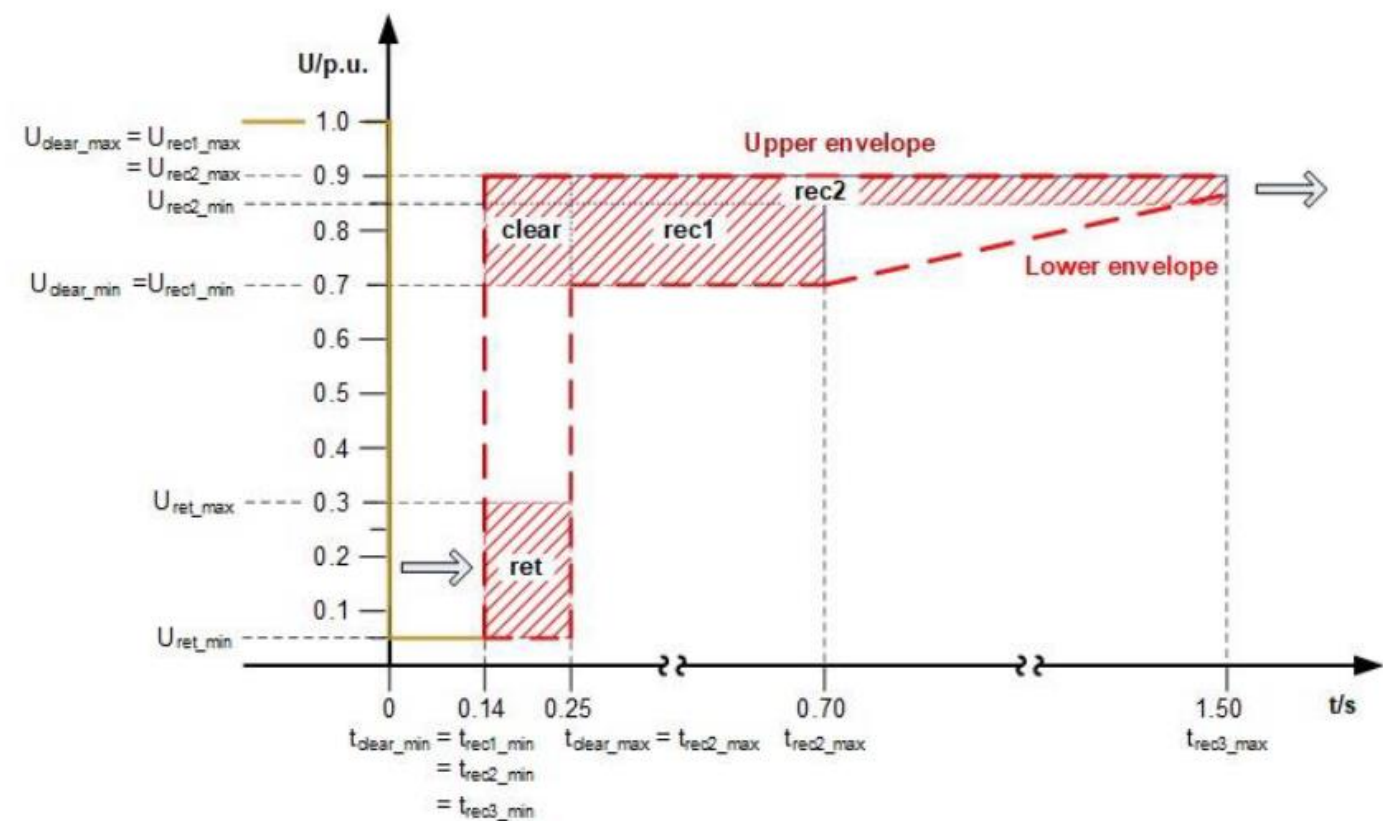


Figure 4: Limit for max. capacity threshold from which PGM is of type D

Annex to the IMR – FRT Capability analysis

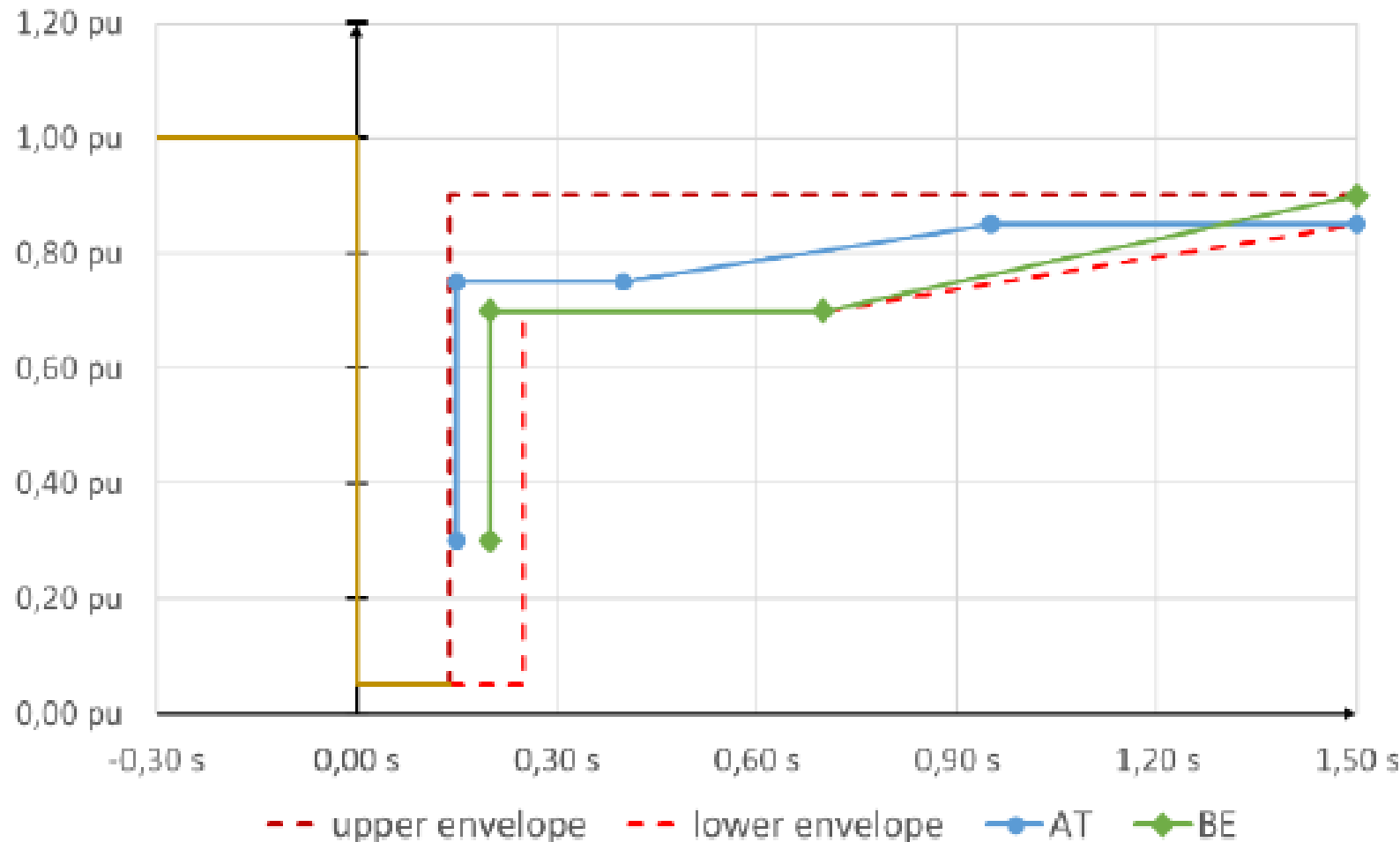
The annex to the report includes a graphical representation of the implemented Fault-Ride-Through capabilities in the CNCs. Fault-ride-through profile, a SPGM type B/C, FRT curve should be inside the defined area limited by the red upper and lower boundary conditions in the figure below. The boundaries are set as per the values indicated in the CNC



Voltage parameters (p.u.)		Time parameters (s)	
U_{ret}	0,05 – 0,30	t_{clear}	0,14 – 0,15 (0,14 – 0,25)
U_{clear}	0,70 – 0,90	t_{rec1}	t_{clear}
U_{rec1}	U_{clear}	t_{rec2}	$t_{rec1} – 0,70$
U_{rec2}	0,85 – 0,90 and $\geq U_{clear}$	t_{rec3}	$t_{rec2} – 1,50$

Annex to the IMR – FRT Capability analysis

FRT SPGM type B/C



Through this graphical representation is easy to visualize the national implementation in respect to the values indicated in the CNCs.

For the reason of readability and easy interpretation the FRT implementation curves of two countries at a time are grouped in one diagram in alphabetic order.

Conclusions

The monitoring report reveals, that a high level of completeness has been reached by the EU Member States. The table below reports the level of implementation of the CNC in the EU member countries.

CNC	Percentage of the mandatory non exhaustive requirements implemented
Requirements for Generators	95.57%
Demand Connection Code	94.53%
HVDC Network Code	89.37%

