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European Network Codes for Grid Connection

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SUMMARY

The need for European Network Codes (NCs) was identified during the course of developing the 3rd legislative package for an internal gas and electricity market of the European Union (EU). The legislative framework assigns specific roles to the following entities: The European Commission (EC) to initiate the development of and to adopt NCs, the Agency for the Cooperation of Energy Regulators (ACER) to release framework guidelines for NCs and to recommend the adoption of NC to the EC and the Network of Transmission System Operators for Electricity (ENTSO-E) to draft NCs. The NCs in the area of grid connection (Connection Network Codes – CNCs) initiated by the EC cover "Requirements for Generators" (NC RfG), "Demand Connection Code" (NC DCC) and "Requirements for HVDC system and DC-connected power park modules" (NC HVDC). After an extensive debate and drafting process across Transmission System Operators (TSOs), Distribution System Operators (DSOs), manufacturers, system users, industrial consumers, NRAs and policy makers, ENTSO-E finalized the CNCs in 2013/2014 and received positive opinions by ACER. Subsequently the CNCs were submitted to the EC for comitology, which is legislative procedure to establish European legislation with involvement of the EU Member States. After their adoption by the EC and European Parliament and Council scrutiny the CNCs will enter into force in the course of 2016 by publication in the Official Journal of the European Union.

This paper shall provide an overview of the NC development process and in particular the objectives and key technical requirements of the CNCs. It outlines technical capabilities of power generation modules, demand and distribution system facilities and HVDC systems, which are essential to meet the future challenges of maintaining security of supply in an interconnected electricity supply system.

KEYWORDS

European Legislation, Connection Network Codes, Connection Requirements, Power Generating Modules, Demand Connection, HVDC systems, Renewable Energies Integration, Market Facilitation

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1 Legislative framework for development and implementation of European Network Codes

Over the last 20 years within the European Union (EU) the European Commission (EC) has established numerous legislative acts in the electricity sector, which have had and continue to have substantial impact on the electricity supply business. These activities are driven by the three main objectives of European energy policy (Figure 1), which consist of:

- Facilitation of a competitive European internal market at all levels of the electrical energy supply chain - generation, transmission, distribution, wholesale and retail.
- Sustainable integration of renewable energy sources (RES) at large scale to decarbonise the electricity sector and to meet ambitious targets of climate protection.
- Ensuring security of supply to all customers at a high level.

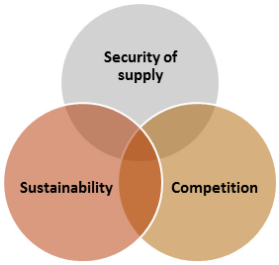

Figure 1: European energy policy goals

These energy policy goals interact with each other and are reflected by the current European legislative framework for the electricity sector, which is predominantly determined by Directive 2009/72/EC [1] and Regulation 714/2009/EC [2].

Regulation 714/2009/EC introduces the development of network codes (NCs) for providing and managing effective and transparent access to the transmission networks across borders, and to ensure coordinated and sufficiently forward-looking planning and sound technical evolution of the transmission system, including the creation of interconnection capacities, with due regard to the environment. It identifies areas, which shall be covered by NCs. These areas can be categorized as:

- Rules and prerequisites for network connection and access
- Rules and responsibilities for transmission system operation
- Market rules

The Regulation furthermore defines the process of NC development (Figure 2), implementation and amendment. Specific roles in these processes are assigned to designated entities.

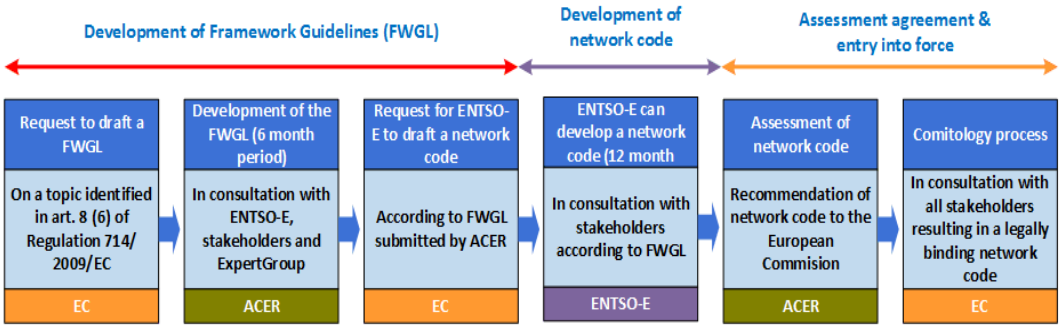

Figure 2: Network code development process

The development of a NC consists of two main steps, which are both initiated by the EC. In a first step the EC mandates the Agency for the Cooperation of Energy Regulators (ACER) to draft, consult and release framework guidelines (FWGL) within 6 months setting out clear and objective principles, for the development of NCs relating to areas, which have been identified in a priority list of NC topics. A FWGL shall specify the issues to be addressed and resolved by one or more NCs with regard to this priority area. Based on the FWGL the EC in a second step mandates the Network of Transmission System Operators for Electricity (ENTSO-E) to draft the relevant NC(s) within 12 months. The NC development also includes a public consultation of relevant stakeholders.

After its development ENTSO-E submits the NC to ACER for assessment of compliance with the relevant FWGL within 3 months. When ACER is convinced that the NC is in line with the relevant FWGL, ACER may recommend to the EC its adoption within a reasonable time period.

In the final stage of enforcement of a NC the EC conducts the comitology procedure, during which the text is consulted with the EU member states (MSs). Comitology ends with a voting for adoption as EU regulation. After a positive vote the regulation establishing the NC is submitted to the European Parliament and the Council for scrutiny before entry into force.

After the entry into force of a NC, ENTSO-E shall monitor and report to ACER its implementation in the MSs and its effect on the harmonisation of applicable rules aimed at facilitating market integration. ACER itself has the same implementation monitoring obligations supplemented by the effect on non-discrimination, effective competition and the efficient functioning of the market and shall report on it to the EC. The precise scope of monitoring may vary significantly between the NCs, because it depends largely on the individual content and the national or regional actions to be taken for implementation. Due to the considerable overlaps of ENTSO-E's and ACER's monitoring obligations, the associations pursue a coordinated approach for reasons of efficiency and avoidance of redundancy.

Draft amendments to any enforced NC may be proposed to ACER by persons who are likely to have an interest in that NC, including ENTSO-E, transmission system operators, system users and consumers. ACER may also propose amendments on its own initiative. After consultation of the relevant stakeholders ACER may make reasoned proposals for amendments to the EC, explaining how such proposals are consistent with the objectives of the NCs.

2 Objectives of Connection Network Codes in the frame of future system challenges

It is important to acknowledge that the three objectives of ensuring security of supply, promoting the decarbonisation of the electricity sector and creating competitive, liquid markets interact closely, and to recognize that focusing on only one or two of them could result in a detrimental impact on the others. NCs shall deliver a balanced set of rules to promote all three of these objectives equally.

The characteristics of the new generation mix with a significant RES penetration, the potential for active consumer behaviour (smart grids, flexible demand) and the increasing level of interconnections are the main challenges electric power systems shall cope with in next years, in particular:

- Operational challenges - The management of load balance becomes more difficult due to increasingly volatile generation, predominantly in periods with highest non-dispatchable RES generation. It shall be ensured that technical capabilities for balancing are available to deploy the services needed to maintain this balance and ensure the security of the grid.
- A changing role for network users – The changes in generation portfolio and operational challenges result in a change in the role of network users. It becomes increasingly important that all types of users (i.e. generation, demand, distribution networks, and interconnections) play an active role in providing the capabilities and services which are needed to maintain the security of the pan-European transmission system.
- Changes in market dynamics - Markets with large volumes of RES tend to have more volatile prices (including low or even negative prices) and there tend to be fewer periods in which generators can recover and consequently fewer running hours for many conventional plants.

The NCs in the area of grid connection (Connection Network Codes – CNCs) therefore cover "Requirements for Generators" (NC RfG) [3], "Demand Connection Code" (NC DCC) [4] and "Requirements for HVDC system and DC-connected power park modules" (NC HVDC) [5]. They deal with these challenges by pursuing the following main objectives:

- Requirements for promoting stronger, robust and smarter power systems - The energy policy targets will not be achieved without robust and flexible generation facilities, transmission and distribution systems, demand facilities and interconnections Therefore they will need to change significantly in the coming years. The changes include much higher levels of interconnection using a greater portion of HVDC and much more active distribution networks with embedded generation and greater customer participation. All of these aspects deserve a framework of requirements with a pan-European scope that can provide fit-for-purpose tools to

manage these changes. From this perspective, CNCs provide a platform for secure system operation and market facilitation.

- Facilitation of a competitive pan-European market - A single European electricity market has the potential to deliver significant benefits: larger and more liquid markets give generators wider access to more customers and give customers more flexibility to choose a supplier, facilitating strong incentives for competition. Comparable set of rules for all affected users through a common package of requirements in NCs RfG, DCC and HVDC, are vital to ensure that the full benefits and potential of the market are achieved.

CNCs are a necessary but not a sufficient condition for achieving Europe's energy policy goals. It is important that policy choices at national and European level, support these goals. Therefore additional issues backing the objectives of CNCs are needed:

- National and European policy measures need to be aligned continuously for development and implementation of new potential services and their associated new required capabilities. If the interrelationships between policy responses at national level and European policy goals are not fully considered, there is a significant risk for distortions and suboptimal outcomes.
- CNCs introduce a set of pan-European obligations which often give rise to pan-European costs. To fully realize the benefits of CNCs, it is important that regulatory frameworks deal effectively with these costs as well as the incentives, which are needed to establish a truly pan-European market.
- Sufficient investment in research and development is another key factor to exploit the full potential of CNCs. Some of the requirements introduce new features, which will be undisputedly needed to securely operate future systems, but detailed specifications and their application to new technologies may need further research studies.

3 Common elements and principles of all CNCs

3.1 Common coverage by structure

The CNCs define clear future-oriented sets of rules for significant system users, which will be connected to either the transmission or distribution network depending on its impact on facilitating the European internal electricity market in terms of cross-border relevance. The common objective of all CNCs is reflected by a similar structure of the codes. The main elements comprise of technical requirements, and provisions for compliance monitoring and derogations in exceptional cases.

Technical requirements define capabilities each significant system user shall provide as a prerequisite for grid connection. They include all issues, which are deemed relevant for an appropriate performance during normal and disturbed network operating conditions. Thereby system users contribute to maintaining system security and facilitate the operation of the European internal electricity market.

NC RfG contains the framework of grid connection requirements for power generating facilities, including synchronous PGMs, PPMs and offshore PGMs, except for DC-connected PPMs. NC DCC defines a common set of requirements for transmission-connected demand facilities and distribution networks. It also contains the common provisions for demand units, which may offer demand response services. NC HVDC specifies requirements for HVDC systems connecting synchronous areas or control areas, HVDC systems connecting PPMs to a transmission network or a distribution network, embedded HVDC systems within one control area and connected to the transmission network, and for DC-connected PPMs.

Compliance monitoring is defined in the CNCs transparently, including the principles of compliance testing and simulation. The impact of non-compliance with any CNC requirement potentially reduces system security as the desired support of system users to maintain or restore a secure system state is not provided or an adverse performance even jeopardizes this security. Such consequences justify robust operational notification and compliance testing and simulation procedures in all CNCs. While each system user is responsible for compliance of its installations, the system operator is entitled to request demonstration of this compliance through tests and simulations during commissioning of these installations as well as repeatedly throughout their lifetime to ensure that adequate performance is maintained in particular after modifications or refurbishments.

Derogation is a measure which allows to release system users from fulfilling all or part of the technical requirements of a CNC or to have them applied differently in reasoned cases. A derogation shall not aim at excluding application of a CNC: it is a choice given to allow for greater flexibility in its application, enabling the relevant entity in charge to take into account special circumstances. They cover exceptional cases, where based on transparent and non-discriminatory criteria a reasoned request for exemption from one or more requirements can be submitted to the relevant network operator (RNO), who shall seek for approval of the national regulatory authority (NRA). The derogation procedure describes the handling such a request and the decision-making to grant such a derogation.

3.2 Principle of (non-)exhaustive requirements

CNCs contain a number of non-exhaustive requirements, which do not provide for a full harmonization because they do not contain all information or parameters necessary to apply them immediately. Further specification at national level is needed rendering the non-exhaustive CNC requirement exhaustively defined as national or site-specific rules within three years from the date of entry into force of a CNC. In many cases these specifications can be brought forward through an already established process at national level, e.g. grid code review panel, user group, public consultation, regulator or ministry approval. According to the CNCs, the national processes shall be done in accordance with EU legislation and the principles of transparency, proportionality and non-discrimination, with the mandatory involvement of the NRA.

3.3 Scope of application

The requirements set forth by CNCs shall apply by default to new system users in a MS which are significant according to the provisions of each CNC.

They shall apply to significant existing users in a MS only to the extent their applicability has been decided by the relevant NRA after a proposal by the relevant TSO and following a public consultation. Such a proposal shall be made in particular on the basis of a sound and transparent quantitative cost-benefit analysis, including the costs of requiring compliance that shall demonstrate the socio-economic benefit of application of the requirements set forth to existing users. The relevant TSO is entitled to re-assess a proposal for application to existing users in case of factual changes such as the evolution of system requirements but not more often than every three years.

4 Key features of each Connection Network Codes

4.1 NC RfG

4.1.1 Significant PGMs

The EU energy policy ambitions regarding integration of RES will result in many medium and large scale RES generation to be connected at high and extra-high voltage and gradually to also cover off-shore, and a rapid increase in domestic level generation, e.g. photovoltaic and domestic combined heat and power. Individually these developments are not of significance with regard to maintaining security of supply. However, when a very large number of generation responds similarly to a common stimulus they quickly become an issue of security of supply through risk of mass tripping. Large simultaneous loss of generation is a threat to frequency stability with potentially widespread consequences. The requirements of NC RfG will be applicable for a rather long time and changes/amendments can only be implemented by running through extensive European legislative procedures. Therefore, the anticipated mid- and long-term development of the power generating portfolio needs to be well considered. As a consequence, smaller PGMs will need to have capabilities to support system security, which have traditionally been provided by transmission-connected bulk generation facilities only.

In order to reflect these developments, NC RfG introduces four categories of PGMs (Figure 3) by following the principle of subsidiarity and proportionality. The categories are defined by the voltage level of grid connection and the installed capacity of a PGM. The capacity thresholds are defined as upper limits of the lower threshold of each category leaving its final determination to the national level. The upper limits have been chosen from an estimation of having sufficient generation capacity of each category and the corresponding capabilities available for secure system operation.

Synchronous Area	maximum capacity threshold of Type B	maximum capacity threshold of Type C	maximum capacity threshold of Type D
Continental Europe	1 MW	50 MW	75 MW
Nordic	1 MW	50 MW	75 MW
Great Britain	1.5 MW	10 MW	30 MW
Ireland	0.1 MW	5 MW	10 MW
Baltic	0.5 MW	10 MW	15 MW
	and	**and**	**or**
Voltage level	< 110 kV	< 110 kV	≥ 110 kV

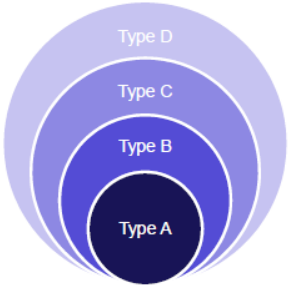

Figure 3: Categories of power generating module

Type A requirements are the basic level requirements, necessary to ensure capability of generation over operational ranges with limited automated response and minimal system operator control. The purpose is to avoid wide-scale loss of generation over system operational ranges. Requirements for Type A are limited to essential aspects with potential system wide implications.

Type B requirements provide a wider level of automated dynamic response with higher resilience to more specific operational events to ensure use of this higher dynamic response and a higher level system operator control and information to utilise these capabilities.

Type C requirements provide refined, stable and highly controllable dynamic response in real time to provide balancing services to ensure security of supply, and to avoid, manage and respond to system events.

Type D requirements cover a wide area of control and range of operation. They ensure specific needs for higher voltage (≥ 110kV) networks, allowing the use of ancillary services from generation Europe wide. Type D requirements apply also for large generation connected at a lower voltage, but above a given capacity threshold.

4.1.2 Power-frequency control by PGMs

Aiming at ensuring frequency stability, NC RfG extends the scope of frequency control capabilities to smaller PGMs including RES, introduces new capabilities for managing extreme high and low frequency events, and allows to require synthetic inertia from PPMs to maintain system inertia despite the decrease of rotating masses. The relation between applicability of the frequency stability requirements and the type of PGM is shown in Table 1.

Frequency Sensitive Mode (FSM), establishes the capability to provide frequency containment reserve. Any frequency deviation from its nominal value results in a change of active power output of PGMs operating in FSM mode within predefined ranges.

Limited Frequency Sensitive Mode - Overfrequency/Underfrequency (LFSM-O/ LFSM-U) provides additional support to manage frequency stability in situations where due to a large load imbalance frequency containment reserves are insufficient. Active power frequency response of PGMs operating in LFSM-O/-U mode is activated, if the system frequency still exceeds predefined thresholds after full deployment of frequency containment reserves.

Synthetic inertia means the facility provided by a PPM or HVDC system to replace the effect of inertia of a synchronous PGM. NC RfG merely allows requiring this capability to emulate by PPMs the effect of very fast active power response of synchronous PGMs in case of faults.

Appropriate performance of PGMs in case of faults is a key feature for maintaining and restoring system security. Table 1 shows the relation between the fault response related requirements and the type of PGM. Distribution system connected PGMs need to be tolerant to faults at transmission level, if a significant amount of them is exposed to a single incident.

Fault Ride Through (FRT) capability describes the ability of PGMs to withstand low voltages without disconnection from the network and hence to limit the potential loss of generation. It is based on a voltage-against-time profile at the connection point during and after a fault.

Fast fault current injection during the initial period of a fault is essential for electrical protection systems to recognise, locate and initiate fault clearance. As synchronous PGMs are increasingly displaced by PPMs with different behaviour in case of faults, there is the need of injecting fast fault current by PPMs with the aim of ensuring fault detection as well as maintaining voltage stability.

Active power recovery after fault shall limit the consequences of a short-term loss of active power infeed and stabilize the frequency after secured faults on transmission level. It is required that PGMs are able to restore active power infeed fast after fault clearance as loss of active power during and immediately after a fault may also spread as voltage instabilities in large systems (esp. offshore long AC connections).

Type of PGM	FSM	LFSM-O	LFSM-U	Synthetic inertia*	FRT	Fast fault current injection*	Active power recovery
A		X					
B		X			X	X	X
C	X	X	X	X	X	X	X
D	X	X	X	X	X	X	X

*) optionally required exclusively from PPMs, which in contrast to synchronous PGMs do not have this capability inherently.

Table 1: Scope of application of (limited) frequency sensitive mode and behaviour in case of faults

4.2 NC DCC

The technical grid connection requirements of NC DCC are fundamentally based on demand facility and distribution system specific technical capabilities. Many of these requirements are based on the existing capabilities and practices, based on the experience gained throughout decades, that have demonstrated their effectiveness to ensure long term reliability and operation, but in cases need to be adapted as a result in changes in the expected portfolio of users and topography of the network.

4.2.1 Reactive power capabilities at T/D-interface

Greater penetration of RES, which are often connected at distribution system level and displace synchronous generators removes a key source of reactive power, which has to be considered in context of voltage stability and availability of reactive power capability. Besides, the development of underground cables on the distribution network and even the transmission network has an increasing impact on the reactive power flows at the interface between transmission and distribution networks. Each connected demand facility or distribution system exchanges reactive power with the transmission network, which must be considered to determine the overall system voltage stability as an important basis for system security. Overall system performance is improved, either technically or economically, if appropriate measures are taken concerning reactive power management. Reactive power delivered where needed is more cost effective allowing also for loss reduction, higher active power loading, balanced voltage profiles, less need for system reinforcements and lower capital cost of lower voltage installation.

Therefore the following requirements have been introduced in NC DCC:

- Transmission-connected demand facilities and distribution systems shall be capable of maintaining their operation at their connection point within a range of reactive power specified by the TSO, but not wider than 48 percent of the larger of the maximum active power import or export capacity. This limit takes into account the reactive power capacities of embedded generation when applicable.
- Based on network design, the transmission-connected distribution systems shall have the capability at the connection point to not export reactive power at nominal voltage for an active power flow of less than 25% of the maximum import capacity.

- In order to allow continuous reactive power compensation, the TSO may require from a transmission-connected distribution system the capability to actively control reactive power exchange with the transmission network.

4.2.2 Features of demand response services

Beyond the changes resulting from wide spread and more prolific RES generation, the development of an effective smart grid concept across the system and resulting operational and market impacts also represent a major change. In this context, the following key issues of demand response services are addressed in NC DCC:

Demand response system frequency control shall support that a single system event due to lack of reserve services from RES or forecast error does not result in the large scale loss of users due to low frequency as a result of insufficient generation. Although frequency containment reserve may be sourced from varied suitable sources, the scale of the reserve shortfall means that all those sources, including change in active demand triggered by deviation of the system frequency from its nominal value, should be utilised and have the capability to do so.

Demand response very fast active power control has the same objective as synthetic inertia requirement to decelerate rate of change of frequency. Rapid changes in active power demand can contribute to the necessary response to permit further expansion of RES.

Demand response active power control, reactive power control and transmission constraint management are needed to manage more volatile power flows on the network expected in the near future. NC DCC ensures that appropriate capabilities are provided where demand respond services are offered to the market.

4.3 NC HVDC

NC HVDC has been developed to establish a set of requirements to operate an electrical transmission system, whose infrastructure and system characteristics are changing rapidly and substantially due to the emerging penetration of power electronics as a result of large-scale connection of RES and DC-links for long distance power transmission. These developments are the background of NC HVDC, which includes grid connection requirements for HVDC systems and DC-connected PPMs.

4.3.1 Requirements for HVDC systems

The general basic objective of the technical requirements for HVDC systems is to ensure that HVDC links like other infrastructure equipment are the most reliable assets of the system. Therefore, HVDC converters shall be capable of withstanding larger or longer frequency deviations, as well as more rapid changes of frequency, than power generating modules. In case of system splits, in which isolated parts can experience large and rapid frequency deviations, system restoration can be better preserved when TSOs still can rely on HVDC connections even though generation has partly tripped.

The management of unpredictable and instantaneous power shifts is critical for secure operation of a power system with high levels of variable generation and HVDC systems. HVDC converters have the inherent capability to rapidly control active power transmission. In case of disturbance, HVDC systems can contribute to system security by modulating active power instantaneously. FSM providing full frequency control is required from HVDC systems for various reasons, to maintain stable frequency in an isolated system, to enable the provision of frequency containment reserves from one synchronous area to another and to allow remote DC-connected PPMs to comply with their own requirements for frequency control.

Synthetic inertial capability can serve to allow more HVDC system and non-synchronous RES generation to be connected to power systems. HVDC converters can provide synthetic inertia by implementing this feature in its control structure.

Voltage control capabilities and the corresponding behaviour largely depends on the HVDC converter technology. The voltage-sourced HVDC converter technology is very flexible in terms of reactive power management and can provide both voltage control during normal operation and voltage support during faults. Other HVDC converter technologies are less flexible in reactive power management, or

do not allow it at all, unless shunt reactive compensation is added. To use the full potential of all technologies while no barriers should be created for future use of any of them, NC HVDC pursues a balanced level of detail in requirements for reactive power and voltage support. The requirements therefore focus on technology-neutral functionality to be provided at the grid connection point.

Like for PGMs according to NC RfG, FRT requirements for HVDC systems are based on a voltage-against-time profile at the connection point. HVDC systems shall stay connected to the grid for voltages above those worst-case conditions and shall continue stable operation after fault clearance. To ensure the compliance of the requirement, taking into account the state of the art, the blocking of the converter at some voltage levels is permitted. As well, it is important that HVDC systems have capabilities to dynamically support voltage stability similar to PPMs.

4.3.2 Requirements for DC-connected PPMs

DC connection to the main power system is a typical feature of remote offshore PPMs. Taking into account the large amount of projects developing offshore networks, their functionality and operation in future is expected to be substantially different from today. Bearing in mind that the PPMs and HVDC converters shall have a lifecycle of 30 - 40 years, the design of this equipment needs to be specified now with a long-term prospect in order to allow a future stable, reliable and economically efficient operation of the system, even when operational or market rules would evolve further:

- AC connections may become DC and vice versa.
- A cluster of DC-connected PPMs may become a node interconnecting two synchronous areas.
- AC and DC circuits should be interchangeable.
- DC-connected PPMs will have low inertia and which impacts power system stability.
- DC-connected PPMs will be required to contribute system services into the network which they are providing power to.

Therefore, as a general principle the requirements for DC-connected PPMs are closely aligned with NC RfG, with possible variation in ranges and settings where needed. Similarly, remote-end HVDC converters shall match the requirements of NC HVDC. DC-connected PPMs and remote-end HVDC converters together need to have economically efficient, consistent, coordinated requirements to not impair requirements at the AC onshore transmission connection point.

5 Conclusion / Summary

CNCs supplement the EU legislative framework for the electricity sector and are an indispensable tool to achieve the ambitious energy policy targets of establishing an competitive European internal market with large-scale RES integration while maintaining security of supply at a high level. They define sustainable technical prerequisites for grid connection of relevant system users. These requirements have been developed with a long-term view on the evolvement of the characteristics of the interconnected power supply system. They take into account in particular substantial changes, which are already in progress and will accelerate further with the transition from a supply system traditionally based on bulk power generation by synchronous generators towards a much more decentralized generation portfolio with high penetration of PPMs connected non-synchronously through power electronics.

BIBLIOGRAPHY

[1] DIRECTIVE 2009/72/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning common rules for the internal market in electricity

[2] REGULATION (EC) 714/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on conditions for access to the network for cross-border exchanges in electricity

[3] COMMISSION REGULATION (EU) 2016/631 of 14 April 2006 establishing a network code on requirements for grid connection of generators

[4] COMMISSION REGULATION (EU) …/… of XXX establishing a Network Code on Demand Connection

[5] COMMISSION REGULATION (EU) …/… of XXX establishing a network code on requirements for grid connection of high voltage direct current systems and direct current-connected power park modules