

NC HVDC User Group 1st meeting

Date: 12 March 2013

Time: 13h00 – 16h30

Place: Martins Central Park Hotel, Brussels

MINUTES

Participants	Affiliation	Present	Excused
Stakeholders			
Peter LUNDBERG	ABB	X	
Andrew McINTOSH	BritNed		X
Damian BACH	BritNed		X
Muhammad JAFAR	DNV		X
Simon LUDLAM	Eleclink		X
Angus NORMAN	Eleclink		X
Ton GERAERDS	Eurelectric	X	
Jean-Baptiste COGNAT	Eurelectric		X
Paul WILCZEK	EWEA	X	
Frans van HULLE	EWEA	X	
Jan SUCKOW	FNN/VDE		X
Stijn COLE	GDF Suez		X
Oliver MAYER	GE Global Research	X	
Ara PANOSYAN	GE Global Research		X
Emad AHMED	GE Global Research		X
Stephen MILLAR	Iberdrola Engineering	X	
Peter CLAES	IFIEC	X	
Mukund BHAGWAT	IFIEC		X
Petter LONGVA	IFIEC		X
Michelle MANNING	Mitsubishi Electric		X
Steve LANGDON	Mitsubishi Electric		X
Mike WILKS	Pöyry		X
Eckhart LINDWEDEL	Pöyry		X
Kim WEYRICH	REpower	X	
Christian FELTES	RWE Wind	X	
Frank SCHETTLER	Siemens	X	

Manfred POHL	Siemens		X
Kamran SHARIFABADI	Statoil		X
Ifigenia STEFANIDOU	Swisselectric	X	
Chuan ZHANG	The Crowne Estate		X
Peter Wibæk CHRISTENSEN	Vestas Wind Systems A/S		
Michael ALDERS	VGB PowerTech	X	
Helge REGBER	VGB PowerTech		X
Claudio GIANOTTI	World Energy SA		X
Mario GENOVESI	World Energy SA	X	
Observers			
Philippe ADAM	CIGRÉ B4-56		X
	ACER		X
	EC		X
ENTSO-E drafting team			
Wilhelm WINTER	TenneT DE	X	
Thomas AHNDORF	Transnet BW	X	
Carmen LONGÁS VIEJO	REE	X	
Kent Hans SØBRINK	Energinet.dk	X	
Anders DANELL	Svenska Kraftnät	X	
Edwin HAESSEN	ENTSO-E Secretariat	X	
Ádám SZÉKELY	ENTSO-E Secretariat	X	

1. Introduction

ENTSO-E welcomed all participants and proposed the agenda of the meeting, which was accepted.

An open call for nominations to a User Group dedicated to support the development of a Network Code on HVDC Connections was published end of January 2013. ENTSO-E welcomes the extensive response from various sectors and invited all interested parties for this first User Group meeting. All participants introduced themselves, mentioning the organisation they are representing. Unfortunately, a relative high number of representatives previously expressing interest are not present at the 1st meeting of the group due to extreme weather conditions in Brussels. A short listing of all parties expressing interest was given.

ENTSO-E presented a general overview of the regulatory framework and overall process of network code development. It is stressed that the ACER Framework Guidelines determine to a large extent which topics need to be tackled by the relevant draft network codes delivered by ENTSO-E. The expected timing of the HVDC NC development process was explained, subject to the assumption that the EC formal mandate is received by ENTSO-E in April 2013. After a brief overview on the topic and status of the other 8 network

codes, the role of national codes and practices as well as standards after the adoption of NCs has been outlined to give a broader overview of the envisaged regulatory framework.

Regarding the involvement of all interested parties in the drafting process, this User Group has been set up with a preference to organisations with a Europe-wide activity, although not excluding other organisations ex ante. Apart from the User Group, other forms of interaction (such as public workshops, participation in the public consultation of the Scope and later the draft Network Code, as well as regular updates of the ENTSO-E website) are offered to organisations only requesting to be informed about the process. In case of special interest, bilateral meetings with organisations requesting so are not excluded.

As for the participants of this User Group, ENTSO-E expects all members to always communicate the agreed position of the organisation they are representing (or clearly indicate otherwise), and to focus on the expected impact of specific requirements on their sector, notwithstanding of course the possibility to give more general comments as well. ENTSO-E aims to send draft minutes of the User Group meetings to all participants about a week after each meeting, allowing sufficient time to review and comment before published (together with the presentations) on the ENTSO-E website.

Responding to the question of EWEA, it is confirmed that EC and ACER are invited to all User Group meetings but were excused for this first meeting.

2. User Group members

All present members are requested to introduce their organisation, focusing primarily on the following questions:

- To which extent would the organisation/sector be impacted by a European Code on HVDC connections?
- How can the organisation/sector actively contribute to the development of the NC HVDC, with focus on e.g. experience, performance data, cost implications, related involvement in national codes/standards?
- What benefit do you believe a European code on HVDC connections could bring to the organisations/sector and the wider power system?

Swisselectric

- Representing all large electricity utilities in Switzerland, including DSOs, and generation companies (also outside Switzerland), with special focus on pump-storage facility operators.
- Involved in the drafting and evaluation of Swiss and international regulations and standards

Impact of HVDC

Pump-storage plants, being very important for balancing services, could benefit from better access to European markets if more HVDC links are installed. Security of supply since a strong impact on the distribution system and generating units is expected.

Contribution

- Research experience and technical expertise of members
- Involvement in grid connection studies for HVDC links

- Participation in CIGRÉ
- Involvement in national and international codes and providing formal opinion on them

Benefits of network code

- Enabling more transit, reducing congestions
- Full access of pump-storage units and other Swiss power plants to the European markets
- Merchant lines must be HVDC in Switzerland
- Harmonization of systems and therefore, contribution to security of supply

It was pointed out that although Switzerland is not a member of the European Union, its location in the centre of the interconnected system of continental Europe, as well as the importance of its pumped storage potential and projects for balancing services in Europe, imply that requirements would be applicable, and therefore an involvement in the drafting process is desirable.

On the question of ENTSO-E, it was clarified that in Switzerland, the TSO (Swissgrid) is responsible for security of the 380 and 220 kV network, while members of Swisselectric are responsible to lower voltage levels, ranging from 150 down to 16 kV.

EWEA

EWEA is representing a very wide range of wind industry stakeholders.

The requirements on offshore PPMs have been suggested to be removed from the scope of NC RfG (to be dealt with in NC HVDC) by EWEA, with the rationale of being at too early a stage of technology development, and thus enabling the formulation of more appropriate requirements in a later code on HVDC with possible synergies with the DC link capabilities. EWEA acknowledged the adoption of its proposal by ENTSO-E.

Impact of HVDC

- Connection requirements for DC-connected PPMs (majority expected to be wind-generation)
- A generally well interconnected European system is of interest of renewable generators
- Present off-shore connection requirements are too diverse among TSOs, and in most cases no specific HVDC requirements exist

Expectations

- A more consistent approach across Europe on connection requirements, reducing investment cost, thus overall cost of renewable energy
- NC to facilitate off-shore (and on-shore) DC grid development
- In the initial phase of drafting, a clear focus on determining the most appropriate scope and structure of the Code is suggested

Contribution

- Structured view on requirements
- Offering contribution with a proposal for a generic Grid Code structure
- Know-how

Vestas

Vestas pointed out that it is very important to get clarified what is the exact scope of the code, particularly in light of the very short working period of 1 year only. Vestas suggested to categorize possible requirements in 5 layers:

1. Point-to-point, back-to-back and few terminal HVDC schemes (i.e. between synchronous zones and embedded)
2. HVDC connected PPM plants – main AC grid side (plant could be situated offshore or onshore)
3. HVDC connected PPM plants – local AC grid of small extension (“AC cluster” – typical a few plants and 1-2 HVDC connections)
4. HVDC connected PPM plants – local AC grid of large dimensions (AC offshore grids, e.g. 5-7-11 GW)
5. Supergrid (systematically built meshed DC grid layer)

Vestas added that category 1 and 2 is what for sure must be covered to cope with short term needs. Category 3 and 4 is what the renewable industry has a very hard wish to get clarified. On the other hand with a 1 year working period only, the key question is if it is realistic to include also category 3. The issue is also to be seen in light of the technology and concepts still being discussed and evolving. Category 3 and 4 should in principle be possible to be specified in the same way generic way, but parameters and characteristics will be quite different. Vestas suggested that ENTSO-E performs realistic estimates of what may be the largest anticipated size of “synchronous” operated AC islands. Vestas did not consider it realistic to include supergrid requirements (category 5) in the scope of this code now.

Vestas suggested to strive hard for a good platform which will make a sequential development process possible, i.e. make it possible to expand the scope of the code, still ensuring consistency between former and future parts of the code (sizable scope and sizable code).

Vestas further stated that it is a key principle to decide upon if the code is intended to be a “one European code” only – or it is intended as a top-level code then to be followed by national codes. Vestas suggests to first of all strive to go for “one European code” to take full advantage of the harmonization advantages.

It is also desirable that the code does not preclude the optimal exploitation of the advantages of different HVDC technologies by setting too general requirements.

ABB

Impact of the code

The requirements of the code are seen as a foundation on how HVDC equipment shall be designed, and should facilitate DC usage wherever it has technological or economic advantages. Therefore, ABB would like to monitor the development process and point out if a planned requirement is expected to unnecessarily hinder applications.

Contribution

Experience in LCC production since the 1950s, and recently in VSC equipment as well

Benefits of network code

Clear, uniform rules across Europe would remove uncertainties from the design and permitting process.

On the question of ENTSO-E regarding the robustness of the requirements of the code in light of the long-term development, ABB supported the approach of not fixing very detailed requirements at this stage on technologies/issues that are still at an early stage of development.

Siemens

Siemens would like to learn more about the needs of TSOs, being important customers for its HVDC equipment, as well as take part in the discussion on new markets. Siemens' view is that more system integration will help market development, while the HVDC technology will play an important role in the technical realisation of the new generation of power systems. Siemens is ready to share its experience in the code development process.

The representative of Siemens is also the convener of a related, newly established CENELEC working group, and as such, expressed his view that standardisation shall be strongly linked to and build on the Network Code requirements. Therefore cooperation is essential. The standards for equipment to be used in HVDC grid/systems shall be based on the functional requirements set by the NC HVDC.

GE Global Research

Scope of research focuses mainly on generators, but issues of grid components are also tackled. GE Global Research has an outlook to the trends of global markets and regulatory environment in US, South America and other parts of the world, thus their contribution to the work of the User Group is expected to enable incorporating the experience already gained outside Europe, bearing in mind the specificities of the European energy system.

World Energy SA

World Energy SA is a project developer undertaking, having experience in managing HVDC projects. Having a stable and good network code is seen as beneficial for financing and other aspects of such projects.

RE power

Being a turbine manufacturer, RE power primarily seeks to understand the requirements of DC-connected generating units. Its contribution is foreseen to be mainly delivered via EWEA. The main benefit of a European code is seen in allowing for clear requirements, thus better optimisation of equipment capabilities, that in turn reducing the overall costs of renewable generation and enhancing its public acceptance.

IFIEC

As the association for industrial consumers, the contribution of IFIEC is expected to focus on monitoring how the code contributes to a better functioning of market and better overall efficiency of the system, as well as making sure all costs imposed by the requirements are well justified and optimal.

RWE Wind

As a developer of generators, the benefit expected from the network code is allowing for the development of stable and optimised designs for off-shore systems. RWE Wind expects to be able to contribute to the User Group thanks to its experience with previous projects.

Iberdrola Engineering

Key expectations from the User Group participation are a better understanding of key parameters of HVDC components, as well as standardisation issues, while Iberdrola is expecting to contribute with its experience from projects of the entire group.

VGB PowerTech

VGB PowerTech represents power plant companies.

Impact of HVDC

- Strong connection with NC RfG requirements is foreseen, considering the HVDC connections as “virtual power plants”
- It needs to be ensured that converter stations do not have a negative impact on generating units, especially with regard to torsional oscillations introduced – no regulation in force yet
- What is the impact on market of the way HVDC lines are utilised and operated?
- How will development of very high capacity HVDC links affect the necessary amount of system reserves?

Eurelectric

Experience

- Power plant operations
- Large frequency converters in power plant auxiliary systems
- Power electronics operation in excitation systems
- Participation in CIGRE NSC B4 (HVDC) since several years

An important aspect proposed to be addressed in the requirements is to ensure the mandatory use of equipment of sufficient quality, in order to limit the impact of converter stations on power quality (esp. THD, voltage spikes, torsional oscillations, asymmetry), and thus limit the possibility of damage or additional losses in equipment of other grid users.

In addition, Eurelectric expressed its view that to ensure similar robustness levels of the system as now, requirements need to be strongly linked to comparable articles of RfG.

Vestas added that the mentioned power quality issues are very relevant – on the other hand the Framework Guidelines only scope cross-border issues. As a part of best-utility practice these issues have to be dealt with anyway and it is highly wishful to get included in the code. To strive for harmonization and rule out uncertainty, Vestas had the opinion that the Framework Guidelines should in principle not prevent ENTSO-E from doing more than required but this process itself should not lead to more stringent requirement unless it is really required and can be documented.

3. Presentation of the preliminary Scope of NC HVDC

ENTSO-E presented the main items of a preliminary Scope of requirements for the NC HVDC.

In order to improve security of supply, handle bulk power flows and accommodate increasing amounts of renewable generation, a hybrid system consisting of AC and DC elements is envisaged in the future in many countries, as opposed to the present systems relying only on AC transmission. Moreover, an increasing amount of non-synchronous generation is expected to be connected to the system via a DC connection. These make it necessary to define the technical capabilities of such DC connections in order to maintain stability of the European transmission system, while exploiting the technical advantages offered by DC technology to the fullest extent possible. The full presentation with the proposed list of topics to be covered by NC HVDC is available for download on the ENTSO-E website.

On the question of VGB PowerTech regarding the location of the connection point in case of DC-connected power park modules (i.e. whether the link itself is included or not), the general principle of applying requirements of connection points, regardless of ownership has been explained. Requirements are imposed on the AC collection grid ('offshore') connection point for the PPM, and at the 'onshore' connection between the main AC grid and the HVDC converter station for the HVDC system. Requirements on the DC connected PPM and HVDC system should be coordinated to reach an optimal solution without impairing the requirements on the main AC grid connection point.

Regarding Significant Grid Users, GE Global Research and EWEA commented that the Framework Guidelines contain only very broad descriptions. It will be the task of the drafting team to set up significance criteria that reflect system needs and are in line with the Framework Guidelines as well, this shall be done with the involvement of the User Group.

Siemens commented that criteria comparable to those applied when assessing n-1 security could be considered, however, ENTSO-E deems it necessary to define significance criteria for connection codes separately from operational issues, while of course respecting consistency between network codes.

With respect to the listing of proposed requirement categories and requirements, following comments were given:

- Vestas considered all the proposed categories to be significant grid users as they are all connected to transmission voltage level and of very large MW block size. ENTSO-E comments that transmission voltage levels varies widely across Europe, therefore an approach allowing for such differences and focusing on cross-border impact will be elaborated.
- ABB: "Control" as such is considered to be too wide a category, splitting up into sub-categories such as control of generator, grid controller, etc. is suggested.

ENTSO-E expressed that at this point, all requirements are foreseen to be defined at the AC side of the connection point. ABB supports this approach, while Siemens asks whether converters connecting existing DC networks should also be subject to requirements applicable on the DC side. ENTSO-E's viewpoint is that system needs justify requirements on the AC side, and believes that these should cover all possible issues in DC networks sufficiently. The approach is to transfer all relevant requirements for the converter DC connection point to the AC connection point of each converter.

Siemens notes that disturbances to existing DC networks caused by new converter connections need to be prevented, but acknowledged the need of limiting the scope of the initial issue of the code due to practical and timing constraints. ENTSO-E's viewpoint is that the initial issue of the code shall focus on the impact of Grid Users identified as significant to the main (AC) system.

Vestas added that for some of the upcoming Supergrid codes a DC-PPC-point is foreseen. Requirements for the DC-PPC-point intend to ensure interoperability and dynamic robustness (DC system integrity) for the DC system in the same way as an AC-PPC-point intends to ensure the robustness in an interconnected AC system (AC system integrity). To include DC side requirements for small multi-terminal systems or Supergrids will not be possible for time reasons and is further too premature technically at this point.

Siemens and Eurelectric acknowledge that without DC side requirements, the last connecting party to the DC system shall adapt to the technical specificities of the existing system, however express that Europe-wide

standards could be useful if defined. ENTSO-E's view is that so far no requirement has been identified that could not be defined in legal terms as a requirement applicable on the AC side, but when defining such requirements, the system needs of the DC networks will be taken into account.

- Eurelectric: the capability of HVDC technology to detect and damp (inter-area) system frequency oscillations could be utilised and would be very useful for the system. ENTSO-E welcomes the comment and foresees this issue to be covered in the network code.
- VGB PowerTech: in connection with LFC&R network code and with regard to necessary system services reserves, how will largest loss of power from HVDC links be handled? ENTSO-E sees two distinct possible issues: loss of active power infeed to the system, to be covered in the network code, and loss of active power transmission capacity within the system, deemed as an operational issue, therefore out of the scope of this connection code.
- EWEA: the proposed requirements on frequency and active power control seem to be tackling very similar, possibly overlapping issues. ENTSO-E acknowledges the comment
- Eurelectric: The requirements in NC RfG are a good starting point especially for frequency, voltage withstand capability and FRT requirements, noting that possible deviations from those in RfG need to be justified sufficiently. Also, with regard to active power control, generation units need to be able to follow the change of active power injected/withdrawn by a DC interconnector linking synchronous areas.

4. Next steps

Shortly after receiving the formal EC mandate for drafting the network code, a public consultation on the Scope and some additional questions will be launched on the ENTSO-E website. Feedback to this consultation is welcomed from all interested parties but at minimum expected from User Group members.

A public workshop may be organised during this first consultation.

The next User Group meeting is suggested to be organised shortly after the end of this consultation period (approximately late May), to enable members to elaborate and discuss their feedback with ENTSO-E.

All dates presented are subject to the EC mandate, the exact dates of following meetings will be finalised and suggested/ to User group members as soon as possible afterwards.

Everybody's active input and constructive feedback in this first meeting is much appreciated.