NC HVDC User Group 2nd meeting

Date: 11 June 2013
Time: 10h00 – 16h30
Place: ENTSO-E offices, Brussels

FINAL MINUTES

Participants	Affiliation	Present	Excused
Stakeholders			
Magnus CALLAVIK	ABB	X	
Peter LUNDBERG	ABB	X	
Andrew McINTOSH	BritNed		X
Damian BACH	BritNed	X	
Torsten HAASE	Dong Energy	X	
Muhammad JAFAR	DNV	X	
Simon LUDLAM	Eleclink	X	
Angus NORMAN	Eleclink		X
Stephan WITTNER (replacing 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	
Ara PANOSYAN	GE Global Research		X
Emad AHMED	GE Global Research		X
Stephen MILLAR	Iberdrola Engineering		X
Mukund BHAGWAT	IFIEC		X
Petter LONGVA	IFIEC		X
Michelle MANNING	Mitsubishi Electric	X	
Steve LANGDON	Mitsubishi Electric	X	
Norman MacLEOD	PB World / Friends of the Supergrid	X	
Mike WILKS	Pöyry		X
Eckhart LINDWEDEL	Pöyry		X
Kim WEYRICH	REpower		X

Christian FELTES	RWE Wind		X
Gavin GREENE	Scottish Power / Iberdrola	X	
Frank SCHETTLER	Siemens		X
Manfred POHL	Siemens	X	
Kamran SHARIFABADI	Statoil	X	
Ifigeneia STEFANIDOU	Swisselectric	X	
Chuan ZHANG	The Crowne Estate		X
Peter Wibæk	Vestas Wind Systems A/S	X	
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
Andrius CIALKA	OFGEM	X	
Tadhg O'BRIAIN	EC		X
ENTSO-E drafting team			
Wilhelm WINTER	TenneT GmbH	X	
Thomas AHNDORF	Transnet BW	X	
Pascal BERTOLINI	RTE	X	
Darren CHAN	National Grid	X	
Carmen LONGÁS VIEJO	REE	X	
Mark NORTON	EirGrid	X	
Kent Hans SØBRINK	Energinet.dk	X	
Edwin HAESEN	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.

On 7 May 2013, ENTSO-E has published the initial proposed Scope for the Network Code on HVDC Connections and DC-connected Power Park Modules, together with a Call for Stakeholder Input elaborating and requesting specific input on the scope from all interested and affected parties. 16 organisations have responded to this call by submitting response documents, which are publicly available on the ENTSO-E website[1]. Some indicated a response was still to come in the short term.

The objective of the 2nd User Group meeting was to clarify the responses received, invoke additional views from all other participants and reach a common view with the User Group on the key directions of the scope.

2. User Group Member presentations

Some of the participants prepared a short presentation to support their key feedback. These presentations are available together with these minutes. The main points are detailed below.

Swisselectric's views:

- Current standards and other network codes are to be considered when drafting the NC HVDC
- Only services that are essential for the reliable operation of the system shall be required as mandatory, other requirements shall be based on a balance of costs and additional advantages
- Free development of DC systems should not be hindered, while ensuring overall system security
- Non-discrimination between TSO and non-TSO owned connections needs to be ensured by due regulatory oversight
- Optimal use of the control flexibility of the HVDC converters (e.g. autonomous adaptation of control modes based on detection of changes in the AC system) in order to ensure maximum cross-border capacities. The HVDC-schemes should be flexible and controllable enough (reaction time, communication, etc.) in order for their control functions to be considered by the TSOs as possible post-fault remedial actions and, therefore, contribute to the maximization of the allocated capacity during the capacity calculation process.

Swisselectric noted that as a practical approach, requirements of the NC RfG should be taken as a minimum starting point, with additional ones identified where necessary and capability warrants it. Statoil disagreed to this approach, noting that HVDC connected consumer islands (e.g. oil platforms) may not be able to fulfil such requirements or only at unreasonably increased costs, while the reasons for the need of all connections contributing with additional services are not caused by them. Additional requirements can be acceptable on a case-by-case basis if extensive cost-benefit analysis indicates that this is the most beneficial solution on a system level, but this should not be mandatory. ENTSO-E noted that cross-border impact of connections will be the determining factor for applicability (mandatorily or not) of the requirements in the NC.

PB World added that the assessment of applicability should also take into account which capabilities are inherent in the HVDC technology and can thus be added at little or no extra cost, and which are the ones bearing major cost implications. ABB expressed concerns that while several additional capabilities are technically possible, an excessive cost implication without appropriate justification of its necessity could block certain projects. Vestas agreed that over-specifying certain requirements at this stage may be a barrier for some projects, while under-specifying them may cause the technology to be locked in at later stages.

[1] ABB, CENELEC TC8X WG06, EDF, EDF Energy, EWEA, Eurelectric, Friends of the Supergrid, GdF SUEZ, Iberdrola, KULeuven, PIVEX, swisselectric, TU Ilmenau, Universidad Politécnica de Madrid , VGB, ViK

PB World also noted that due to the fact that R&D activity is still on-going in the field, it would not be desirable to define e.g. DC-side protection requirements at this point. Statoil suggested that fault clearing times on the DC side should also be left open as DC grids are not sufficiently developed yet.

EWEA's views

- A well-designed structure of the code is essential as a basis for the future
- The wind industry is supporting the use of standard and harmonized solutions
- Specificities of the technology should be taken into account duly, instead of copying requirements from previous network codes (RfG, DCC).
- Technology neutrality will lead to excessive costs.
- Requirements for Power park modules were not sufficiently elaborated in the Preliminary Scope document to comment on.
- Requirements for Power park modules should be coordinated with those applying to the DC link that connects the PPM to the main system, to enable developing the most efficient solutions.

ENTSO-E noted that one of the options for realising this request is to specify requirements only at the onshore AC connection point and leave the possibility for optimisation between PPM and DC link owners.

Vestas' views

- The definition of a connection point is crucial with a clear aim of which configurations are covered by this NC in the limited time for development available.
- Offshore AC collection grids have specific characteristics in which there is limited experience at present.
- Requirements and characteristics of the offshore AC collection system should be specified as soon as feasible to allow possible optimisation.

Eurelectric / VGB PowerTech's views

- Requirements of the NC need to be justified to ensure that there are no other, more efficient measures that TSOs or other grid users could provide to meet the same objective.
- The operation of DC grids should be defined at a very general level, from the point of view of effects on the AC system
- To ensure non-discrimination between technologies in a very broad sense, the requirements should be based on those of NC RfG and NC DCC (in some cases depending on the direction of active power through the converter station, some services may the provided irrespective of the direction)
- The grid quality needs to be ensured by avoiding any negative impact on other grid users (sub-synchronous resonances, torsional stress on the shafts, increasing demand of reactive power for other grid users).
- The N-1 criterion still needs to be respected in view of possible DC grids, which may be achieved by limiting the maximal capacity of DC links or increasing the amount of reserves. Dependencies with other Network Codes need to be addressed.

3. General questions on the NC HVDC approach

ENTSO-E asks for a common view of the User Group on 5 key principles of the NC HVDC (and which were also addressed in the Call for Stakeholder Input)

Relation of requirements on DC interconnectors / DC Connected PPMs and NC RfG / DCC

The User Group agrees to use requirements of the other two connection codes as a starting point. Using this reference point, the NC HVDC can allow for potential additional capabilities that are inherent to HVDC technology with little additional cost, justification will be given for differences in treatment of generation/demand and HVDC connections.

Significant Grid Users

The User Group agrees on the classification of significant grid users as presented in the Preliminary Scope.

ENTSO-E clarifies that DC-connected generation located onshore shall also be in the scope of the code.

Sustainability of requirements

The User Group agrees to focus on requirements applicable at the AC-side of the connection point wherever possible, and leaving meshed DC grid requirements out of scope at the first version of the code.

EWEA noted that DC grid codes are nevertheless very important on the longer term for the wind industry, and requests ENTSO-E to jointly promote the development of proper solutions.

GDF Suez noted that at the AC connection point, the same requirements should apply irrespective of the topology of the DC grid behind, i.e. without specifying the internal characteristics of the DC grids.

Statoil noted that many of these questions are tackled in CIGRÉ working groups, with a draft report of working group B4-56 (Guidelines for Preparation of Connection Agreements or Grid Codes for HVDC Grids) expected in December 2013.

ABB asked to define the terms “radial” and “multi-terminal” systems more precisely.

Technology neutrality

On the topic of technology specificities, very diverging views have been received in the Call for Stakeholder Input.

ENTSO-E proposes to maintain the NC HVDC technology–neutral as much as reasonably possible. All agree that this principle needs to be further discussed later on, based on specific draft requirements.

Multi-vendor flexibility

The User Group agrees that the NC HVDC focus is on AC side system needs, since additional requirements to impose multi-vendor compatibility can create barriers.

EWEA argues to exclude requirements for multi-vendor interoperability, as it may increase the CAPEX for HVDC connected projects. There are no indications that multi-vendor solutions will be available in the near future. Moreover, standards for HVDC VSC solutions, products and technologies are not available. With regards to compliance testing of the requirements, it should be considered that future proofing of solutions for multivendor interoperability is currently not possible, as there are no open models which can be used for feasibility studies of such solutions.

4. Detailed discussion of scope items

Active power control and frequency support

ENTSO-E has asked for information on cost implications or any possible 'knee-points' in case of more demanding requirements than those in NC RfG. No information was received in the written responses.

Frequency withstand capability

Vestas noted that it is not possible to provide such information without the knowledge of the details of the requirement, e.g. simultaneous voltage deviations. Statoil questioned the necessity of more onerous requirements than those in NC RfG due to its implications on the cost and rating of converters. ABB pointed out that the benefit of such additional capability may also depend on the electrical characteristics of the specific connection point within the network.

ElecLink questioned why an extra service would be required without clear compensation, pointing out that connection requirements can be a barrier for 3rd party grid investment. ENTSO-E's view is that the capability of withstanding frequency within a certain range is not a service, but stems from the need that all grid users (generation, demand, HVDC systems) support the system during disturbances.

EWEA noted that in general, a wider frequency range increases the CAPEX cost of wind turbines and offshore electrical equipment, especially if the requirement is implemented after commissioning. Also there is no need to have different frequency range requirements for the synchronous zones because of the decoupling from the onshore AC side.

ENTSO-E summarizes that the principle of having wider frequency ranges than in RfG is accepted provided it is not too wide to not incur excessive costs.

Rate of change of frequency

Vestas indicated that (up to approximately 2-3 Hz/sec values) this requirement probably does not have major cost implications, however, the time duration and the maximum change in delivered active power is an important factor.

ENTSO-E clarifies that in all prescriptions on Hz/sec, also the time duration over which this is measured is of importance.

Active power and frequency control

Additional inherent capability is available from HVDC technology compared to synchronous generators. ABB suggested that a base-case or more specific questions are provided by ENTSO-E so that all manufacturers could give more specific and comparable input.

Synthetic inertia

Research suggests that both the delivery of energy from one synchronous zone to another as well as using the capacitive energy stored within the DC link could be used to deliver an inertia-like behaviour. ENTSO-E asks for views on this.

Vestas expressed doubts whether the stored capacitive energy would be sufficient to provide such behaviour. If so, control margins with respect to other parameters could be compromised. Statoil added that it should be assessed on a system level whether requiring this characteristic from DC links is the cheapest and most efficient solution.

PB World argues that decoupling of two AC systems has been one of the selling points of HVDC, avoiding a spread of a fault impact in one system to the other. ENTSO-E agrees that synthetic inertia requires an adequate control.

Maximum loss of active power

User Group members note that this is partly covered by planning standards and requirements of NC Load-Frequency Control and Reserves. Much depends on what the specific requirement in the NC HVDC would ask for.

Reactive power control and voltage support

Voltage ranges

The same view applies as on frequency withstand capabilities.

Short circuit power contribution

No comments have been received in the written responses.

Statoil noted that the changes in filter design may have cost implications. PB World noted that technically, any P/Q response can be programmed up to the rated power of the link, but there is no overload capability. Fast ramping is not an issue in case of VSC technology.

Reactive power capability and exchange

Foreseen requirements are similar to those in the previous connection codes, i.e. capability of reactive power provision as well as the installed capability to limit reactive power spillage. The earlier point on technology-neutrality deserves special attention for this requirement.

EWEA underlined that while the onshore network is dominated by overhead lines with an inductive behaviour during high load hours, the offshore AC cable grid has capacitive behaviour, and therefore requirements for high capacitive reactive power factors like in the onshore network are inappropriate. Voltage Source Converters (VSC) have inherent reactive power capability, whereas wind turbines or more generally PPMs can be designed more cost-effectively with unity power factor at the MV or LV terminal. As such, EWEA considers that a power factor which is not equal to 1 has to be justified by ENTSO-E.

ABB noted that it is important to consider and specify the behaviour across the entire P/Q range, as e.g. full reactive power provision at full active power could be difficult/costly. High AC-voltages will increase cost since it will increase voltage ratings for all equipment and great reactive consumption at low AC voltage will result in high current ratings.

Power quality

No comments or objection to inclusion in the scope have been received.

Fault ride-through

ABB expressed its view that this requirement needs to distinguish between LCC and VSC technologies due to inherent differences. Time limitation for faults needs to be checked at a later stage.

Control interaction

This requirement aims to avoid adverse interaction with other grid users. No comments or experience was received in the written responses

Scottish Power pointed out that due to the lack of extensive experience, this issue is too early to be discussed. PB World noted that due to the fact that joint studies with products of different manufacturers would be difficult to carry out, a European network code cannot include any specificities, but acknowledged that the issue is important to be dealt with.

5. Other items

No suggestions for adding further items in the scope were expressed by the User Group.

Regarding the links with other network codes, VGB asked whether a code on the dimensioning and operation of TSO's AC systems is expected. ENTSO-E's notes this is covered by planning standards and other network codes.

Swisselectric summarised its view that besides the RfG and DCC, possible links and alignment with NC LFC&R, as well as NC CACM (efficiency in capacity allocation)) and NC on Electricity Balancing (delivery of ancillary services, exchange of balancing energy) need to be identified and handled in a consistent manner.

On the foreseen alignment with previous connection codes regarding the articles on compliance testing and monitoring, derogation procedures and retrospective application, VGB asks for independent regulatory oversight of the processes when it comes down to the ownership of HVDC connections by TSO´s and its daughter companies.

Regarding the largest incremental cost of HVDC capabilities, EWEA named black start, synthetic inertia, reactive power and demanding fault-ride through capabilities as most relevant, while ABB identified high voltage and current ratings.

6. Next steps

In the following months, ENTSO-E will take into account the responses received to the Call for Stakeholder Input, the public workshop held on 23 May 2013, as well as this meeting, and finalise the scope, as well as the first drafts of specific requirements.

A first draft code will be provided to the members of the User Group ahead of the following meeting which is scheduled for 12 September 2013.

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