nationalgrid

HVDC Network Code – Preliminary Scoping Requirements

Code Drafter: Darren Chan

June 2013 JESG

nationalgrid

ACER's Framework Guidelines

"The network code(s) developed according to these FWGL shall apply to grid connections for all types of *significant grid users*, already or to be, connected to transmission or distribution network."

"Any grid user not deemed to be a significant grid user shall not fall under the requirement of the network code(s)"

"Significant Grid Users – pre-existing grid users and new grid users which are deemed significant on the basis of their impact on cross border system performance via influence on the control area's security of supply, including provision of ancillary services"

nationalgrid

HVDC Considerations

Why is HVDC included in EC codes?

- It's inherent capabilities – fast active and reactive power control, supplementary control, etc. can help the EU to achieve its three energy goals

- Why are PPMs included?
  - Originally in RfG, stakeholders wanted it included with HVDC as combination could bring economic benefits
  - Only AC collected PPMs are included

Requirements should not favour or discriminate technology

Requirements should not be a barrier to future expansion into multi-terminal or meshed DC grids

- Meshed DC grids are not included
- Standardisation issues are part of separate WGs

nationalgrid

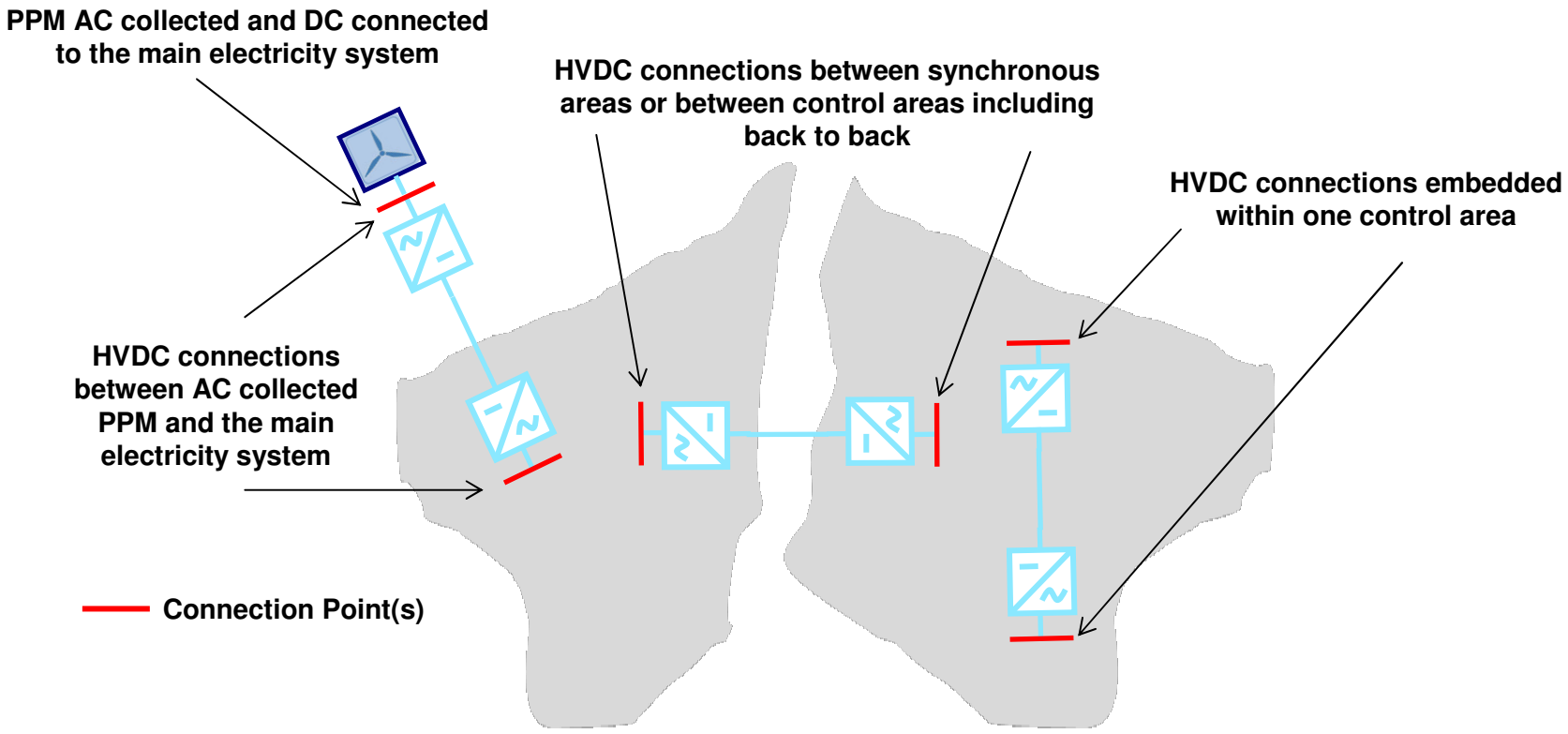
Significant Grid Users

- The following configurations will be treated as significant:

- HVDC connections between synchronous zones or between control areas inside the same synchronous zone
- HVDC connections embedded within one control area, if connected at AC transmission voltage
- HVDC connections to offshore and onshore Power Park Modules
- HVDC connected Power Park Modules (AC collected)
- Back to Back HVDC
- Single and radial Multi-terminal HVDC connection types

nationalgrid

Significant Grid Users



nationalgrid

Requirements for HVDC Connections

- Active power control and frequency support
- Reactive power control and voltage support
- Fault ride through
- Control
- Protection devices and settings
- Power system restoration

nationalgrid

Requirements for Active Power Control and Frequency Support

- Frequency ranges
- Rate of change of frequency withstand capability
- Active power controllability; control range and ramp rates
- Synthetic inertial capability
- Frequency sensitive mode
- Limited frequency sensitive mode (overfrequency, underfrequency)
- Frequency control
- Maximum loss of active power

Requirements for Reactive Power Control and Voltage Support

nationalgrid

- Voltage ranges
- Short circuit contribution during faults
- Reactive power capability
- Reactive power exchange
- Reactive power control mode
- Priority to active or reactive power contribution
- Power quality

nationalgrid

Fault Ride Through

- Capable of riding through fault, i.e staying connected
- Fault conditions specified as a voltage-time profile
- Helps to maintain voltage and frequency stability

nationalgrid

Requirements for Control

- Converter synchronisation/disconnection
- Control interaction between converter station and PPMs
- Power oscillation damping
- Subsynchronous torsional interaction damping
- Operability at minimum short circuit power
- Converter operational robustness
- Grid controller

Requirements for Protection Devices and Settings

nationalgrid

- Re-Connection post contingency
- Electrical Protection Schemes and Settings
- Control Schemes and Settings
- Priority Ranking of Protection and Control
- Changes to protection schemes and settings – coordination and agreement

nationalgrid

Restoration Requirements

- Black start capability
- Capability to take part in isolated network operation

nationalgrid

Power Park Module Requirements

- Requirements at converter AC interface point
- Requirements as in RfG, with possible variation in ranges and settings
- Additionally, also needs to meet requirements as per HVDC connections
- PPM and HVDC connection need to have economic coordinated requirements so as not to impair requirements at AC onshore transmission connection point

nationalgrid

Requirements for Information Exchange

Adequate and coordinated information exchange between operators of HVDC and PPMs and TSOs is necessary to fulfil several objectives.

- Operational strategy
- Parameter setting
- Fault recording and dynamic performance
- Fault and disturbance analysis
- Simulation models

nationalgrid

Compliance and Derogation

- Compliance shall be demonstrated according to Operational Notification Procedure for connection

- The derogation procedure for non-compliance shall be transparent, non-discriminatory and based on cost benefit analysis

nationalgrid

What Happens Next?

- 3rd User Group Meeting in September 2013
- Publication of Draft Code in November 2013
  - 2nd workshop, and public consultation within 8 weeks
- Finalising Code: Jan-Apr 2014
  - Interactions with User Groups
- Submission to ACER by 1 May 2014