

# Draft General Requirements for NC HVDC

# Application

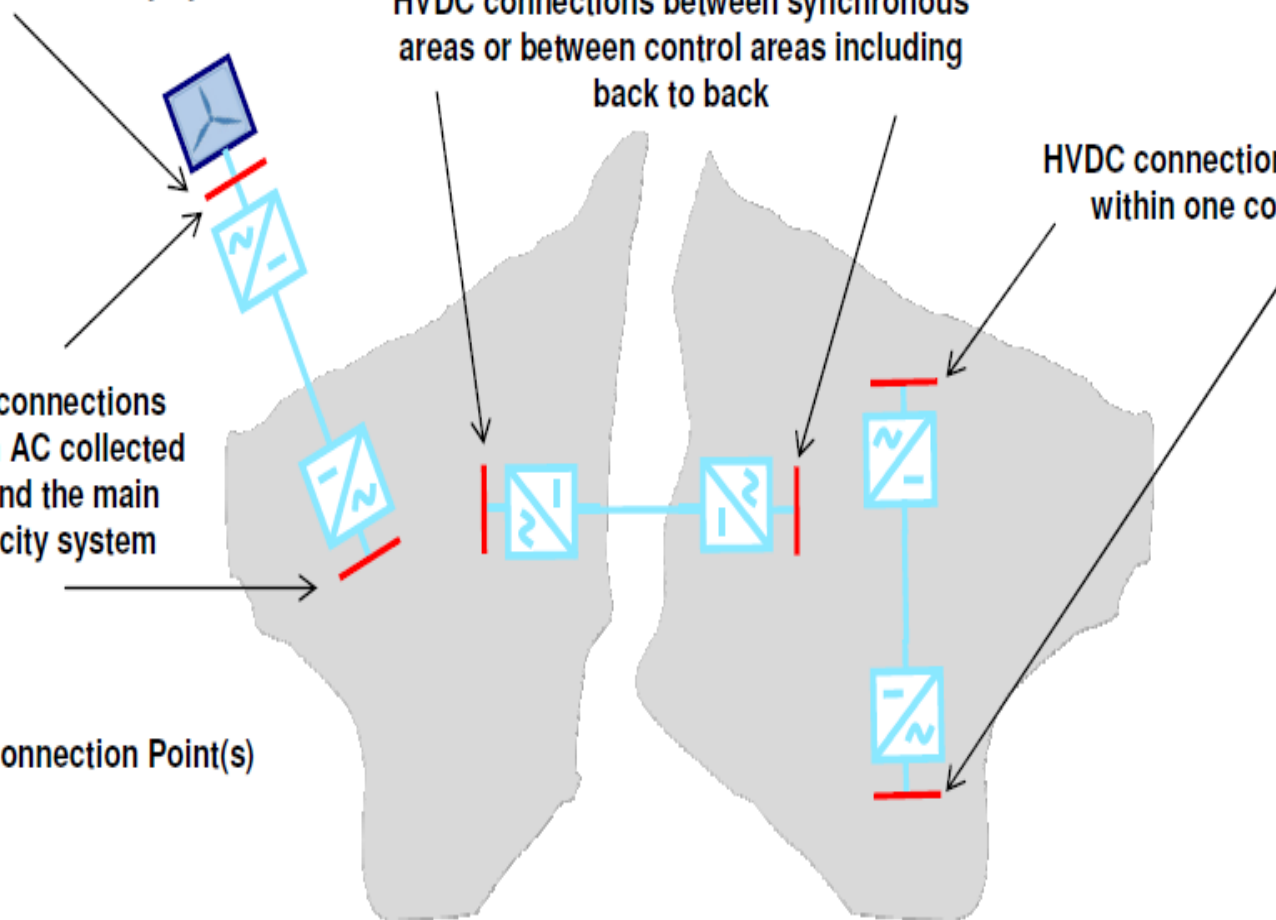
PPM AC collected and DC connected to the main electricity system

HVDC connections between synchronous areas or between control areas including back to back

HVDC connections embedded within one control area

HVDC connections between AC collected PPM and the main electricity system

— Connection Point(s)



- HVDC VSC converters: **operational** but still limited *European* operational experience
- NEMO and ALEGrO: advanced stage - no obligation to comply
- No operational experience in Elia (NEMO: starting 2019)
- Academic & industrial R&D on DC-AC interactions still in early stage
- Control tuning = site specific (possibly w. control opportunities)
- No complying HVDC converters planned within 5 – 7 years

ENTSOe “IGD *Minimalistic approach*”: for TSO’s w/o actual experience and first applications beyond 5 years

- ENCODE §5.4 on the national translation:
  - fixed statement proposal
  - OR *methodology* to establish them
  - OR define statements as *site-specific*

**STRATEGY:** only the most obvious clauses stated, for others propose methodology (fill gaps at suitable timing) or **project specific agreement.**

# Chapter overview

Chapter	Clause range	Statements
Frequency	Ranges, auto. disconnection, active power control, ...	Based on NEMO & ALEGrO and at least req. for RfG – type D
	Stability issues, WPP, Remote end	Site-specific statements
Voltage	Ranges, fault ride through, reactive power control, priority control	Based on NEMO & ALEGrO and at least req. for RfG – type D
	Power Quality issues	Synergrid regulations (also Site-specific)
	Short circuit & reactive power contribution, WPP, Remote	Site-specific statements
System restoration	Power oscillation damping, black start	Spec. in Connection Contract
	WPP, Remote end	Site-specific statements
Simulation and models	All interactions AC-DC, WPP, Remote end	Agreement TSO – System Owner
	Protection schemes	Agreement TSO – System Owner

# List of abbreviations

- ❖ IGD: (ENTSOe) Implementation Guideline Document (for Grid Code Implementation)
- ❖ HVDC: High Voltage Direct Current
- ❖ VSC: Voltage Source Converter (a particular HVDC technology, applied for NEMO & ALEGrO)
- ❖ WPP: Wind Power Plant
- ❖ PPM: Power Plant Module
- ❖ RfG: Requirements For Generators

# Many thanks for your attention!

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