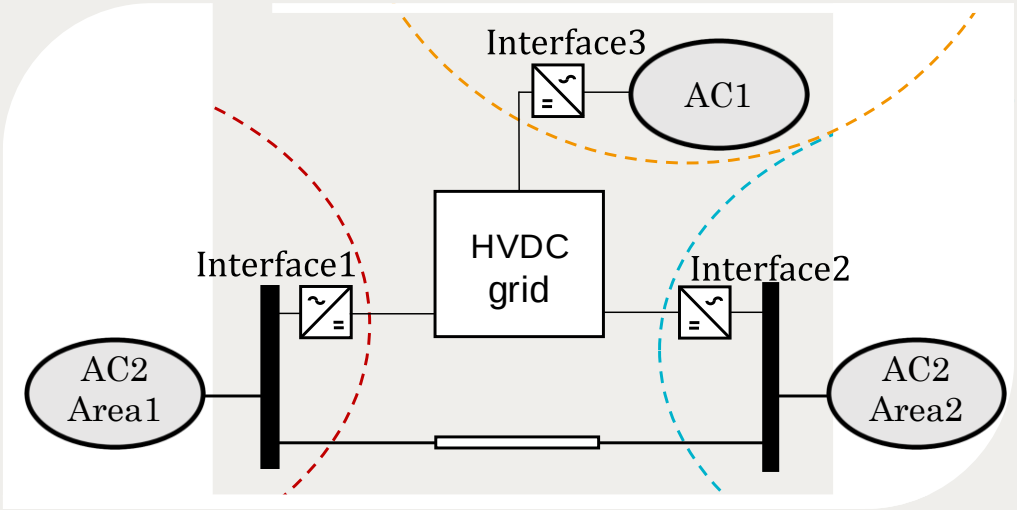
Paris Session 2022

The Admissible Temporary Loss of DC Infeed : a necessary specification for optimal design of HVDC grids

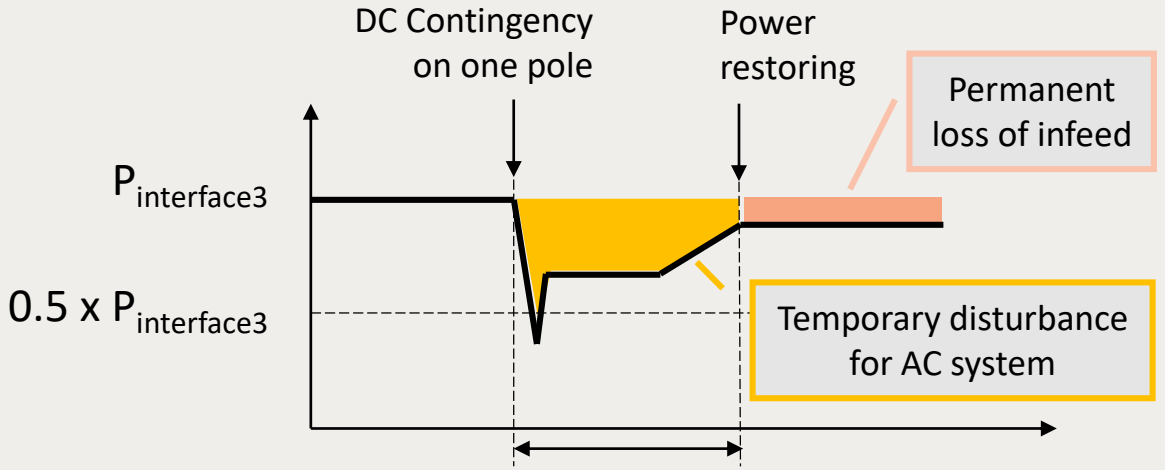
PS1.2: Fault Ride-Through & Clearing in VSC HVDC Applications
Q1.4: With the large number of HVDC converters being integrated to the power system what challenges are foreseen with lack of harmonized grid codes? What impact would a harmonized grid code have on the project development cost and time?

Bruno LUSCAN, France

Disturbance induced by DC-fault ride through and clearing in VSC-HVDC grids



HVDC grid in Bipolar Configuration



Typical restoring time when DC breakers are used:
P: 0-500 ms
Q: 0 - 50 ms

Temporary disturbance magnitude is driven by

1/ Converter fault-ride through capability before blocking

2/ Performance of DC protection process (fault-clearing + restoration)

3/ Healthy pole capability to compensate temporary Loss of Infeed

HVDC protection design is driven by AC systems operation constraints

DC criteria !

Converters fault-ride through capability, before blocking

Poles sizing (voltage, current, transient overload)

Lines and busbars configuration

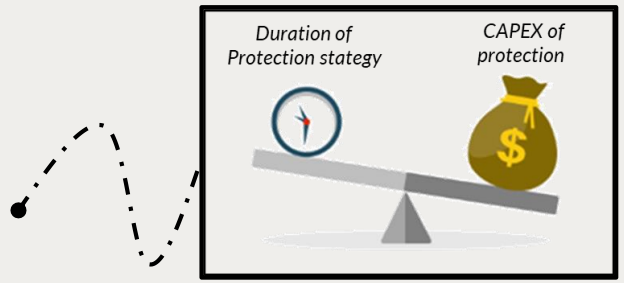
HVDC architecture

Protection strategy options

HVDC protection system

DCCB (or Fault Separation Device) requirements

DC reactor sizing



MTDC solution
Cost-effective (TOTEX)
Best performance (KPIs)
Expandable (in scale)
Stepwisely (in pace)

Techno-Economic-Analysis - based
DC grid protection choice

AC system

Adequacy analysis

AC criteria !

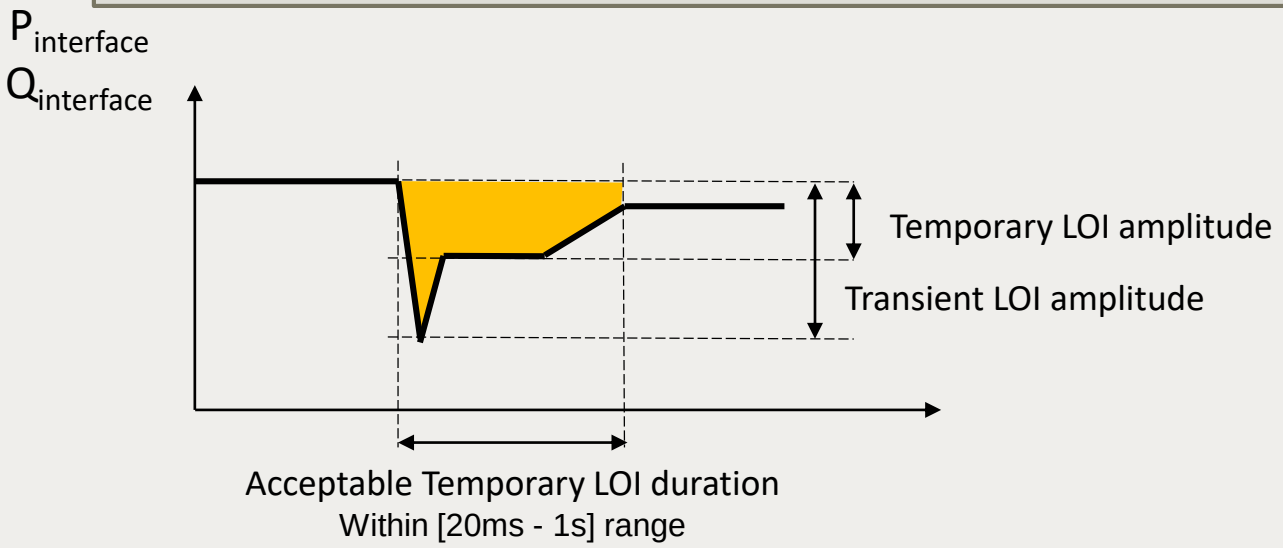
Grid support resources
Admissible Loss of Infeed

AC criteria !

Security analysis

A DC Fault-Ride-Through capability that must be considered and specified

The ***Acceptable <u>Temporary</u> Loss of DC Infeed*** of AC systems connected to the DC grid



LOI: Loss Of Infeed

For Bipole scheme & Per pole

		Offshore Wind Farm AC grid	*Synchronous AC system area*
1/ T_LOI_P	⟺	Wind Turbines control Curtailment strategy	ROCOF / Inertia Transient stability
2/ T_LOI_Q	⟺	Grid Forming strategy	AC voltage strength