Paris Session 2022

Irish considerations for LCC vs VSC

B4 PS1-1 Q1.3
What are the main considerations on technology selection for new and refurbishment HVDC projects?

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Group Discussion Meeting

Background

All Island system

- Synchronous island
  - *>80% generation from renewable resources by 2030*
  - *(Inverter Based Resources)*
- 2 existing HVDC interconnectors to Great Britain
  - *1x LCC HVDC link (**Moyle**)*
  - *1x VSC HVDC link (**East West**)*
- *2 HVDC interconnectors in development*
  - *VSC HVDC link to Wales (**Greenlink**)*
  - *VSC HVDC link to France (**Celtic**)*
- *Numerous planned HVDC links*
  - *Offshore wind integration*
  - *Further interconnection*

Considerations in Technology Selection for New HVDC schemes in Ireland

Multi-criteria Techno-economic appraisal

- Fundamental requirements
  - Grid aspects per EirGrid's *Framework for Grid Development*

Active Power Transfer	**Can the realisable capacity be matched against system needs? (Consider Largest single infeed / outfeed)**
	Are active power losses minimised?
	Is Power flow reversal practical? (To enable import and export)
Reactive Power Compensation	**Are there Reactive power requirements?**
	Is there inherent VAR control or Grid support?
Power Quality	**How significant are AC and DC harmonic levels? (any AC cables may promote resonances and exacerbate)**
	Are Harmonic filters required?
Performance	**Can Active and Reactive Power be controlled independently?**
	Is there a dependency on the Grid frequency?
	Is it prone to commutation failure or internal faults?
	Can overloads be tolerated?
	How are DC side faults handled?
System Services	**Can it provide Blackstart in the event of a power interruption?**
	Can the technology provide any ancillary services for frequency or voltage control?
	Can it support Grid Forming in low inertial grids?
Interactions	**Are there any potential interactions with the wider electric system? (Dynamic stability simulations, control & protection schemes)**
	Is there a threshold for operation?

Group Discussion

Medium / Longer Term Considerations in HVDC Technology Selection

Multi-criteria Techno-economic appraisal

– Asset Management (Consider whole asset lifetime)

Maintenance	Is the technology proven with a reliable track record?
	Are Spare parts readily available? (off the shelf or OEM only?) Are there vendor-dependent components / IP to consider?
	What number of components to achieve desired rating? (impact on number of spares required, more parts to maintain, outage duration)
	What is the cost of components to achieve desired rating?
	Are there any special transformer considerations?
	Are there any special cable considerations?
	Is DC smoothing required?
Future-proofing	Are appropriate models available to address future compatibility? (control schemes, real time simulator, digital twin)
	Can it operate in low system strength conditions? (i.e. reduced voltage stiffness)
	Is it suitable for connecting Inverter Based Resources?
	Can it accommodate more than 2 terminals? (Consider multi-terminal / mesh expandability)
	Can more than one vendor be integrated into the solution?
Environmental	What is the size of the Site footprint? (visual impact and blending with surrounding environment)
	Are there audible emissions? (Loud sounds, sporadic or consistent)?
	Are there any special shielding requirements? (electromagnetic interference)
Cost	What is the overall cost of the project delivery?

Group Discussion