Paris Session 2022

Compensation Method to speedup offline and real-time Electromagnetic Transients simulation of inverter-based transmission networks

SC C4 PS3/Q3.11

What are the latest initiatives for reducing the computational time of offline wide-area EMT simulation for power systems with high share of inverter-based resources, and how are these off-line models compared in general against wide-area real-time EMT models??

B. BRUNED (France)

Need of offline and real-time EMT simulation at RTE

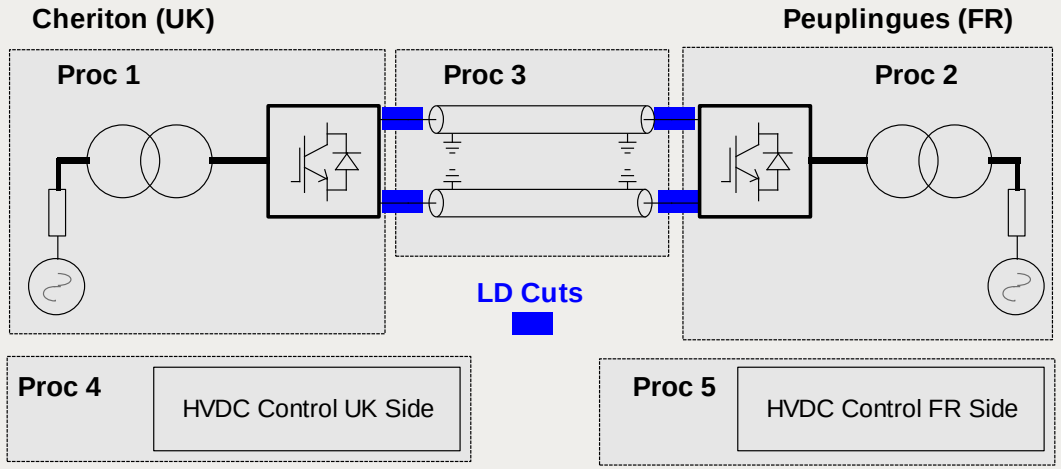
- More power electronics equipment (Energy Transition)
- Interaction Studies with EMT simulation (offline and real-time)
- Real-time lab in Campus Transfo (Lyon)

- Need to speedup computation time

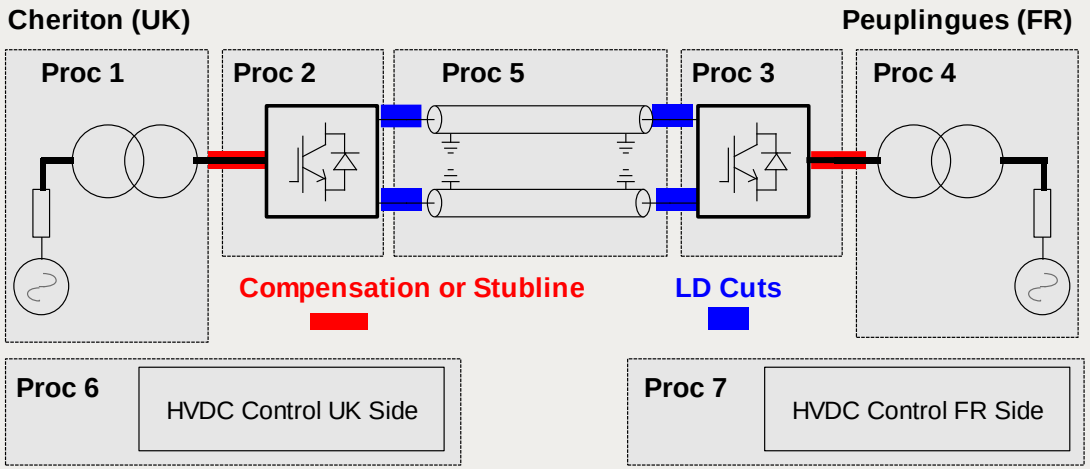
- Parallelization Techniques:
  - **Delay-based :** Line-Delay (**LD**) and Stubline or TLine (**SL**)
  - **Delay-free** : Compensation Method **(CM)**

Test case Eleclink HVDC interconnection (Fr-UK)

- VSC-HVDC with MMC
- 1000 MW, +/- 320 kV
- Offline and real-time simulation (HYPERSIM)
- Test of three parallel methods, **LD**, **LD+SL** and **LD+CM**



LD



LD+CM and **LD+SL**

Test case Eleclink HVDC interconnection (Fr-UK)

- Starting Sequence simulation of 20 s
- **LD+CM** best trade-off speedup/accuracy
- Next step HIL simulation

Parallel Solutions	Offline		Real-time 10 µs
	Computation time (s)	Speedup	
LD	16.2	1.0	No
LD+SL	10.6	1.5	Yes
LD+CM	11.6	1.4	Yes