

# Paris Session 2022



## Electromagnetic transient simulations for assessing the risk of a live black start test of an VSC HVDC

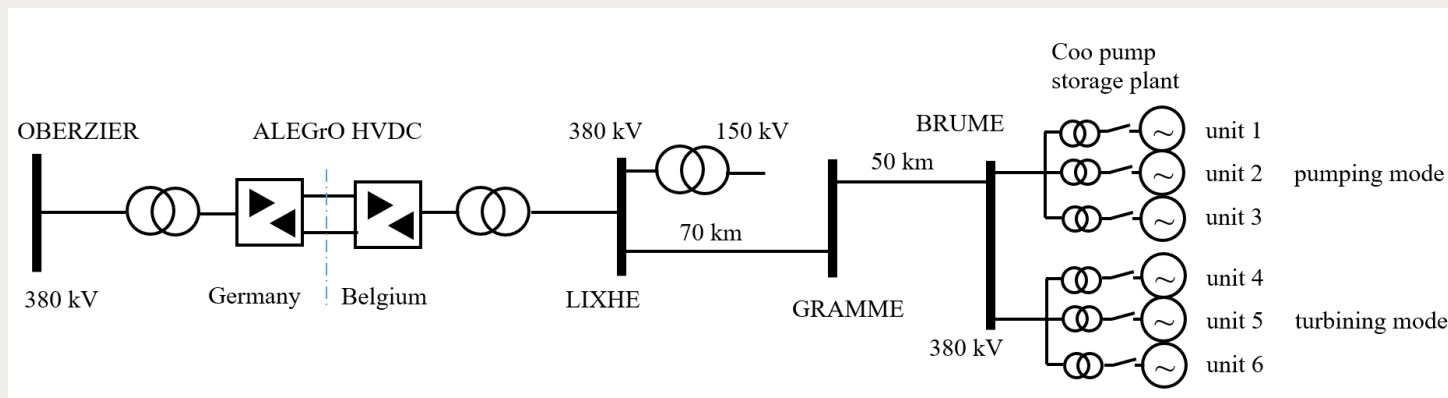
SC C4

PS 3/Question 14 - What are the worldwide experiences in situations where the overall power system model failed to predict an actual system event or ongoing occurrences of abnormal responses, and were the causes could be deterministically identified and rectified?

Fortunato VILLELLA - Belgium

# Large scale blackstart test of a 1GW HVDC VSC

- Blackstart test performed on new HVDC
  - 1GW VSC - U/f mode (“Forming the grid”)
  - Feeding an islanded network with 6 pump/turbines
  - Connected through a 120 km OHL circuit
- Tests involving third party (owner of the power plant)
- Tests concluded positively with resynchronization to the EU grid
- High quality model developed for EMT assessment of the risks related to the blackstart test



# Interaction between parallel OHL at different frequencies

- Long (120km) OHL un-transposed conductors on the same tower are energized at different frequencies during the tests
- Interaction between the conductors have been detected with EMT simulations and confirmed via measurement during test
- An EMT model without the geometric details of the OHL would not have allowed determining the unbalance that caused the oscillations (no interaction and no oscillations)
- An EMT model would not have allowed the correct simulation of the U/f mode and of the limitations of the HVDC interconnector (no blocking or trip).

