Paris Session 2022

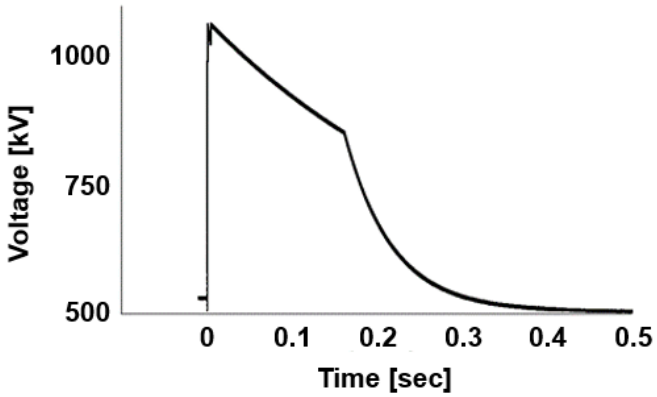
Challenges and feedback on Temporary Overvoltage (TOV) tests from CIGRE TB 852 (853)

SC B1 Insulated Cables – PS2 – Q5

Markus Saltzer, Switzerland

HV laboratory test set-up for reproducing TOV wave shapes – challenges and feedback

- Generation specifically of some long TOV wave shapes, have been restricted by laboratory equipment constraints.
- Reproduction of TOV wave shapes in a HV laboratory environment on a level of 525 kV is possible, but complex and comes still with many open questions and uncertainties, e.g.:
  - Lack of expertise in practical implementation.
  - Lack of experience and robustness in test execution and laboratory set-up.
  - Open questions in reproducibility, measurability, potential secondary effects.
  - Only very few labs in the world have been able to produce such wave shapes



Measured TOV wave shape as applied to a 525 kV HVDC cable system (by the courtesy of NKT).

TOV recommendations: implementation, challenges, open questions

CIGRE TB 852 (853) – Special temporary overvoltage tests

- Raise awareness, "*investigate the system limits*", "*intended for development purpose*".
- Tests are an "*exception*" and "*shall not be considered as design parameters*" for insulation coordination
- Purpose to "*address project specific issues or for engineering information*"

  - "*project specific*" → interpretation risk that every commercial project is considered a special case and an exception
  - In fact, TOV appears as a general phenomenon in DC pole-to-ground faults and has its strongest dependency on the HVDC system layout.
  - General system layout dependence points towards a universal technology clarification, rather than project specific testing.

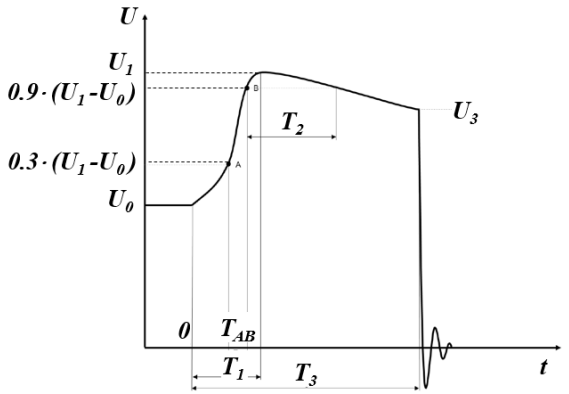
TOV recommendations: implementation, challenges, open questions

CIGRE TB 852 (853) – Very slow front temporary overvoltage (TOV)

- Implementation has been restricted to laboratory equipment constraints at time of publication
  - Restrictions are not valid any longer.
  - Recharacterize the pulse shape description to the core character: plateau time, initial voltage peak or overshoot.

CIGRE TB 852 (853) – chopped TOV

- "*Some type of converter operation*" (protective)
  - Potential risk to TOV chopping on the plateau
  - Restrictions need to be discussed on TOV chopping
  - Are all relevant descriptive parameters considered in the suggested test curve?



CIGRE TB 852 Figure 7, Very slow front temporary overvoltage with chopped tail (chopped TOV)

Discuss in the community. Run a B1(/B4) Task Force with the target to amend CIGRE TB 852 (853) by latest knowledge and experience.