



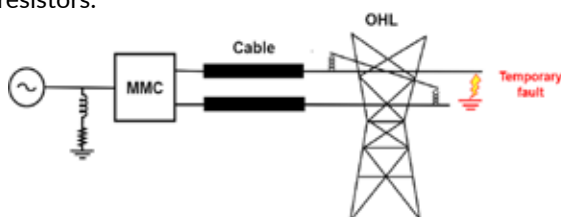
# Fast MMC-based line energization

*A novel strategy for HVDC bipole and asymmetrical monopole line fast re-energization using half-bridge MMC internal energy*

## CONTEXT

In a HVDC point-to-point link comprising a section of OHL, the majority of pole to ground faults can be considered as a non-permanent faults. Therefore, fast reconnection of the link must be considered in order to restore the power as soon as possible.

After clearing of the fault by opening the AC breakers, a common solution to discharge the pole voltages is through resistors installed at the DC side of the converter and to recharge them through pre-insertion resistors.



## TECHNOLOGY DESCRIPTION

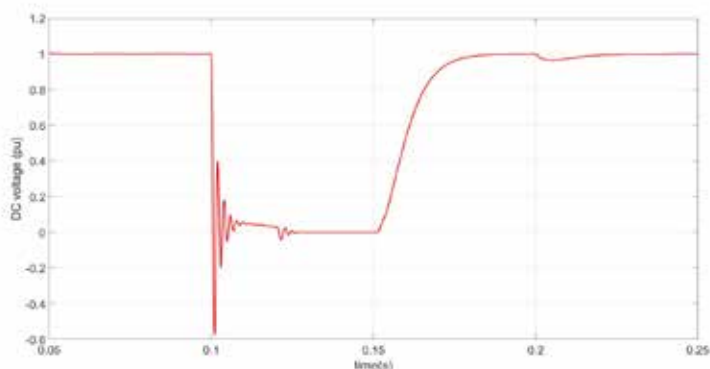
Besides the recognized advantages over conventional VSCs, one of the remarkable features of the MMC is the ability to store energy in the distributed sub-modules.

As a solution to the DC voltage restoration problem, we propose a novel strategy that makes use of the energy storage capability of the MMC to bring the voltage in the HVDC lines back to its rated value.

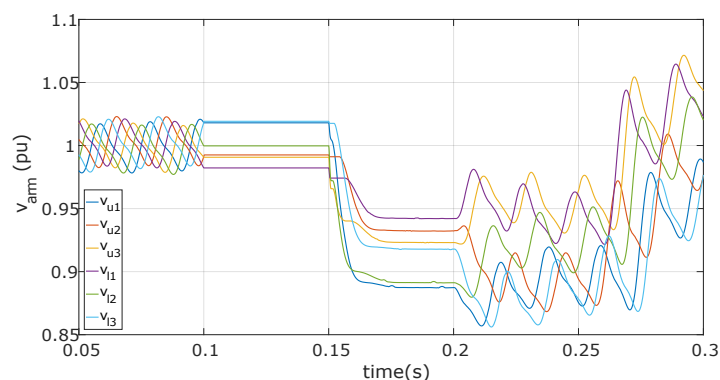
This implies a disconnection of the concerned MMC from its correspondent AC grid, in order to control the lines energization.

By employing this method, the total time from the fault occurrence to the power restoring is around 1 sec.

The proposed strategy allows to accelerate the time to restore the power while avoiding the use of DC discharging resistors and DC pre-insertion closing resistors. An insulation recovery check can be also performed smoothly.



LINE DC VOLTAGE



MMC ARMS VOLTAGE

## APPLICATION DOMAIN

Point to point HVDC connection (bipole and asymmetrical monopole with an OHL portion)  
Also applicable to cable-based MTDC grids

## ADVANTAGES

- No need for discharge or closing resistors
- Fast power restoration after a DC fault
- Capability to check smoothly check voltage recovery

## TRL SCALE



EMT simulation work.

## DELIVERABLES

Patent appl. FR3065590  
PCT/EP2018/059849  
Virtual mock-ups  
Training, technical support