2018 CIGRE SESSION

PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

cigre

CIGRE SC A3 & B4 Techincal panel on HVDC circuit breakers

In cooperation with PROMOTioN project

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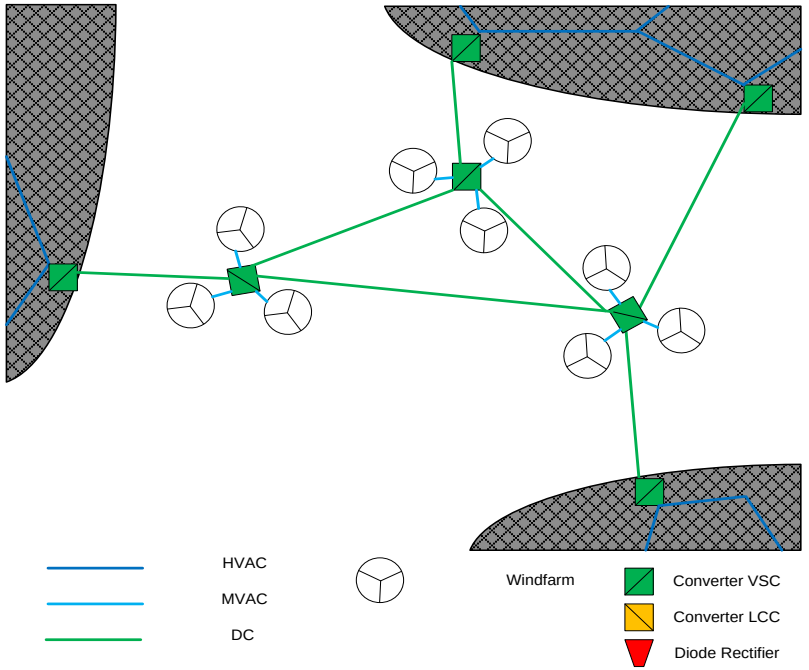
Place: Room 242B, Level 2, Palais des Congrès, France
Date: 15:00-17:00, Thursday 30 August, 2018

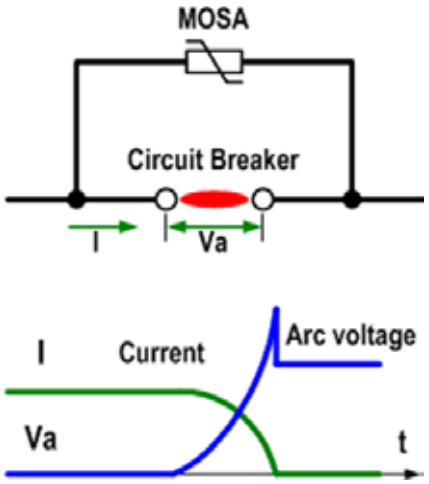
DC circuit breaker for future MT HVDC grids



Rapid fault current clearing to secure healthy line operation continuously
Long term reliability and less maintenance under off-shore installations
Repetitive large energy dissipation with multi column MOSAs
Rapid auto reclosing for HVDC OHL
Minimum current carrying loss
Economic cost

DC circuit breaker with different technologies

Arc voltage current limiting scheme

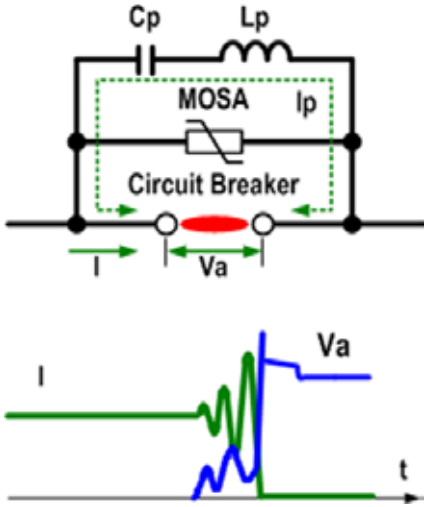


LV-DC Circuit Breaker
DC DS, DC-ES

480V-15kA MCCB for industrial applications, Less than a few ms

Arc voltage generated across the contacts limits the DC current.

Passive resonant current zero creation scheme

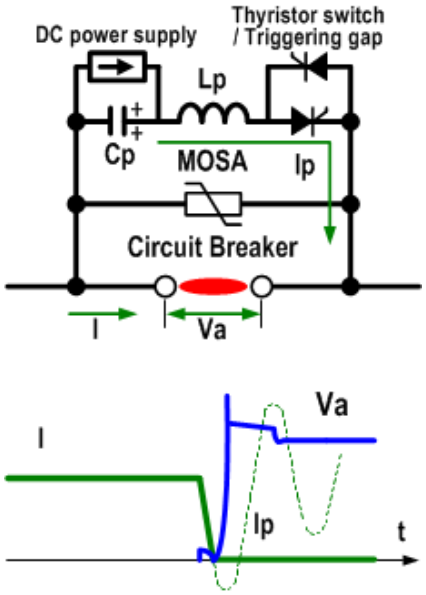


MRTB for LCC Bipolar HVDC with metallic return lines

10kV-5000A for MRTB
550kV-2800A for LLC
20-40 ms for interruption

Parallel capacitor & reactor across the circuit breaker generates the current oscillation, which eventually leads to the current zero.

Active resonant current zero creation with current injection

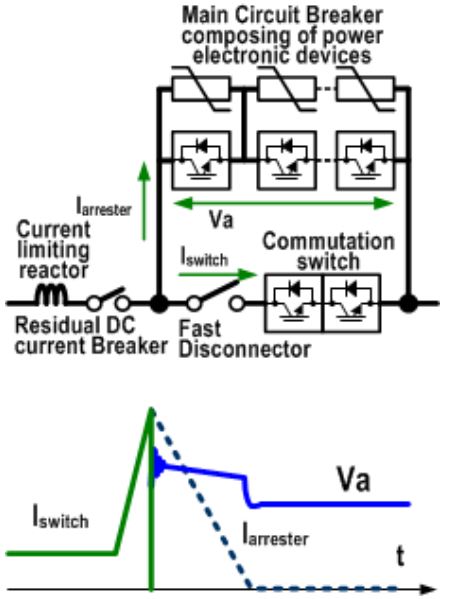


DC Circuit Breaker for VSC HVDC grids

1500V-100 kA DCCB for railway network, less than 8 ms
72-320 kV-25kA for VSC HVDC,

Pre-charged capacitor imposes an reverse current on DC current and instantly creates the current zero.

Hybrid mechanical & power electronic switch



DC Circuit Breaker for VSC HVDC grids

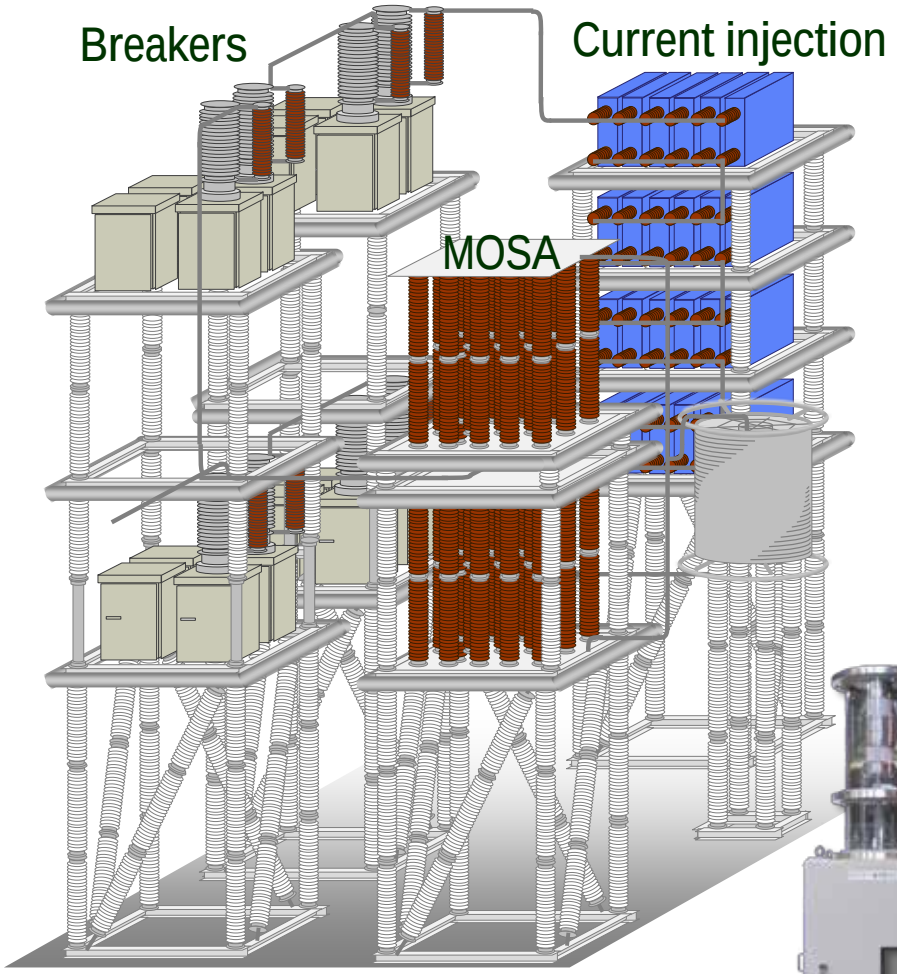
80kV-9kA for VSC
500kV-25kA prototype DC CB
Less than 5 ms

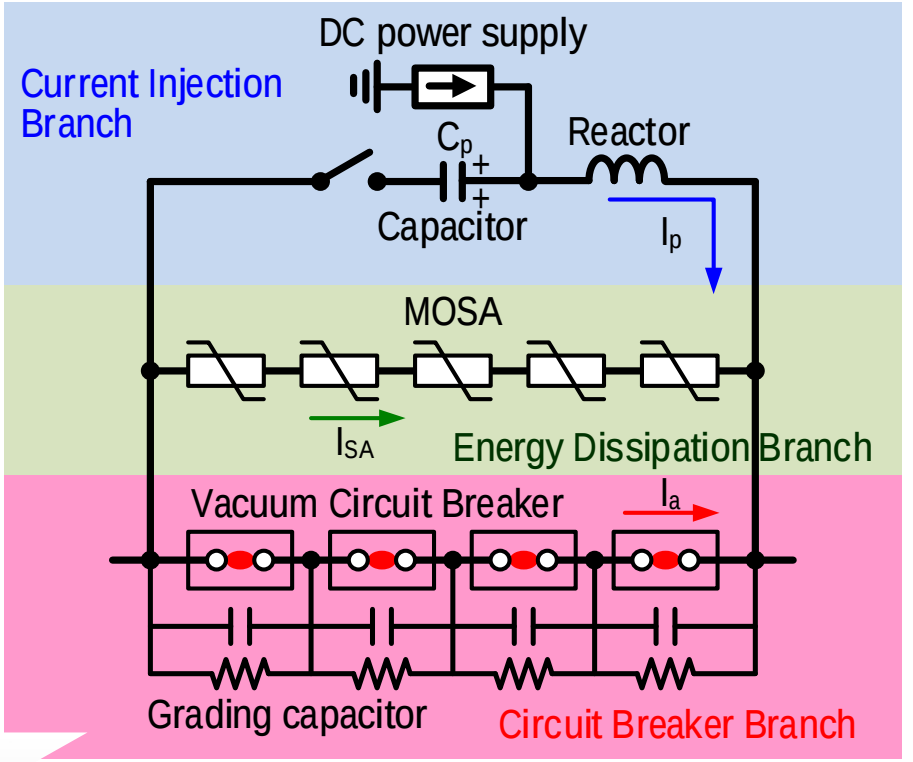
IGBT devices connected in parallel and series block DC fault current.

MCCB: Molded Case Circuit Breaker

MRTB: Metallic Return Transfer Breaker

DC circuit breaker prototype of 320 kV 16 kA capability

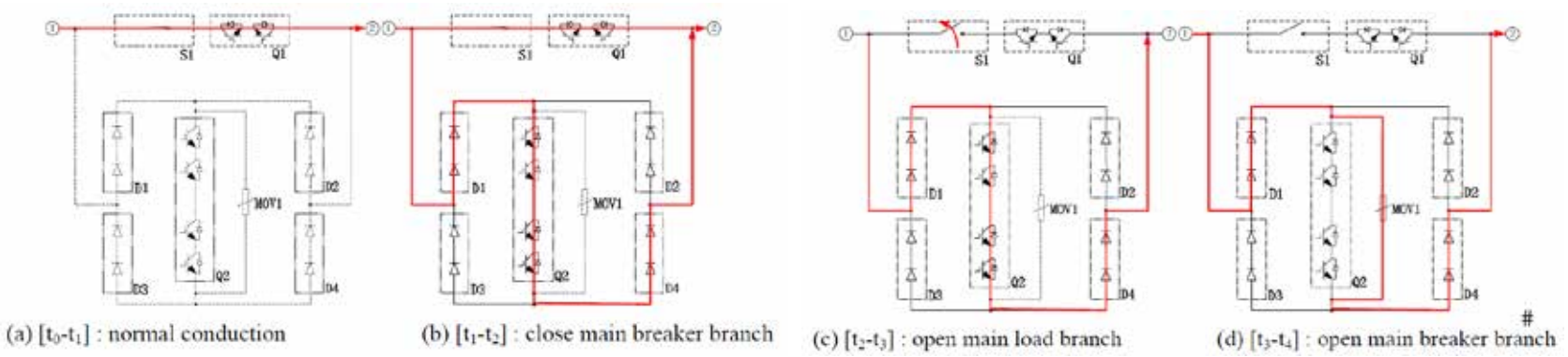




HV vacuum interrupter

MOSA

Hybrid mechanical-electronic DC circuit breaker



(a) Current carrying through a main circuit (b) Current commutation to interruption blanch
(c) Open a main circuit (d) Current interruption and energy dissipation

China NR news: On December 15th 2016, ±500kV 25 kA DC circuit breaker demonstrated in Lab

Agenda and Speakers

Program / Titles	Affiliation / Company	Speaker
Opening	CIGRE SC A3 PROMOTioN	Hiroki Ito Cornelis Plet
HVDC breaker experience in China	GEIRI (State Grid Corp. of China)	Ting An
	China Southern Power Grid	Shukai Xu
Considerations on HVDC breaker application in Europe	SHE Transmission, Scotland	Paul Neilson
Current injection circuit breakers	Mitsubishi Electric Corp., Japan	Hiroki Ito / Tadao Minagawa / Sho Tokoyoda
Novel technology DC circuit breaker	SciBreak, Sweden	Lennart Ängquist
Testing of HVDC circuit breakers	KEMA Laboratories DNV GL, NL	René Smeets
Discussion		

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For power system expertise

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