

# High Voltage Direct Current Power Converter

An alternative solution to using circuit breakers which provides fast control and protection of multi-terminal MMC VSC HVDC systems



*The header image is purely illustrative. Source: 3mikey5000, Pixabay, CCO.*

## IP Status

Patented

## Seeking

Development partner, Commercial partner, Licensing

## About **University of Birmingham**

At the University of Birmingham our research leads to new inventions and fuels innovation and business growth.

# Background

Transmission of power in voltage sourced converter (VSC) based high voltage direct current (HVDC) power distribution grids has many advantages over conventional AC networks, especially over long transmission distances. However, switching systems are costly due to the high price of the DC circuit breakers used, which contributes significantly to the overall capital cost of developing DC grids.

## Tech Overview

Researchers at the University have developed an alternative solution to using circuit breakers. The new solution provides fast DC fault control and protection from DC fault currents using a VSC Multi-level Modular Converter (MMC) topology in a two-terminal or multi-terminal HVDC power transmission system by reducing the current to zero through a novel routing managed by the VSC converter itself.

Transmission of power in VSC based HVDC power distribution grids has the advantage of being able to transmit large amounts of power over long distances more efficiently and at lower capital cost than AC systems. However, a major problem with HVDC grids is the need to suppress DC fault currents to protect the converters and the DC grid.

DC fault current suppression is extremely important for a VSC HVDC power transmission system to suppress both AC and DC currents arising from a DC-side (or DC-grid) short circuit, to control and protect the converters and the DC grid, and hence isolate the faulty DC circuit.

Existing solutions utilize switching systems using expensive DC circuit breakers that contribute significantly to the capital cost of developing DC grids. Our new solution allows for the expensive DC circuit breakers to be replaced by simple low cost switches, thereby reducing the complexity and cost of new HVDC power grids.

The new control strategy provides fast control and protection of multi-terminal MMC VSC HVDC systems where DC or AC faults arise.

## Benefits

- Reduces the cost and complexity of new HVDC power grids
- Allows a simple low cost switch to be used as a circuit breaker
- The ability to force the current to zero overcomes the problem of contact wear due to arcing
- Improved availability of power with reduction in power failures

## Applications

The technology has the potential to be applied to existing and new VSC HVDC power grids to improve grid performance and reduce capital cost of new installations.

## Opportunity

Extensive system modelling carried out using state-of-the-art tools. Looking for collaboration and licensing opportunities.

ZSR823

## Patents

- International patent application published as WO2013/079937 and granted as US 9,780,556 and CN201280067850.2