

SCiBreak

Enabling the Supergrid

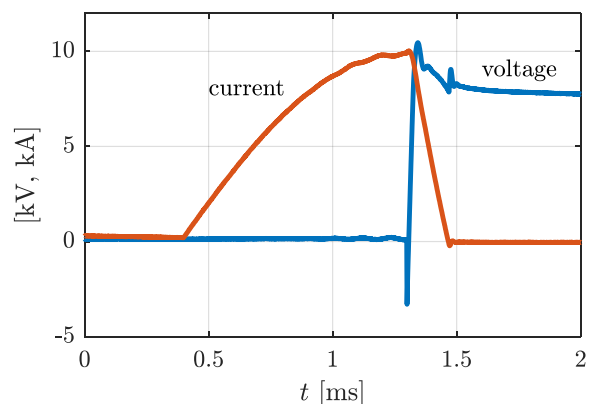
SCiBreak AB is a Swedish company founded in 2014 to develop and commercialize ultra-fast electric circuit breakers based on a new concept. This concept allows for interruption of high AC or DC currents with high returning voltage within a few milliseconds to a much lower cost than competing solutions.

Circuit breakers are used in high- and medium-voltage power systems to rapidly disconnect parts where short-circuit faults have occurred. This is necessary to prevent damage to equipment and to permit continued operation of the rest of the grid. This will also be the case for the high-voltage direct current (HVDC) grids that are currently being planned. In an HVDC grid there is no short-circuit impedance apart from the very low resistance of the cables or overhead lines, and a fault will therefore rapidly de-energize the whole grid if it is not cleared.

Compared to AC breakers the design of DC breakers is generally more complex since no zero-crossings in the current occur. Instead, semiconductor switching elements are needed to perform the interruption. The semiconductors incur significantly higher cost and much higher power loss in the conducting state, increasing the life-cycle cost of such a breaker. To address the issue of power loss *hybrid breakers*, involving both mechanical parts and semiconductor elements, have been developed. Unfortunately, these tend to be very costly due to the reliance on a large number of semiconductor devices.

Compared to other hybrid breakers SCiBreak's proprietary technology allows for a radical reduction (around ten times) of the amount of power electronic components. Furthermore, it mostly relies on standard components and devices, already manufactured in large volumes for other purposes. Therefore, the overall cost is very low compared to competing solutions.

The concept has been experimentally verified in a down-scaled laboratory prototype that has been successfully operated with currents up to 10 kA and 10 kV transient returning voltage, see figure.



Interruption of 10 kA with 10 kV peak transient recovery voltage, by SCiBreak technology.

During 2017-2018 SCiBreak, together with KU Leuven and the TSO Svenska Kraftnät, will develop and manufacture a breaker module that could form part of a breaker for a meshed HVDC grid. The module will be rated for 40 kV and 10 kA and will be tested at DNV GL in the Netherlands.



Modular breaker concept.

SCiBreak is also collaborating with the rest of the HVDC industry within the EU-supported project *PROMOTioN*, which aims to further the development of meshed offshore HVDC grids in Europe. Together with other manufacturers SCiBreak will contribute to the creation of standards for HVDC breakers and their testing.