ASTRI | Hong Kong Applied Science and Technology Research Institute 香港應用科技研究院

DC Building Power Protection by Digital DC Circuit Breaker

A semiconductor-based digital ultra-fast DC circuit breaker for protecting the power source, load, and cables in LVDC grid from damage in abnormal electric conditions.

Keywords:
- Smart City, low voltage DC, circuit breaker, DC building, protection, safety, arc

Problems addressed

Energy efficient DC voltage powered building can reduce the power consumption by 5 – 20% compared to nowadays AC voltage powered building. However, the short circuit failure is much more serious in DC voltage, and it cannot be effectively protected by nowadays DC mechanical type circuit breaker (MCB).

The mechanical disconnection process by MCB is too slow, in millisecond range, in responding to the current increase in DC short circuit, in microsecond range. Short circuit current can go up to thousands of amperes and electric arc will be generated and resulted in risk of fire.

ASTRI's team designed a semiconductor-based digital ultra-fast DC circuit breaker for LVDC applications. It is used to protect the power source, load and cables from damage in abnormal electric conditions, such as short circuit and overload. It ensures a "microsecond range" protection speed in responding to a fault and provides an in-time protection to the system.

Innovations

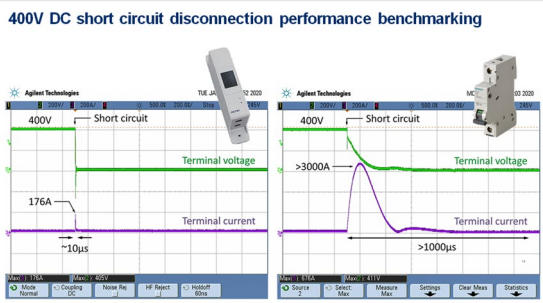
The semiconductor-based digital ultra-fast LVDC circuit breaker can effectively protect the electrical system from damage in abnormal electric condition. The innovation also includes the followings:

- **Ultra-fast protection** – x100 faster than classical MCB, significantly reduce short circuit current
- **Ultra-efficient** – 99.9% power efficiency
- **Safe & quiet** – electric "arcless" disconnection, no risk of fire; natural cool design
- **Fault identification** – avoid false trigger due to "fault similar" phenomenon
- **Ultra-long life** – semiconductor-based disconnection
- **Online configurable** – reconfigurable trip curves on-site

Key impact

- Ensure a safe operation of DC voltage powered **green** building which can provide 5 – 20% energy saving to nowadays AC voltage powered building
- Significantly minimized the safety hazard from arc flash

Innovation snapshot



Digital DC Circuit Breaker | Classic MCB

Project completed

- Ongoing

Applications

- Low voltage DC application
- Battery energy storage system
- DC building power supply

Patent(s)

- US Patent No. 11,070,045; CN App. No. 202080001432.8 and HK App. No. 62021034089.4
- US Patent No. 11,283,214 and CN App. No. 202180000607.8

ASTRI Patent Search

Commercialisation opportunities

- IP licensing
- Technology co-development

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