Protecting the LVDC last mile: translating concepts to technologies

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Concept: Multi-function LVDC protection scheme

Features

- Communication-assisted
- Fault detection and locations are based on DC current directions and magnitudes, and DC voltages
- Using multiple IEDs
- Using solid state circuit breakers for interrupting DC faults

Offered Functions

- Fast detecting and locating DC faults
- Good level of selectivity
- Fast interrupting DC faults at low level
- Blocking reverse DC fault current
- Fast reclosing function
From concept to realisation of technologies

- **Concept**
  - T&T Technical report
  - CIRED paper

- **Prove of concept in simulation**
  - UoS-LUT (Finland) first meeting
  - KEPCO LVDC international workshop

- **Prove of concept in experiment**
  - EU DCFORWARD
  - IEEE Trans
  - UoS-LUT LVDC workshop

- **Company engagement**
  - IEEE SG4 IET LVDC CoP
  - UK LVDC community
International collaborations

- Invited talk: LVDC international workshop 2013 by KEPCO South Korea (29-30th Oct 2013)
- Ustrath (UK)-LUT (Finland) LVDC workshop (29th Nov 2013)
- DCFORWARD consortium across EU (2014) (good LVDC networking opportunity)

Strathclyde PNDC and DC protection facilities (UK)
LUT LVDC network (Finland)
Aalborg DC home (Denmark)
Supporting standards and policy (IEC SG4 and IET CoP)

- Presented last mile LVDC work in Milan 16-17/April/2014
- Issues with existing IEC61660 (reported in the minutes)
- Last mile LVDC has been added to the SG4 LVDC roadmap
- More companies joined DCFORWARD

- Joined the IET TC2.4 on LVDC power systems
Industrial engagement

- New company engagement
  - Collaboration with Moixa Technology (testing DC RCD <500mA on the rig)

- Winning other EPSRC fund

Moixa Battery-LVDC sub-systems: MASLOW

http://www.moixatechnology.com/
Conclusions

What has the Top and Tail demo used for?

- Informing relevant standards (IEC & IET CoP)
- Specifying the requirements for a higher TRL demonstrator
- Stronger validation of the simulation models
- Appraisal by industrial colleagues and cooperation with international researchers

Publications ↔ Collaborations
Demo ↔ Fund
LVDC testing facilities
Thank you & any Q?