Planning and Control of Offshore Multiterminal VSC-HVDC (MTDC) Transmission Grids

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Closer look at the North Sea region

HVDC links in operation by 2020

• By 2020, there will be 12 HVDC links in operation
  – Some of the cable routes are located close to or crossing each other
  – 7 of them are VSC-HVDC with ±320 kV
  • In the future, the first offshore MTDC in Europe might emerge by interconnecting these VSCs
Closer look at the North Sea region
HVDC links in operation by 2020

• At a later stage, COBRAcable is planned to be operated as MTDC system
  – Hosting additional converter(s) along its cable
  – How to prepare COBRAcable for future expansion?
COBRAcable research project

What?

• Joint research project between Aalborg University and Delft University of Technology
  – Executed in cooperation with Energinet.dk (Denmark) and TenneT TSO B.V (the Netherlands) under the COBRAcable project and co-financed by the European Commission under the European Energy Program for Recovery.
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Objective?

- Provide guidelines for future connections of converter(s) to the existing COBRAcable
  - Possible case is depicted on the left
  - ”Plug & play” principle
  - only allow to adapt the existing control and protective devices, not replace
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How?

**TUD:**
- Methods to study readiness
- VSC model development

**AAU:**
- DC control methods
- DC protection algorithms

Multiprojective control optimization.

Readiness case study setup

AC-side readiness

DC-side readiness

guidelines
Publications

Published


2. —, “A categorization of converter station controllers within multi-terminal DC transmission systems,” in 2016 IEEE/PES Transmission and Distribution Conference and Exposition (T&D), Dallas, TX, May 2016

3. —, “DC power flow control for radial offshore multi-terminal HVDC transmission system by considering steady-state DC voltage operation range,” in The 13th IET international conference on AC and DC Power Transmission, Manchester, UK, Feb 2017

Publications
Submitted

COBRAcable research project

Further information:

www.cobracable.et.aau.dk
Thank you!!!