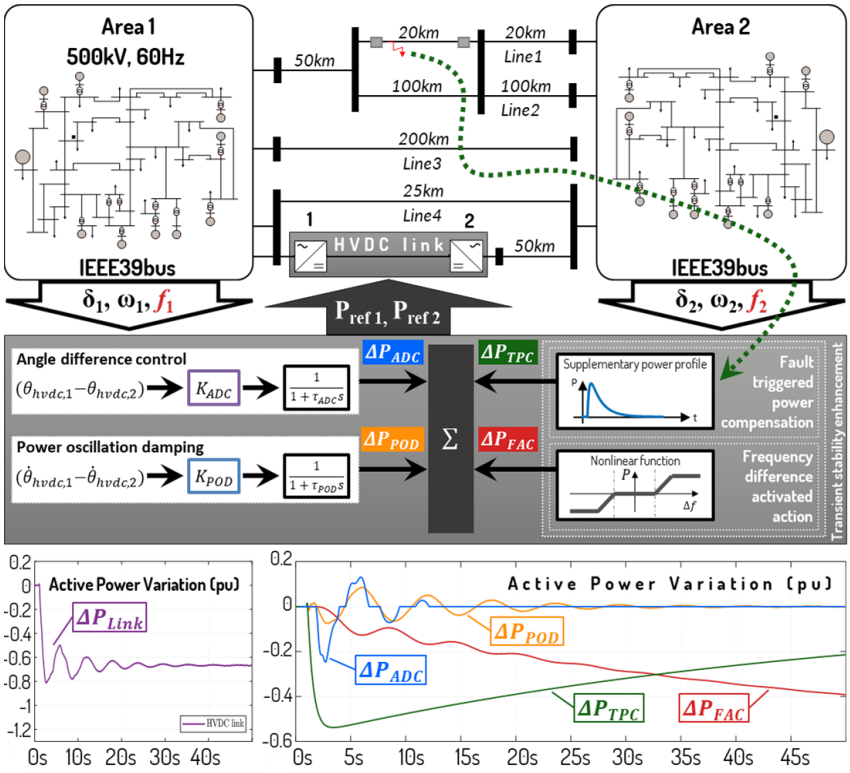
Dynamic Virtual Admittance Control

HVDC enhancing stability and security of hybrid AC/DC transmission systems

CONTEXT

HVDC transmission is increasingly present around the globe, reinforcing power systems while enabling the control of long distance **transnational energy flows**. Power transmission will soon become a **hybrid AC/DC** system where converter control schemes can greatly impact AC transient stability. Whenever an **HVDC** link is **embedded** in an AC system, the **Dynamic Virtual Admittance Control** (**DVAC**) scheme can be easily tunned to enhance the **transient stability** of adjacent AC zones.



TECHNOLOGY DESCRIPTION

The proposed solution consists in a **HVDC control scheme** which dynamically computes power references for HVDC converter stations. In complement to the classic **ADC** and **POD** damping algorithms, the **DVAC** adds-up two new transient stability enhancement factors: the **fault triggered power compensation** and the **frequency difference activated action**. As a function of a wide-area control scheme, the **DVAC** is a smart way of using **PMU** data on rotor angles, speeds, frequencies and fault events. As a result, the HVDC link is best controlled to improve the AC network stability by **damping inter-area oscillations**, **increasing transient stability margins** while keeping interconnected **AC networks synchronized**. Expanding the **DVAC** functionality to a large number of converters in a **hybrid AC/DC** grid will **increase the security** of the overall system, **reducing human intervention** in re-dispatching HVDC power and avoiding power loops which **reduces system losses**.

APPLICATION DOMAIN

- Hybrid AC/DC networks with embedded HVDC links.
- AC transient stability.
- VSC-HVDC MMC and LCC-HVDC

ADVANTAGES

- Increased Net Transfer Capacity of HVDC interconnectors.
- Rapid reallocation of power distribution in case of severe disturbance.
- Reduce TSO intervention costs in re-dispatching HVDC power references.
- Increased availability of interconnectors.

TRL SCALE

1 2 3 **4** 5 6 7 8 9

First industrial validation in HIL environment

DELIVERABLES

- Patent FR1852136, FR1853273, FR2112011, FR2112012
- Technical reports (off-line & HIL tests)
- Virtual mock-ups
- Technical support and advisory

SCIENTIFIC REFERENCES

J. C. Gonzalez-Torres et al. "Transient Stability Enhancement through the control of embedded HVDC transmission systems", CIGRE, Paris, Fr, 2022.