T&D europe

The European Association of the Electricity Transmission and Distribution Equipment and Services Industry

The role of HVDC technologies in a highly decentralised RES generation

European perspective: making DC as easy as AC

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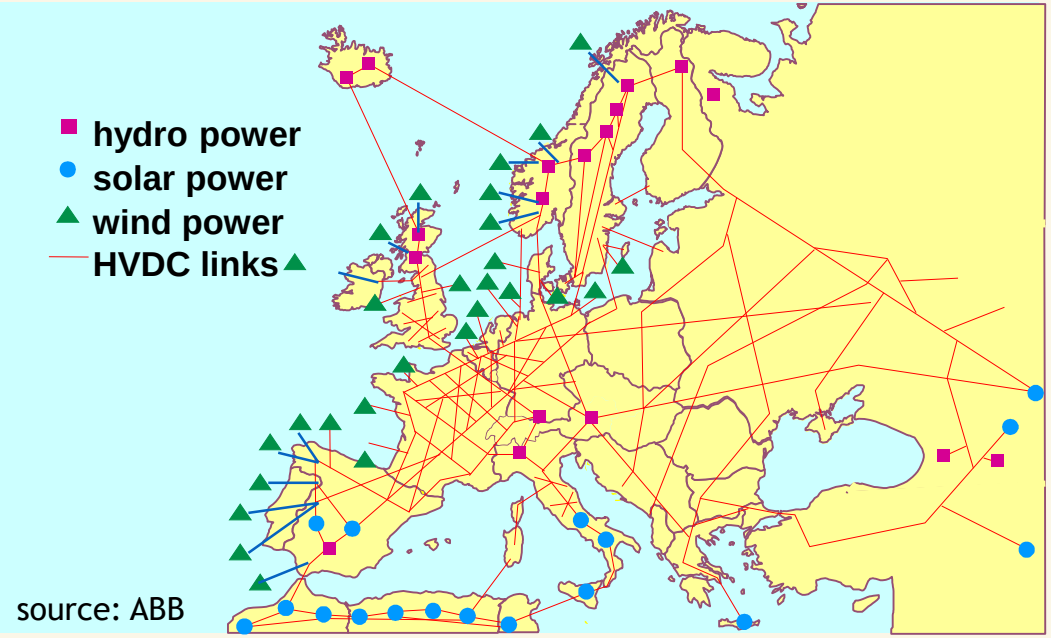
INCREASING RELEVANCE OF HVDC IN EUROPE

The topic is not brand new:
An industry vision from the 90ies



Geographical reasons

- RES are geographically constrained
- Local concentration of generation
- Even highly distributed resources may feed in locally concentrated peaks
- More need for long-distance transmission

Operational reasons

- Much stronger variation of load-flow situations due to low utilization of RES
- Active network control beneficial

HVDC therefore should be reflected in network planning by default.

WHY DO WE NEED TO CHANGE THE APPROACH?

Traditional HVDC approach

- Few point-to-point projects
- Limited / no operational interference
- Complete lines (at least both converters) usually built by one technology provider
- No need of cooperation or coordination between technology providers

HVDC as standard element of transmission networks

- Converters become either nodes in a network or are placed so close to each other in an AC network, that they are interfering
- Entire HVDC network will not be ordered in one go
- Systems need to be expandable by others than the original technology provider (as for components of an AC network)
- Network operators need to be enabled to analyse interaction of HVDC elements in their simulation tools

LIMITATIONS TO THE AC-DC ANALOGY

Traditional approach in AC networks

- Network components are described by standards and network codes
- Models for their (passive) behaviour are available
- Network operation means setting of network elements prior to operation
- During operation components are behaving widely autonomous, based on their passive behaviour

HVDC as standard element of transmission networks

- Converters also need to be described by standards, network codes and standardized models
  (work in progress, CENELEC TC 8X/WG 06, ENTSO-E with T&D Europe)
- But some differences will remain
  - Capability of actively influencing load flow as an additional opportunities of HVDC
  - Faster and wider fault propagation

  A much closer integration with network control systems will be required

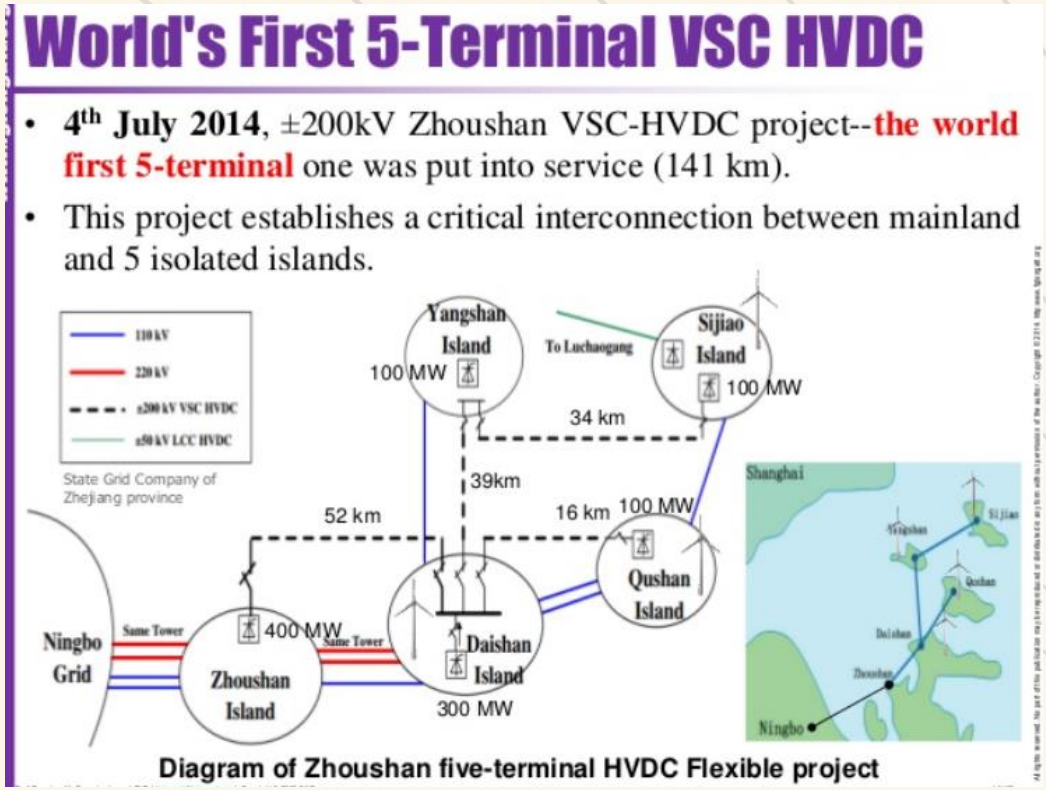
HVDC can therefore not become as easy as AC, but close to it.
On the other side HVDC also offers more operational flexibility.

BEYOND STANDARDIZATION OF COMPONENTS

Research areas for HVDC grids

- DC circuit-breaker
- DC protection
- High voltage DC/DC converter

- Load flow control
- Automatic re-closing
- Active network operation



Practical experience requires a multi-vendor, multi-terminal pilot project – in Europe, too.

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