Challenge 2.2

Floating wind farms

Dynamic electric cables	Short-term	High priority

Description and scope

Cables for floating wind are a challenge in shallow water due to the dynamic motion of the floater. In deep water cables are a challenge due to cost, in particular for array cables.

Power cables for floating wind experience dynamic motion during service. Traditional high voltage submarine cable designs include a metallic barrier to prevent water from entering the cable cores and reducing the service life. Recently a recommendation by the International Council on Large Electric Systems (CIGRE) describes tests on high voltage submarine cables without metallic barriers. This calls for new designs with lower weight and reduced cost in particular for inter array cables but also for deep-water submarine cables.

When modelling electric characteristics of cables, it is in general assumed that they are straight (only Transverse Electromagnetic Mode – TEM) and do not change dimension along the way. This is not the case with dynamic cables. Therefore, it is necessary to validate the existing cable modelling tools and methods, especially when it comes to loss estimation, harmonics and transients. Additional topics are to investigate fault detection and localisation methods in dynamic cables.

Subsea electrical connectors should be also explored for better and faster installation of inter array cables, linked with static cables on the seabed, lowering the cost of deployment.

Recommended research actions

- Validated software for cross sectional analysis.
- Validate and develop cable modelling tools and methods, with regards to loss estimation, harmonics and transients and long-term performance of new dynamic designs.
- Qualify dynamic High Voltage Direct Current (HVDC) cable and assessment of the applicability.
- Long dynamic infield cables (e.g. bellows, floater-to-floater).
- Research on different configurations of dynamic cables with respect to water depth.
- New materials, structure and designs (e.g. non-metallic designs for submarine dynamic power cables, cost-effective and reliable bend stiffeners).
- Mechanical behaviour of bitumen, and use in cross-sectional structural analyses.
- Use of monitoring data from cable response and environment for on-board cable integrity assessment.
- Review non-metallic designs for submarine dynamic power cables.

Milestones

- Selection of new cable design(s) and materials to reducing manufacturing and installations cost.
- Established lifetime model(s).
- Performed long-term tests for validation of the models.
- Developed new modelling tools.