POWER NETWORKS

AC and DC Cable Systems

Overview

PSC are a highly specialized engineering consultant with global expertise in the design and development of HVDC Interconnectors. We are also vastly experienced in developing HVAC cable projects (onshore and offshore), whether that be for the reinforcement of utility networks, the connection of renewables, or the integration of battery energy storage systems for future-proofing our electricity grid.

We can help provide a comprehensive service from concept to completion, including consultancy, design and advisory of power cables from MV to the highest-rated AC/DC interconnector.

PSC's cable experts have the knowledge and experience to assist in conceptual design, FEED design, and procurement of cable supply and installation contractors. We are proficient in cable system design, thus allowing for an optimized design that considers thermal interaction and bonding arrangements.

We are also vastly experienced in supporting projects during the construction and operation phases. Some of our engineers are involved in the development of engineering standards and CIGRE technical brochures which ensures that technical specifications are written with design risk and asset integrity in mind.

We have also been uniquely involved when cable systems have not performed as expected. We support asset owners during system operation and regularly support HVDC asset owners during fault investigation and restoration.

Key capabilities - HVDC Interconnectors & AC Cable Projects

Design and Development:

- Cable system design and onshore cable route assessments
- Cable trench design, installation methodology and termination, and routing support for substations
- Budget planning and forecasting, including both CAPEX and OPEX analysis
- Development of technical specifications for land and subsea cables, including installation of land cables
- Project development and support during procurement of EPC (Engineering, Procurement, Construction) contractors
- Factory audits of cable suppliers

Construction and Operation:

- Management of EPC Contractors
- Review of detailed design submissions
- Quality inspection of cables during manufacture, and witnessing of prequalification, type testing and factory acceptance testing
- On site support during construction and commissioning
- Support during fault investigation and repair planning
- Support during maintenance and repair of power cable systems

PSC experts

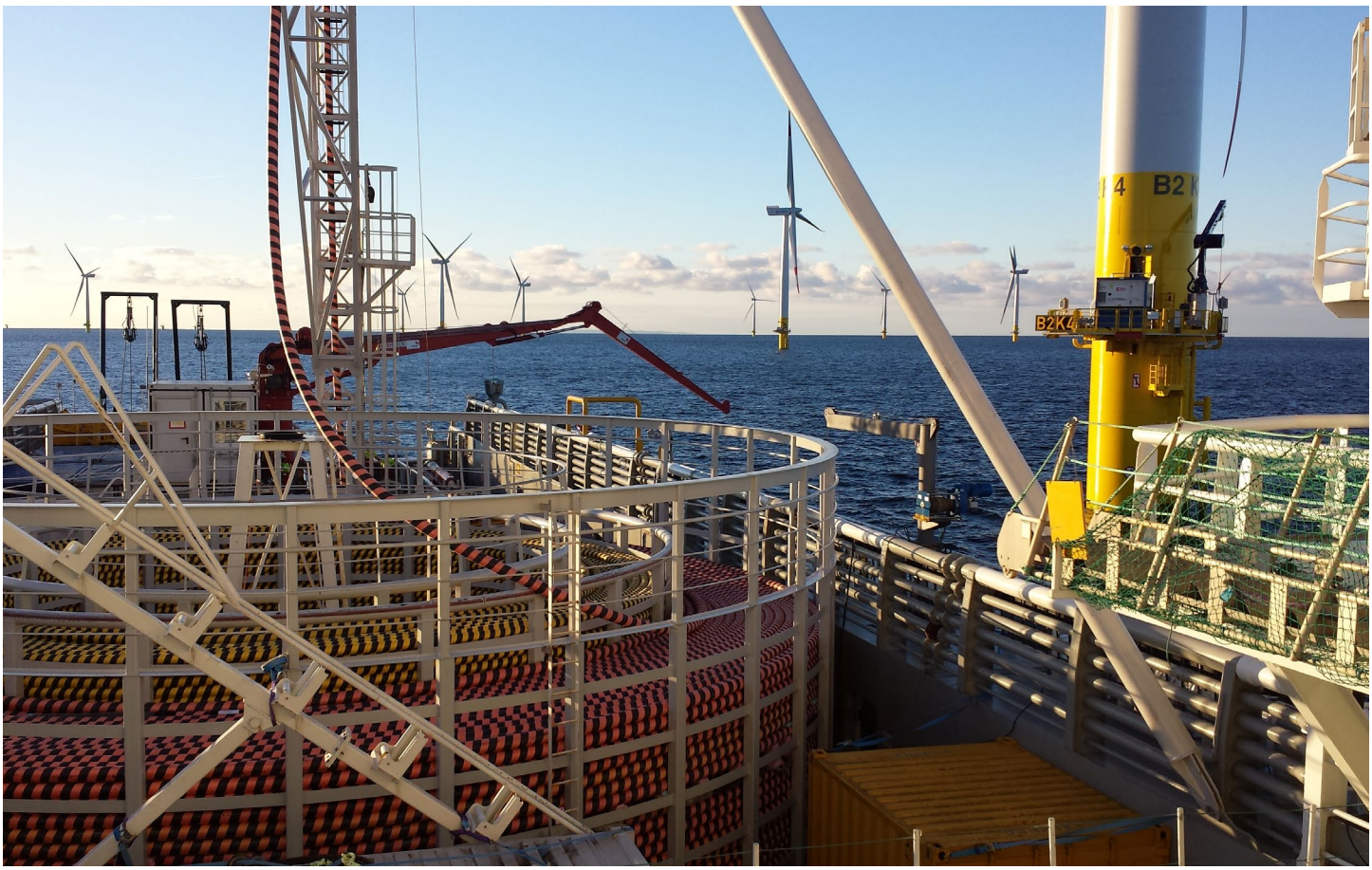
A sample of our experienced Cable specialists are listed below.

Joe Oliver is a principal consultant with over 34 years of experience in cable advisory, designing and installing, including land and submarine cables. He is experienced in EHV and HV AC/DC cable system design, manufacturing, installation, commissioning and project management. He is a specialist in feasibility studies and preparation of specifications, through tender preparation and negotiation to contract execution, including maintaining a site presence in charge of design functions. Joe has worked on HV DC and AC cable projects in the UK, Europe, North America, South East Asia, the Middle East, Australia and New Zealand, recently specializing in HV DC interconnectors and the associated AC circuits.

Bradley Railing is an experienced principal HVDC consultant who has over 35 years of electric utility experience, including direct involvement with regulated and merchant transmission projects worldwide. His extensive experience encompasses technical feasibility studies, conceptual design, technical specifications, field commissioning, fault tracing, expert witness testimony for HVDC and AC systems, HVDC submarine cable system repair support, root cause analysis, project management, operations and maintenance with a specialization in HVDC transmission systems.

Scott Murray is a senior engineer and manager with 14 years of experience in HVDC interconnectors, onshore and offshore cable design, development and installation. He is a Chartered Engineer specializing in subsea cables and grid compliance management. Scott was involved during the subsea return cable installation on the Moyle HVDC Interconnector between Scotland and Northern Ireland. He held roles in the development of the Aquind HVDC Interconnector and design phase of the Celtic HVDC Interconnector. He also has experience in the conceptual design of offshore array cable circuits. As a qualified project manager, he strongly appreciates project and strategic risks and has undertaken manufacturing quality audits at cable suppliers.

James Matthewman has over eight years of experience as a cable system design engineer, working on both AC and DC projects from 11 to 400 kV. These projects vary from HVDC interconnectors such as Celtic, Greenlink and Xlinks, to AC grid connections for battery energy storage systems (BESS), photovoltaic (PV), and wind farms.



PSC projects

A selection of projects which demonstrate our Cable experience is shown below.

Eastern Green Link 2 (EGL2) HVDC Interconnector, Scottish and Southern Energy (SSE), Scotland – England, HVDC Cable Technical Lead, UK

PSC provided technical support to develop the design and specification of a technical cable solution for a 2 GW 525kV bipolar HVDC VSC link. PSC provided technical guidance, including cable systems, performance requirements and parameters, installation, testing, commissioning, maintenance and cable monitoring system.

Celtic HVDC Interconnector, Technical Lead for Cables, Ireland

PSC is providing cable technical management for EirGrid and in collaboration with RTE for the procurement of ±320kV HVDC submarine and land cables and HVAC land cables. This has included providing technical guidance, leading technical negotiations and evaluating tenders.

Eastern Green Link 3 (EGL3) HVDC Interconnector, Scottish and Southern Energy (SSE), Scotland – England, HVDC Cable Technical Lead, UK

PSC are providing technical support to develop the design and specification of a technical cable solution for a 2 GW 525kV bipolar HVDC VSC link. PSC provided technical guidance, including cable systems, performance requirements and parameters, installation, testing, commissioning, maintenance and cable monitoring system.

Harmony HVDC Interconnector (Poland – Lithuania), Technical Lead for Cables

PSC provided technical support to develop the design and specification for the Harmony HVDC cables. This engagement also included formulation of tender materials and negotiation with tenderers.

East West HVDC Interconnector, EirGrid - EWIC Fibre Optic Cable System Support, UK

PSC are providing ongoing support to Eirgrid to maximize the potential of the fiber system between Ireland and the UK with specific attention given to the Distributed Temperature System (DTS).

Taghart - Grid Connection Cable Design, Ireland

PSC designed a cable route that included a screen bonding design and cable sizing study for 39kV cables. The studies took into account the essential load and fault current carrying capabilities in line with IEC 60287. Cable optimization work was carried out in detail, including capital cost, energy losses, and costs arising from energy losses.

Trans Bay Cable - Owner's Engineer Cable Repair, USA

PSC provided owner's engineer service for the repair of the ±200kV, XLPE-DC insulated submarine cable. PSC worked with the owner and repair personnel to determine the condition of the submarine cable, make repair recommendations, review the repair budget and work plans, provide field support during the repair process, witness the testing of the cable system and provide daily reports.

Arise Renewable UK Ltd, UK

PSC provided support to identify a preferred cable route for a 400kV connection from National Grid's transmission system to a proposed Arise substation (confidential).

Xlinks HVDC Interconnector, Onshore Cable Separation Study, UK

PSC undertook a project to study the separation distance between the onshore cable bipoles, quantify the risk of faults, and offer mitigations to achieve availability targets.

Enso Energy Limited – Enso Cable Route Assessment (Walpole)

PSC undertook a high-level assessment of two proposed cable connection options within a narrow corridor for two 100 MW solar/BESS sites connecting to National Grid Walpole 132kV substation.

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