POWER NETWORKS

Connecting renewables to the grid

Overview

PSC supports the global renewables market with independent services in specialized technical advisory, engineering and project management consulting. Using PSC's expert technical and owner's engineer services in the power sector, our clients build projects to their requirements, save on costs, optimize availability and mitigate risk. With our local and international resources, extensive technical knowledge and experience in renewables, power system studies, and power networks engineering, PSC is well equipped to support any renewables project.

We help our global clients interconnect all renewable generation to the grid, including PV, on- and off-shore wind and waste-to-energy plants. We also support all ranges of distributed generation energy resources (DER), including energy storage and electric vehicle charging infrastructure, with services to help you design, operate, and optimize the effectiveness and efficiency of your DERs.

Key capabilities

Lender's and/or Owner's Engineer and Technical Advisor

- Technical due diligence
- Techno-economic feasibility studies
- Power system and grid connection studies Concept design and FEED
- Technical specifications and tender management
- Specialist technical and regulatory advice
- Grid connection applications
- Factory acceptance testing Asset Management, O&M plan reviews

Substation Primary Layout and Engineering

- Single line diagrams
- Switchgear and transformer specification substation layout and optimization
- Protection & Control philosophy, concept and engineering
- Protection relay settings and co-ordination (Grading) Studies

Electrical Infrastructure Optimization

- Optimization assessment of the HV electrical components
- Cable layout design
- Cable design and losses optimization
- Conceptual design of HV/MV Equipment
- Substation detail design

Power System Analysis

- Grid code compliance studies
- Steady state load flow, reactive compensation and fault studies
- Harmonic assessment, switching and transient studies (PSCAD, EMTP)
- Insulation co-ordination studies
- Arc flash studies
- Earthing and lightning protection studies

PSC relevant projects

A selection of projects which demonstrate our renewable experience is shown below:

Owner's Engineer role on the following wind farms**

- Gortfinbar 15 MW (Co. Tyrone)
- Altamuskin 15 MW (Co. Tyrone)
- Slieveglass 7.5 MW (Co. Tyrone)
- Cornavarrow 26 MW (Co. Tyrone)
- Teiges Mountain 12.65 MW (Co. Fermanagh)

Solar Power Technical Advisor Services to PCRE, Ireland**

PSC have been providing Technical Advisor Services to Power Capital Renewable Energy (PCRE), an Irish based solar PV developer, with a portfolio of over 200 MW. PSC support to PCRE included strategic advice on the development of their solar PV farm portfolio and the optimum connection locations. For each PV site development PSC has provided technical support through the concept, grid connection and design of the solar generation facilities.

Jennings O Donovan, Wind Farm(s), UK**

Owners engineer for the design and construction of multiple wind farms (>100 MW). Responsible for the 33 kV substations, grid connection and grid code compliance of the power plants. Also included high level concept design of the wind farms, review of submitted electrical documentation, authorization and interface between the IPP and network operator.

Kirby Group Wind Farm(s), Grid code compliance studies, Ireland**

Providing grid code compliance system studies support to Kirby Group including load flow, short circuit, harmonics, FRT, transformer energization and earthing studies. Also undertook system studies not required by the grid code such as busbar forces calculations and cable crossing calculations.

Technical Advisor/Electrical Designer for the following renewable projects**

- Silovouri Wind Farm (Finland)
- Killala Wind Farm, 30 MW (Co. Mayo)
- Ratipera Wind Farm, 27 MW (Finland)
- Old Mill Wind Farm, 16.9 MW (Co. Monaghan)
- Bindoo Wind Farm (Co.Cavan)
- Tournafulla Wind Farm (Co.Limerick)

System Studies for Kilgallioch 240 MW Onshore Wind farm, UK*

This work included optimization of the grid connection, and grid connection assessments comprising load flow, fault level and reactive compensation analysis for grid code compliance. PSC performed a dynamic and transient stability analysis to assess the wind farms ability to remain connected (Fault Ride Through) during fault conditions. Our services provided confirmation of technical compliance with the connection of renewable generation of the UK Grid Code.

Darling Downs Solar Connection Project, Australia

PSC completed system studies and developed a proposed set of generator performance standards for the Darling Downs 110 MW Solar farm in Australia.

Galetech, Kipeto Wind Farm, Kenya**

Owners engineer for the design and construction of a large wind farm (>150 MW). Responsible for the 110 kV substation, grid connection and grid code compliance of the power plants.

Kemsley Waste to Energy Plant, UK

PSC acted as Wheelabrator Technologies (WTI) Owner's Engineer providing electric system connection technical and regulatory support from the initial concept through the design and construction phases.

Parc Adfer Waste to Energy Plant, UK

PSC provided WTI with support across a range of areas relating to the 33 kV and 11 kV substations and major electrical infrastructure for connecting to the DNO.

Insulation Coordination Studies for Wind and Solar Farms, Australia

PSC routinely carries out insulation coordination studies for integration of wind and solar farms to the transmission and distribution grids. Insulation coordination is carried out applying the principles of IEC 60071.

Wind Farm Cable Sizing Study, Australia

PSC performed load flow, short circuit, voltage profile and power loss studies for a prospective wind farm to be connected to the 275 kV network in South Australia. The results of these studies were used by PSC to recommend cable sizes to be used in the wind farm 33 kV collector network.

Hare Hill Extension Wind Farm, UK*

PSC provided a protection grading study for the Hare Hill Extension Wind Farm in Ayrshire, Scotland, with the site consisting of 36 Wind Turbine Generators, totalling 29.75 MW connected to the 33 kV Distribution Network Operators system.

Dorenell Wind Farm, UK*

Production of a protection philosophy document and protection key-line diagram to outline the protection requirements from the 132 kV connection point to 33 kV switchboard to which the turbine strings are connected.

Battery Storage Integration with SCADA - 1Energy Systems and Snohomish County PUD, USA

PSC provided conceptual design and system integration services to support energy storage software vendor 1Energy Systems and Snohomish Public Utility District in Washington State with the deployment of a one-megawatt battery energy storage system.

Remote Islanded Solar-Diesel Grids, Australia

PSC was engaged to provide electrical engineering services for the Solar Energy Transformation Program at remote locations with existing diesel generation. PSC provided analysis of system load flow, short circuit, feeder voltage profile and protection systems and advice regarding HV and LV cable and transformer sizing, along with recommendations for earthing and lightning protection for 11 kV assets.

Cultana Solar Farm, Australia

Australia's Transmission Network Service Provider engaged PSC to perform due diligence studies to verify that the Cultana Solar Farm would meet their proposed Generator Performance Standards (GPS) before connection to the South Australian transmission network and the National Electricity Market. This work included checking to ensure that the application package was complete and within regulatory guidelines, as well as repeating a sub-set of the Proponent studies to ensure their accuracy and conformity to the proposed GPS and regulatory rules.

Goole Fields II Wind Farm Insulation Co-ordination Studies, UK*

PSC carried out an insulation coordination study utilizing EMTP software to investigate potential overvoltages on the wind farm electrical system. These included both lightning and switching overvoltages associated with the connection to the local 66 kV distribution network and also switching overvoltages generated internally within the Goole Fields II 33 kV collection network.

Redhouse Energy Storage, UK*

PSC carried out transformer energization, harmonics and voltage flicker studies and earthing studies to assess what impact there would be from the new Redhouse energy storage plant connection to the DNO, and ensure that these were within requirements. The earthing study was carried out using CDEGs software to ensure that the proposed earthing system complied with the relevant standards.

Offshore Transmission Owner (OFTO) – Technical Due Diligence*

Technical due diligence for UK offshore transmission assets under Ofgem's tender rounds TR4, TR5 and TR6 (on-going).

** Experience gained at Ramboll Energy UK Power Systems prior to acquisition of the group by PSC (2020).*

Our services included full technical due diligence at ITT Phase and PB Phase, providing full and confirmatory due diligence and advice to the Client and Lenders through to Financial Close.

After Financial Close, we continued as the Lender's Technical Advisor providing regular reports to the Lenders on the OFTO's technical and operational performance including an assessment of factors such as availability, incidents that affect availability, and O&M strategy and exceptional costs, including seabed inspection and burial regimes. TDD has been undertaken for Westermost Rough, Dudgeon, Burbo Bank, Rampion, Galloper, Race Bank, Walney Extension, Beatrice and Hornsea.

Proven reputation

PSC has a global reputation for excellence. A cornerstone of this reputation is an unshakable commitment to excellent client outcomes and value driven client relationships. The breadth and caliber of our people, coupled with the longevity of our relationships with many of our clients, has led to a portfolio of successful projects around the world.

Today's energy industry requires new services and collaborative thinking to better deal with global challenges, such as the proliferation of renewable - and increasingly distributed - resources. PSC has an innate mindset centered around agility and collaboration, bringing lessons learned from around the world to every project as we help our clients develop, deploy, and operate sustainable solutions. PSC has delivered Power Network solutions in a range of markets and situations including:

- Europe – power systems studies and engineering support
- North America – power systems studies and engineering support
- Australia – systems studies, transmission line projects
- New Zealand – systems studies and engineering support.

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