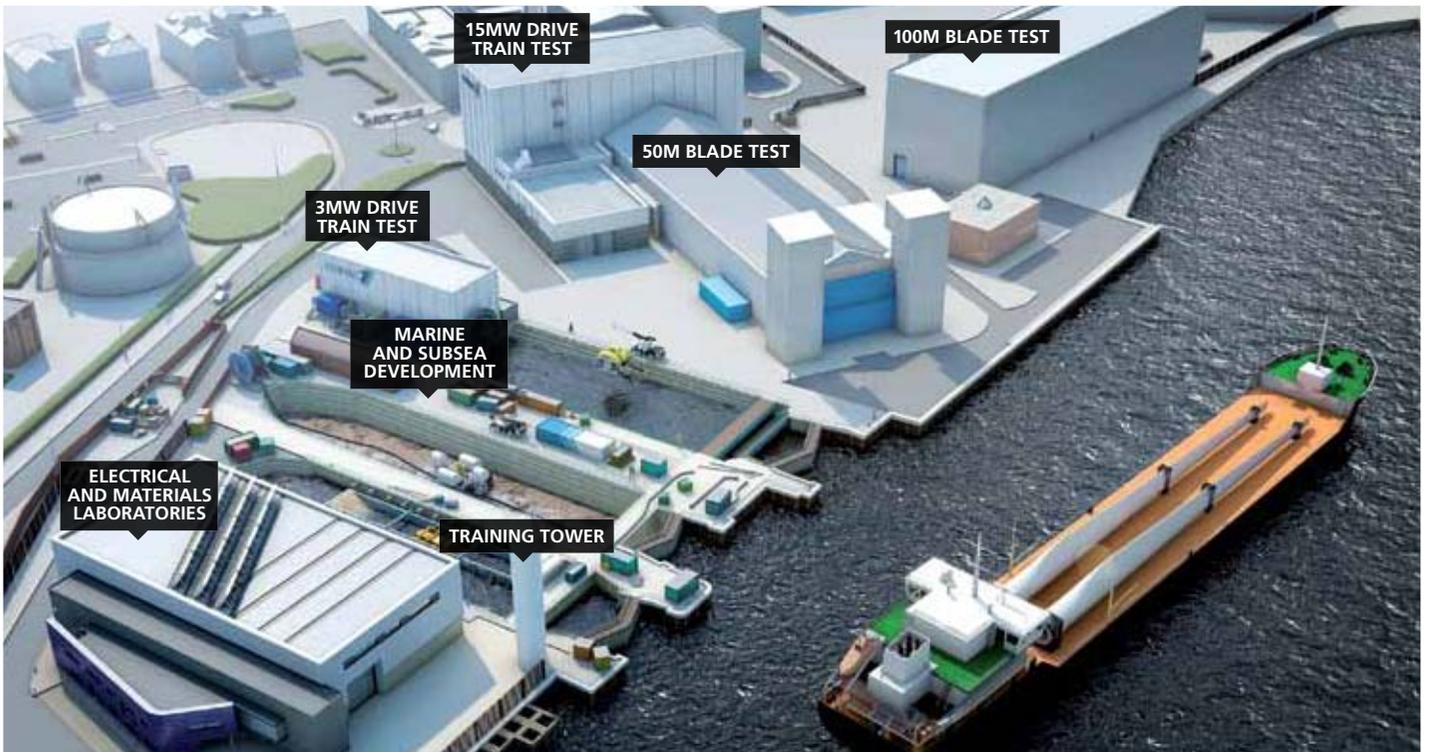

National Renewable Energy Centre
Electrical Systems and Materials





The Power Industry and Offshore Renewables

Narec is an established development and certification partner to the power industry with accredited laboratory facilities for electrical, materials, mechanical and environmental testing.

We provide specialist consulting and test services, assisting clients to develop products to cater for the needs of the developing power systems and exploring life extension opportunities for ageing assets.



Specialist Support

Narec works with designers of transmission, distribution and industrial power systems to develop reliable, safe and efficient power systems. We assist with integrating new generation into these systems and in developing innovative solutions for future systems. This drives our approach to economic feasibility and market studies for new networks. Our involvement in the test, research and development of new renewable generation, and transmission and distribution equipment, allows us a unique insight into these technologies and their effects on power systems.

Power Systems

As the level of renewable generation increases, grid connection and network reliability becomes increasingly more critical to maintaining network stability and security of supply. Narec is actively involved in the design of new and offshore networks, assessment of existing infrastructure and the integration of distributed energy systems through provision of the following services:

- Failure investigations on switchgear, transformers, bushings and cables.
- Power systems analysis: including insulation coordination, dynamic stability, protection coordination, load flow and fault level analyses.
- Guidance through the grid connection process, including grid connection studies and submission of a grid connection application.
- Feasibility studies to examine energy generation from renewable sources.
- Field services: Medium voltage partial discharge field monitoring and analysis, power quality measurements and assessment, ER G59 commissioning testing.
- Field measurements and data analysis to diagnose unhealthy equipment and understand the power quality related issues surrounding the connection of distributed generation to power systems.

Product Development Support

Our team of specialists possess key skills and experience supporting clients through the product development stages, up to and including equipment and system certification. The support function at Narec is built around a mix of specialist knowledge, analytical work and testing. Emphasis is placed upon a solution-based approach to product development, application and investigation. This service is provided by highly experienced staff through a wide suit of specialist testing equipment together with local universities and other facilities who offer other specialist testing facilities. Tests are carried out to established standards or ad-hoc tests can be developed to suit specific requirements.

Services include:

- Type test management service: Coordinated and witnessed by our Testing Authority Observer.
- Development of insulator materials: Electrical insulation materials selection and testing for high voltage equipment, transformers, bushings and cables. Large database of insulator materials and equipment suppliers for manufacturing bushings, and transformers components.
- Electrical field plotting and transient analyses.
- Materials selection: Corrosion prevention calculations, design and use of specialist coatings, temperature and process data telemetry.
- Technical support, feasibility analyses, market consultations.
- Process engineering: Problem solving techniques (facilitating and training), process mapping and lean manufacturing, materials processing and cycle efficiency analysis, high vacuum processing fundamentals.



Siemens offshore substation, Lillgrund, Sweden

Development and Certification Laboratories

The Charles Parsons Development Laboratories provide research and testing facilities. Specific emphasis is placed on component development, materials selection, system certification, electrical grid integration and accelerated lifetime test programme delivery.

The Charles Parsons ASTA/Intertek recognised laboratories are equipped with an extensive suite of specialist test and measurement facilities. It is located adjacent to and integrated with our marine test and prototype development facilities. The laboratories incorporate electrical, materials, mechanical and environmental test facilities through which we provide the following services:

- HV/MV development and type testing: Impulse, Dielectric (AC and DC), partial discharge, corona, RIV, temperature rise, thermal cycling and thermal stability.
- Microgeneration: Certification testing for microgeneration and inverter technologies, for example, ER G83/59 compliance testing.
- Ingress Protection (IP) test services: IP 1X, 2X, 3X, 4X, X1, X2, X3, X4, X5, X6 and X7.
- LV testing: Power analysis from 1W to 5MW, voltage and current harmonic analysis to 99th harmonic, pre-compliance testing for EN61000-3-2 harmonics, EN61000-3-3 flicker.
- Accelerated ageing tests: Live HV testing, voltage endurance, mechanical (including vibration) and thermal cycling, humidity and thermal ageing.
- Test facility for electrical rotating machines, drives and storage systems: Regenerative loading capability, variable speed motor drives, motor loading capability to 100kW, variable speed DC drives, inrush current testing, dynamic loading capability.
- Fault finding and diagnostics on transformer oils using DGA analysis and other quality analysis. We also offer transformer oil processing capability.
- Full range of polymeric materials testing and analysis, specifically focussed on electrical insulation materials for medium to high voltage equipment. Polymeric insulator materials processing techniques and coating applications.
- Environmental assessment and mechanical testing: Cyclic temperature and humidity exposure, chemical resistance, vibration (shaker table), mechanical lift and mechanical operations testing capabilities.

Subsea Engineering

Our laboratories are equipped with an extensive suite of specialist facilities and are located next to and integrated with our marine test and dry dock facilities. This allows for saltwater immersion, simulated seabed trialling, system erection and dismantle and testing of equipment.

Our clients utilise these facilities for a wide range of project work including trialling MV cable and umbilical systems, unmanned and robotic devices and sonar location detectors. Our low voltage facility has various generator technologies linked to a fully controlled 400V three phase electrical grid network for trialling and simulation of various electrical equipment and systems. We provide an open access and fully controlled onshore saltwater dry dock environment to perform verification activities, reliability and performance appraisals of new mechanical and electrical subcomponents and whole systems.



Associated Facilities

- Operational technical support team: electricians, mechanical fitters and plant operatives.
- Engineering support team: civil, mechanical, electrical, marine, instrumentation and control/SCADA technical disciplines.
- Indoor and outdoor assembly area with crane and engineering support.
- Exclusive and secure onsite office and workshop facilities.
- Site equipment includes a 30 tonne truck mounted mobile crane, cherry picker, 5 tonne forklift and tele-handler.
- Full health and safety and waste disposal support.
- Mobile tower lighting and flat-bottomed work boat.



Laboratories' Specifications

Electrical Test Laboratories

High voltage, high current, lightning impulse, partial discharge, RIV, corona protection, thermal stability, temperature rise and power quality test facilities.

Electrical Test capabilities

Test Capabilities	Volt/Current
Lightning impulse (wet and dry)	400kV
AC Voltage (Wet and dry)	200kV (100mA at 200kV)
AC Voltage Partial discharge, RIV	200kV
AC Voltage Capacitance tan delta	200kV
DC Voltage (Wet and dry)	1 MV, 10 mA
AC Current (temperature-rise testing)	Up to 8000 A

Remarks

- Main Lab dimensions: 26m (l) x 24m (w) x 12m (h)
- Ferranti Lab 8m (l) x 6m (w) x 5m (h)
- 3 high current laboratories and associated measurement systems
- Testing to all relevant BS EN, IEC, ANSI standards

Materials Test Laboratories

Metallurgy services, mechanical failure investigations, HV insulation materials characterisation, corrosion assessment, paint and other coating assessments, organic and inorganic analysis, characterisation and performance tests on oils, polymeric and composite materials, SF₆ handling and oil processing capability.

Environmental Test Laboratories

Environmental chamber (-40 °C to +180 °C & 10% to 98% RH) with internal HV live testing capability, high humidity/salt corrosion assessment/studies, IP and wet testing for HV tests.

Mechanical Test Laboratories

Vibration test facility (shaker table), mechanical lift, impact testing.

Low Voltage Power Network

Investigation, demonstration and emulation of a wide range of intelligent network elements, including prime mover and load elements, configured to represent the effects of generators in the field.

- Variable speed drives.
- Synchronous, DC, induction and doubly-fed-induction generators.
- Motor loading capability to 100kW.
- Inrush current testing capability.
- Dynamic loading capability.
- Power analysis from 1W to 5MW.
- Low voltage fault ride through test for machines up to 100kW.
- Voltage and current harmonic analysis to 99th harmonic.
- Pre-compliance testing for EN61000-3-2 harmonics
- EN61000-3-3 flicker.

Advancing Offshore Renewable Energy

www.narec.co.uk

Enquiries

For further information please contact Gareth Wynne, Sales Manager

Email: gareth.wynne@narec.co.uk

Telephone: +44 (0)1670 357 769 **Mobile:** +44 (0)7872 464 974



National Renewable Energy Centre, Eddie Ferguson House, Ridley Street, Blyth, Northumberland NE24 3AG United Kingdom
Tel: +44 (0)1670 357 770 | Fax: +44 (0)1670 357 771 | www.narec.co.uk