



A specialist energy consultancy

Offshore wind services

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TNEI is an independent specialist energy consultancy providing technical, strategic, environmental and consenting advice to organisations operating within the conventional and renewable energy sectors.

Offshore wind services

TNEI has significant electrical design experience gathered over many years, from the infancy of offshore wind to the current significant industry. We have undertaken analyses for numerous wind farms, from concept, through FEED, to detailed design in UK waters, and internationally. We have been involved in all major UK offshore wind farm projects either in design stage, technical support or the due diligence phase.

Electrical system design

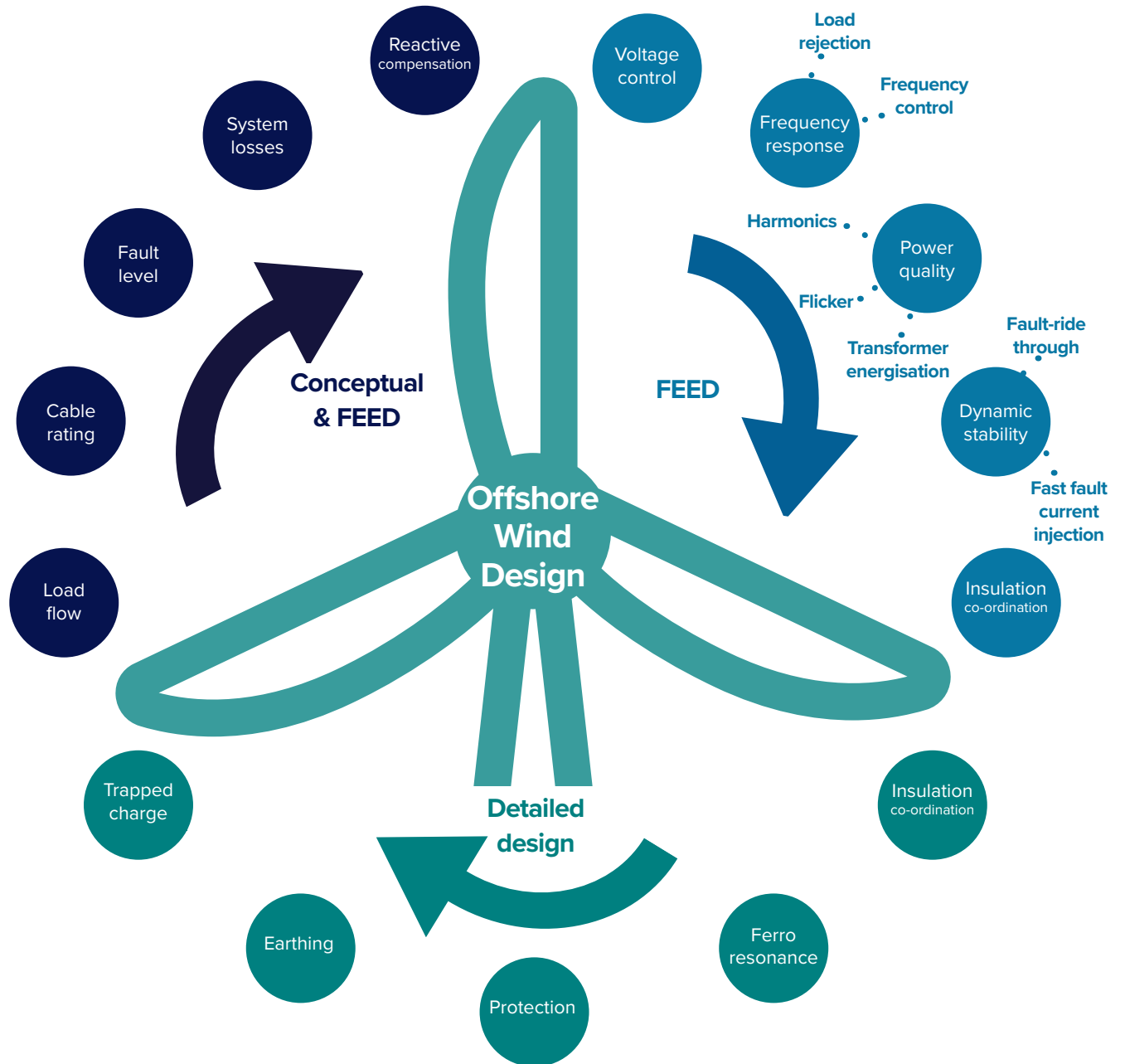
Electrical design is the heart of an offshore wind farm, we believe that it is absolutely crucial to get the design right the first time for these million-pound projects. A robust design has to be considered from various aspects such as efficiency, reliability, cost as well as operational point of view. This is where our extensive experience and specialist knowledge can help developers making the right decisions. We keep our clients involved at every stage of the design development phases.

The design process for any offshore wind farm generally follows a multi-stage process of optimisation and refinement with each subsequent stage reducing design uncertainty. Our design services are listed on the right.

In addition, we offer:

- Validation of the model results against site measurements
- DRC schedules
- EMC evaluation
- Cable design and optimisation
- Availability calculations
- Harmonic filter design
- Strategic and regulatory advice
- Technical due diligence
- Life cycle cost modelling and cost reduction opportunities
- Concept design and evaluation of current and future technology
 - HVDC and HVAC
 - Low frequency
 - DC arrays.
- Review and assessment of grid connection options
 - Onshore planning and consenting issues
 - Network charging (e.g. TNUoS)
 - CION review.

Our team is very experienced in offshore electrical design, using comprehensive knowledge, technical expertise and practical applications to assist clients, such as The Carbon Trust, Crown Estate, DECC, Ofgem, and network operators and wind farm developers. TNEI has also supported various offshore transmission owners (OFTOs) as part of the transitional and ongoing enduring regimes. Whatever your offshore wind project's requirements, the TNEI team is well placed to provide you with expert support.



Technical Due Diligence & Advisory Services

TNEI works on behalf of international banks, investors, asset owners and developers to provide technical due diligence and advisory services. We have extensive experience of offshore renewable energy through our diverse team of civil and electrical engineers, acousticians, environmental and consenting professionals. Our expert technical due diligence and advisory services providing support to both public and private sector organisations around the world.

We can add value to projects and help our clients unlock the potential of their assets, by identifying and quantifying risks and advising on complex technical issues. We have delivered services to clients both independently and collaboratively with our partners in the UK, Europe and emerging markets in Asia.

TNEI can provide expertise ranging from technical due diligence, policy and strategy development and power systems analysis through to scheme design, project consenting, project management, environmental assessment, environmental management, Owner's Engineer and Technical Advisor.

Our technical due diligence services include red flag identification and analysis of project critical risks and detailed due diligence assessments covering any one, or a combination of the following areas:

- Technology assessment (HVDC & HVAC)
- Grid connection arrangements, offers and agreements
- Grid code compliance
- Electricity regulation
- Civil and electrical design assessments
- Ground risk
- Construction contracts, interfaces and programmes
- Resource assessment and energy yield (with our selected partners)
- Capital cost assessments
- Stakeholder analysis
- Operation and maintenance
- Consenting and permitting
- Environmental aspects
- Noise monitoring and assessment
- Site monitoring, inspections and investigations.

Whatever your offshore wind project requirements, the TNEI team is well placed to provide you with expert support.

TNEI Offshore Experience - UK

Inchcape – Concept/FEED

Grid connection and array layout concept engineering studies to deliver to the project's environmental team technical parameters for the development of a 'Rochdale Envelope' for consenting purposes.

Neart Na Gaoithe (NnG) - FEED

Expected maximum generation capacity of 450 MW. TNEI defined the requirements for the onshore Harmonic filters at 400kV and 220kV filters and determined the shunt reactors and dynamic reactive compensation capacity.

Dogger Bank - DD

Developer due diligence as part of pre-FID development for a 1200MW HVDC connected offshore wind farm.

West of Duddon Sands - DD

Technical due diligence in support of tenders and negotiations in relation to this wind farm OFTO as part of client's Transaction Team support.

Walney Extension – Concept/Engineering Support

- Conceptual review of grid connection options for 720 MW offshore Walney wind farm (voltages, HVDC/HVAC numbers of cables etc.)
- Harmonic filter design and specification.

Gwynn y Mor - DD

Technical due diligence in support of tenders and negotiations in relation to this wind farm OFTO as part of client's Transaction Team support.

Hornsea - DD

Technical due diligence as part of validation of the owner's design 1200MW offshore wind farm.

Gallopier – Concept/FEED/Detail Design

- Provision of concept design verification, optimisation studies and technical support in order to de-risk the clients tender offer.
- Detailed design power system studies including load flow, power losses, fault level, transient studies, dynamic studies, harmonics and grid code compliance for a 360 MW offshore wind farm.
- Validation of frequency response and voltage control performance of the offshore wind farm.
- Studies to validate the dynamic models against on-site voltage and reactive power measurements.

Moray East - DD

Technical due diligence as part of validation of the owner's design 950MW offshore wind farm.

Aberdeen – FEED/Detail Design

- 92.4MW offshore wind farm - one of the first offshore wind farms to utilise 66kV array cables.
- FEED study and tender support for this demonstrator site particularly concentrating on system integration issues for 3 different models of 'first of type' turbines.
- Detailed design power system studies including load flow, power losses, fault level, transient studies, dynamic studies, harmonics and grid code compliance of a wind farm with 'first of type' turbines.

Blyth – Concept/FEED/Detail Design

- Concept design and grid connection studies for 33kV and 66kV connected wind turbine designs.
- Detailed design power system studies including load flow, power losses, fault level, transient studies, dynamic studies, harmonics and grid code compliance for a 66kV connected wind turbine design.

Westermost Rough - DD

Technical due diligence in support of tenders and negotiations in relation to this wind farm OFTO as part of client's Transaction Team support.

Triton Knoll - DD

Technical due diligence as part of validation of the owner's design 1200MW offshore wind farm.

Dudgeon - Concept/FEED

Performed studies to determine system voltage and capacity of on and offshore substation electrical system main components.

East Anglia - Concept/FEED

Optioneering for the OTSDUW works for this 6GW zone and considering phasing and detailed analysis for the first phase – EA ONE

Thanet Extension offshore wind farm – Concept

TNEI performed concept design studies for this wind farm with up to 340MW export capacity. Three potential options and two turbine sizes necessary to allow the developer to make an informed decision on which option to pursue. The options considered included connecting the wind turbine array directly to the shore, while the other options tested having an offshore substation and testing different transmission voltages. Load flow, fault level, losses and harmonics studies were performed as part of the assessment.

TNEI Offshore Experience - International

Oriel - Ireland – DD

Technical due diligence on the 3-4MW Scanwind turbine (acquired by GE) as well as the onshore grid connection infrastructure.

Rental – Belgium – Concept/FEED/Detailed Design

- Full suite of design studies was performed for this 308.7 MW offshore with an array voltage of 33kV.
- Load flow, reactive power capability, fault level, harmonic (power quality), dynamic (grid code compliance) and insulation co-ordination for this wind farm to aid the procurement of primary equipment and to develop and then validate the final design.

Borkum Riffgrund II – Germany – DD

Third party validation of in-house design for corporate Final Investment Decision.

Confidential – Germany –DD

Technical due diligence as part of divestment of a number of offshore wind farms in the German North Sea.

St Briec – France – FEED

FEED studies were performed for this 496MW offshore wind farm. These included load flow, reactive power capability, fault level, losses, power quality (harmonics), dynamics (grid code compliance), insulation co-ordination, and transient analysis.

Confidential – France –DD (2 OWF)

Technical due diligence as part of validation of the owner's design for two (≈500MW) offshore wind farms in France.

Norther – Belgium - Concept/ FEED

Concept design studies for this 369.6MW offshore wind farm were carried out to determine the optimum configuration for steady state grid code compliance, load flow and fault level.

Confidential - Taiwan – DD

Technical due diligence as part of validation of the owner's design for an offshore wind farm.

Confidential – DD (2 OWF) – Poland

Technical due diligence as part of validation of the owner's design for two offshore wind farms in Poland.

Key contacts

Steve Dixon

Specialist Consultant



Steve is a Chartered Electrical Engineer with over 25 years' experience in design, installation and commissioning of projects within the power industry and is TNEI's lead for offshore renewables. He has undertaken offshore technical due diligence for numerous projects, including the UK transitional and enduring OFTO transmission assets and German HVDC assets. In this lead role, Steve ensures consistency and continuity across all offshore renewables' projects (wind, wave and tidal) through direct technical support or lead roles, including concept design FEED, tender support and detailed design.

Dr Muhammad Ali

Principal Consultant



Ali is a Chartered power system engineer with more than 10 years' experience. He holds a PhD in electrical engineering, and his research topic was optimising the design of large offshore wind farms. He has been involved with power system studies in all phases of the project, pre-FEED, FEED, and detailed design. He is also experienced in technical due diligence and has worked on a number of national and international projects. Along with technical skills, he possesses excellent communication skills and project management experience.

Get in touch

We are a specialist, independent company. That's why we can offer a flexible, personal service and help our clients quickly and efficiently, without all the big corporate distractions.

But most of all, we love to solve problems.

For more information about our offshore wind services, please contact

Steve Dixon; email: stephen.dixon@tneigroup.com,

Muhammad Ali; email: muhammad.ali@tneigroup.com

or call: +44(0)161 233 4816.





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tneigroup.com



Manchester
2nd Floor Bainbridge House
86 - 90 London Road
Manchester
M1 2PW
+44 (0)161 233 4800

Newcastle
7th Floor West One
Forth Banks
Newcastle Upon Tyne
NE1 3PA
+44 (0)191 211 1400

Glasgow
7th Floor
80 St.Vincent Street
Glasgow
G2 5UB
+44 (0)141 428 3180

Cape Town
1st floor
Willowbridge Centre
39 Carl Cronje Drive
Cape Town 7530
+27 (0)21 974 6181

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