



A specialist energy
consultancy

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A large-scale photograph of an offshore wind farm. In the foreground on the left, a large, semi-transparent teal circle is superimposed over the image. The background shows a series of white wind turbines with three blades each, stretching across a dark blue sea towards a horizon under a bright blue sky with scattered white clouds. The overall composition is clean and modern, emphasizing renewable energy.

Leading the energy industry into a low carbon future

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TNEI is a specialist consultancy in the energy sector. We help our clients respond to the complex challenges of integrating low-carbon technology into our everyday lives.

Our technical prowess combines power systems analysis, renewables design and integration solutions, and environmental services.

We have three offices in the UK (Manchester, Glasgow and Newcastle) and a fourth in South Africa (Cape Town). Our project experience spans globally – from Shetland to the South Sea Islands.

We are an independent SME excelling in a competitive market. We offer a flexible, personal service that supports our clients quickly and efficiently, and without all the big corporate distractions.

Industry-leading technical expertise.

TNEI consultants put quality above all else. We are well-known for our technical knowledge, our conscientious, collaborative approach, and our expert attention to detail. Our clients span the entire energy system in the UK and overseas, and know they can count on us to deliver stellar analysis skills and innovative solutions. TNEI is also the owner and developer of the power systems analysis software tool IPSA – first founded in 1979 and still at the core of our business to this day.

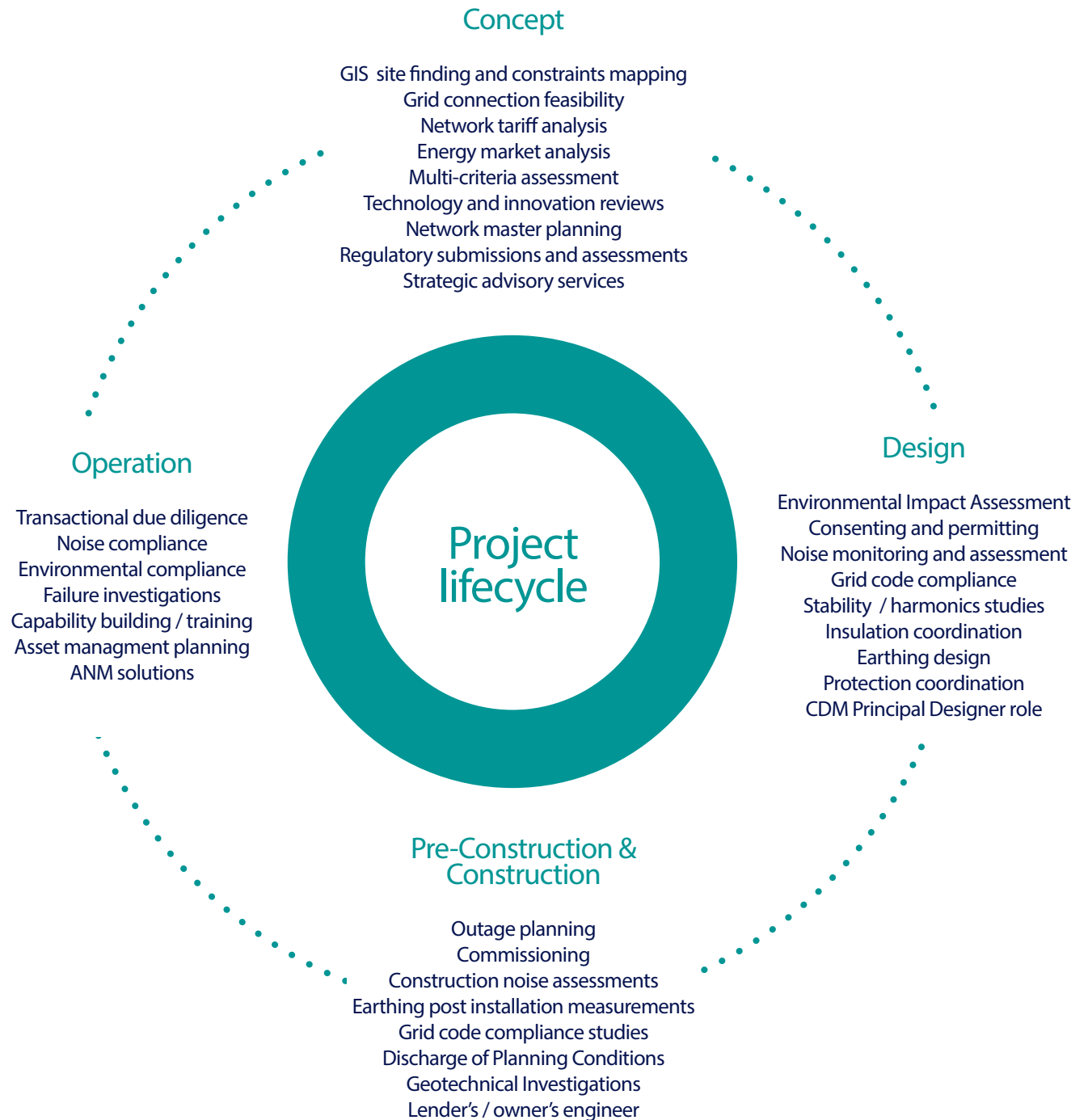
Diverse capability. Seamless delivery.

We are a small company but we have a big presence. As an SME, we take a more tailored approach to our projects – whether they are technical, strategic or environmental, or a hybrid mix – and bring together multi-skilled teams who deliver as one. For our clients, this means greater flexibility, and a strong guiding hand to power them through their most challenging of projects – from concept to delivery.

Rapport-builders. Problem-solvers.

We get our clients the answers to the difficult questions. Whether it's renewable or conventional energy, our clients know that we can steer them through the most complex of engineering issues – and that we've most likely solved problems like theirs before. And as an independent consultancy, we can stay proactive and responsive to their needs in the ever-shifting energy landscape.

Our services can be applied to any renewable or conventional energy requirements. Get in touch to find out how we can help you deliver your project successfully: email info@tneigroup.com or call +44(0)161 233 4800.





Our Services

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Acoustics and Noise Monitoring

We offer a range of acoustics and noise consultancy services including environmental and occupational noise assessment, vibration and blast monitoring and control and management. Our acoustics team operate in a wide range of sectors from residential developments, to renewable energy and oil and gas, to major infrastructure projects. Our diverse mix of knowledge and experience means that we can match specifically skilled consultants to your project. We offer the following services:

- Industrial noise assessment
- Expert witness services
- Commercial & residential noise assessment
- Smart monitoring - noise
- Ports & near short noise assessments
- Wind farm noise assessment.

Civil Engineering

We can provide tailored services throughout the development, pre-construction, construction and operational project phases, using a combination of technical analysis and extensive experience. We tailor our designs to your specific needs whilst also ensuring compliance with relevant health and safety legislation and other technical requirements. By providing early input at the development stage, we can ensure that designs are cost effective and buildable, minimising potential delays and cost overruns later.

Environmental Impact Assessments

We provide a range of comprehensive and integrated environmental impact assessment (EIA) and wind farm design services critical to the delivery of new development projects in the energy and infrastructure sectors throughout the project lifecycle. Our EIA services include:

- Pre-screening advice
- Robust EIA reporting
- Relationship building with key stakeholders
- Project management
- Site constraint and technical assessments
- Wind farm design.

Our clients include major developers, industrial and commercial sector companies, small specialist renewable energy developers and the public sector.

Feasibility Studies

Feasibility studies are the first step in any energy project, and we are here to guide you through each stage of the process. TNEI can offer feasibility services to a variety of clients including wind farm developers, land portfolio

owners, solar PV developers and energy storage clients. Our feasibility services include:

- Initial desktop appraisal
- Landowner services England and Wales
- Landowner services Scotland
- Indicative financial appraisal
- Planning authority review.

GIS, mapping & analysis

We provide a comprehensive array of GIS and mapping services to support projects at all stages of development and operation. TNEI's team is able to develop bespoke solutions to provide accurate mapping and informative graphics. Our GIS services include:

- Site finding and appraisal
- Computer Aided Design
- Single Line Diagrams (SLD)
- Swept path analysis plans
- Wireframes and Zones of Theoretical Visibility (ZTV).

Grid Connection

TNEI provides wind farm connection studies for projects ranging from sub 10MW sites through to large scale transmission connected projects.

TNEI will:

- Undertake site design assessments and grid connection for wind farm developers at all stages of development
- Connect generation projects, ranging from small feed-in tariff (FIT) sites, Distribution Network Operator (DNO) connected wind farms through to large Offshore Transmission Owner (OFTO) sites
- Manage the preparation of initial connection assessments, cost estimates, and detailed connection applications
- Negotiate connection offers with the relevant DNO/TNO
- Review Distribution Network Operator DNO and Transmission Network Operator (TNO) technical and commercial requirements
- Guide clients through the regulatory process, assessing risk and potential costs
- Provide up-to-date knowledge of changes affecting grid connection clients, such as CUSC amendments, ENA guidelines and OFGEM consultations
- Interpret the implications of these proposals in a clear and concise manner
- Complete technical documentation including power system studies and DRC documentation.

Planning and Consenting Support

Our team of chartered and experienced planning consultants take projects from an initial site finding or feasibility stage through to environmental



appraisal and assessment and the submission of planning applications and other consent applications. We work with developers to undertake public consultations, prepare and present evidence for and assist with planning appeals, provide clarity on regulations and provide strategic policy advice and research. Our planning and consenting services include town and country planning and post consent support.

Power Systems Design

We have one of the largest and most experienced systems studies teams in the world, with more than 35 specialist power systems engineers. We provide power system analysis consultancy services in the areas of industrial systems, the petrochemical industry, power quality and harmonics, distributed generation and active networks (smart grids). Our services include:

- Engineering design/protection
- Power systems studies
- Power generation services
- Transmission and distribution network analysis
- Wind farm design, assessment and connection
- Thermal and renewable generation plant modelling
- Grid code compliance
- HVDC, SVC, STATCOMS, (FACTS)
- Failure investigations.

Shadow Flicker

We carry out shadow flicker assessments for urban and rural wind energy sites, from single turbine developments to large wind farms, working with developers and local planning authorities to minimise flicker through good site design without restricting site capacity. We can draft suitable planning conditions and protocols for sites where shadow flicker is anticipated to protect local residents against the impacts and provide technical mitigation measures and advice on planning permissions, as well as undertake shadow flicker complaint investigations.

Due Dilligence

TNEI provide technical due diligence advice in legal, financial and technical issues, consenting, noise and acoustics, grid connection and civil engineering. We identify critical aspects through a red flag review, allowing clients to concentrate on key issues. We can provide review of environmental related topics through our extensive experience of a range of renewable energy developments. Due diligence scopes can be tailored to meet your specific requirements.

Network Design and Modelling

TNEI has significant experience in network modelling and design. We regularly perform capacity assessments for integrating renewable generation



connections, and undertake studies to assess different methods of network reinforcement or reconfiguration. More recently, we have been supporting clients on modelling lower voltage networks to a much more granular level to better understand the impacts of new technologies such as electric vehicles. TNEI also has a growing data science capability such that we can respond to industry requirements around the modelling of demand or renewable generation patterns.

- Transmission and distribution network modelling
- Low voltage modelling
- Probabilistic demand modelling
- Master planning

Strategy and Regulation

TNEI works with our network operator clients on a range of services. In addition to our technical support, we provide advice and external assurance on the regulatory aspects of their business, most prominently on RIIO price control business planning. We are also heavily involved in the development of distribution network charging methodologies. We have undertaken numerous technical and market assessments for public sector industry organisations, such as Scottish Enterprise, who use these assessments to inform local and national strategy.

Innovation

TNEI are supporting our clients through the energy transition, and we have been actively involved in many Low Carbon Network Fund (LCNF), Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) projects over the last 5 years. As power system specialists, we are invested in the future of electricity networks and are continually developing innovative ideas on how to better plan, design, operate and manage these networks. We are a project partner on the flagship innovation NIC project Distributed ReStart, on which we are collaborating with National Grid ESO and SP Energy Networks.

International services

Our UK offices serve the UK, European, Middle East and Asian markets. Our office in Dublin provides a local hub for our clients in Ireland, while our Cape Town office in South Africa has been serving the African market since 2014. TNEI has experience in helping regulators, governments, network operators, industrial organisations and developers in over 40 Countries. We combine our specialist technical skills with the market knowledge and experience of local partner companies to ensure we provide the best possible service to our clients. We place an emphasis on local capacity building during the execution of our assignments to ensure that our clients gain maximum long-term benefit. Several of our consultants are actively involved in national and international technical working groups such as Cigré, so we remain at the forefront of emerging technology development for the benefit of our clients.





Sectors

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TNEI has been operating for over forty years and during this time, we have accumulated a wide breadth of knowledge, expertise and experience across wide a spectrum of industries and project types.

Electricity Networks and Innovation

TNEI is a leader in the provision of consultancy advice to electricity utilities and regulators, developers, and government on the challenges and opportunities presented by evolving energy systems. We are technical experts in the design and operation of power systems and this is complemented by a strong understanding of the regulatory and commercial environment as well as innovative grid technology and techniques. We also provide power system software solutions for smart network innovations both through our proprietary software, IPSA2, as well as through the development of custom software models and tools.

Our team of power system engineers have extensive experience in the modelling and design of electrical networks. We use power system analysis software (Digsilent Power Factory, PSS/E, IPSA, etc) to support our clients and perform complex analysis of network behaviour. We have experience in modelling all types of electrical network, from large interconnected transmission systems to small island networks. We regularly perform steady state and dynamic analyses to assess network capability and performance, analysing such things as frequency stability, sub-synchronous oscillations, voltage regulation and capacity to integrate renewable generation.

As network operators focus increasingly on innovation and develop new methods of planning and operating their networks, our specialist team are able to offer wide ranging expertise. TNEI is supporting a number of distribution and transmission network operators in their network innovation ambitions, primarily in Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) projects including Distributed ReStart, Smart Network design Methodologies, Smart Street, and many more.

Offshore Assets

TNEI is involved in a variety of projects in this sector, including marine energy and offshore wind energy. We have significant electrical design experience gathered over many years, from the infancy of offshore wind to the current significant developments. We have undertaken analysis and designs for numerous wind farms, from concept, through FEED, to detailed design in UK waters, and internationally. We have been involved in almost all the UK offshore wind farm projects either in design stage, technical support or the due diligence phase.

Onshore Renewables

We provide specialist consultancy services to large as well as small-scale onshore renewables. Our range of services and commitment to taking a flexible approach has allowed us to deliver at all stages of generation projects. TNEI has established an impressive track record in delivering challenging large scale renewable projects and taking sites from inception through

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to operation with a track record of delivering planning approvals and compliance studies for wind, solar, biomass, hydro and energy storage plants.

TNEI supports offshore wind developers, OFTOs, contractors and innovation projects in the design of offshore wind connections and arrays in the UK and Internationally.

Industrial and Conventional Energy

We offer specialist electrical system analysis of industrial facilities, including aluminium smelters, ports, pharmaceutical plants, petrochemical plants, power stations and oil and gas refineries and terminals. The complex electrical networks that feed critical systems need careful assessment to ensure they can maintain supply to critical operations.

Our expertise for conventional generation include electrical studies, AVR and governor modelling and model validation, site measurements and failure investigation, grid connection support and liaison with the network operators.

TNEI provides a multi-faceted approach to industrial projects, drawing upon our significant knowledge in consenting and permitting, environmental assessment, civil and structural design, geotechnical surveys, cable routing and installation, and operations and maintenance.

Additionally, our noise and acoustics team has industrial noise assessment experience across a diverse range of industrial sectors, including waste management, manufacturing, oil and gas, food and drink, animal rendering, quarrying and sawmills.





Our Experience

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Case Studies

Environmental Impact Assessment, Mossy Hill Wind Farm

TNEI completed an Environmental Impact Assessment (EIA) for the Mossy Hill Wind Farm near Lerwick on Shetland Mainland. TNEI was involved from the early stages of the design and formal EIA process through to post consent and delivery works. This challenging project sought to gain consent for a 49MW wind farm on a site where the key environmental sensitivities included ornithology, peatland habitats, noise and landscape and visual impacts. In addition, potential constraints relating to impacts on aviation and telecommunications interests and on nearby recreational land uses needed to be addressed.

Copies of the EIAR documentation are available via the Shetland Island Council website at: <https://pa.shetland.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=PAXTV6OAJ3P00>.

TNEI delivered the EIA on time and within budget and the scheme gained local level consent in May 2019 having had no sustained objections from statutory consultees.

Elements delivered by TNEI included:

- EIA coordination;
- Design coordination and management;
- Stakeholder engagement;
- Noise impact assessment;
- Shadow flicker impact assessment;
- EMI and TV impact assessment;
- Hydrological, hydrogeological and geological impact assessment;
- Peat and soils assessment (including Phase 1 & 2 probing & coring, PSRA, production of Peat Management Plan);
- Socio-economic impact assessment;
- In-combination effects impact assessment; and
- Civil engineering support and infrastructure design.

Network Innovation Allowance (NIA) project, National Grid ESO

This Network Innovation Allowance (NIA) project for National Grid ESO assessed the capability of non-traditional generation technologies (wind, solar, battery storage) to provide Black Start and restoration services. The project had three distinct parts:

1. Technology Capability and Readiness

The project assessed the capabilities of each technology to provide the different required services during a Black Start, as well as their potential role in a power island. Technical requirements were examined, alongside communication requirements and other considerations. An extensive stakeholder engagement exercise was undertaken as part of this project

2. **Wind Variability Case Study**
For the Wind Variability Case Study, TNEI built and demonstrated a sophisticated statistical time series model for predicting the firm-level of output that could be provided by wind farms, over different required durations. This employed a class of time series models called “SARIMA-GARCH” models, and simulated the outputs of these in order to make predictions about wind output, understanding that wind would play a significant role in future Black Start.

The issues associated with islanded networks operating with high levels of converter-connected generation were investigated here, to understand some of the challenges that would face distributed power islands in a Black Start. A number of case study island networks were highlighted to demonstrate different techniques and solutions to overcome challenges relating to system strength and stability of these types of network.

TNEI's International Experience



TNEI was appointed by a large international wind farm operator to discharge noise related planning conditions on a large wind farm scheme located in western Ireland. TNEI initially produced a compliance Programme outlining in detail the full scope of the work required, and describing in detail the proposed assessment methodology. The Programme was approved by the Council, and subsequently used as the basis of a long-term noise measurement survey at a number of key noise sensitive properties located in proximity to the wind farm. Due to the presence of a number of other wind developments in the area, it was necessary to undertake detailed data analysis in order to reliably extract the contribution of noise from the target wind farm from the overall noise levels measured. This was achieved through the use of multiple noise measurement kits at key locations within the wind farm in order to identify and accurately predict noise levels at locations where the signal to noise ratio for the target wind farm was poor. TNEI's assessment concluded that the wind farm was in compliance with the noise conditions, and the assessment was accepted and agreed by the Council.

TNEI supported multiple parties, including the developer, contractor, manufacturer and TSO, through power system studies for the 169MW

- Design studies, involving multiple turbines to help the developer choose the optimal WTG.
- Flicker, voltage step change and inrush studies.
- Comprehensive harmonic studies to assess compliance based on impedance loci (using over 1000 points per area) and site-specific incremental limits.
- Fault-ride through and dynamic voltage control studies (including parameter modifications) to demonstrate compliance against the Grid Code requirements.
- Detailed 110kV harmonic filter design studies for the TSO to manage the low order harmonic background amplification across the wider network due to long transmission cables. Detailed 30MVar C-type harmonic filter specification and individual component tolerances were established.
- Insulation coordination studies (switching, temporary and lightning overvoltages) in PSCAD to determine whether the wind farm and the filter components were adequately rated for transient events and establish the surge arrester characteristics.

Specialist services for Africa, Tanzania network grid integration analysis and developer support

TNEI Africa (Pty.) Ltd. was appointed by a renewables developer to perform capacity assessments for wind farms under development in Tanzania. The scarcity of robust network data in Africa can be challenging, and as such, the contracted services included in-country data collection.

By tapping into and further developing our existing relationships with the local electricity utility, we were able to enhance our knowledge of the relevant network status and future plans, and in so doing, forge a strong foundation for a successful future project for our Client. The data and planning projections were then used to develop a detailed grid model for the Tanzanian transmission network. A suite of power system analysis studies was performed to evaluate the conditions of the network and observe its response to the simulation of the proposed wind farms.

The results, both steady state and dynamic, were used to influence final site selection, front-end engineering interconnection design, and to identify integration risks - existing and future - for both the developer and the utility. Based on these early stage system study results, our Client was able to make informed decisions to take their project forward, and respond to the subsequent national renewable power tender with insight and confidence.

Key contacts

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Nigel Tate CEO

Nigel has been with TNEI since its inception and has been a constant member of the management team which has seen TNEI transform from a fledgling renewables operation in the north east of England to the multi-site, thriving and diverse specialist consultancy that it is today. He is delighted to be leading such a talented team of specialists and experts in their fields.

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Dieter Gütschow Director of Client Strategy and Policy

Dieter has more than 20 years of electrical engineering-, project management- and consulting experience in Europe and Africa. His experience includes managing renewable EPC projects, distribution network reliability modelling and planning, asset management, control and communication systems, smart grid technologies, due diligence and techno-economic feasibility studies. Dieter is the main contact for companies looking to discuss strategic partnerships.

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Stephanie Hay Director of Networks and Innovation and Director of TNEI Ireland

Stephanie is Director of the Networks and Innovation team at TNEI and has been with the company for over 5 years. Stephanie has been supporting clients through the energy transition, providing technical and market advice on emerging technologies and delivering concept, innovation and strategy projects for utilities and other industry organisations. Contact Stephanie to discuss innovation, strategy, regulation, network design and modelling solutions.

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Nathaniel Cowton Director of TNEI Ireland

Nathaniel is a commercially aware engineer and project manager, with experience of HVDC schemes at all stages of the project lifecycle. He works well within multi-disciplinary teams, including interfacing with planners, EIA coordinators, lawyers, procurement specialists and land agents. Nathaniel takes an active interest in energy regulatory and policy matters and has acted as a Senior Policy Advisor to the National Infrastructure Commission.

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Nilanga Jayawarna Resources and Operations Director

Nilanga has been with TNEI for over 10 years and enjoys the daily operational challenges of leading a team of 50+ consultants whilst still being involved in the varied technically challenging projects as a project director. She has extensive experience in power system analysis studies, including load flow and fault, harmonics, power system transient and voltage stability studies. Nilanga is the main contact for recruitment, staff training and development and operations management at TNEI.

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Mustafa Kayikci Director of Connections

Director of Connections, Mustafa has been with TNEI since 2007 and specialises in the modelling of power system equipment and network analysis. He has experience in load flow, fault level, harmonic analysis, traction networks, dynamic models, and the transient behaviour of transmission and distribution systems. Mustafa is the main contact for power systems studies, electrical design and offshore renewables.

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James Mackay Director of Environment & Engineering

James is Director of the Environment & Engineering team. Since joining TNEI in 2006 James has been involved in a range of energy and infrastructure projects in Europe, Africa, Asia and the Middle East. James has a particularly detailed knowledge of wind farm noise assessments and has worked on over 4 GW of onshore wind projects. James is the main contact for noise assessments, expert witness services, GIS / CAD mapping, soil resistivity measurements and shadow flicker assessments.

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Johan Smith Africa lead

Johan has over 10 years' experience in power systems analysis, including transmission and distribution modelling, network planning and feasibility, HVAC/HVDC interconnections and grid code compliance studies in Africa and internationally. Johan is the main contact for companies looking to discuss projects or strategic partnerships in South Africa and the rest of Africa.

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Contact

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 who we are and what we do, please contact: info@tneigroup.com

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