



A specialist energy consultancy

Conventional Energy

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Thermal power 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.

Conventional energy services

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 has experience in electrical system design and verification studies on Energy from Waste (EFW), biomass, diesel, Combined Cycle Gas Turbine (CCGT) and coal fired power stations. Our knowledgeable team can undertake full system design and verification studies at preliminary, intermediate and final design stages, taking into account a wide range of plant operating conditions, including emergency generation, demonstrating compliance with design and engineering standards.

Typical studies we can provide include:

- Load flow
- Short circuit/fault level
- Motor starting and re-acceleration
- Protection scheme and protection settings
- Arc Flash
- Dynamic and transient stability limits and margins
- Bespoke AVR and governor modelling and tuning
- Load rejection
- Power quality including harmonics distortion and filter design, flicker, notching and ringing
- Electromagnetic transient studies/insulation coordination
- Load shedding and sharing
- Grounding study (allowable step and touch voltage study).

All work is performed to appropriate international and local standards and regulations as required by the client. TNEI has extensive experience using ETAP, PSCAD, ATP, DigSilent PowerFactory, SKM Power Tools, as well as our own specialist software, IPSA 2, which provides clients with unique bespoke solutions.

Our experts are able to provide a multi-disciplinary approach to industrial projects, drawing upon our knowledge in consenting / permitting, environmental assessment, civil and structural design, geotechnical surveys, cable routing and installation, and operations and maintenance.

Our knowledgeable team can undertake full system design and verification studies at preliminary, intermediate and final design stages.

Case studies

Service: **Earthing design and protection settings**
Client: **Scottish Power Generation**

TNEI was appointed to provide motor and cable protection settings for a new 11kV system associated with a new fuel gas compressor at Shoreham Power Station. TNEI designed the earthing arrangements required for the new 11kV switchboard and specified the detailed earth mat design requirements in the vicinity of the new switchboard and the earth conductor sizes.

Service: **Technical advisor on the impact of RoCoF on thermal plants**
Client: **CER (Irish Electricity Regulator)**

Following on from an earlier review undertaken by TNEI, a grid code change to increase the RoCoF withstand level from 0.5Hz/sec to 1.0Hz/sec was proposed. Conventional generators have cited safety concerns (e.g. catastrophic failure of a unit) as well as the potential adverse impacts of frequent high RoCoF events on the lifetime of the plant equipment.

CER therefore requested detailed technical studies to be undertaken by the generators in order to determine compliance with the new RoCoF standard. Each plant would have to be adequately represented with its limitations and interdependencies between thermal, mechanical and electrical subsystems.

TNEI provided the following services:

- An independent expert to support CER over 3 years in order to facilitate the studies and provide an ongoing coordination and monitoring role for the project
- Coordination of the overall industry project; setting out the study requirements and participating in trilateral meetings between CER, generators, and the TSO
- Advice to CER on the appropriateness of the study outputs required by the TSO
- Assessment of the proposed approach of the generators for the technical studies
- Advice to CER on the appropriateness of information required by the generator from the TSO
- Regular review of the TSO scenario development and generator's detailed technical studies
- Advice of the TSO's report(s) following the completion of generator studies in those categories completed.

This independent expert role builds on TNEI's strong track record of managing multi-stakeholder projects, providing advice to regulatory bodies and undertaking steady-state and dynamic studies for transmission networks.

Service: **Identification and mitigation of power quality issues**
Client: **Confidential developer**

Harmonic distortion, in the form of post-notching high frequency ringing voltage waveform, caused substantial damage to equipment fed from the auxiliary MV board of a multi-GW CCGT during normal operation. TNEI carried out root-cause assessment by taking on-site measurements for a number of running configurations. Simulation models have been developed in PSCAD and IPSA and were verified and validated against the measurements for all scenarios. A filter design solution has been developed with a detailed functional specification of individual components. TNEI worked with the filter manufacturer and developer to successfully implement and mitigate all power quality issues on the auxiliary board.

On another OCGT plant for the same developer in another country, high harmonic distortions were observed during the various different stages of start-up of the generating unit. This was found to be especially damaging to the diesel gen-sets under black start conditions. TNEI has carried out site measurements and successfully implemented a dual-filter solution to resolve the power quality problems.

Service: **Failure investigation for diesel gen-sets**
Client: **Aggreko**

TNEI carried out detailed investigations into synchronous generator failures in Tanzania, examining insulation failure and mechanical shocks due to electrical disturbances. Recommendations were made to review transient stability/ pole-slipping, protection relay settings and neutral earthing policy, as well as to install surge arrestors together with RC dampers to protect the generator against external transients.

Service: **Lightning and voltage surge protection assessment**
Client: **Petrofac**

TNEI was appointed to carry out a lightning structural protection assessment at the Chergui gas processing facility in Tunisia. The scope of work was to produce layout drawings for several sites showing positioning of all lightning protection equipment, example installation drawings and to produce marked up single line diagrams to show the location of all required surge protection devices. The existing lightning protection scheme at Chergui had been designed to BS 6651:1992, Code of Practice for Protection of Structures against Lightning, which does not require surge protection as mandatory. The recommendations took into account the design requirements of the BS EN 62305:2006 standard which supersedes BS 6651 and explicitly requires surge protection.

Key contacts

Luke Taylor
Industrial Lead



Luke has over 10 years' experience working with large and/or critical electrical power systems including petrochemical plants, power stations, pharmaceutical plants, banks and data centres. His professional experience includes power systems analysis, power quality measurements and analysis, protection coordination and forensic analysis of failed plant. His varied professional experience has required excellent written and verbal communication skills in addition to a broad technical knowledge.

Dr Mustafa Kayikci
Director of Connections



Mustafa's core skills are modelling of power system equipment and transmission & distribution network analysis with 13 years of experience. He has a strong track record in dynamic stability and transient studies, power quality assessment and mitigation, failure investigation and root-cause analysis. He has provided specialist technical support and advice to developers, manufacturers and utilities. His extensive experience in system studies and on-site investigations allows him to develop solutions for complex power network

problems.

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 thermal power services, please contact Mustafa Kayikci; email: mustafa.kayikci@tneigroup.com or call: +44(0)161 233 4812.



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For more information about who we are and what we do, please contact: info@tneigroup.com

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