

enspec

Realising the full potential of Power



25+
YEARS
EXPERIENCE

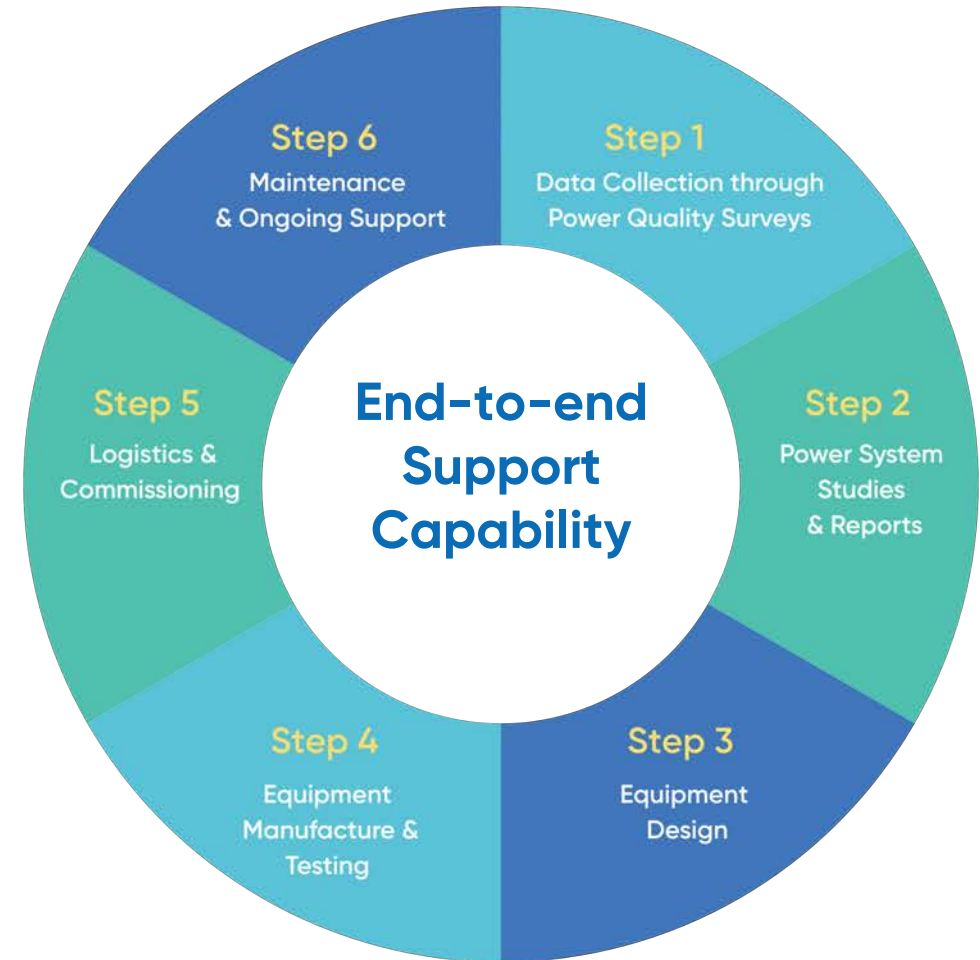
Enspec Power is a privately-owned Electrical Engineering consultancy, design and manufacturing company. Enspec has over 25 years' experience in power quality services, providing grid code compliance support and solutions to large energy generators and users. This introduction outlines Enspec's experience, capabilities and specific areas of added value that we offer.

The Benefit of Enspec

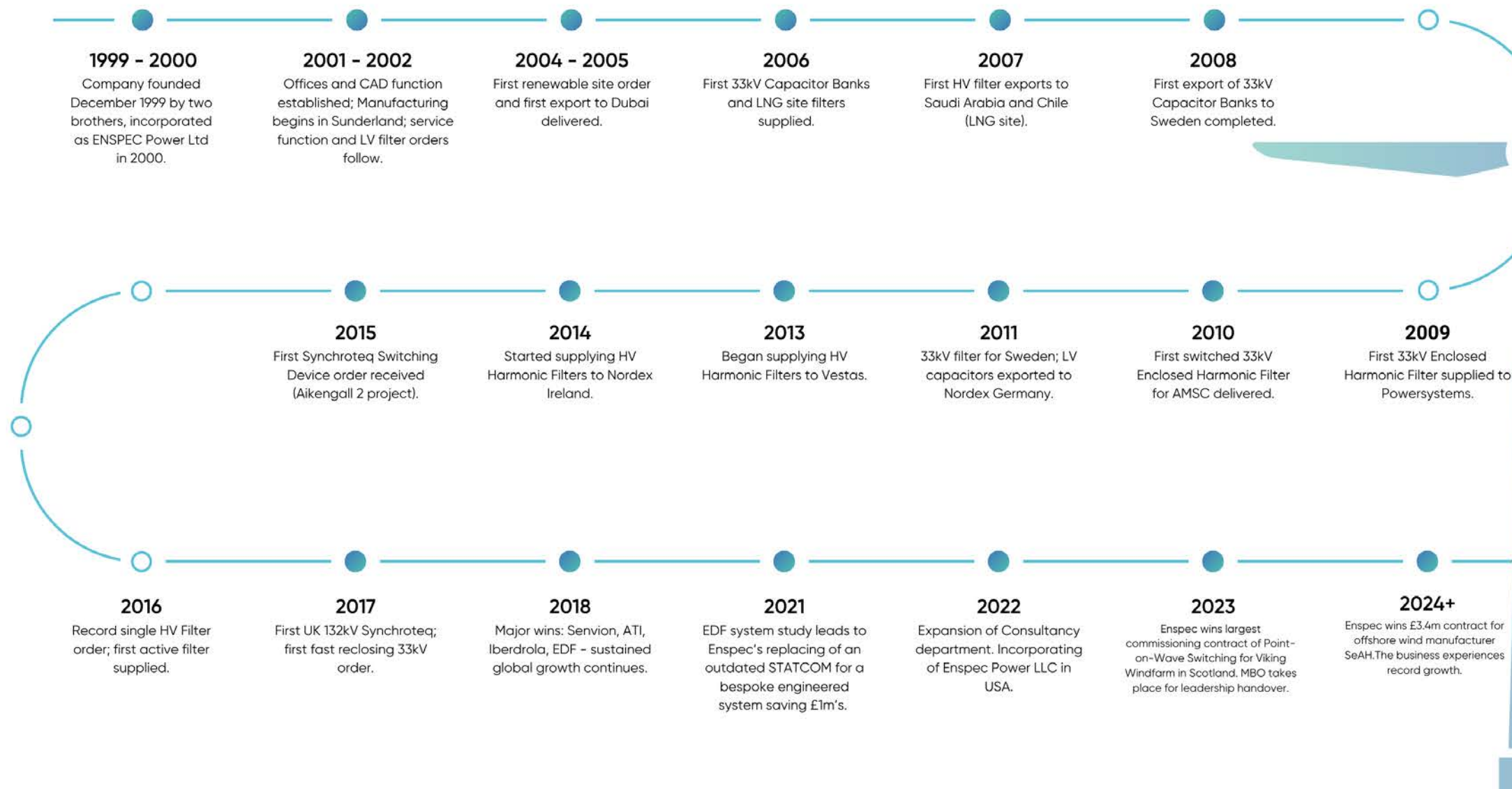
Enspeg is unique in combining end-to-end power systems consultancy with the in-house design, manufacture, and supply of engineered solutions that address common grid and power quality non-compliances.

That means we bring both the insight to diagnose issues and the capability to resolve them - closing the gap that can exist with stand-alone consultants when studies identify non-compliance but delivery responsibility sits elsewhere. We're also the right size to provide a personal, responsive service, while still having the capacity to deliver complete multi-discipline study packages across multiple projects, with fast turnaround.

With extensive experience in dynamic and steady-state studies across a wide range of technologies and applications, we can quickly identify manufacturer model limitations or errors and provide clear, practical corrective actions. This reduces project risk and helps avoid the costly delays that model issues can introduce to programme timelines.



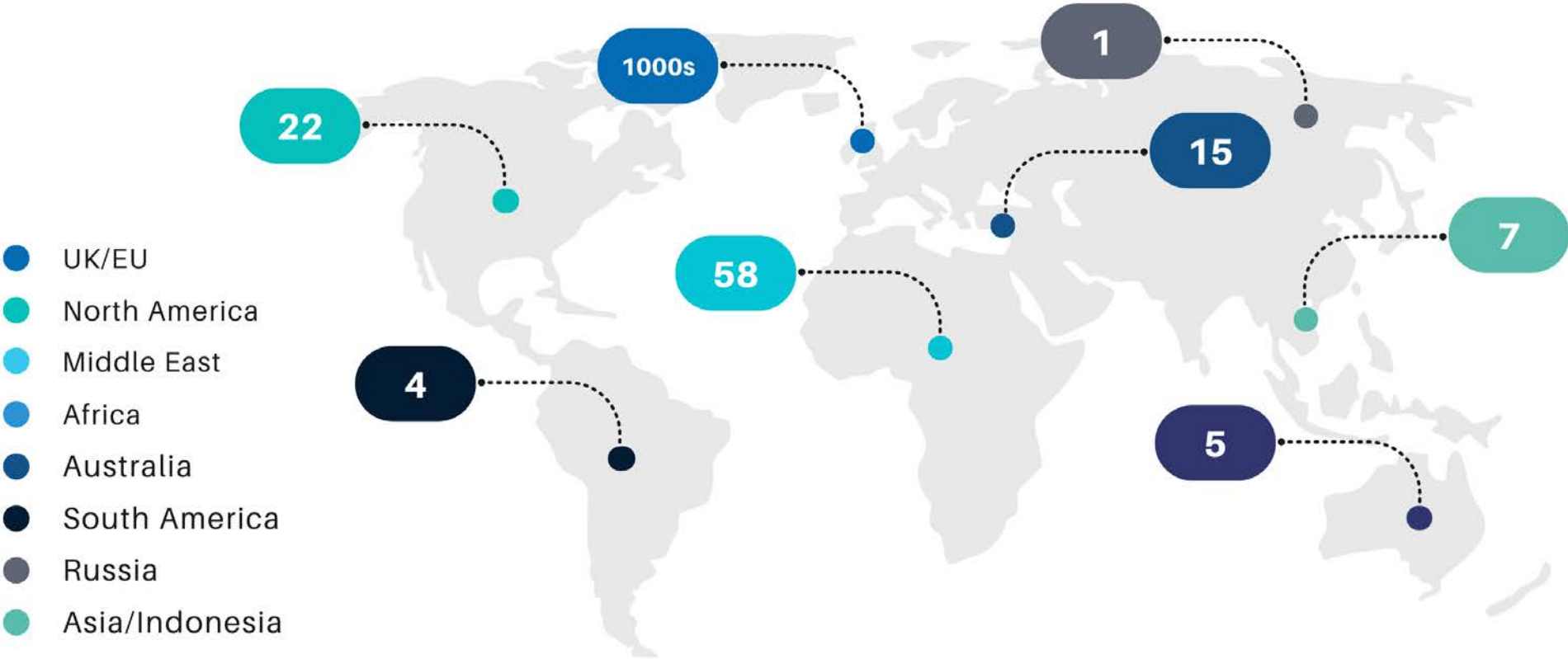
Knowledge built through experience



A snapshot of who we work with

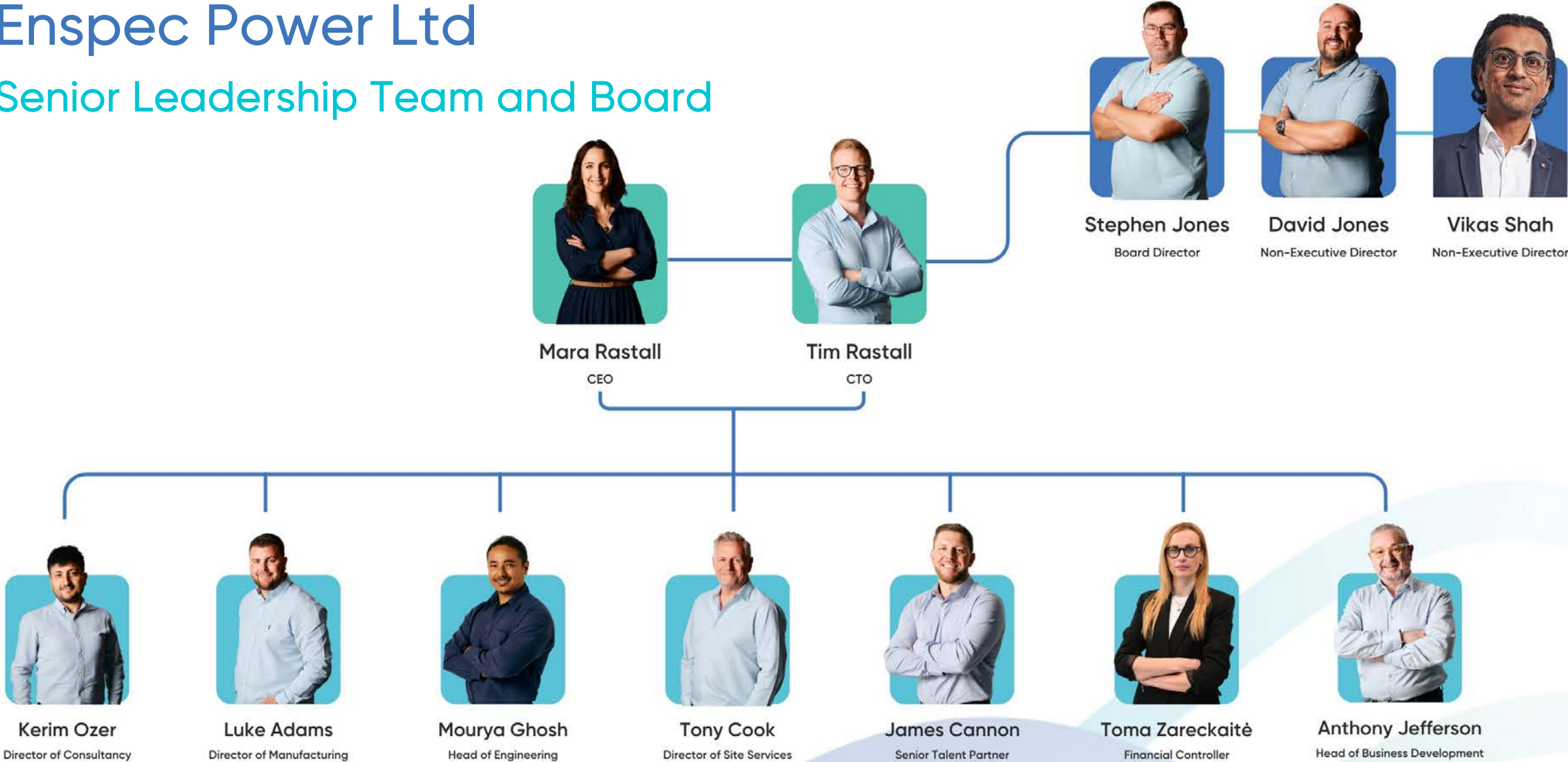


With global expertise



Enspec Power Ltd

Senior Leadership Team and Board



Our Products and Services

We provide high-quality, tailored solutions that support electrical stability, compliance, and reliability. Enspec prides itself as a “Knowledge Partner”, combining theoretical knowledge with practical engineering to deliver bespoke equipment for complex challenges.



Power Quality Surveys

Detailed assessments to uncover and address disturbances that impact electrical stability, efficiency, and equipment protection.



Power System Studies

Expert Analysis to ensure safe, efficient, and compliant grid connections, identifying and resolving issues early to support long-term performance.



Consultancy & Bespoke Design

Tailored consultancy and product innovation combining practical and theoretical expertise in power systems and power quality, ensuring effective renewable integration and custom-engineered solutions.



Power Factor Correction

Solutions that enhance energy efficiency, reduce costs, and improve compliance by optimising electrical system performance.



Harmonic Filtration

Engineered filtering systems that reduce electrical disturbances, protect infrastructure, and meet grid standards across industrial and renewable applications.



Reactive Compensation

Voltage control systems that stabilise power supply, support grid compliance, and optimise performance in demanding environments.



Point-on-Wave Switching

Precision switching technology that minimises transients, safeguards critical equipment, and ensures smooth operation during energisation events.



Site Services

Full lifecycle support - installation, commissioning, testing, and maintenance- to maximise equipment reliability and ensure smooth project execution.

Power Systems

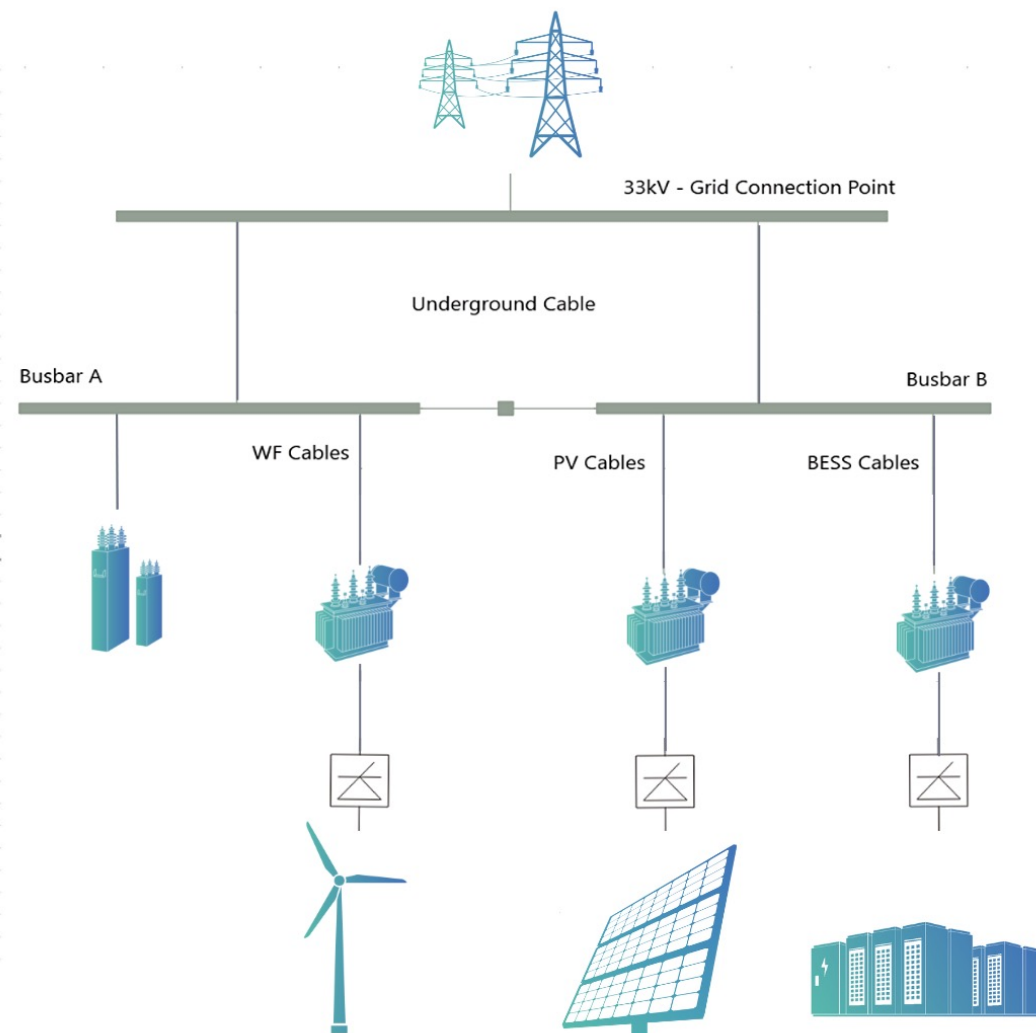
Surveys – Studies – Simulations – Consultancy

Power Systems Experts

After reviewing the available information – such as design drawings, equipment specifications, and connection details – our engineers model and analyse your network against relevant standards for performance, safety, and efficiency.

Where information is incomplete, we can support primary data collection by installing power quality analysers to capture the critical parameters needed for robust assessment.

We then issue a professionally indemnified engineering report that sets out clear findings and practical, actionable recommendations to address any identified issues.



The key to our technical team

Enspec delivers end-to-end dynamic and steady-state power system studies and simulations for large energy users and generators, combining practical network modelling with real-world engineering insight to de-risk design decisions and accelerate project delivery. We support compliance with ENA grid connection standards and relevant safety requirements, while also improving operational efficiency through clear, actionable recommendations that enhance power quality, protection performance, resilience, and asset utilisation.

Software capability:

- ✓ PSCAD
- ✓ ETAP
- ✓ IPSA
- ✓ DigSILENT PowerFactory
- ✓ Creo
- ✓ AutoCad

Grid Connection, Compliance & Submissions

- G99 Type A–D studies + application form completion
- Grid Code Type C/D studies + reactive power capability
- Voltage & frequency model validation (incl. post-connection)
- RMS/EMT model submission packs with checklists
- Feasibility & stability pathfinder assessments

Power Quality & Harmonics

- G5/5 pre-assessment and Stage 1–3
- G5/4–1 Stage 2–3 (where required)
- P28 pre-assessment / compliance support
- Harmonic filter design + switching studies
- Reactive compensation design + capability studies

Stability, Control Interactions & Oscillations

- SSO / SSR studies (converter and turbine interactions)
- RMS and EMT dynamic studies as required
- Manufacturer model review and issue resolution support
- LOV / SOV / TOV studies for operational resilience

Protection, Safety & Switching Risk

- Arc flash studies and safety documentation
- Protection performance, coordination & settings support
- FFO / TRV and switching transient assessments
- Cable / PoW switching studies and mitigation
- Study report revisions and rapid turnarounds

Network Design & Asset Optimisation

- Cable ampacity and transformer sizing
- Motor acceleration and starting assessments
- Power system model development (multi-platform)
- Site SLD drawings and documentation packages
- Hourly consultancy for project support

Earthing, Lightning & Measurements

- Earthing study + earthing risk assessment
- Soil resistivity measurement
- Lightning Protection System (LPS) design

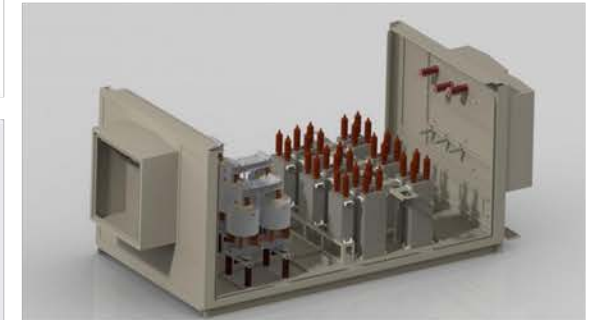
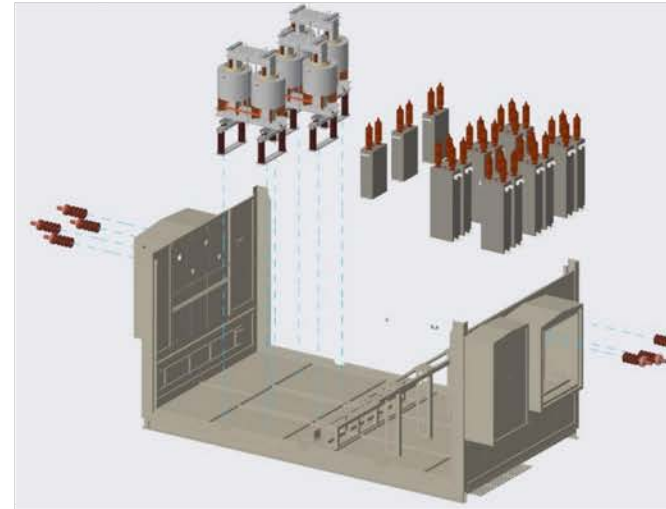
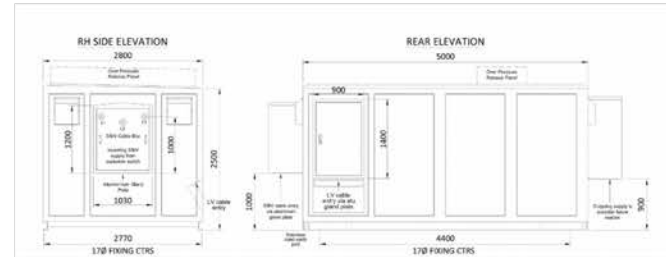
Manufacturing

Reactive Compensation – Power Factor Correction –
Passive and Active Harmonic Filters – Point-on-Wave Switching

Design

Our designs begin with the same depth of analysis as our consultancy work -using data, simulations and network modelling to define what the system needs and how it will perform. We then translate those outcomes into engineered solutions optimised for efficiency, reliability, and total installed cost, balancing performance with real-world constraints like space, access, budgets, lead times, and programme.

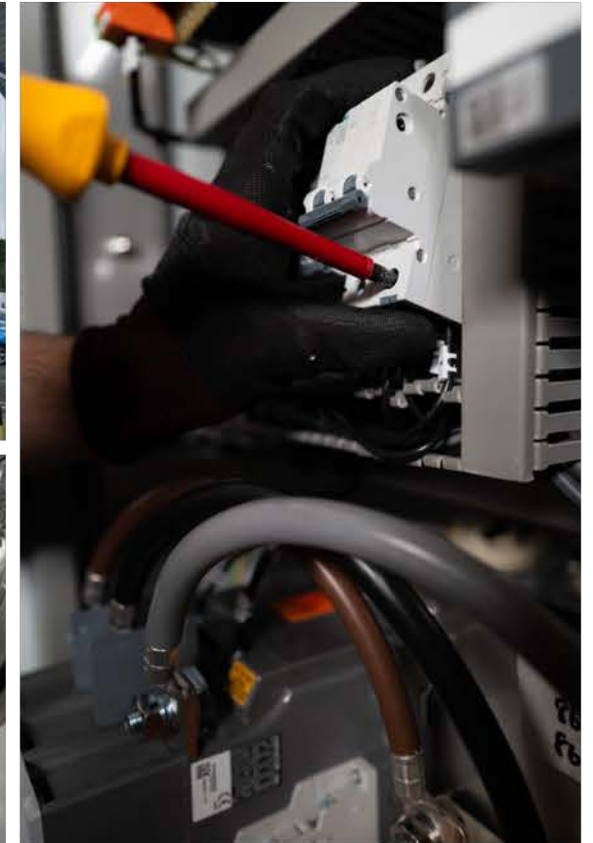
To improve manufacturability and quality, we produce detailed 2D electrical schematics and dynamic 3D equipment renders, supporting design validation, manufacturing efficiency, and robust quality control.



Manufacture

Built by our specialist UK team, our equipment uses carefully selected components and robust construction for long-term reliability in industrial and utility environments. Our integrated 2D/3D workflow improves build accuracy, reduces rework, and enables consistent quality checks through assembly.

Every unit is completed with rigorous Factory Acceptance Testing (FAT) to verify wiring, protection, controls, and functional performance prior to client sign-off and transport, ensuring it arrives on site ready for efficient installation and commissioning.



Design

Manufacture

Commissioning

Maintenance

Commissioning

Because we design and manufacture the solution, we commission with full technical ownership - verifying wiring, settings, and performance through to live testing and handover. We support you from installation and energisation through to final Site Acceptance Testing (SAT), confirming the equipment performs as intended under real operating conditions and meets safety and compliance requirements.

Most of our equipment includes a 10-year warranty as standard, backed by full documentation and clearly defined handover requirements.





Maintenance

Ongoing maintenance protects performance over the full asset life - identifying degradation early, preventing unplanned downtime, and ensuring equipment continues to operate safely and efficiently as site conditions change. Preventative testing can include functional checks, electrical inspections, thermal imaging where appropriate, verification of protection/control settings, capacitor health checks, filter/reactor inspections, and performance trending against commissioning baselines.

Enspec can deliver this through a seamless framework agreement, providing a consistent service model, predictable scheduling, and clear reporting - so maintenance becomes proactive, not reactive. The result is peace of mind: assets remain compliant, reliable, and operating at maximum efficiency, with a single partner accountable for ongoing support.



Our equipment

Voltage Level	Solution	Primary purpose	Typical outcomes
LV	Power Factor Correction (PFC)	Reduce reactive power demand	Lower losses/costs, improved voltage stability, better efficiency
	Active Harmonic Filter (AHF)	Cancel harmonic distortion in real time	Improved power quality, fewer nuisance trips, reduced equipment stress
MV	11 kV Capacitor Bank (standard / de-tuned)	Reactive power compensation	Improved PF/voltage; de-tuned option reduces harmonic amplification risk
	33 kV Capacitor Bank	Reactive power compensation	Improved PF/voltage, reduced upstream loading and losses
	11 kV Enclosed Harmonic Filter	Reduce MV harmonic distortion	Protect transformers/motors/switchgear; improved network stability
	33 kV Enclosed Harmonic Filter (2nd order / Type C)	Target specific harmonic orders	Reduced resonance risk; lower thermal stress; improved power quality
	Point-on-Wave Relay	Synchronous switching control	Reduced transients/inrush; improved protection of switching equipment
	Point-on-Wave Switching Systems (11/33 kV)	Controlled switching for major assets	Lower switching overvoltages; longer asset life; improved stability
	11 kV Shunt Reactor	Absorb reactive power to control voltage rise	Better voltage regulation on lightly loaded/long cable networks
	33 kV Shunt Reactor	Absorb reactive power to control voltage rise	Reduced overvoltage risk; improved system performance and reliability
	11/33 kV Snubber	Suppress fast switching transients	Lower peak overvoltages & dv/dt; protection for insulation and equipment
HV / EHV	66kv - 400 kV Open Rack Harmonic Filters	Transmission harmonic mitigation	Protect critical HV assets; improved reliability and compliance
	Voltage Modulator	HV voltage control & stabilisation	Improved voltage regulation; reduced fluctuations; optimised reactive flow
Cross-voltage	Product Innovation (Build-to-Requirement)	Manufacture + integrate + FAT + commissioning	Site-ready engineered solutions, compliant delivery and verified performance



Case Study Snap Shots
Industrial Focus

Monopile Manufacturer Harmonics & PFC Optimisation



Enspec completed a detailed power quality and grid compliance study for SeAH Wind's new monopile manufacturing facility, supporting the electrical design of a brand-new factory producing monopiles for offshore wind turbines (customer: SES Engineering Services Ltd).

The work included G5/5 harmonic analysis and a full P28 compliance assessment across all 17 supply transformers. To ensure accurate results, we modelled the DNO background network to capture the site impedance profile and assess interaction with the proposed mitigation equipment. A protection and coordination study was also completed to verify protection performance and selectivity under the expected operating and fault conditions.

The studies informed and validated the final equipment solution, comprising 29 × 415V Active Harmonic Filters providing 5,125A of harmonic mitigation and 29 × 415V PFC Units providing 6.2MVar of reactive power compensation. Commissioning of the PFC and AHF systems is now commencing.

Legacy Power Factor Correction Replaced

The Komatsu logo is displayed in a bold, black, sans-serif font. The letters are thick and blocky, with a distinctive small square above the letter 'T'.

A detailed Power Quality (PQ) survey and engineering study for Komatsu's crawler excavator manufacturing facility to assess the site's existing, failing Power Factor Correction (PFC) system and define a suitable replacement solution.

The work involved deploying 7 PQ Analysers to capture representative operational data across the site, followed by a data-led assessment of PFC performance, loading characteristics, and site operating conditions. The measured results were then used to engineer and size a replacement PFC system aligned with the site's reactive power compensation requirements.

Based on the findings, we supplied 6 × 415V PFC Units providing a total of 1.15MVAR of reactive power compensation. Following installation, the new PFC system was successfully commissioned, restoring reliable power factor correction and improving overall site electrical performance.

Coca Cola's Harmonic Mitigation Survey & Design



Enspec completed a detailed power quality assessment for Coca-Cola's Wakefield manufacturing site, supporting operational resilience and compliance through a targeted harmonic mitigation solution (customer: BSB Electrical Services Ltd).

The work included seven harmonic surveys across key areas of the facility to quantify harmonic distortion levels and identify the primary sources of power quality issues. Alongside this, we carried out a site-wide review of the existing Power Factor Correction (PFC) system to confirm suitability, understand interactions with site loading, and ensure the proposed mitigation would perform as intended.

The survey findings directly informed the final equipment solution, comprising 8 × 415V Active Harmonic Filters providing a total of 2,250A of harmonic mitigation. This enabled an evidence-led mitigation strategy designed to improve overall site power quality performance.

Hamonic Support for Water Services



Enspec delivered a targeted harmonic mitigation solution for **Northumbrian Water Ltd**, one of the UK's major water and wastewater service providers responsible for supplying drinking water and treating wastewater across the North East of England, at **Bran Sands Water Treatment Works** (customer: Armah Switchgear Ltd).

The project supported an upgrade to the site's blower scheme, helping to maintain power quality and reliable operation for critical treatment processes. The scope focused on reducing harmonic-related risk associated with the upgraded blower installation and supporting stable electrical performance under operating load conditions.

To meet the site requirements, Enspec supplied **1 × 415V Active Harmonic Filter (625A)**, providing targeted harmonic mitigation to support robust, compliant operation of the new blower system.

Motor Start Voltage Dip Mitigation Feasibility Study

The logo for Wood, featuring the word "wood." in a bold, lowercase, sans-serif font. The letters are dark blue or black, and the period is a solid black dot.

A detailed electrical feasibility study for water treatment plant to consider all available options for Motor Start Voltage Dip Mitigation.

Involved detailed modelling in PSCAD to represent motors and starting characteristics. Various mitigation options were then modelled and assessed including STATCOM's, VFD's, Capacitor Banks, Generators and Slip Ring Motors.

The study assessed the electrical practicality in terms of solving the voltage dip non-compliance as well as the physical/ cost practicalities for each solution. This allowed our client to make an educated decision on mitigation.

Impact Studies for Polyhalite Mine with BESS integration



Grid impact studies for Anglo Americans Polyhalite Mine to assess impact of BESS integration and shaft sinking upgrades.

Studies included transient, fault level, harmonic and stability analyses. A particular focus was to assess the impact of the planned BESS system and addition of extra machines. This involved steady state and dynamic modelling across multiple software platforms.

The study confirmed that the BESS system was appropriately sized for requirements and that no negative electrical impacts were to be expected. We assisted with revisions to the site's protection settings in-line with scenario fault level variations.

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