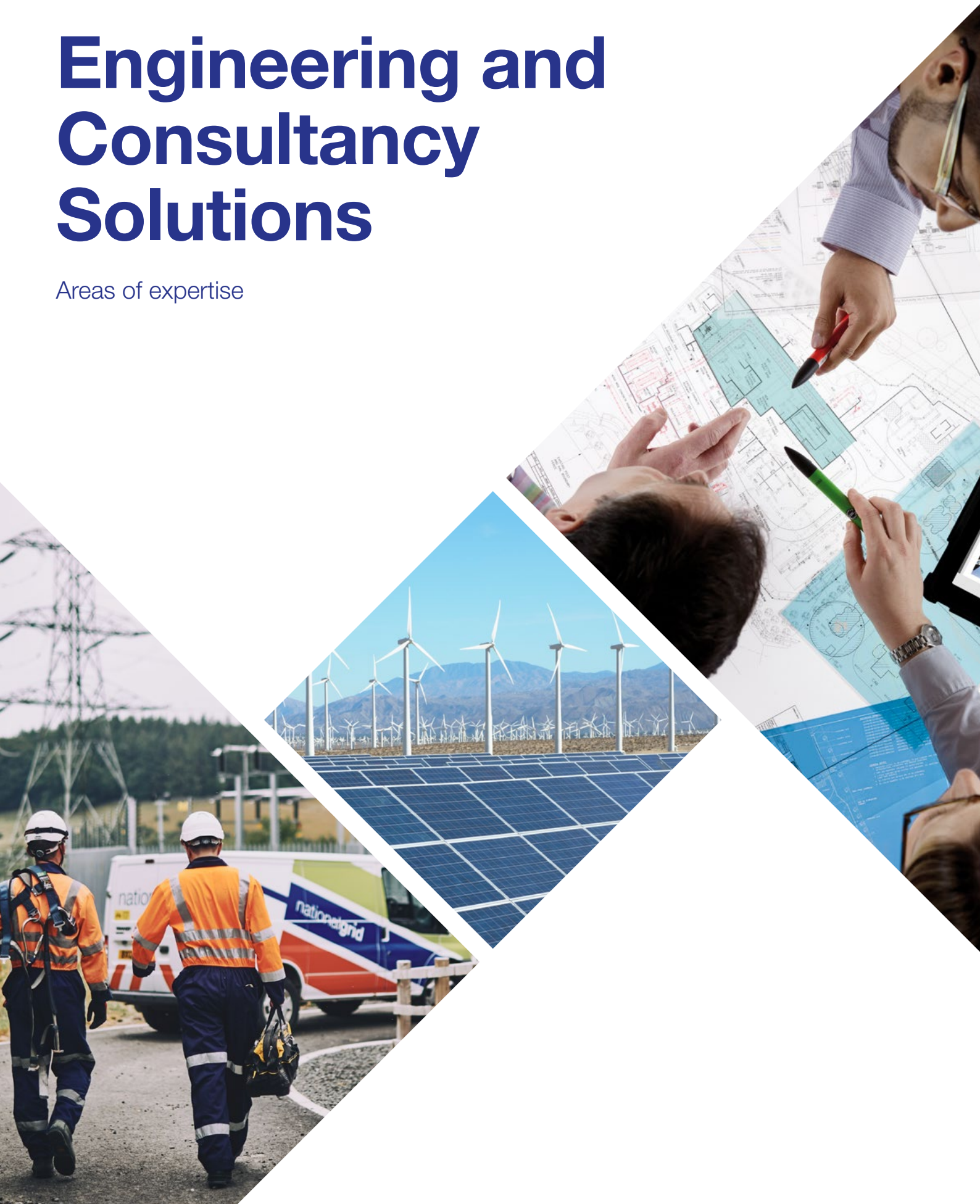


**Electricity
Transmission**

nationalgrid

Engineering and Consultancy Solutions

Areas of expertise



We offer:



Asset maintenance

Oil management

SF₆ surveys and top-up

Overhead line condition monitoring (surveys by helicopter)

High voltage services



Consultancy and policy support

Asset health

Harmonics consulting services

Electric and Magnetic Fields (EMFs) management

Noise impact management

Flooding and natural hazards risk management



Build, refurbish, replace, decommission

Air Blast Circuit Breaker (ABCB) refurbishment and bay refurbishment services

Decommission and recycle

Replacement and new build



Incident response

Spares and storage

Cables and accessories

24 hour emergency call-out



Operational control

Control Person Operation (CPO) and alarm monitoring

Control Person Safety (CPS)



Additional solutions

Special equipment hire

Engineering document library

Telecommunications sector services

Hire of storage facilities

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Tel: +44 (0)800 7839 228

Email: ecs@nationalgrid.com

Website: nationalgridet.com/ecs

Engineering and Consultancy Solutions

Electric and Magnetic Fields (EMFs) Management



Who for

If you own or develop High Voltage (HV) electricity assets, are planning a development close to electrical assets or have a company with equipment that generates EMFs, you may require specialist advice. Our environmental engineering specialists are here to assist you in managing EMFs associated with HV transmission assets and other EMF management issues.

Why choose National Grid

- **We are experts:** Our team of specialists are industry experts in understanding, resolving and communicating EMF issues; from achieving legal compliance, approaching policy level issues to finding practical solutions for your business. Our specialists are chartered and members of professional institutions including **The Royal Society of Biology** and **The Institution of Environmental Sciences**.
- **Legal EMF compliance:** Our team of experts will provide step by step advice on how to comply with the UK EMF legislation with particular consideration for staff with pacemakers or who are pregnant <http://www.hse.gov.uk/radiation/nonionising/emf.htm>
- **Innovative solutions:** We are actively engaged in cutting edge research including:
 - biological thresholds of EMF.
 - occupational exposure between high EMF and disease outcomes.
 - evaluating the uncertainty in childhood leukaemia and magnetic field exposure.

- **International reputation:** We follow independent policies and guidance, ultimately to protect members of the public and we are proud to sit on several industry standards committees such as: **CENELEC**, the European committee responsible for standardisation in the electrotechnical engineering field; **ENTSO-E**, the European steering group for EMF issues, and **CIGRE**, a global community that collaborates and shares power system expertise.

Our solution

- **Electric and Magnetic Field Assessment:** We can measure and calculate EMFs from electrical assets to ensure compliance with Government exposure limits.
- **Compliance with regulations:** If you are an employer, you will need to ensure that you are compliant with the new 2016 Regulations. We can provide the necessary guidance and documents to achieve compliance and keep every member of staff safe.
- **Property Development issues:** If you are developing a site for residential use, you will need to consider the public exposure limits, what information you need to provide in your planning application, and what the impact might be on saleability. We can help with all aspects of EMF management for your site.
- **Design specifications:** We can advise on EMF specifications for new equipment to ensure compliance with EMF requirements and prevent associated issues such as microshocks.
- **Developing new electrical infrastructure:** We can support you through the process of obtaining consent, including the required assessment and information in your Environmental Statement, and answer questions during the consideration of your application.
- **Expert witness and cross-examination on EMFs**
- **Stakeholder communication:** If you are consulting with the public, we can help manage your stakeholder communications to ensure complex and sensitive EMF issues are effectively handled.

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Flooding and Natural Hazards Risk Management



Who for

Are you looking to understand asset vulnerability and risks, minimise the impact of flooding and natural hazards for your site? Our environmental engineering solutions will ensure that supply runs smoothly, and local infrastructure remains resilient to flooding and other natural hazards.

Why choose National Grid

- **Our international reputation:** We are recognised for demonstrating best practice on flood risk mitigation and management of water-driven natural hazards.
- **Cost-saving:** We will support your business in developing natural hazard exposures and efficient adaptation to climate change.
- **Our experts** will advise you on natural hazard investment plans and provide flooding and natural hazard risk assessments and mitigation solutions.
- **One point of contact:** You will be provided with a dedicated point of contact who will work with you to make sure we deliver what you need.
- **Reporting insight:** The environmental engineering team will provide insight into your site flood modelling and data analysis. They will help with identifying the issues and possible solutions.
- **Trusted by others:** We are often consulted by governmental departments, local authorities, research groups and academia on the application of policy and flood resilience.

Our solution

- **Flooding impact assessments:** We can provide support and advise in developing an impact assessment of flooding and water-related geohazards in your area.
- **Design and specification:** Our experts will consult you on your site design and specifications for asset flooding and water-related geohazards.
- **Incident support:** We can undertake and support analysis of flooding and erosion incidents and impacts on sites and assets.
- **Planning applications:** The team can support and advise on the development of the flood risk assessments for planning applications.
- **Flood action planning:** We can prepare action plans for flooding, natural hazard resilience and climate adaptation.

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Harmonics Consulting Services



Who for

If you are a business that is working to advance the decarbonisation of electricity and utilises electronic-based technologies when connecting to the transmission network, our harmonics experts can support you and help you manage the impact of your connection to the network.

Why choose National Grid

- **Tailor-made modelling:** We can construct a model of your connection based on the supplied manufacturer's data.
- **Ensure compliance:** We can carry out a harmonic assessment to ensure compliance with the harmonic specification provided by the relevant network owner.
- **Our experts** can produce a conceptual design for an efficient mitigation solution for your connection.
- **One point of contact:** You will have access to a highly experienced engineering team with a single point of contact to manage your project.
- **We have an in-depth knowledge** of industry standards and grid connection compliance processes and requirements. We have a proven track record of providing consultancy services to customers and other utilities, both within the UK and internationally.
- **Quality of work:** We deliver efficient and customer-focused design solutions.

Our solution

Offshore connections:

For offshore wind, it is your responsibility to study the impact of your connection on all affected networks and then design any mitigation required to meet these limits. Our harmonics team can do this task on your behalf, offering the following services:

- **Produce the outage study specification** for submission to the Electricity System Operator.
- **Set the harmonic limits** and impedance loci for the connection of the Offshore Transmission Owner (OFTO) network.
- **Construct a suitable model** of the OFTO network and wind farm connection based on the supplied manufacturer's data.
- **Determine whether the connection will be compliant** without mitigating measures.
- **Produce a conceptual design** for an efficient mitigation solution if required.

Onshore connections:

For all onshore connections, it is your responsibility to study the impact of the connection and to demonstrate compliance with a harmonic specification provided by the Network Owners. Our harmonics team can do this task on your behalf, offering the following services:

- **Construct a suitable model:** Our experts will use the manufacturer's data to construct a model for your onshore connection.
- **Determine whether the connection will be compliant** without mitigation measures.
- **Produce a conceptual design** for an efficient mitigation solution if required.

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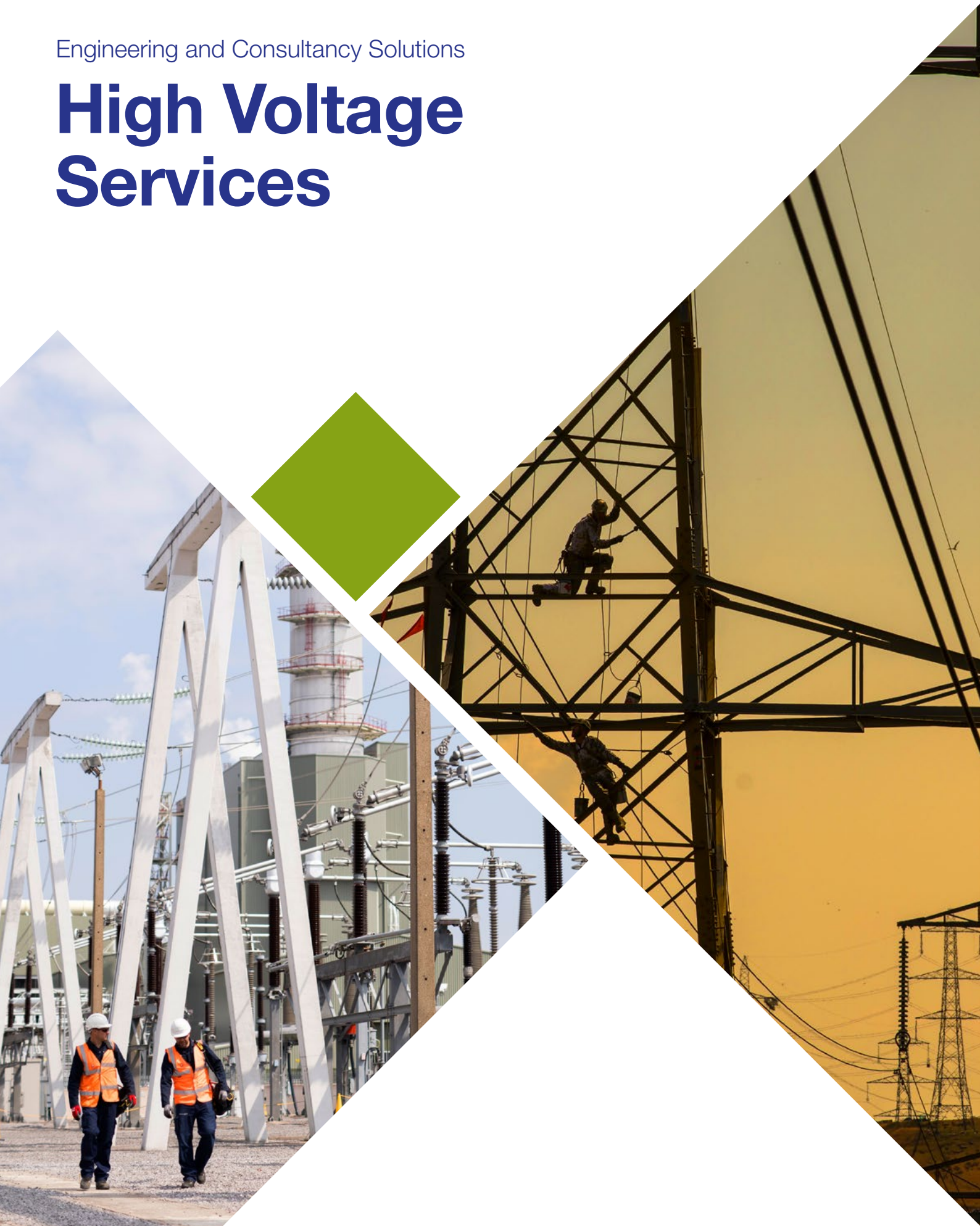
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High Voltage Services



Who for

National Grid's High Voltage (HV) maintenance and support services enable you to extend the performance of your assets and mitigate any future risks. We provide a wide range of High Voltage engineering services for Power Stations, Interconnectors, Transmission Networks and Distribution Network Operators.

Why choose National Grid

- **Safety is our top priority:** All our experts are trained and authorised to carry out High Voltage maintenance work under National Grid Safety Rules.
- **Engineering excellence:** Our team has a unique combination of experience and expertise which will enable work to be carried out to world-class safety standards.
- **Tailor made approach** to suit your site specifications. Our experts will work with you to define the work scope and deliver work to agreed timescales.
- **Relationship with Electricity System Operator:** We work with the Electricity System Operator when planning outage periods and reporting, which enables us to deliver the work to agreed timescales.

Our solution

Our workplace service is tailored for your business needs:

- **First line support is provided** either remotely or by deployment of a standby person to your site. The service includes:
 - remote fault or incident evaluation by telephone.
 - where necessary, attendance at the relevant site and provision of site-based fault or incident evaluation on the plant and equipment.
 - provision of a summary report on any work carried out.
- **Second line support:** As required, is a follow-on to the first line support, working to rectify faults or incidents.
- **Site routine inspections:** We offer routine, non-invasive, non-outage inspections of plant, equipment and site infrastructure. In addition, we can provide you with a detailed report on the condition of your High Voltage assets. These inspections ensure that your assets are being regularly monitored in line with our own best practice procedures or to your own requirements. Any defects found are either rectified at the time, if practical to do so, or included in planned work programmes.
- **Outage maintenance:** Outage maintenance work on High Voltage plant and equipment includes planning, execution and reporting of results. It is carried out during notified outage periods. This is an area where our team has extensive technical competence and expertise, particularly in outage planning liaison with the Electricity System Operator and in resource delivery. Outage maintenance is dependent upon you giving a pre-determined minimum notice period for agreed work windows and a defined work scope. We will then allocate resources for delivery of the work in agreed timescales.
- **Safety switching:** We provide appropriately authorised and trained National Grid Electricity Transmission personnel to provide an ad-hoc and pre-planned switching service on plant and equipment under National Grid Safety Rules.
- **Reactive maintenance:** In addition to any pre-determined outage maintenance work, we are able to quote for, plan and deliver reactive maintenance work on your assets throughout the year.

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Noise Impact Management



Who for

If you own High Voltage (HV) electricity assets or are planning a development involving the installation of equipment that generates noise, you may require specialist advice. Our environmental engineering noise specialists are here to assist you in managing noise associated with HV transmission assets and other noise management issues.

Why choose National Grid

- **We are experts** in noise associated with electricity transmission assets and noise impact assessment. Our team of engineers are members of professional institutions including **The Institute of Acoustics**, **The Institution of Engineering and Technology** and **The Institute of Environmental Management and Assessment**.
- **International reputation:** We are actively involved in international working groups such as **CIGRE** and support electricity transmission companies and their suppliers all over the world.
- **Environmental compliance:** Failure to comply with relevant environmental legislation is an offence, potentially resulting in equipment termination and/or unlimited fines. We can assist you with your environmental compliance requirements.
- **Stand by your side:** We can act as an expert witness on behalf of your company in noise-related matters.

- **In-depth analysis:** Our environmental specialists can undertake acoustic testing, measurements and noise modelling.
- **Cost-saving:** We can advise you on the selection of suitable noise reduction measures and mitigating the risks of non-compliance.
- **Your brand matters:** We can assist you with stakeholder engagement and minimise the risk of brand damage.

Our solution

- **Noise impact assessment:** We can help you minimise the risk of noise complaints, potential legal action and damage to your company's brand. Our experts will support you by undertaking assessments in line with BS 4142:2014.
- **Planning consent:** We can support you throughout the process of obtaining planning consent for developments that generate noise.
- **Permitted development:** We can prepare statements for works undertaken under Permitted Development and liaise with relevant stakeholders.

- **Compliance:** We can help you demonstrate compliance with planning conditions by undertaking noise monitoring, acoustic modelling and production of acoustic reports.
- **Noise complaint management:** We can assist with the management of noise complaints by liaising with affected parties, carrying out noise monitoring, assessing the noise impact and providing advice on potential engineering solutions.
- **Expert witness:** We can act as an expert witness on behalf of your company.
- **Design Specifications:** We can advise on operational noise specifications for new equipment, including siting and layout and support the assessment of tenders and design delivery to ensure compliance with technical specifications.

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Engineering and Consultancy Solutions

Oil Management



Who for

Are you looking to optimise your asset availability and prolong its life?
We have a wealth of experience and technical expertise to provide world-class solutions for all your oil management needs.

Why choose National Grid

- **Bespoke equipment:** We own Oil Management Units (OMUs) and bespoke specialised mobile oil processing units. They are fitted with the latest technology including satellite broadband connections; onboard oil testing facilities and onboard fuel-efficient; low emission diesel generators.
- **We can save you time:** Our oil units can operate 24 hours a day on your site, reducing the time taken to complete work. We will use results to tailor the services we provide.
- **We innovate:** Our engineering team has a strong innovative drive to look for new opportunities to overcome current challenges.
- **Industry expertise:** Our many years of experience have allowed us to develop systems of best practice for all oil handling and oil processing requirements.
- **National coverage:** Our OMU locations at Thorpe Marsh (South Yorkshire) and Dartford (Kent) enable us to cover the whole of the UK and Ireland.
- **Our experts:** All our OMU operatives are rigorously trained, working to the highest standards.
- **Licensed sites:** The Environment Agency licenses our OMU sites under Pollution Prevention and Control legislation.
- **We are accredited** to ISO9001 and ISO14001, and at Dartford, we are licensed for PCB (Polychlorinated Biphenyls) destruction.
- **All in one:** We tailor our service to accommodate all your oil management needs from sampling right through maintenance and oil reclamation.
- **Independent oil testing:** We offer a full range of oil testing and analysis tests at a third party UKAS ISO/IEC17025 accredited laboratory.

Our solution

• Sampling, testing and analysis:

At our OMU sites:

- we use calibrated instruments.
- we can test High Voltage breakdown up to 100kV, moisture to below 5ppm, resistivity and copper corrosion to IEC standards and silver corrosion to DIN 51353.

Oil supply to your site:

- all our oils can be delivered to your site reconditioned (dried and degassed).
- we provide 12 hour emergency and 24 hour response service for oil deliveries.

- our expert teams can remove excess oils from your equipment and dispose of it in compliance with environmental regulations.
- new oils can be supplied as uninhibited or inhibited depending on your requirements.

• PCB (Polychlorinated Biphenyls) destruction:

- PCBs are environmentally hazardous pollutants that are strictly regulated.
- we own and operate a waste treatment facility licensed for PCB destruction for small volume equipment.
- the strict procedures used by the OMU allow us to transport PCB-contaminated equipment without having to give prior notice of movement to the Environment Agency, saving both time and cost.

• Oil replacement or reconditioning:

Our areas of expertise:

- oil circuit breaker service.
- transformer diverter oil service.
- transformer selector oil service.
- topping up transformers.
- transformer oil drying and degassing service.
- transformer major oil change service.
- inhibitor/passivator.

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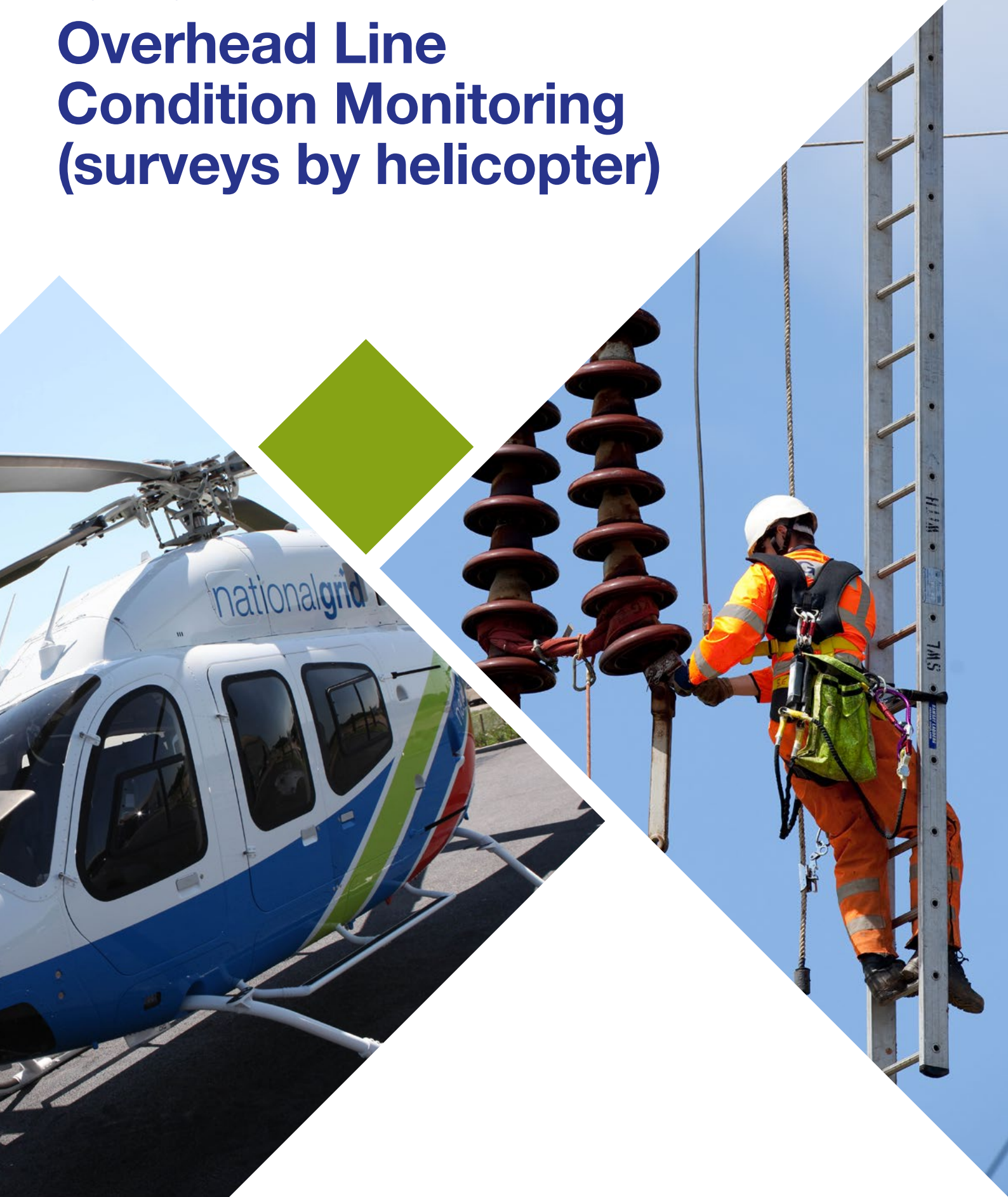
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Overhead Line Condition Monitoring (surveys by helicopter)



Who for

If you are a business owner in the power industry, you may require a specialist service from our Helicopter Unit to provide asset quality insight.

Here at National Grid, we combine our technical engineering knowledge and the latest thermal and high definition equipment to provide customers with in-depth asset quality insight. Our asset quality assessments offer unique insight and evidence.

Why choose National Grid

- **In-depth analysis:** We will provide a unique analysis of your assets' condition, complete with a review and set of recommendations.
- **Benefit from top of the class** Airbus Helicopters' Twin Squirrel and the Bell 429. Both possess excellent performance, safety margins, reliability and operate in most weather conditions in the UK.
- **Cost-saving:** We use Wescam's highly-acclaimed MX10 high-definition, electro-optic and infra-red sensor package. The equipment allows us to detect the minor asset imperfections and provide detailed video evidence.
- **We pride ourselves on precision** by using high definition SLR to take 50-megapixel images of steelwork, fittings and other specific components as required to provide an in-depth analysis of the asset.

- **Our experts** will consult you on a repair and refurbishment schedule.
- **Optimise your time:** No hassle, fast and efficient surveys.
- **Working with you all the way:** Asset team experts will be available on hand to provide detailed analysis.

Our solution

We offer two survey options to suit your needs:

Thermal Surveys:

- Identify thermal contrast in similar components – this can often be the precursor to equipment failure.
- Identify high resistance joints before joint failure.
- Identify conductor problems, hot tower footings and earth wire continuity issues.
- Highlight transformer, switchgear and bus bar problems where components show dissimilar hotspots (or cold spots where equipment has failed).

High Definition Condition Assessments:

- Provide detailed condition assessment of towers, fittings and ancillary equipment including all spacers, conductors, insulators, joints, repairs, bonds, shoes, hangers, bolts, washers, split pins, and earth wire fittings.
- High definition photography of steelwork that emphasises areas in need of painting and/or steelwork repair.
- High definition condition assessment of overhead gantries and substation equipment.
- Different surveys to monitor overhead lines and substations, including High Definition Condition Assessments and Thermal Survey techniques.
- The results of both types of surveys are available to you through high definition imagery and summary reports.*

*Extra costs apply

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Refurbishment, Replacement and New Build



Who for

Are you looking to refurbish an asset or to design and commission a new asset onto the National Grid Electricity Transmission system? We offer refurbishment and replacement asset management solutions to customers within the High Voltage (HV) electricity industry.

Why choose National Grid

- **Cost-saving:** By choosing to refurbish your assets with us, you will lower unit costs of delivery and shorten outage times with less complex commissioning switching programmes.
- **Our expert teams** will refurbish your assets to the highest possible required standard.
- **Comply with industry standards:** The results that we deliver will adhere to the Grid Code.
- **Efficient delivery of your programme:** We have a single contract with the manufacturer to ensure efficient and safe programme delivery.
- **Original asset parts:** We can provide you with a wide range of original replacement parts as needed.

Our solution

Refurbishment:

- Refurbishment addresses the condition of an asset, assessing any known failure modes, ageing and defects.
- Refurbishment enables direct, like-for-like asset exchange and doesn't interfere with the busbar protection system and civil structures.
- Allows you to keep familiar assets on site.
- Lower unit costs of delivery.
- Shorter outage times with less complex commissioning switching programmes.
- By refurbishing your assets, you will be able to keep familiar assets on site.

Replacement and new build:

We offer our customers:

- Feasibility studies, design, and procurement, through to build and commissioning for power transmission and distribution plant and equipment at 132kV and above.
- A single contract with the manufacturer – customers benefit from integrated equipment with a consistent design, key dates, and delivery milestones.
- Single resource reduces the risk of delay on the programme through reduced number of interfaces.
- All assets are designed and installed in compliance with Grid Code requirements.
- We can provide you with replacement parts as needed.

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SF₆ Surveys and Top-up



Who for

If you are a business that uses Sulphur Hexafluoride gas (SF₆) in your daily operation, you will appreciate the importance of correctly managing it and safeguarding your equipment against potential leaks.

Why choose National Grid

- **In-depth analyses:** We use latest leak detection systems, analysers and gas carts that can quickly be deployed to cover England and Wales.
- **Environment:** We will work with you to develop gas leak repair solutions that will be tailored to your site specifications to reduce or eliminate environmental cost.
- **SF₆ expertise:** As an asset owner, we will share the expert knowledge of the SF₆ filled equipment with all our customers.
- **Effective reporting:** Our engineering team will supply accurate mass-flow measurements of gas usage.
- **Our experts** are trained to the latest F gas regulations and module 3 for handling contaminated SF₆.
- **One point of contact:** We are an SF₆ all-in-one contact for your business.
- **Quality of work:** We are one of the six approved organisations to certify engineers to work with SF₆ in the UK and EU.

Our solution

- **Thermal imaging:** In National Grid, we use specialist in-house thermal imaging technology to pin-point SF₆ leaks and be able to make strong recommendations as to where closer monitoring and repairs may be required.
- **Engineering knowledge:** Our highly experienced SF₆ engineers can attend your site to carry out leak detection surveys, either to locate a specific leak or to survey entire SF₆ filled installations; such as Gas Insulated Switchgear substations.
- **Bespoke reporting:** The team will create a bespoke report and tailor to your requirements. These reports identify the location of your leaks and can form the basis of a rectification plan.
- **SF₆ top-ups:** Our SF₆ experts can attend your site with equipment to empty or top up your SF₆ assets. We can complete this service both pre-and post-maintenance. Alternatively, we can top up leaking assets to continue their reliability until a repair can be carried out.
- **SF₆ gas handling:** Our specialist team will remove SF₆ for maintenance using specialist gas handling equipment. We will store the SF₆ gas for you temporarily during maintenance works.

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Spares, Cables and Accessories



Who for

National Grid stores is a dedicated facility for the management and distribution of extensive stocks and strategic spares.

For many years, we have offered customers emergency access to our National Grid stock of spares on a 365 days a year basis. Our solution removes the need for customers to finance and maintain their own stock.

Many of these spares either are no longer supported or produced by the original equipment manufacturers, or they are subject to long lead times from the suppliers. You can take spares and cable services separately or as a combined access arrangement.

Why choose National Grid

- **Emergency assistance:** As a club member you will gain emergency access to spares 365 days a year.
- **Cost-saving:** We store and manage emergency strategic stock that means you reduce cost for unnecessary storage facilities, site security, maintenance and out of date equipment.
- **One point of contact:** We have tailored our service to suit your business needs.
- **Exclusive access:** We offer spares club membership to businesses who want to have exclusive access to our stock and first line support.
- **Efficient delivery:** All our stock can be delivered to your chosen location overnight or same day if required.

Our solution

- **Spares:** We keep a comprehensive range of High Voltage (HV) components. This includes: tap changers, cables, switchgear, protection, larger spares and overhead line spares in tailored environmental conditions at our Didcot stores. Our instant access service and UK-wide fast delivery, including overnight or same-day service, reduce asset restoration to the shortest possible time.
- **Cables:** We manage an emergency strategic stock of oil filled and XLPE cables covering 132kV to 33kV voltages along with some associated accessories and joints. We are equipped to provide spares 24 hours a day to all club members. Because of that, our customers can reduce the cost for unnecessary storage facilities, site security, maintenance and out of date equipment.

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