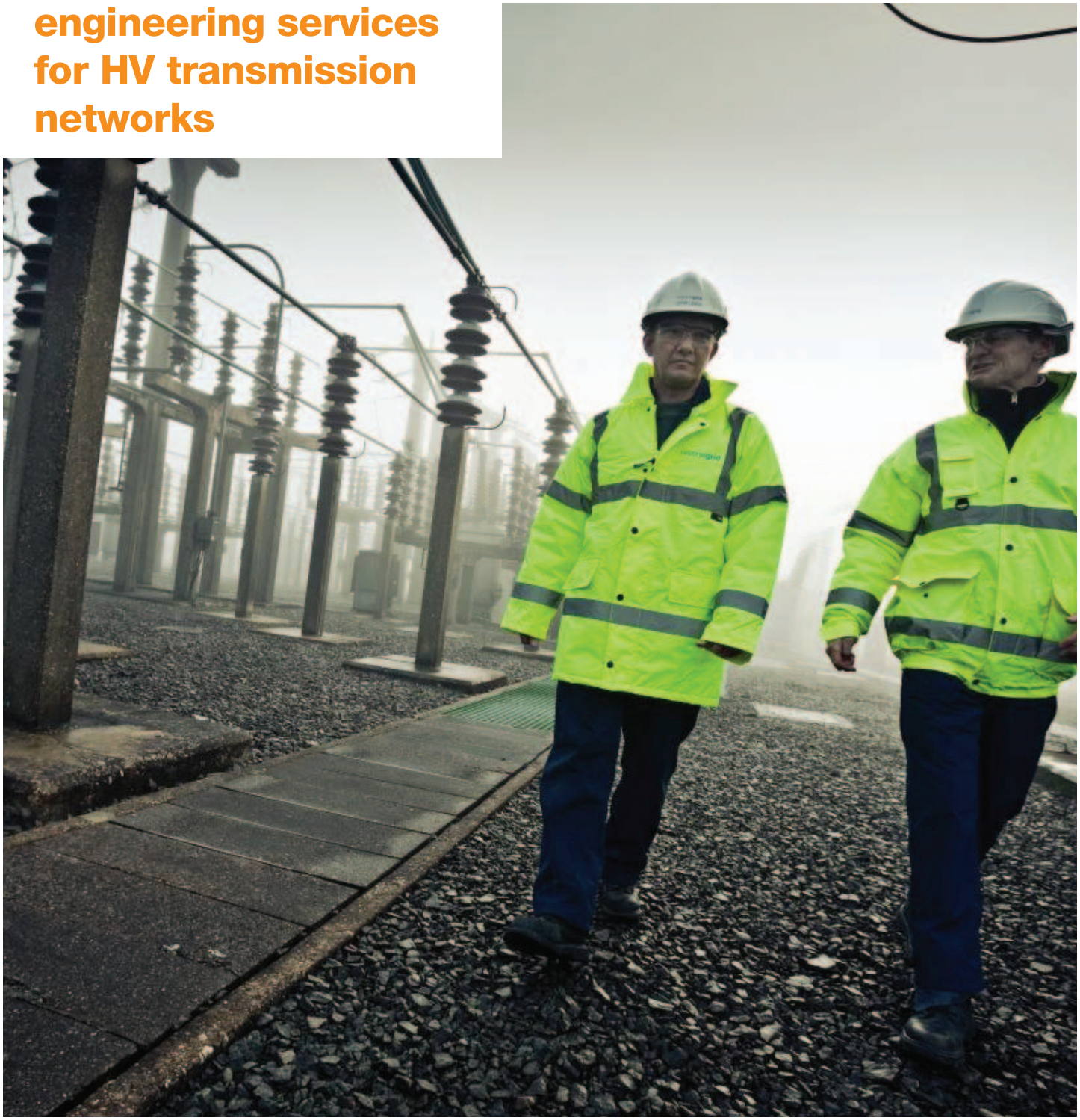
nationalgrid

THE POWER OF ACTION

UK Engineering Services

As the owner and operator of the high voltage electricity transmission network in England and Wales, we have gained substantial experience and technical expertise in the provision of engineering services for HV transmission networks



HIGH QUALITY HIGH VOLTAGE ENGINEERING SERVICES

National Grid provides a wide range of high voltage engineering services to external customers including Power Station operators, Interconnectors, Transmission Owners (on and offshore), and Distribution Network Operators (DNOs), all of which are delivered through our highly experienced maintenance and support teams.

STRENGTH IN DEPTH

As the owner and operator of the high voltage electricity transmission network in England and Wales, we have gained substantial experience and technical expertise in the provision of engineering services for HV transmission networks. We have been providing these services to external customers since 1990 and are dedicated to providing high quality work and excellent customer service alongside our commitment to deliver safely, reliably and efficiently.

National Grid's HV engineering services are delivered by our core Asset Management business and managed for our customers by a dedicated UK Engineering Services team (UKES). UKES looks after the customer interface and provides a full account management service including contracts, work planning, delivery liaison and invoicing. Based at National Grid's UK headquarters in Warwick, UKES works with its colleagues within Asset Management to help deliver our services to customers throughout the UK and Ireland.

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HIGH QUALITY HIGH VOLTAGE ENGINEERING SERVICES

CUSTOMERS AND MARKETS

Power stations
HV substation and connection assets from the generator transformer to the National Grid connection point.

Transmission networks

Distribution networks
132kV assets at Grid Supply Point substations and overhead lines.

Offshore Transmission networks
- Asset care onshore
- Network services

HV DC interconnectors

SUMMARY OF SERVICES

HV asset care
- Substation plant inspection and condition monitoring
- Substation site care
- Outage maintenance on HV plant and equipment
- 24-hour emergency call-out
- Switching
- Cable route and overhead line routine inspection and condition monitoring (helicopter and/or foot-patrols)

Network services
- Safety Management (acting as a Safety Controller)
- Network Mapping

Specialist equipment hire
- Skycradles
- Temporary towers

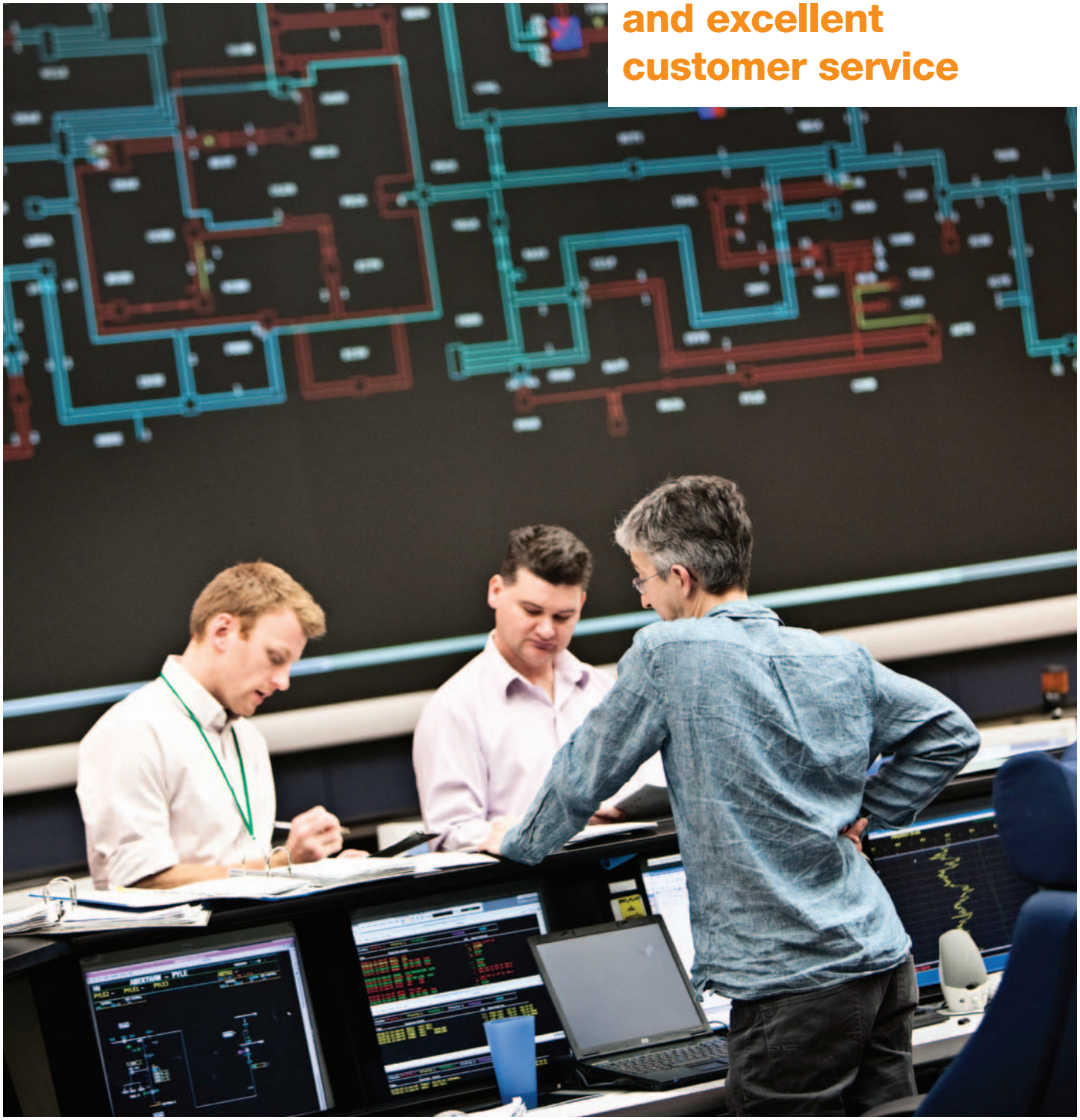
Electrical insulating oil
- Reclamation
- Reprocessing
- Disposal

Strategic spares support
- Access to National Grid's HV strategic spares inventory
- Membership of 132kV and 33kV oil-filled cable clubs

Specialist technical support and advice

Technical Libraries
- Access to engineering documentation and specifications
- Access to our exclusive transmission tower drawing library and associated expertise

We have been providing our services to external customers since 1990 and are dedicated to delivering high quality work and excellent customer service



HOW WE CAN HELP

HV ASSET CARE

SUBSTATION PLANT INSPECTION AND CONDITION MONITORING

Routine, non-invasive, non-outage inspections of plant and equipment providing the customer with a detailed report on the condition of its HV assets. These inspections give peace of mind that plant and equipment are being regularly monitored in line with either National Grid's own best practice procedures or to the customer's own requirements. Any defects found are either repaired immediately or if necessary included in planned work programmes.

SUBSTATION SITE CARE

Routine inspections of site infrastructure and property providing the customer with a detailed report on the condition of the site(s), its buildings and structures. These inspections can give peace of mind to the customer that site occupier duties are being discharged properly, and that structures and property are being regularly monitored in line with either National Grid's best practice procedures or to the customer's own requirements. Any defects found are either repaired immediately or if necessary included in planned work programmes.

OUTAGE MAINTENANCE ON HV PLANT AND EQUIPMENT

Planned outage maintenance requirements for all your HV plant and equipment, managed from planning through to delivery and completion reporting of the work. This is an area National Grid's Asset Management team has significant technical competence and expertise particularly in outage planning liaison with the system operator and in resource delivery. Work is usually undertaken using National Grid's own work specifications ensuring consistency and excellence in quality and work delivery with our own assets, although as a flexible provider we can, if required, work to a customer's own specifications.

24HR EMERGENCY CALL OUT FIRST LINE SUPPORT

We offer a 24 hour, 365 day a year emergency call-out service, providing both remote fault and incident evaluation either by telephone and/or immediate attendance at site to identify a problem and make safe where required. Subject to resource availability, we can subsequently mobilise second line support to carry out any emergency fault repairs as and when required.

CABLE ROUTE AND OVERHEAD LINE ROUTINE INSPECTION AND CONDITION MONITORING

Our experienced substation and overhead line teams are able to provide a comprehensive condition monitoring service, based on either foot patrols and/or our fleet of twin-engined helicopters equipped with the latest monitoring equipment, as appropriate. These inspections can often be undertaken as part of monitoring National Grid's own assets resulting in a very cost effective service.

Our specialist helicopter unit is staffed by experienced pilots and observers/camera operators to carry out visual overhead line inspections, thermal imaging and condition assessments. All of our aircraft are fitted with the latest gyro stabilised video, thermal imaging and digital recording media. Data collected during line surveys is reproduced into professional survey reports, enabling engineers to evaluate faults and effect remedial action. Each year our specialist team carries out detailed line surveys for our customers, to check for faults and damage resulting from high winds and adverse weather conditions.

See also our **Network Mapping service** which also uses our helicopter platform and can be used to provide detailed condition assessment analysis.

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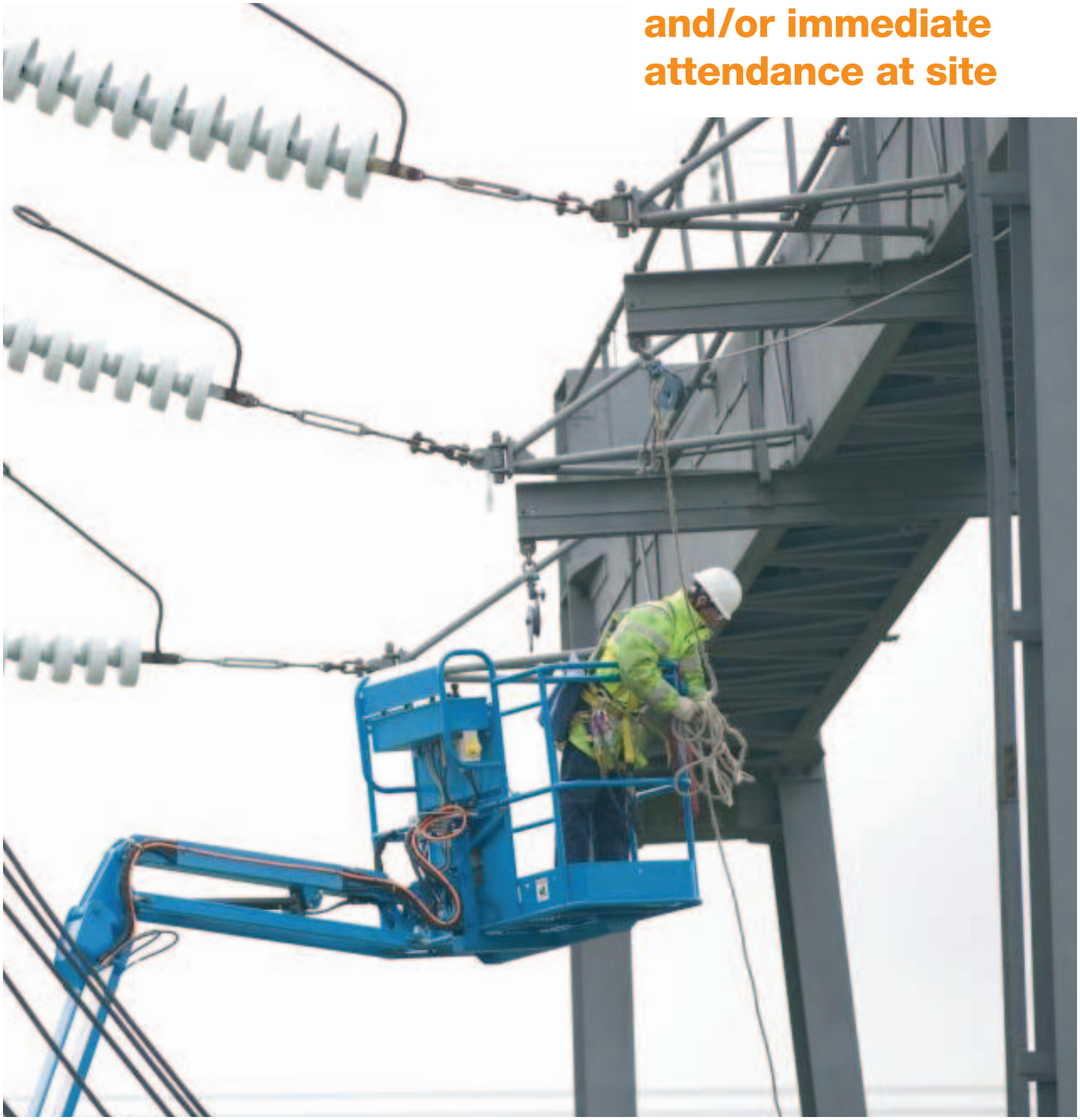


HOW WE CAN HELP

NETWORK SERVICES

SAFETY MANAGEMENT (ACTING AS SAFETY CONTROLLER)

Through our Network Operations Centre (NOC), we can provide a comprehensive safety management service using National Grid Safety Rules, covering the establishment and control of safety precautions (isolation and earthing), transfer of HV equipment from the customer's Control Person (Operation) to the NOC's Control Person (Safety), issue/cancellation of safety documents to permit the start of work, or test of, HV equipment, and safety co-ordination across control boundaries. Following completion of work, the service will ensure return of control to the customer's Control Person (Operation) following cancellation of the final safety document and removal of safety precautions.

The service also includes everything required to set up and look after your safety management needs including preliminary advice and assessment of your requirements, definition of control boundaries, modifications to operation diagrams/site responsibility schedules, design and build of the required control system for use by the NOC and on-site training of customer employees including refresher training where appropriate.

SPECIALIST TECHNICAL SUPPORT AND ADVICE

We are able to provide engineering consultancy services on a wide range of high voltage related subject areas, with particular emphasis on asset management. We are currently developing cutting-edge techniques in areas such as 'smart' asset management enabling real time monitoring of equipment in service and fault predictive technologies, allowing long term savings in operational expenditure.

We have considerable expertise in DC power transfer and conversion through our interconnector experience with France. As renewable energy sources and interconnection between networks expand, advice on and the operation and maintenance of these HVDC links is a key service we can offer.

We can also provide assistance in such specialisms as Electro Magnetic Frequency (EMF) and Rise of Earth testing. Our specialist EMF team can carry out assessment work on the magnetic fields of plant and equipment on behalf of our customers and reporting on these results. Rise of Earth testing includes determining the earth return current for a given customer's required location and a report/assessment of the results.

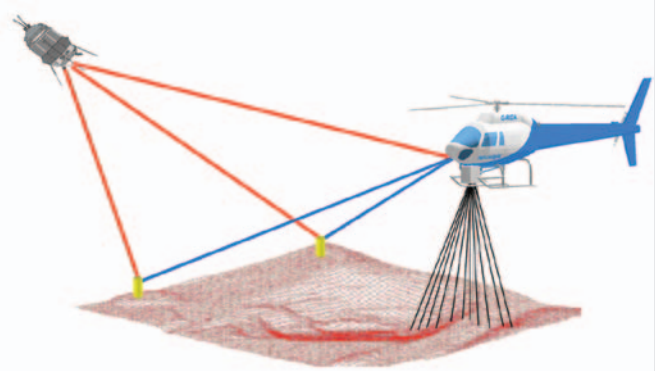
NETWORK MAPPING

National Grid utilise Light Imaging Detection and Ranging (LIDAR) survey techniques to map and model high voltage overhead line transmission systems in both the UK and US.

We can analyse, interrogate and model the survey data to provide:

- Thermal uprating reports
- Re-conductoring studies
- Structural analysis of overhead line towers
- New build and route planning
- Flooding analysis
- Infringement analysis
- Land and Development support

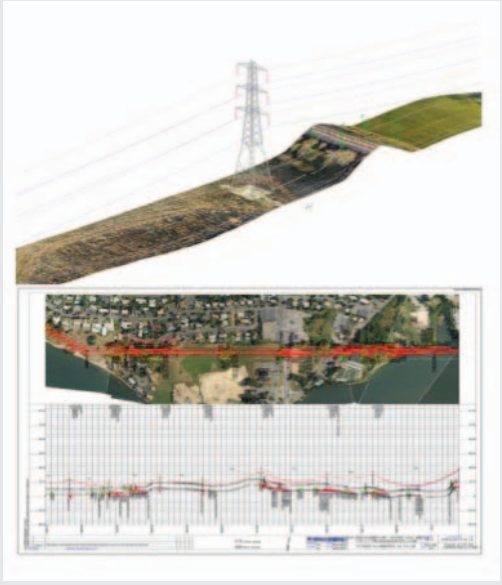
This service is available to customers and can be used to provide detailed assessment, mapping and modelling of networks, assets and structures.



Aerial Laser Survey Capture process

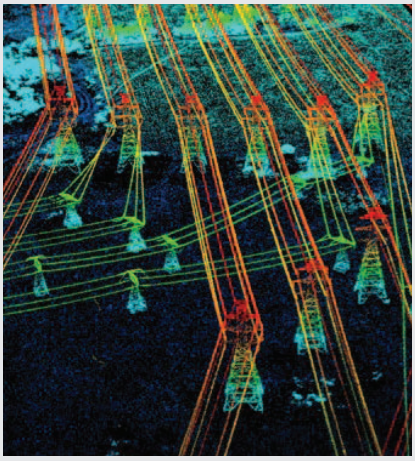
The laser scanner and downward looking digital camera are attached to the helicopter. The laser scanner fires 250,000 pulses (250KHz scanner) a second. Each pulse gives 4 returns, when a pulse hits an object it is reflected back to the scanner which measures and records the signal. In conjunction with the scanner the digital camera takes images every 2 seconds. The GPS position of every image and laser point is recorded to allow accurate geo-referencing and positioning of all captured data.

At the time of survey, ground weather stations record the local climatic conditions which are combined with the load data of the line to give the temperature of the conductor at the time of capture. This allows accurate modelling of the conductor in the PLS CADD software.



PLS CADD software

The classified object files are loaded into the software and assigned the required electrical clearance value, the overhead line is then modelled using the laser points to accurately position tower and conductor wire models. The downward looking images are mosaic-ed and loaded into the software.



Laser point cloud captured by the scanner, coloured by elevation

Further classification takes place on the laser data - object classes are separated out and filtered, then loaded into PLS CADD software to allow the modelling of the Overhead Line.

HOW WE CAN HELP

INSULATING OIL RECLAMATION, REPROCESSING AND HANDLING

Using the very latest mobile re-processing technology, our Oil Management Unit (OMU) operates from three locations - Dartford, Leicester and Doncaster, with a range of leading-edge equipment including:

- High speed mobile de-gasser dryer units that pull vacuum, dry, filter and remove gases from oil.
- Mobile reclamation units that re-generate oil - dry, filter, remove gases and chemically treat oil to remove acidity and sludge.

The OMU is able to provide a full range of services on the following HV plant:

- Oil circuit breakers (OCB) - including the removal of dirty oil into a road tanker. On completion of your maintenance, reconditioned oil is then used to refill the circuit breaker.
- Transformer diverters - drain existing dirty oil, flush through and clean the transformer diverter. The transformer diverter oil is then reconditioned or new, clean oil is re-filled, in units of 2,000 litres.
- Transformer selectors - existing selector compartment oil is drained. After your maintenance work is completed, the unit is flushed and the oil processed and re-filled by an oil processing unit to remove any potential contamination.
- Transformers - provision of dried and degassed transformer top up oil which is supplied in units of 2,000 litres with a 12 hour emergency and 24 hour response.
- Supply of transformer bushing oil in 1 and 5 litre units.

Transformer oil drying and degassing services are carried out using a mobile drying and degassing unit to remove moisture and gas to return the oil to IEC Standard. The addition of inhibitor and/or passivator to a transformer is undertaken using a mobile drying and de-gassing unit to drain oil from the transformer and adding an equivalent amount of inhibitor and/or passivator. Transformer major oil changes are undertaken using a mobile drying and degassing unit to drain, flush and dispose of 20% of the transformer oil, or as directed by the manufacturer's instructions. The transformer is then refilled with new oil via the mobile drying and degassing unit to remove moisture and add an inhibitor.

STRATEGIC SPARES SUPPORT

ACCESS TO STRATEGIC HV PLANT SPARES

National Grid maintains a comprehensive strategic stock of spares to provide emergency security-of-supply cover for the National Grid 132, 275 and 400kV system across England and Wales. We can offer access to this unique spares resource through payment of an annual access fee tailored to the range of stock you require cover. Our National Stores facility contains over 25,000 strategic spares items across a comprehensive range of plant types including transformers, tapchangers, cable, switchgear, protection and overhead lines, many of which are either no longer supported or produced by the original equipment manufacturers (OEMs) or subject to long supply lead times.

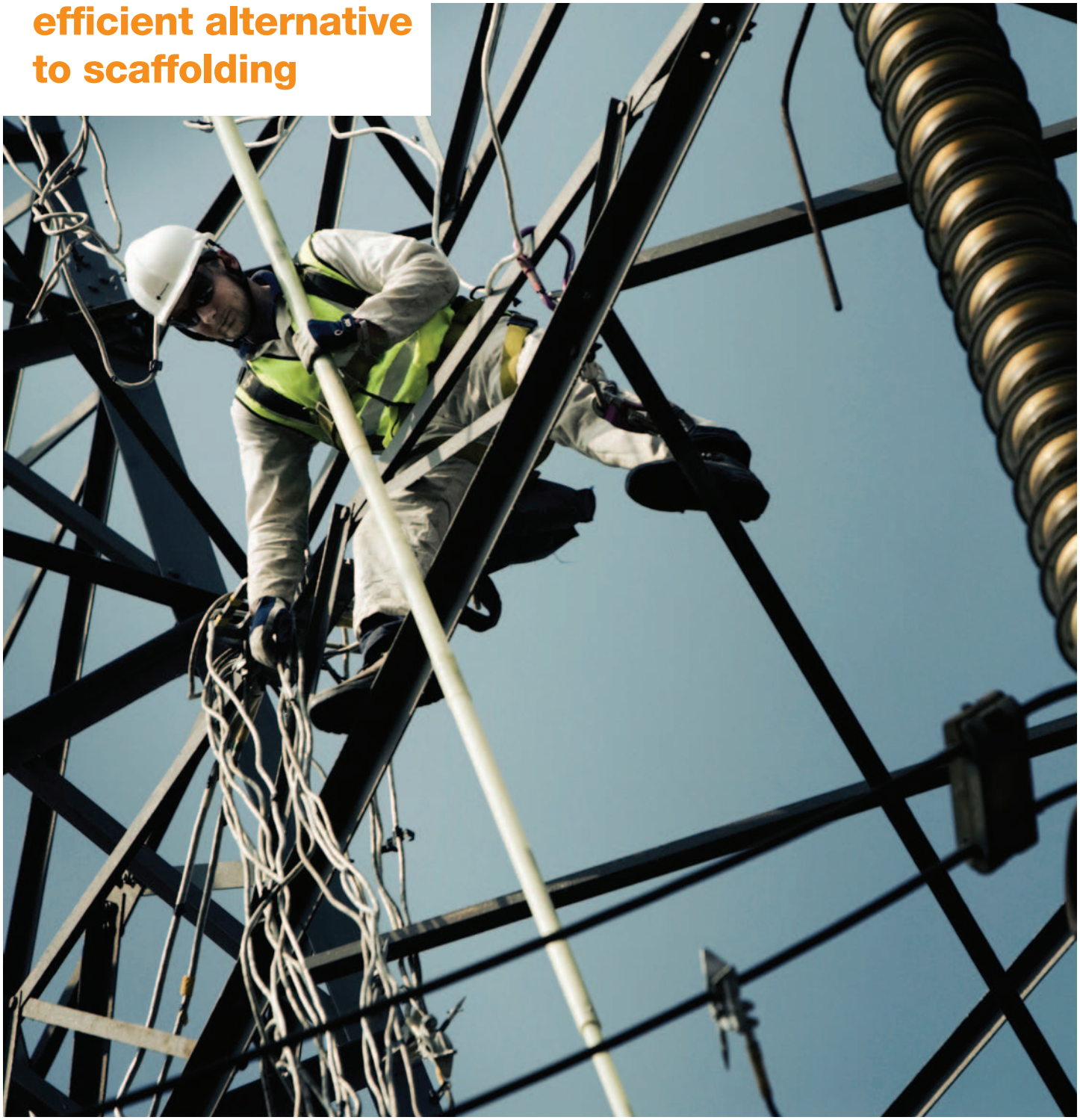
Our 24 hour, 365 day per annum access and UK-wide fast delivery service, means that you can get your equipment repaired and running again in the shortest possible time, protecting your valuable revenue stream and minimising emergency downtime.

132kV and 33kV Cable Clubs

National Grid manages an emergency strategic stock of 132 and 33kV oil-filled cables and cable accessories on behalf of Distribution Network Operators (DNOs) and other Transmission Owners (TOs), as well as it for its own use. We finance stock acquisition, source alternative supplies of cable and provide technical support to all Club members in return for payment of an annual access fee. The Club is seen as a valuable national strategic resource across the electricity supply industry, crucially avoiding the need for individual customers to finance and maintain their own stocks of HV cable.

Our National Stores facility contains over 25,000 strategic spares items, many of which are either no longer supported or produced by the original equipment manufacturers or subject to long supply lead times

A stock of temporary towers and mobile Skycradle crossings are available for hire, as a cost efficient alternative to scaffolding



TECHNICAL LIBRARIES

Access to engineering documentation (Extranet)
We maintain an extensive and expanding technical documentation suite, in support of managing our assets safely and efficiently. Through payment of an annual fee, our Extranet service provides customers with a licence to electronically access the following:

- National Grid's 'Technical Standards' (TS) document suite
- Operational Engineering Safety Bulletin (OESB)
- Engineering Modification Instructions (EMI)

Tower Library
National Grid operates a fully comprehensive and ever expanding library of generic overhead line tower drawings covering 132, 275 and 400kV tower designs. We can offer access to this Tower Library on an annual fee basis covering:

- shared storage
- retrieval
- use and modification
- documentation management

SPECIALIST EQUIPMENT HIRE

A stock of temporary towers ideal for use in projects such as temporary or permanent overhead line diversions are available for hire as and when required. We also make available our 'Skycradle' mobile conductor 'bridges', ideal for working on major road or motorway overhead line crossings as an alternative to costly scaffolding.

National Grid - our standard

National Grid is committed to being a responsible and sustainable business and operates to the highest standards of business and personal integrity, ensuring day-to-day actions and behaviours respect those with whom we work and those affected by our operations.
We ensure our suppliers and business partners use principles and policies consistent with our own throughout their supply chain, and make sure they work responsibly and sustainably alongside our employees and customers.

CASE STUDIES

URENCO

MANAGEMENT OF LATE OUTAGE CHANGES

Outage dates were requested via UK Energy Services (UKES) in order to carry out maintenance on Urenco's circuits. Close to the outage start date, a problem was identified by the customer concerning the requested dates for one of the circuits. An extended outage requested by a third party had resulted in a direct impact on the original dates and Urenco UK Limited requested a late change to the programme.

UKES were able to assist in rearranging the outage, working closely with our Planning and Maintenance Delivery Electricity (MDE) teams to ensure that Urenco UK didn't have to decline their own third party outage or put at risk their own circuit maintenance.

MAGNOX NORTH LTD

EXTRA INFORMATION REQUEST

National Grid carries out major outage maintenance work on two generating units at Wylfa Power Station each year, making this site one of our larger customers. As a direct response to the customer's request to provide more regular and detailed cost information, a bespoke weekly financial summary report was designed. This provided the customer and site with a weekly financial update plus full details of any delays and additional work as it happened.

As a result, both UKES and the power station saw a positive improvement in communication and the customer has requested this form a part all future outage work at Wylfa.

Dafydd J Jones, Contract Manager at Wylfa Power Station commented "Weekly summaries against the quote, were seen as a valued exercise."

CENTRAL NETWORKS

AN EMERGENCY SPARES REQUEST

An emergency enquiry was received from Central Networks for a cable modification kit. Following prompt liaison with our spares strategy engineer and our National Stores, the required item was identified and delivered to site on the same day.

Ian Evans, Project Manager for Central Networks, said "Thanks for the prompt service again from both UKES and the National Stores."

E.ON

CIRCUIT BREAKER REPLACEMENT

National Grid were approached by E.ON to undertake a circuit breaker replacement at Ratcliffe-on-Soar Power Station. This involved the local National Grid delivery team planning and delivering the project from start to finish, managing all safety and co-ordination issues, and delivering to a challenging programme. During the project, a good working relationship was established and maintained with the customer, which ensured the work progressed well and was successfully completed on time and to budget without any issues.

Reflecting on the success of the project, Richard Montgomery, E.ON's Project Manager said "I would just like to take this opportunity to thank the Ratcliffe team for successfully delivering the outage works you have undertaken for us, including the replacement of the circuit breaker, all planned routines and the repair of the isolator."

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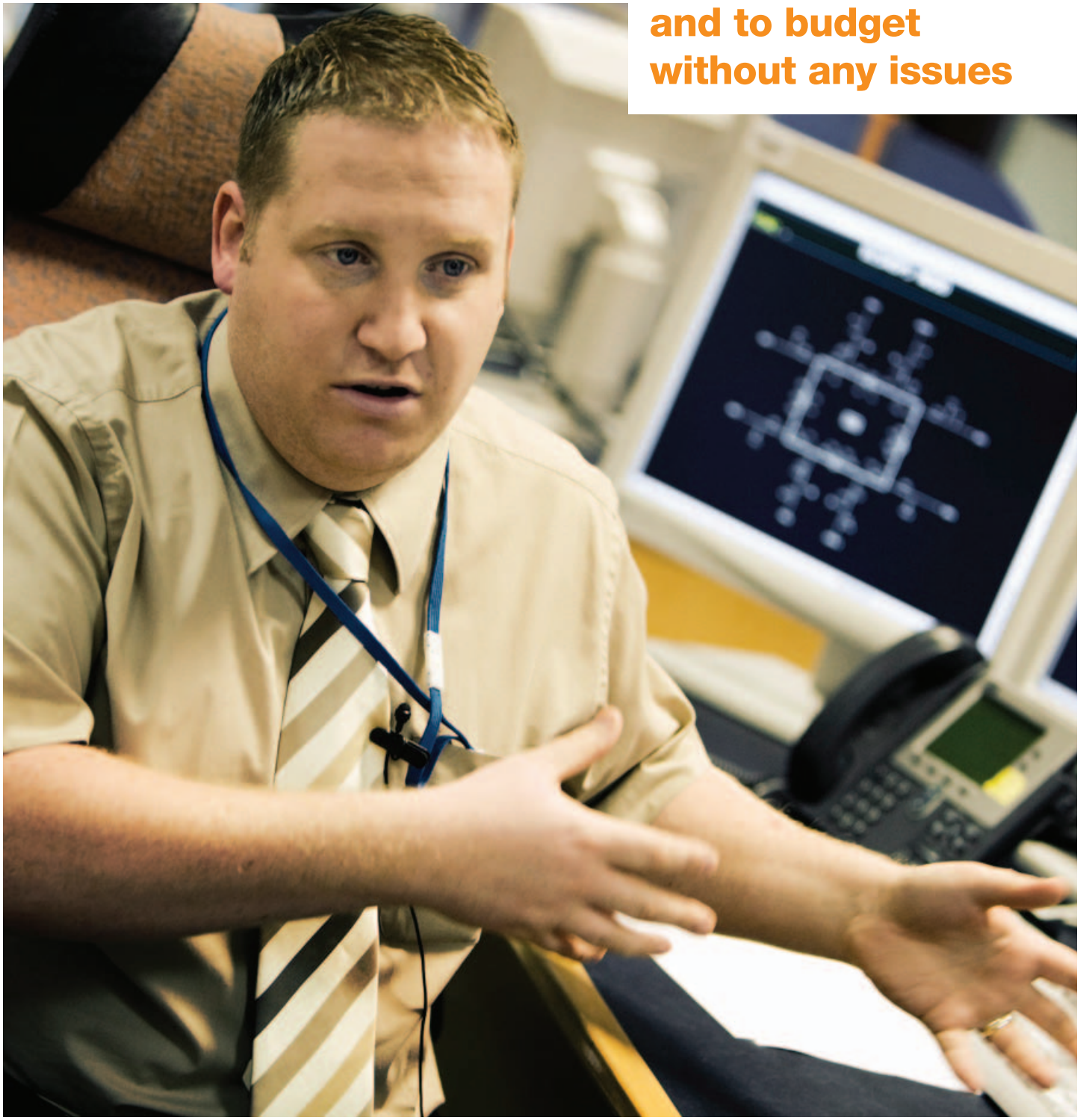

FURTHER INFORMATION

For further information on any of the service areas outlined in this brochure or if you wish to discuss any specialist or bespoke requirements please contact:

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