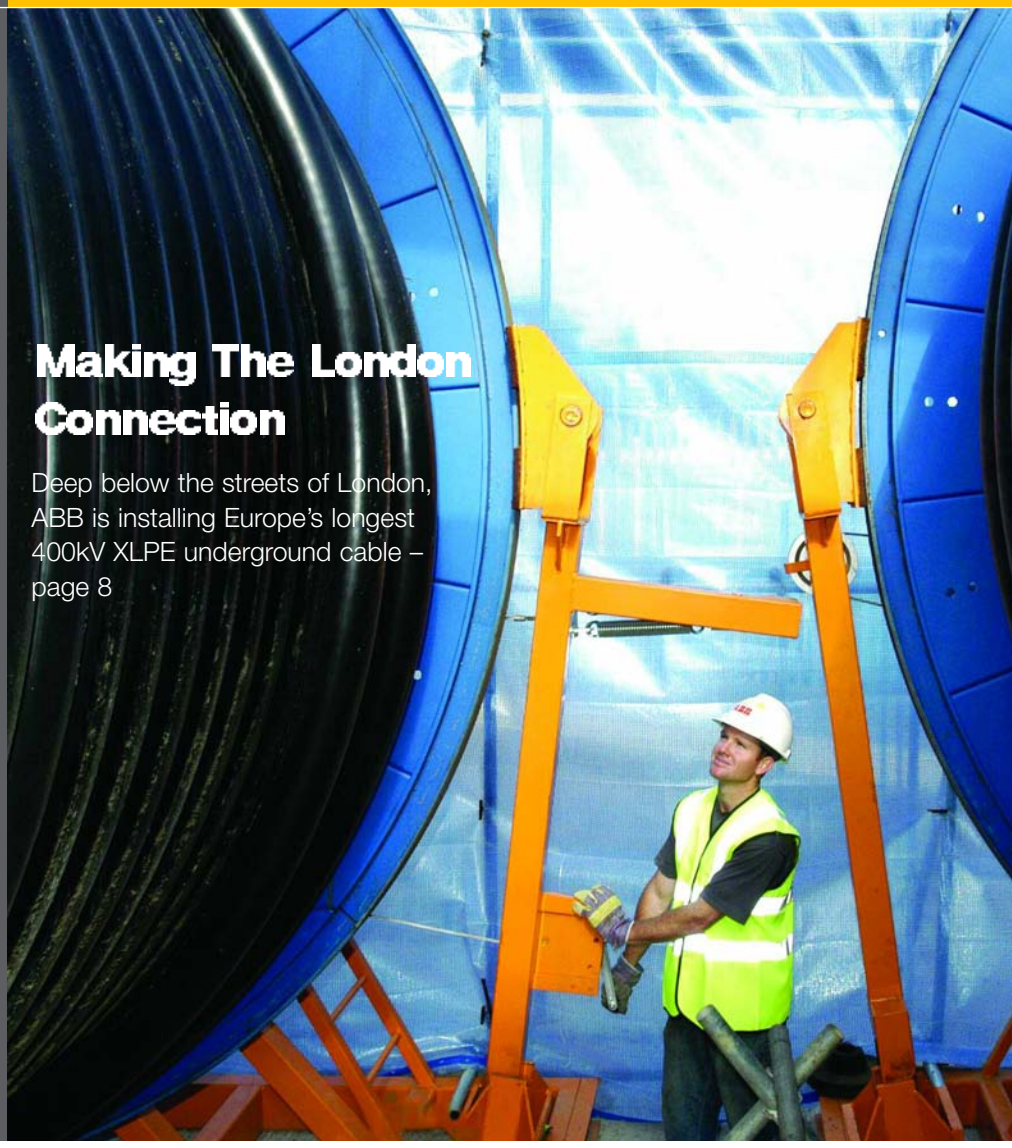
FWD

Summer 2004

FAST FORWARD WITH **ABB POWER TECHNOLOGIES**

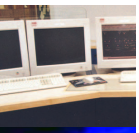
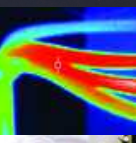


Making The London Connection

Deep below the streets of London, ABB is installing Europe's longest 400kV XLPE underground cable – page 8

Issue 8 Summer 2004

contents



Published by:
ABB Limited
Power Technologies
Oulton Road,
Stone, Staffordshire
ST15 0RS

Editor:
Karen Strong

Telephone:
01785 825050

The appliance of British science

Trevor Gregory
ABB UK Managing Director

> When the UK Chancellor, Gordon Brown, launched a consultation with business, research foundations and the scientific community on the framework for a ten-year strategy for the UK's investment in science and engineering, ABB was among the first companies to offer its support.

> One of the key elements the government has identified is "greater collaboration between universities and business to provide a sharper focus for research and an impetus to innovation and productivity growth". That is exactly what ABB is doing through its collaborative work with around 70 of the world's leading technology institutes, including Cambridge University and Imperial College London in the UK.

> ABB has always acknowledged the importance of building partnerships with universities to create an outward-looking network of innovators. No technology company, however inventive or well resourced, can do it alone.

> This combination of core research expertise and co-operation with other institutes is helping us achieve a number of breakthroughs in key areas of corporate research.

> At Imperial College, for example, we are sponsoring projects in asset management, advanced process control and power system control. This includes a three-year project addressing the use of power electronics for control of Facts (Flexible AC Transmission Systems), to improve transient performance of power systems.

> The need for a new framework for R&D management between industrial and academic partners was emphasised by Markus Bayegan, ABB's Chief Technology Officer, speaking at the recent Cambridge University Horizon R&D Management conference.

> He said: "Developing relationships with the leading research universities in the US, Europe and Asia is a key element in our global R&D strategy. The mutual exchange of ideas and information is proving invaluable in helping to encourage some of the best young researchers in the world as well as giving ABB access to the latest developments in emerging technologies".

> Continuous technological development provides the foundation for ABB's future growth and profitability. It enables us to keep our products and systems competitive and to develop innovative solutions that deliver real customer value.

> That's why we invest around 5% of revenues in R&D and employ some 6,000 scientists and technologists at corporate research centres and laboratories around the world.

ABB's new Network Management system for the control of London Underground's power supply has just gone live. Duncan Botting reports.

SPIDER sense for the London Underground

In 1998, London Underground signed a 30-year, £1 billion Private Finance Initiative (PFI) contract with SEEBOARD Powerlink (SPL) – a consortium formed by EDF Energy, Balfour Beatty and ABB – to manage, maintain, develop and finance London Underground's high-voltage power supply system. One of ABB's main roles in the first five years of the contract has been the design, installation and commissioning of a new single, centralised SCADA (Supervisory Control and Data Acquisition) SPIDER system for the power distribution network.

A typical control desk within the main control room from where the London Underground's power supplies system is managed.

The London Underground (LU) power distribution network has a 22kV sub-transmission system with load delivered via an 11kV system to 158 delivery points. Local transformer rectifiers provide 630V DC (750V DC in future) for the train motive power as well as lower voltage supplies for lighting, lifts, escalators, ticket barriers, communications and control systems, and so on. ABB's task was to implement a new fully integrated SCADA system to provide overall control of the network, initially in place of five existing SCADA systems. This was a considerable challenge for a network serving some 250 miles of track and 270 stations, each with its own substation, and an annual power requirement of some 900,000MWhr – especially as disruption to passenger services had to be kept to an absolute minimum.

At the design stage, the SPIDER system received intensive input from ABB, SPL and LU to customise it to an underground working environment. In particular, there were specific safety and dual-operator considerations had to satisfy HMRI (Her Majesty's Rail Inspectorate).

Access for work was restricted to a short window in the small hours of the morning when the whole LU network shuts down for cleaning and maintenance, requiring careful planning to ensure restoration.

The SPIDER SCADA system has been fully integrated with LU's existing communications system. Control of the network is now centralised in two replicated command centres (main and emergency) manned both by LU staff, who are responsible for DC traction feed, and SPL staff, responsible for AC supply. Great care has been taken in the ergonomic design of the command centres to provide optimum conditions for the operators. Control can be switched between the centres to ensure safe and reliable operation in an emergency.

Commissioning of the SPIDER system, which was completed in the early summer of 2004, was progressive, ensuring no interruptions to supply as control was switched over from the five existing SCADA systems in a phased approach. The design allows for expansion to meet some of the expected future system changes and migration over the 30-year lifetime of the PFI project.

Smooth operators

A key element in the PFI scheme was the planned closure of LU's dedicated 180MW Lots Road power station, with LU taking all its power from the National Grid, via London's local distribution network operator, EDF Energy.

Discussions with EDF Energy identified that the additional traction load on the local distribution network, due to the diode rectifiers that feed DC electricity to the trains, would have an adverse effect on the power quality for the London area unless corrective action was taken.

A £60 million 'power quality' variation to the original PFI contract was agreed between SPL and LU, with ABB being asked to carry out a series of extensive studies covering the existing electrical system. These studies checked the potential for harmonic distortion and voltage fluctuation under all credible, different, power supply network variations likely to be encountered. It then went on to ascertain the nature and size of the power quality correction installations needed to smooth load fluctuations and reduce harmonic disturbance.

Following the studies, ABB installed a total of five Static VAr Compensators (SVCs) and ten stand-alone harmonic filters in critical points of the distribution system.

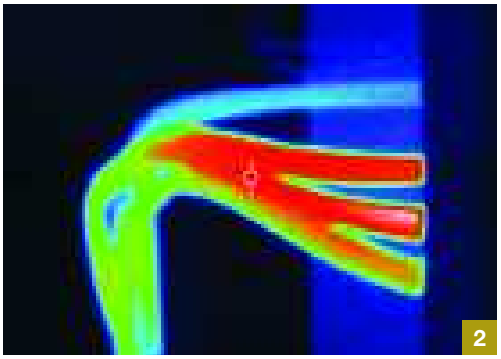
Maintenance hotspot

ABB's maintenance and inspection service for private distribution networks up to 33kV is now offering customers an even broader view thanks to its own in-house thermal imaging service. The new ABB thermal camera can indicate temperature differences as small as 0.1°C. This enables it to identify changes from normal operating conditions to hotspots that can indicate a developing problem such as a loose connection.

Thermal imaging is intended primarily for the inspection of cables and unenclosed low voltage switchgear, as well as visualising oil circulation in transformers. Because it is a non-contact technique, which can be carried out at some distance from the equipment, it is ideal for situations where downtime has to be kept to a minimum. For example, it can be useful to carry out a thermal sweep prior to an annual shutdown to enable the maintenance team to focus on the most likely problem areas.

ABB's HV maintenance and inspection service is provided by a highly trained and experienced team that is capable of working with equipment from any manufacturer. The main focus is on planned maintenance for customers such as BHS, Marks & Spencer, Morrisons and Severn Trent Water over long-term contracts, but the team is also happy to carry out short-term maintenance projects. With thermal imaging now allied to ultrasound monitoring – carried out as standard on every maintenance exercise – and transformer oil sampling, ABB believes it now offers the UK's broadest service for private distribution networks.

1 Thermal imaging is used to inspect cables and unenclosed low voltage switchgear. Being a non-contact technique it is ideal for situations where downtime needs to be avoided.



2 A thermal image highlights the hotspots.

Self contained delivery

As part of Network Rail's seven-year framework contract for the Kent area of its Southern Region Power Upgrade Project the ABB/Mowlem consortium is installing 25 new containerised substations. Two of the latest to be delivered and commissioned are at Chatham and Ramsgate.

The pre-fabricated 33kV containerised substations, which use ABB's new ZX1.2 metal-clad gas-insulated medium voltage switchgear rated for up to 31.5kA and 2000A, are housed in stainless steel enclosures which should last for 40 years.

Lifting a substation into position.

The power to withstand short circuits

Central Networks has awarded ABB a contract worth £600,000 to supply three specialist 26MVA, 132/25kV single phase railway transformers. They will be used to supply power to Network Rail and are to be installed at trackside substations in Kidsgrove and Tamworth.

The short circuit withstand capability of ABB rail transformers was the key to winning this contract. As David Sullivan, UK Product Marketing Manager for ABB Power Transformers, says "Short circuits are a relatively rare occurrence for a normal grid transformer. But a rail transformer is effectively subjected to a short circuit current of between 6 to 10kA every time a train goes past.

"This calls for a highly developed and very robust design, and ABB's track record as the UK market leader in rail transformers, combined with a proven short circuit test record, persuaded Central Networks and Network Rail that it could offer the optimum technical solution for this application."

Central Networks is the new name for Midlands Electricity and East Midlands Electricity.

Rail visibility

Almost 10,000 visitors from 50 countries visited Railtex in 2002.

ABB is exhibiting at several rail industry events during 2004. The company will be showing its expertise in reliable and high-performance power equipment and power supply systems for railway applications.

In the UK, the major event at which the company is exhibiting is Railtex 2004 which takes place at the National Exhibition Centre, Birmingham, from 2nd to 4th November 2004.

In September ABB will also participate in the international rail exhibition, InnoTrans, which will be held in Berlin.

Recently the company took part in the Rail Engineering 2004 conference and exhibition. This event was staged at the Commonwealth Institute in early July.

ABB has enjoyed considerable success in supplying power distribution equipment including substations, transformers and static var compensators, among others, for the West Coast main line, the London Underground and the Channel Tunnel Rail Link.

New sales and marketing manager

Ian Funnell, a well known face in ABB, has been appointed sales and marketing manager of its UK Power Technologies business. Immediately prior to this appointment, Ian was in charge of ABB Power Technologies' products business working closely with customers and looking after the entire portfolio of ABB power products in the UK.

Ian joined ABB from Scottish & Southern Energy in 1999, bringing with him a wealth of experience in general management and operations management in the electrical industry.

He is a graduate of Aberdeen University with a BSc (Hons) in engineering science. He is also a chartered engineer (CEng) and member of the Institution of Electrical Engineers (MIEE).

INTERNATIONAL NEWS

SWITZERLAND

Recreating the Big Bang

CERN, the world's largest particle physics laboratory, has chosen ABB FACTS technology to stabilise the voltage supplying its super proton synchotron (SPS) accelerator. Here, sub-nuclear particles are accelerated almost to the speed of light in an attempt to recreate the Big Bang. The SPS accelerator requires rapid reactive power for voltage filtering and strong filtering to reduce the harmonics to a very low level.

CHINA

Latest long line connection

A major power transmission contract worth US$390 million has been won by ABB. Working with local manufacturers, ABB will build a 1,100km long, 3,000MW high voltage direct current (HVDC) transmission link connecting the The Three Gorges hydro plant in central China to the coastal city of Shanghai. The project will be completed in just three years. This is the latest of a number of contracts won by ABB connected with The Three Gorges power plant.

UNITED STATES

More power to Hollywood

The top studios in Hollywood, movie capital of the world, are benefiting from reliable power upgrades thanks to ABB. Burbank Water and Power, the local utility has installed four compact ABB gas insulated (GIS) substations to supply the needs of the Disney Studios, Warner Bros and Universal, and the town of Burbank, California. ABB completed the orders up to two months ahead of schedule. A fifth substation will be installed in October, further upgrading the studios' power systems.

POLAND

Seamless connection

The Gdansk I substation in Poland is the most important in the Polish grid network. Built in 1959, it was in need of replacement, a task that had to be undertaken without any disruption to the power supplied to Poland's industrial heartland. ABB was chosen to supply a turnkey replacement substation. The new gas insulated substation was installed in just 21 months. The compact hybrid design leaves room for a power capacity upgrade, if and when it is needed.

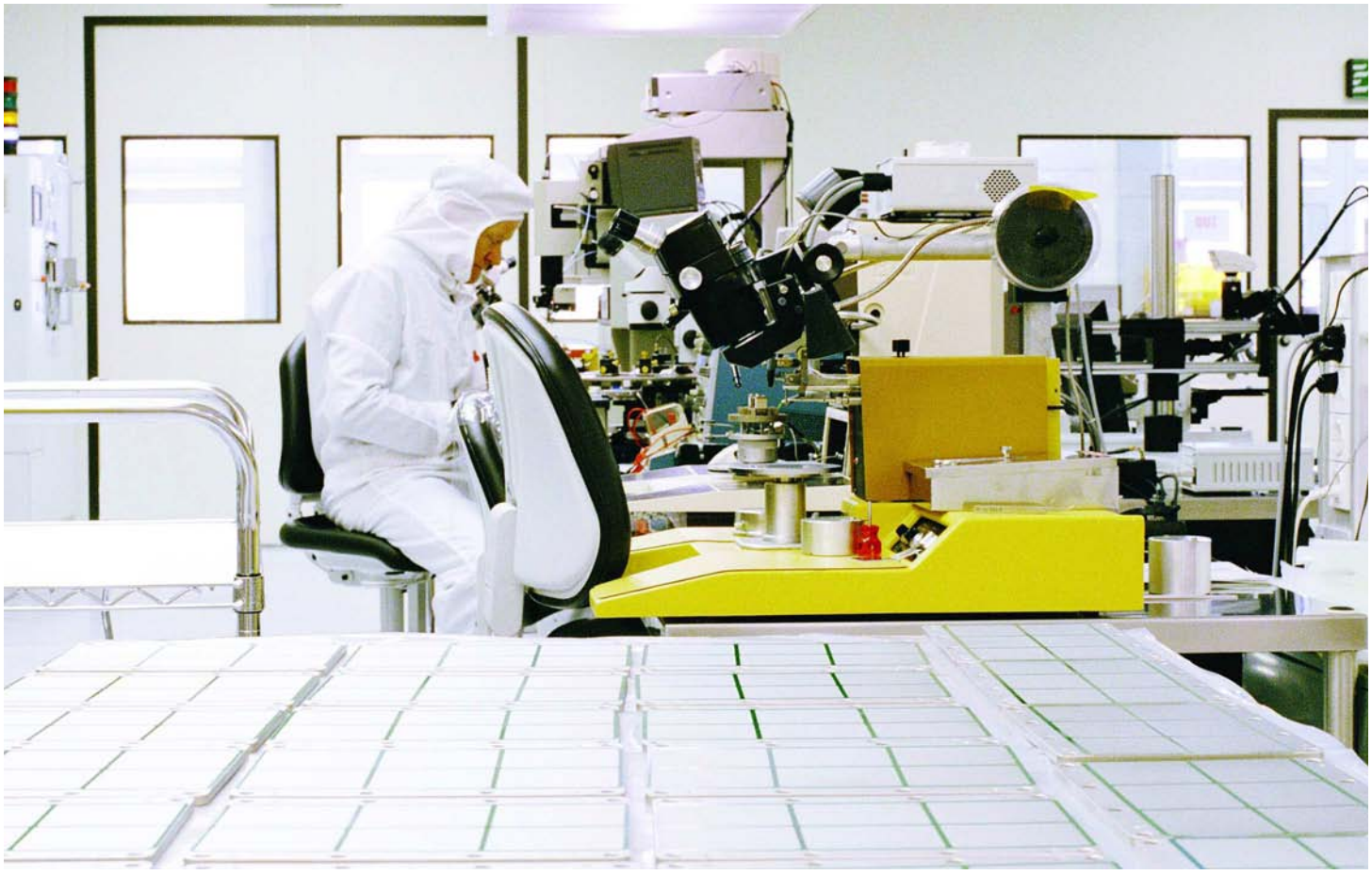
SUDAN

Power contract for Sudan traction components

ABB has been awarded a $16 million contract to design, manufacture, supply and commission a complete secondary electrical system for seven new substations on Sudan's power grid. The order includes substation automation, control, protection, substation design and a complete telecommunication system. The project connects the Merowe hydroelectric power station to the nation's supply.

Georg Schett, head of technology for ABB Power Technologies, outlines ABB's global R&D programme.

A powerful vision for the future



The design and manufacture of solid, liquid and gaseous insulation systems is a key element in ABB's R&D programme.

As the recognised global leader in power technologies, ABB is committed to major ongoing investment in research and development to ensure that we continue to meet the ever-changing challenges of availability, safety and reliability for power networks.

In 2003, we ploughed back around five percent of our revenues, some £500 million, into R&D and order-related developments.

Our R&D programmes operate on a truly international basis, with a focus on eight research centres in Finland, Germany, India, Norway, Sweden, Switzerland and the USA and, in the near future, we plan to open a centre in China. We employ some 6,000 of our own science and technology experts and also have active links with around 70 leading universities and research establishments – in the UK these include Cambridge University and Imperial College, London.

The thrust of ABB's R&D is to develop a focused range of products, systems and services for power transmission, distribution and power plant control. We are working on electrical

insulation, current interruption and the system aspects of complete power grids to enhance reliability and interconnectivity and reduce their environmental impact. We are also focusing research on improving manufacturing processes for products such as transformers and switchgear to improve quality and shorten delivery times. Here are some highlights of our R&D programme:

THE TRANSFORMER OF TOMORROW

ABB's range of power transformers is being given a complete facelift to introduce a new stylish look and feel across the whole family. Intelligent electronics, such as the TEC (Trafostar Electronic Control) system, are also being integrated within the design to enable the transformer to be linked into a larger control system for easy monitoring and maintenance. And soon, it will even be possible for an individual transformer to have its own home page on the web so that the operator can check its status remotely.

NANOTECHNOLOGY

The gradual implementation of nanotechnology, a set of technologies that enable individual molecules or atoms to be manipulated, is paving the way for the development of new custom designed materials. Nano-designed dielectrics can be engineered to an exact specification with an improved response to changing electric fields. This opens up the possibilities for cables, bushings, surge arresters and insulating materials. At the same time ABB is perfecting a nano-structured sliding bearing that works in MV and HV switchgear without oil, offering lower operating costs and less environmental impact.

DRYHED CAPACITORS

ABB's revolutionary DryHED capacitors – short for dry high energy density – can store twice the energy in half the space of conventional capacitors as well as being completely oil-free. They are already in use for HVDC Light systems and are in development for HVAC applications.

QUIET CIRCUIT BREAKERS

Traditional circuit breakers use spring, hydraulic or pneumatic systems to separate the breaker contacts. These are noisy and easily worn out. So ABB is taking a totally different approach with a new generation of modularised breaker that is the very first to use a motor drive. Not only is it much quieter, making it ideal for urban substations, it's also more reliable, operating up to three times longer before needing maintenance.

Further developments in circuit breakers will see them integrate functions such as measuring, disconnection and control within a single, compact highly-sophisticated device that will communicate over a high-speed link to a web-based operator, creating a new generation of 'E-breaker'.

The transformer of the future will even have its own home page on the web.

Dry HED capacitors – twice the capacity in half the space.

LOWERING ENVIRONMENTAL IMPACT

Network components will continue to shrink over time and there will be a trend towards smaller substations as current and voltage sensors are increasingly integrated. Further improvements in power electronics and motor drives will support this trend.

We have already seen indoor and underground substations. And we expect more power transmission to go underground, with overhead transmission and distribution lines disappearing and being replaced by cable systems.

WIDE-AREA GRID MONITORING

ABB is developing a wide-area monitoring system (WAMS) for large power distribution grids that can substantially improve transmission capacity. For the first time, it gives operators accurate early warning signals by providing real-time information about any developing instability, even when the grid is operating at high loads.

The dynamic monitoring system will enable grids to run closer to full capacity. The hardware comes in compact units that can be deployed around the grid in substations and linked to a central PC for online monitoring.

We are combining the WAMS system with FACTS (Flexible AC Transmission Systems) technology to create a large-scale warning and control system to help operators identify and correct problems across an entire power network.

THE OUTLOOK

Advanced simulation techniques are enabling ABB to challenge the barriers of seemingly mature power technologies. By combining new materials with process research and enhanced connectivity, we are confident that we are developing a powerful vision for the future.

Deep below the streets of London, ABB is installing Europe's longest 400kV XLPE underground cable

Making The London Connection

ABB's three-year project to help National Grid deliver more power to central London reached a key stage as the 400kV cable started the 20km underground pull from Elstree to St John's Wood.

The £40 million turnkey project, known as 'The London Connection', is part of National Grid's programme to upgrade the power grid for North West London and the City area. Running in a 20km long, three-metre diameter tunnel – the largest tunnelling project that National Grid has ever undertaken – the cable will link an extended substation at Elstree to the new indoor high-voltage GIS (gas insulated switchgear) substation, which ABB has been building at St John's Wood.

The 400kV connection is using ABB's high-technology cross-linked polyethylene (XLPE) insulation technology, which requires less maintenance. A similar ABB underground cable installation has been in service in Berlin since 1998.

ABB is supplying, installing, commissioning and testing 61km of 150mm diameter cable, weighing a total of 2,440 tonnes and delivered on 63 massive drums. The cable is being laid as three separate lengths, one for each phase of the three-phase electricity supply. The project is scheduled for completion in June 2005. The tunnel allows space for a second 400kV cable circuit in the future should London's demand for electricity increase even further.

Underground cable facts

ABB is a leading supplier of efficient, high quality cable systems with polymeric insulation at all voltage levels and, to date, has delivered well over 6,200km of underground XLPE cable for voltages above 100kV. Advantages of ABB XLPE cable include:

- low maintenance
- low electrical losses
- Environmental advantages
- meets international standards
- two state-of-the-art manufacturing facilities in Sweden
- choice of traditional lead or laminate foil coating
- 66/132kV ranges designed specifically for UK market
- cable design service enables ABB to provide the ideal solution to meet a customer's needs for length and load etc
- complete range of accessories including sealing ends, joints and new transition joints, which enable XLPE cable to connect to oil filled cables typically found in older substations

Peter Jones, Sector Manager – Renewables ABB PT (UK), outlines the key technical issues relating to the AC grid connection of offshore wind farms and explains how reactive power control via SVC (Static VAr Compensation) can enhance system stability and reliability.

Building resilient and reliable AC offshore wind farm grid connections

With very large offshore windfarm arrays about to become more commonplace, new challenges are being placed on the transmission system operators to maintain system stability and limit dynamic voltage variations.

SYSTEM CONNECTION

In the past, wind turbine units typically had a small power output rating when compared to the strength of the connecting electrical network, so a simple control system that disconnected the wind farms whenever a network disturbance occurred was sufficient.

With the larger windfarms presently being planned, this design philosophy becomes questionable. Windfarm connections must be designed so that the wind turbines are capable of continuous, uninterrupted operation during the protection clearance times for the faulted, adjacent, network components ('ride-through capability').

STABILITY AND RELIABILITY

For large wind farms there are a number of stability and reliability issues that need to be addressed during the design stages.

Conventional induction generator units and doubly-fed induction generator (DFIG) wind turbines may disconnect from the transmission system for low voltage conditions caused by system faults more quickly than conventional existing synchronous generator power plants.

An induction generator has the potential to over-speed beyond its pullout torque, at which point the machine races away and disconnects from the grid. For DFIG induction generators, there are issues relating to the control and protection of the voltage on the converter DC bus that can lead to the tripping of the unit, which a conventional synchronous generator could normally endure.

If these issues are not addressed at an early planning stage, the performance of the windfarm may be in violation of system security, planning and availability criteria – resulting in a requirement for an increase in spinning reserve. In more serious situations it may lead to the grid system experiencing a cascading power outage.

VOLTAGE CONTROL

Reactive power control is necessary to address these network stability and reliability issues. With synchronous generators, reactive power control is achieved by means of the exciter system. However, this is not possible for basic induction generators. Instead, a Static VAr Compensator (SVC) positioned at the grid connection point can act as a central exciter system but with the advantage that reactive power can be controlled even when no power is generated.

The transmission systems to which offshore windfarms may be connected are usually designed to distribute power from the main grid to remote customers. These remote systems are, in many cases, weak and a change in power flow direction will affect voltage levels.

Mechanically switched capacitor banks (MSC) are often used to deal with voltage level problems. However, power production, and thus reactive power consumption, in windfarms varies with wind speed. The resulting frequent switching of MSC deteriorates power quality and decreases the lifetime of the MSC. An SVC, with continuously variable susceptance, offers a cost efficient alternative to several small MSC units.

Several phenomena associated with power produced from wind introduce voltage flicker on the connecting node – generator start and stop, wind speed variations, and tower shadow effects. This flicker has a detrimental effect upon other components connected to the grid causing complaints from power consumers. By connecting an SVC at the grid connection points, this flicker can be mitigated.

SVC IMPLEMENTATION

SVCs are available in two different versions. The first SVC approach is based on conventional capacitor banks together with parallel thyristor-controlled inductive branches, which consume the excess of reactive power generated by the capacitor bank. This type of equipment can be directly connected to the intermediate voltage bus, which interconnects the wind farms (up to 36kV). When needed, it is also possible to connect the SVC to the high-voltage network via a dedicated transformer.

The second alternative implementation of the SVC makes use of a power electronic voltage source converter (VSC). The converter utilises semiconductors having turn-off capability. The converter can inject or consume reactive power to or from the bus where it is connected. This application of VSC technology is usually referred to as STATCOM (Static Compensator). This alternative has the benefits of a smaller footprint, as large air-cored inductors are not used. Another advantage stems from the fact that a smaller parallel capacitor bank can be used, as the converter itself may contribute reactive power.

By combining the two types of schemes, a cost-effective dynamic compensator can be achieved, rated for a high dynamic yield during a short time and a lower yield for steady-state operation.

SUMMARY

The UK has generally benefited from a stable and reliable transmission grid system based on traditional sources of generation. SVC technology will have an increasingly vital role to play in ensuring that networks with large amounts of windfarm connections remain resilient and that small scale local network faults do not escalate into more serious widespread transmission outages.

High voltage direct current (HVDC) transmission has come of age. The technology pioneered by ABB was first used half a century ago to bring power from the Swedish mainland to a remote Baltic island.

The golden era of HVDC

In 50 years HVDC has evolved from a pioneering technology to a well proven, effective and economic method of transmitting power over long distances. The first ever HVDC connection has recently celebrated its fiftieth anniversary. The story is one of unending development.

Fifty years ago the world's first high voltage direct current (HVDC) link was inaugurated between the Swedish mainland and the Baltic island of Gotland. The new power connection not only brought down costs for consumers, it opened up a new era for the island's economy.

Gotland lies 80km off the east coast of Sweden. It has an area of 3,140 sq km and a population of more than 57,000 people. The main industries are agriculture, fishing and tourism.

The advent of power from the mainland was sponsored by the Swedish government in a bid to reverse worrying trends in unemployment and a declining population. The technology chosen was HVDC delivered via a 90km, 100kV, 2MW submarine cable.

HVDC has proved itself in this and subsequent installations as an ideal vehicle for bulk power transmission and interconnecting independent power grids. HVDC lines cannot be overloaded, and so protect grid reliability and eradicate the 'loop flows' found in AC systems.

ABB pioneered HVDC with the Gotland link and has gone on to supply more than half of all the HVDC converter stations installed over the years. ABB has an installed transmission capacity of about 40,000MW out of a world total of 70,000MW.

Apart from the first installation, ABB has created the highest voltage HVDC link, the longest HVDC lines, above and below ground, the highest converter power rate and the longest submarine cable.

ABB's unique HVDC Light, the latest patented innovation, is designed for underwater and underground transmission. The technology relies on voltage source converters and cables and its first installation was made in 1997.

STEPPING UP THE POWER

For Gotland, the first submarine cable was laid in 1953 between Västervik on the mainland and Ygne a town 10km south of the island's capital, Visby. The power connection commenced with a rated voltage of 100kV and a transmission capacity of 20MW.

In 1970 the stations were supplemented with thyristor valves, connected in series with the mercury-arc valves. This made it possible to raise the voltage to 150kV and the transmission capacity to 30MW.

In 1983 a new cable was laid providing a rated voltage of 150kV with a 130MW transmission capacity. The converters were built up of thyristor valves. The two connections operated independently. This additional power meant that all the islands' needs could be supplied by the link and the local power station closed.

The third connection, planned in 1985, anticipated demand for 147MW. This is usually used in conjunction with the second link to form a bipolar link but can also also operate independently.


1


2


3

1 Pulling the Gotland DC cables ashore in the 1950s.
2 An ABB engineer on site in Gotland.
3 In a large HVDC station, it must be possible to isolate the power circuit. This is done in the AC switchyard with help of instrument transformers and 500kV circuit breakers.

RVT – the ultimate power factor controller

ABB's RVT power factor controller is the 'ultimate' controller for the flexible monitoring and switching of capacitor banks in power factor control (PFC) applications. It features easy commissioning and automatic set-up, a user-friendly menu-based operator interface with a full graphic display, and a highly efficient switching strategy that combines integral, direct and circular switching.

The RVT provides comprehensive measurement, monitoring and event-logging of network and capacitor bank information including: active and apparent power; reactive power; voltage and current; temperature; total harmonic distortion on voltage (THDV) and total harmonic distortion on current (THD I); and frequency.

Programmable parameter setting enables the operator to set the switching strategy, with the flexibility to determine different control targets for day and night operation, and to enter alarm thresholds to protect the capacitor bank against such events as over- and under-voltage, over-temperature and excessive harmonic distortion.

The standard RVT has the facility to trigger external alarms, while the RVT-Modbus version is fitted with an RS485 Modbus adapter which makes all its operational parameters accessible and downloadable for full integration within a BMS.

New-generation PQF active filters

ABB has launched a new generation of its PQF (Power Quality Filter) range of microprocessor controlled active filters designed to solve the growing problem of harmonics in low voltage electrical networks. Two new models are now available, the PQFM for small to medium three-phase industrial loads and the PQFK, a three-phase, four-wire unit for industrial and commercial networks with high triplen (third and its odd multiple) harmonics.

The increasing use of non-linear loads in all types of industrial and commercial applications has resulted in the introduction of potentially harmful harmonics into the power network that can lead to overheating of cables, motors and transformers, damage to sensitive equipment, tripping of circuit breakers and blowing of fuses as well as premature ageing of the installation.

ABB PQF active filters provide a reliable and cost-effective solution to this problem by continuously monitoring the current in real time to determine which harmonics are present and then injecting harmonic currents in the network with exactly the opposite phase to the components that are to be filtered. The two harmonics effectively cancel each other out so that the feeding transformer sees a clean sine wave.

ABB PQF active filters are factory assembled and tested, ready to install and use at site. They have a modular construction, which allows easy extension to cater for future load growth. There is also no need to apply a de-rating factor when PQF units are coupled in parallel, which makes it feasible to achieve a high rating within a small footprint. Since the PQF does not operate according to the conventional low harmonic impedance principle employed by passive filters, it remains unaffected by changes in network parameters and can not be overloaded.

The PQF offers features such as: event logging with real-time stamp, programmable load balancing, isolation between control and power units by optical fibre link, digital I/O and Modbus communication.

The fully programmable filters can either be pre-programmed by ABB or programmed on site using PQF-Manager, a simple, user-friendly front panel module that offers direct control, programming and monitoring capability. The PQF can also be controlled by a standard PC via its RS232 port and the optional PQF-Link software. PQF units can also adopt the secondary roles of reactive power compensation and load balancing.

TrafoStar is ABB's common concept for the design, engineering and manufacture of power transformers covering voltages from 72.5kV up to 800kV and is implemented in all ABB factories worldwide.

ABB TrafoStar concept steps up with fast response for BNFL

When BNFL came to ABB with a request for a fast track replacement GSU (generator step up unit) transformer for Sizewell A, its 420 MW Magnox nuclear power station on the Suffolk coast, ABB's TrafoStar concept for power transformers helped put BNFL back on the way to full production.

The new generator transformer will replace the existing transformer which came to the end of its useful life following an electrical fault which tripped Reactor One offline in March 2004. The new transformer, one of two GSU's at Sizewell will step up Sizewell A's 17.5kV terminal voltage to the 145kV required for the National Grid.

The TrafoStar concept means common design criteria, global processes and quality supervised by the Six-Sigma system for generator step up transformers, substation transformers and railway feeding transformers. A TrafoStar transformer is built of standardized, service-proven components and modules, ensuring flexible, dependable and tailor-made transformer designs. It meets high-reliability, high-availability and low maintenance requirements which add up to a low life cycle cost.

David Sullivan, UK Product Marketing Manager for ABB Power Transformers, says "Within just ten days of the event we were able to specify the new transformer, pass BNFL's factory quality audit, achieve factory approval, produce a quotation and agree the contract.

"We were also able to guarantee delivery within seven months, which should bring Reactor One back on-line for November this year."

BNFL's new 17.5/145kV 340MVA generator transformer will be manufactured in ABB's Lodz factory in Poland. Marcin Rutkowski, Sales Manager for ABB Power Transformers, says "The excellent co-operation between ABB UK, ABB Poland and BNFL has enabled us to offer a very competitive price and exceptional delivery time".

1 BNFL's Sizewell A nuclear power station

2 The new TrafoStar GSU transformer will be manufactured at ABB's Lodz factory in Poland

CONTACTS

For further information about any of these subjects please contact:

Substations	–	01785 825050	Transformers	–	01925 741244
HV/MV Switchgear	–	01925 741469	Asset Management	–	01785 825050
Automation	–	01785 825050	Wind Power	–	01785 825050
Service	–	0845 6011946	General Enquires	–	01785 825050

www.abb.com