Flexibility is the key for smaller substation projects

Jon Downs, General Manager Utility Substations, explains how ABB has replaced the old ‘one size fits all’ approach with a new philosophy tailored to meet the needs of smaller substation projects.

ABB is well known for its superb long term track record in delivering major multi-million pound turnkey substation projects, such as Connah’s Quay – one of Europe’s largest substations – which you can read about in the other pages of this newsletter. What is perhaps not so well appreciated is that we are equally adept at working on smaller value projects such as the delivery of individual packages.

Listening

That is why over the past year or so we have spent a lot of time talking to our customers and importantly listening to exactly what they need in terms of delivery models and processes when we work with them on lower level contracts. A clear picture emerged that a ‘one size fits all’ service simply isn’t appropriate. What is needed is a totally flexible, tailored service that can deliver the ideal response for each project.

An important change is reflected in the adoption of multi-functional roles. This means that the project manager might also be the design engineer and then follow on to be the site manager. While making these changes, the over-riding concern is of course to maintain the outstanding levels of health and safety performance, on time delivery and quality demonstrated on our larger projects. In essence, the aim is to deliver ‘big project’ performance for our small project customers in a model that meets their needs.

Encouraging results

We rolled out this new approach in 2011 and the results have been extremely encouraging, both in terms of winning orders and in the feedback from customers on our tender submissions. The approach to small projects is continuing to evolve as we create a new team with the specific skill sets aligned to the needs of this market, especially in terms of flexibility, adaptability and speed of response.

Upgrades and extensions

Typical utility substation projects that the team is focusing on include upgrades and extensions, such as circuit breaker replacements, as well as system integration or installation of equipment. In fact, we anticipate that the need for modification and extension of substations is set to increase significantly as they have to adapt to the increasing demands of renewable energy sources in the UK grid.

Overall, the message is that ABB now has the flexibility to support any size of substation project from £100k to £100 million. And for what some may describe as a small project we still aim to deliver big project performance and quality.

High Speed 1 power quality project enters test phase

The start of on-line testing is a critical milestone in ABB’s project to design, manufacture and install state-of-the-art capacitive compensation systems for High Speed 1.

This involves running real trains – a Eurostar and an Hitachi Class 395 – on a representative section of the network to confirm the capability of the ABB equipment to prevent voltage drop issues on the traction power catenary supply.

The 68 mile (109 km) High Speed 1 route, from the Central London terminal at St Pancras International to the Channel Tunnel at Dover, is used by Eurostar trains operating the international high speed routes between London, Paris and Brussels as well as high speed domestic trains that provide a commuter service between London and Kent.

The High Speed route is supplied with power on the 2 x 25 kV principle using autotransformers. Its nominal line voltage is therefore 25 kV. There are, however, some sections of the line where it can drop as low as 17.5 kV, causing a reduction in overall system performance as well as spurious tripping of the network protection and control systems.

Voltage drop

The cause of the voltage drop is the inherent design of the isolation transformers (used to isolate between High Speed 1’s AC traction power supply and the adjacent Network Rail DC traction power supply), located in substations along the line. This is because they require large magnetising currents and therefore demand substantial inductive reactive power, which results in a drop in the voltage supply as seen by the train’s catenary.

A number of studies commissioned by High Speed 1, including a detailed investigation by ABB’s power quality expert team based in Sweden, confirmed that a reduction in the reactive power demand from the isolation transformers will improve system performance. ABB was then awarded a major contract to design, develop, manufacture and install a turnkey capacitive compensation solution that will effectively cancel out the inductive power demand of the transformer, and hence reduce the voltage drop.

Harmonic filters

The ABB solution for High Speed 1 is based on harmonic band pass filters with a rated output of 1512 kVAr, each comprising a 6.4 MVAr capacitor bank and a 303 mH inductor. This equipment installation also includes associated protection and control equipment and a switch-disconnector that enables it to be isolated from the network for maintenance and repair.

A total of 17 capacitive compensation filters have been installed at nine AC/DC compounds at strategic positions along the line.

“The strength of ABB’s technical solution is of course vital to the success of the High Speed 1 project. However, our overall detailed, consistent and consultative approach to the stakeholder management of all the parties involved during the construction and installation phases while working alongside a live operating railway network is just as important,” said Seamus O’Neill, ABB Power Systems Operations Manager for Rail. “For example, we worked very closely with the High Speed 1 and Channel Tunnel Rail Link (CTRL) System Review Panel, who are responsible for the introduction of all new assets, to ensure that our project met their stringent technical and operational needs.”

“Furthermore, during the equipment delivery and construction phase the ABB team worked very closely with High Speed 1’s own stakeholder management team to support their efforts in liaising with local authorities and residents to minimize any potential disruption.”

Live tests

The ABB capacitive compensation filters have already passed comprehensive factory acceptance tests (FATs) and pre-commissioning testing with flying colours. Now, in the live test phase, trains are being run between two selected points on the High Speed 1 route to validate the design and prove their capability, ready for all nine sites to be put into full operation later in 2012.