TP POWER SERVICES LIMITED

Contract Case Study

ELECTRICAL ENGINEERING SOLUTIONS FOR HIGH VOLTAGE NETWORKS

CONTRACT:	TPPS-09
SCOPE OF WORK:	Substation Compound Refurbishment
END CLIENT:	Centrica KPS Ltd
LOCATION:	Killingholme, Immingham
DURATION:	18 weeks
VALUE:	£ 316,500 GBP

SUMMARY:

TP Power Services Ltd was approached in late 2009 to tender for the inspection, maintenance and refurbishment of each of the power stations 4 off main Generator Transformer compounds. The equipment maintained included 1 off 270 MVA Steam Turbine Generator Transformer, 3 off 165 MVA Generator Transformers, 2 off 15/20 MVA Station Transformers, 2 off 6.3 MVA Auxiliary Transformers and interconnecting Isolated Phase Busduct. The main scope of works was completed over two statutory outages, the first in March 2010 lasting 10 weeks, and the second in September 2011 lasting 8 weeks.

As detailed inspection was not possible before the outage the planned work was limited to painting, general maintenance and operational testing, leaving the majority of works to be completed on a reactive basis as non-conformances were identified, accounting for approximately 60% of all works. Effective work management was critical to meet lead times for replacement equipment using existing supply chain links with industry leading suppliers, to reverse engineer and fabricate like-for-like components and to design and fabricate solutions to seal the transformer for operation. Our dedicated site engineers volunteered and delivered weekend working on many occasions to work around other contractors requiring access to plant, maintain the work programme and ultimately achieve outage deadlines to recommence generation.

SCOPE OF WORKS:

Throughout a total of 18 weeks over 2 outages our project managers and engineers planned and delivered a wide variety of external conditioning, invasive inspection and maintenance works to overhaul four Generator Transformer compounds. The works completed across both outages included:

- Overhaul, testing and replacement of contacts on 3 off UCGRN 390/300 ABB On Load Tap Changers
- Removal, external conditioning, motor overhaul, testing and re-installation of 8 off Generator Transformer cooling fans
- Steam cleaning, abrasive cleaning and triple coat phosphate paint system to all transformers and IPB sets
- Major over-plating and welding works on severely corroded areas of main transformer tank lid and HV Turrets
- Abrasive cleaning and dual coat application of two-part epoxy paint system to all fire protection system pipework
- Inspection, maintenance and Insulation Resistance testing of radiator cooling fans on three Generator Transformers
- Supply and replacement of sight glasses and gaskets on multiple EMB Buchholz sets on Generator Transformers
- Oil removal, processing and circulation of a combined 250,000 litres of mineral insulating oil on 3 off GT's
- Supply, dismantle and replacement of ABB UCG motor drive mechanism kiosks for OLTC's on 3 off GT's
- Inspection, testing and commissioning of control and protection circuits on all transformers to the control room
- Supply, replacement and testing of Oil and Winding Temperature Indicators on Station and Auxiliary transformers
- Physical and Dissolved Gas Analysis (DGA) and report of oil samples taken from all GT's and oil filled HV bushings
- Supply and replacement of 5 off expansion joint couplings with VJ Quickfit Repair Clamps on GT cooling pipework
- Dismantling and lifting of large bore cooling pipework to replace Hydran equipment on all Generator Transformers
- Dismantle and replacement of the entire cable support system and framework on a Station Transformer compound
- Reverse engineering, fabrication and supply of Current Transformer connection boxes on all 3 phases on 2 off GT's
- Like-for-like fabrication of multiple items such as access covers, brackets and cooling pipework on 3 off GT's
- Supply, replacement, testing and commissioning of Hydran local control panel on 1 off Generator Transformer
- Design, fabrication and supply of 'encapsulated sealing nuts' to remedy oil leaks on HV bushing flanges on 1 off GT
- Supply and replacement of large HB77 and desiccant breathers on all Generator Transformers and OLTC's
- Supply and fitting of replacement transformer, component and phase identification labels on all GT compounds

TP Power Services Ltd, Head Office, Rempstone Road
Wymeswold, Loughborough, Leics, LE12 6UE

www.tppowerservices.com | enquiries@tppowerservices.com

TP POWER SERVICES LIMITED

Contract Case Study

ELECTRICAL ENGINEERING SOLUTIONS FOR HIGH VOLTAGE NETWORKS

Continued....

STRATEGIC SPARE:

Centrica issued TPPS with an ABB Stromberg 6560 kVA transformer to be tested and refurbished at our factory, delivered to site and lifted into position as a strategic spare. Following successful routine, type & special tests to BS EN 60076 the unit was externally refurbished.

Although generally in good condition overall the 15 year old unit had suffered corrosion from the elements and some components needed to be replaced. TPPS fabricated new cable box covers, CT connection boxes, blanking plates and changed all gaskets and isolation valves. Once the integrity of the unit had been sealed, a dual coat phosphate paint system was applied after abrasive cleaning to the main tank and cooling radiators, before being packed and shipped for storage.

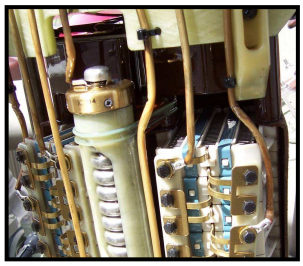
TEST SCHEDULE:

A full test schedule to BS EN 60076 was agreed with the client and included:

Winding Capacitance (Tan Delta Test)
Winding frequency responses (SFRA)
Winding Resistance Test
Voltage Ratio & Magnetising Current
Short Circuit & Open Circuit Losses
Insulation Resistance Test
Hi Potential Test of Winding Insulation
No-load Loss & Current Test
Dielectric Test @ 80% voltage

TAP CHANGER REFURBISHMENT:

As part of the scope of work TPPS were required to complete the maintenance of the on-load tap-changers (OLTC) on three of the ABB Generator Transformers. Due to a failure on one of the tap changers the previous year, TPPS removed the remaining three complete units for detailed inspection and general maintenance. Each of the ABB UCGRN 390/300 tap changers had its insulating oil removed, lifted out of the casing using a mobile crane and flushed with clean oil using low pressure spray to remove carbon deposits. After inspection and replacement of two sets of contacts each unit was lowered back into position and underwent operational testing and commissioning.



The motor drive mechanism kiosks needed replacing on three of the units due to degraded housings, seals and hinges from almost 20 years exposure to the coastal elements. The BUE type cabinets were procured directly from ABB with a lead time of 8 weeks; meaning the works had to be completed in the second outage. To change the unit's engineers had to remove the drive shaft feeding into the kiosk and the drive mechanism itself to replace the cabinet. Once replaced, the mechanism was re-assembled within the cabinet, drive shaft installed and the unit fully commissioned for operation.

PAINT SYSTEM:

Each of the 8 off Transformers, 4 off Fire Protection Systems and 4 off sets of IPB were degreased, cleaned and a dual coat high phosphate paint system applied for protection against the harsh coastal elements. Across the 18 week outage over 1500 litres of high grade paint was applied to plant via spray, flood and brush method and the client offered a 10 year guarantee against the work completed. All new components were given a dual primer coat before delivery to site and replaced, such that the most exposed components had a 4 coat protection system.

EXTERNAL CONDITIONING:

The worst affected by the elements was the Steam Turbine Generator Transformer. Being more exposed to the elements and having no protection from other buildings had allowed significant degradation of the main tank lid and high voltage turrets. Thickness testing identified that almost half of the material had been weathered away in some places, and unlike other components simple fabrication and replacement was not an option. All areas were cleaned using grinding equipment to AS 2.5 standards and primer paint applied, with the worst areas having 10 mm steel plates secured over the top with double fillet welds on all sides, before a the final dual coat paint system was applied. TPPS also designed and implemented a method of sealing oil leaking from the studs securing the HV bushings to the turrets using 'encapsulated sealing nuts' with O-rings rather than the timely and expensive solution of dismantling to replace gaskets.

TP Power Services Ltd, Head Office, Rempstone Road
Wymeswold, Loughborough, Leics, LE12 6UE

www.tppowerservices.com | enquiries@tppowerservices.com