

CONTRACT: TPPS-08
 SCOPE OF WORK: Transformer & GIS Refurbishment
 END CLIENT: GDF Suez Energy UK
 LOCATION: Teesside Power Station
 DURATION: 34 days over 10 months
 VALUE: £ 148,400 GBP



SUMMARY:

GDF Suez's Teesside plant is a CCGT power station capable of producing 1875 MW of electricity from 8 gas powered turbines, each with its own 300/399 MVA, 15.75 / 275kV generator transformer, with all plant connections completed through air or gas insulated busduct and switchgear. TPPS Ltd were initially approached to replace the conservator cell membrane on a generator transformer, although the client soon contracted us to complete further works on other units based on our experience in delivering works on transformers, switchgear and busduct systems.

When TPPS Ltd were contracted to complete the 5 yearly inspection, testing and maintenance of one of the stations 24 / 36 / 48 MVA, 16 / 11.5 kV station transformer, we were requested to offer a competitive quotation to complete the dismantling and resealing of the interconnecting 275 kV gas-insulated switchgear (GIS) to cure leaks from the transformer connection. Specialist training previously undertaken by engineers allowed the handling of the hazardous sulphur hexafluoride (SF₆) insulating the metal-clad switchgear, and each of the three phases had their gas removed, sections stripped down to component parts, gaskets inspected and replaced, re-greased and the system vacuum tested before refilling with recycled and new gas and re-commissioned in conjunction with National Grid as the system fed into their substation.

In 2011 as discussions were taking place for the long term maintenance contract, the owners announced the power plant was being mothballed due to the low cost of energy imports, the site now operates only one Open Cycle Gas Turbine (OCGT) producing 45 MW of electricity and has suspended all contracted maintenance in order to minimise operating costs. TPPS Ltd is still in contact with key personnel and offering technical support as required.

TRANSFORMER SERVICES:

The majority of services delivered on site were to replace components such as pressure release devices, conservator cell membranes and gaskets to cure leaks from the main tanks and required the removal, handling and processing of mineral insulating oil on the 399 MVA generator transformers. TPPS Ltd procured replacement ancillary components from the OEM on behalf of the client to safeguard the integrity of the units for operation and spare components for the site stores. Works also included inspection and testing services as part of the stations five yearly maintenance programme, and included:

- Inspection of mechanical assembly for signs of leaks, degradation & moisture ingress
- Insulation Resistance test of transformer windings and report
- Testing of alarm and trip settings on Buchholz relays, WTI's, OTI's and relays
- Temperature Indicator equipment – Calibration & Current injection tests
- Dissolved Gas Analysis (DGA) of mineral insulating oil and client reports
- Inspection and testing of cooler control for manual, automatic and phase starting
- Maintenance of OLTC and OCTC barrel type tap change equipment
- Inspection and maintenance of marshalling and control kiosks

Works were completed on a total of 6 units at the plant, and delivered most of these on an emergency basis which required mobilisation to site within 72 hours of the works being confirmed by the client.



275kV GAS-INSULATED SWITCHGEAR (GIS)

As TPPS Ltd had already been contracted to complete maintenance on the 24 / 36 / 48 MVA, 16 / 11.5 kV station transformer, the client requested we also complete invasive works that would cure gas leaks on one phase of the units connection to the 275 kV GIS, which connected directly to switchgear in the National Grids 275kV Transmission substation. TPPS Ltd was able to complete the works as engineers had previously attended a 3 day training course for safe handling and use of sulphur hexafluoride (SF₆). With only a 6 day window to complete these works, the client requested that the remaining two phases be completed also, and engineers accepted the challenge of completing the extra works in the same timeframe. Each phase of the GIS was split into a number of gas zones and it was essential that any zones adjacent to the one being emptied and dismantled had gas removed to half pressure to avoid rupturing the barrier boards separating each zone due to differences in pressure. Replacement components were procured and delivered directly to site from suppliers, including O-ring gaskets made of EPDM rubber, contact sealant, grease and injection gun for sealing flanged connections and Tor-Wax for coating external flange connections. Although the switchgear was owned by the station, National Grid had operating control of the switchgear as it connected directly to their 275 kV outgoing feed, and TPPS were required to ensure all HSQE documentation was designed and implemented to NG standards for works delivery. The full scope of works included:



- Procurement of replacement EPDM gaskets, contact sealants and greases
- Supply of empty gas container to decant gas for re-use
- Design and implementation of bespoke QA documents to ISO9001:2008
- Ensuring a safe system of work for delivery of services to OHSAS 18001
- Identify and maintain strict environmental controls for hazardous substances to ISO14001
- Safe working induction to work in National Grid 275kV substation
- Isolation of 275kV system and implementation of safe working area within NG substation
- Preliminary testing of the SF₆ for oxygen, moisture and contaminated gases
- Removal of SF₆ gas using DILO gas cart and flow monitoring equipment
- Dismantle of the connector cover to expose main conductors and completion disconnection
- Dismantle of the main connector and replacement of multiple gaskets per phase
- Cleaning of all surfaces on the main connector using isopropyl alcohol
- Re-connection of main busbar and Ductor testing to ensure integrity
- Application of sealants on all gaskets, and greases to flange connections via injection nipples
- All fixings checked with OEM torque settings and witnessed by the client
- Reassembly of the connector set and application of external sealants and Tor-Wax
- Pressure testing of dismantled gas zones with Nitrogen to check for leaks
- Re-filling of gas zones using recycled gas following approval of integrity tests
- Topping up of gas zones with new gas to replace that lost through original leaks
- Use of gas detection equipment to inspect for leaks and ensure integrity of the remedial works
- Final testing of the SF₆ to ensure oxygen content and dew point are suitable for operation
- Review and transmittal of all recycled and new SF₆ gas handled as per legal requirements

The system was commissioned and energised in line with clients outage programme, and follow-up surveys by the client have confirmed the system has no recurring leaks and is still sealed to this day. Completion of this work proved TPPS's commitment to delivering quality services and constantly developing our service portfolio with of works completed on gas-insulated switchgear.

CLIENT TESTIMONIAL:

"Overall it was an excellent job and the work scope was extended threefold during the program and TP Power services still managed to complete the works in time..... engineers worked the Easter weekend including bank holidays to keep the task on schedule. I would have no hesitation in recommending TP Power Services to others both within our company and externally"

Derren Wicks – EC&I Section Engineer, awarded a KPI score of 93%