

NATIONAL GRID ELECTRICITY TRANSMISSION

Plc

NGET PROJECT SPECIFIC WORKS INFORMATION

LITTLEBROOK 400kV GIS SUBSTATION REPLACEMENT

31 May 2019

VERSION 9.0

OVERVIEW OF WORKS INFORMATION DOCUMENTS

This document forms part of the Works Information, provided by National Grid Electricity Transmission plc (the *Employer*). The Works Information comprises the following documents detailed below:

Generic Works Information Document

This document contains Works Information which is applicable to all types of construction works undertaken on behalf of the *Employer* (i.e. HV Overhead Lines, HV Cables and HV Substations including associated civil engineering works). It also contains additional asset type specific Works Information applicable to the asset.

Project Specific Works Information Document

The Project Specific documents contain information specific to the project and should be read in conjunction with the Generic Works Information.

The *Contractor* must comply with the requirements set out in **both levels** of the Works Information documentation.

If there is any inaccuracy, discrepancy or ambiguity contained in or between the documents which form the Works Information the priority of the documents is in accordance with the following sequence:

- Project Specific Works Information
- Generic Works Information

Table of Contents

1	Introduction.....	9
1.1	Description of the Works.....	10
2	General Constraints on how the Contractor provides the Works.....	13
2.1	Access to Site.....	14
2.2	Primary Consents	14
2.3	Secondary Consents	15
2.4	Access and Egress.....	15
2.4.1	Provision of Roadways.....	15
2.5	Consideration of Others.....	15
2.6	Working Hours	15
2.6.1	Working Hours Specific to OHL Works.....	15
2.7	Occupied Premises and Users	16
2.8	Pollution, Ecological, Archaeological or Environmental Impacts.....	16
2.8.1	Minimising Agricultural Impacts	16
2.8.2	Minimising Land and/or Crop Damage	16
2.8.3	Minimising Animal Disease	16
3	Programme / Project Controls	17
4	Design Management	19
4.1	Design Responsibility	19
4.2	Employer's Design Requirements	19
4.2.1	DESIGN SPECIFICATIONS	19
4.2.1.1	CONTRACTOR'S DETAILED DESIGN.....	19
4.2.2	CONSTRUCTION DESIGN SPECIFICATION: SUBSTATION (CDS-SUBS).....	20
4.2.3	CONSTRUCTION DESIGN SPECIFICATION: PROTECTION, CONTROL AND TELECOMS (CDS-PCT)	42
4.2.4	CONSTRUCTION DESIGN SPECIFICATION: CIVIL (CDS-CIV).....	63
4.2.5	CONSTRUCTION DESIGN SPECIFICATION: OVERHEAD LINES (CDS-OHL).....	72

4.2.6 CONSTRUCTION DESIGN SPECIFICATION: CABLE (CDS-CAB)	76
4.3 Design Submission Procedures	82
4.3.1 Design Delivery Programme	82
4.3.2 Design Compliance Audits	82
4.3.2.1 DESIGN COMPLIANCE AUDIT – SATISFACTORY OUTCOME.....	82
4.3.2.2 DESIGN COMPLIANCE AUDIT – UNSATISFACTORY OUTCOME.....	82
4.3.3 DESIGN RE-SUBMISSIONS	82
4.4 Design Coordination	83
4.5 Requirements of Others.....	83
4.6 Design Approval from Others	83
4.7 Emergency Return to Service (ERTS) Requirements Strategy.....	83
5 Employer's Work Specification and Drawings	84
5.1 Applicable Standards.....	84
5.2 Drawings.....	84
6 Working with the Employer and Others	85
6.1 Sharing the work area with the Employer and Others	85
6.1.1 Authorities and Utilities Providers	85
7 Management of the Works.....	86
7.1 Contractor's Project Resources	86
7.1.1 PROJECT COMMISSIONING RESOURCE.....	86
7.1.2 PROJECT TEMPORARY WORKS COORDINATOR.....	86
7.2 Contractor Procurement.....	86
7.3 Site Establishment / Contractor's and Employer's Accommodation	86
7.3.1 SITE ESTABLISHMENT PLAN.....	87
7.4 Contractor's Site Emergency Plan.....	87
7.5 Security.....	87
7.5.1 Protection of the Site.....	87

7.5.2 Identification of People	88
7.5.3 Control of Site Personnel	88
7.6 Contractor's Traffic Management Plan	88
7.7 Site Cleanliness	89
7.8 Protection of Existing Structures and Services	89
7.9 Hazard Register/Risk Management	90
7.10 Reporting and Documentation	90
7.10.1 General	90
7.10.2 Contract Status Report	90
7.10.3 Photographic Records	90
7.10.4 Installation, Operation and Maintenance Documentation (IOM)	90
7.10.5 Asset Technical Data and Financial Reporting	91
7.10.6 Project Handover Documentation	91
7.10.6.1 ADDITIONAL REQUIREMENTS FOR FINAL RECORDS	91
7.10.6.2 HEALTH AND SAFETY (H&S) FILE INFORMATION	91
7.11 Meetings	91
8 Health, Safety, Environmental and Sustainability (SHES)	92
8.1 General Requirements	92
8.1.1 Safety Leadership	92
8.1.2 Communication and Consultation	92
8.1.3 Health, Safety and Environment Notice Boards	93
8.1.4 Employer's Safety Communication	93
8.2 SHE Management Plan	93
8.2.1 Health and Safety Handover Records	93
8.2.2 Environmental Handover Records	93
8.3 Method statement, Risk Assessments and Safe Systems of Work	93
8.3.1 Contractor's Work Permit Management System	93

8.3.2 The use of Radio Detection Cable Avoidance Tool	93
8.3.1.2 Excavations	93
8.4 Training and Competency.....	93
8.4.1 Training and Competency of the Employer's Staff	93
8.5 Hazardous Substances and Occupational Health	94
8.6 Sensible Monitoring Site Inspections and Audits	94
8.7 Personal Protective Equipment	94
8.8 Incident Reporting	94
8.9 SF ₆ Gas Usage and Leakage	94
8.10 Sustainability	94
8.10.1 Sustainability Review and Good Practice	95
8.10.2 Mandatory practice.....	95
8.10.3 Carbon Management	95
8.10.4 Management of Waste and Resources.....	95
8.11 Nuisance.....	95
8.12 Water Management	95
8.13 Contaminated Land	95
8.14 Concrete	96
8.15 Refuelling.....	96
8.16 Pollution Prevention.....	96
9 CDM	97
10 Quality Management.....	98
10.2.4 Site Quality Plan.....	98
10.2.5 Site Inspection and Test Plans	98
10.2.5.1 CHECK SHEETS, TECHNICAL REPORTS, TECHNICAL RECORDS ETC.	98
10.2.6 Subcontractor/Supplier Quality Plans	98
10.2.7 Contractor's Manufacturing Assurance.....	98

10.2.7.1 MANUFACTURING QUALITY ASSURANCE INSPECTION REPORTS	98
10.2.7.2 MANUFACTURER/SUPPLIER'S CERTIFICATE OF CONFORMITY.....	98
10.2.7.3 PROJECT MANAGER'S MANUFACTURING QUALITY ASSURANCE AUDITS.....	98
10.3 Quality Audits	98
10.4 Inspection by the Employer	98
10.5 Inspection by the Contractor.....	99
10.6 Quality Documentation	99
10.7 Site Defects and Non-Conformance during the Works	99
10.7.1 Defects	99
10.7.2 Non-Conformance Reporting	99
11 Commissioning	100
11.1 Tests and Inspections.....	100
11.1.1 Commissioning Programme	100
11.1.2 Commissioning Risk Assessment and Method Statements	100
11.1.3 Acceptance Testing Requirements.....	100
11.1.4 Acceptance Testing Resources	100
11.1.5 Commissioning File	100
11.2 Management of Tests and Inspections.....	100
11.3 Covering up Completed Work.....	100
11.4 Type Registration	101
12 Other Requirements	102
12.1 Software Provision	102
12.2 Accounts and Records.....	102
13 Completion	103
13.1 Introduction.....	103
13.2 Pre-completion arrangements	103
13.3 Take Over.....	103

13.3.1 Technical Completion Statement 103

13.3.2 Completion Certificate..... 103

Appendices..... 104

Links Table 106

Amendment Record..... 107

1 Introduction

This Project Specific Works Information document contains information, of a commercial and technical nature, that is project specific – i.e. relating to the Littlebrook 400kV GIS Substation Replacement project. It supplements and should be read in conjunction with the 'Generic Works Information - NGET' document.

The *Employer* reserves the right to amend the enclosed information if it considers it necessary or prudent to do so regarding a particular Project. This shall not prejudice the *Employer's* rights or duties in respect of any current Projects nor shall it be taken as an indication of the *Employer's* future intentions, unless otherwise stated.

Defined terms used in this document are identified as follows:

- Contract Data (in *italics*): *Employer, Contractor, Project Manager, Supervisor*
- ECC terms (Capital Initials): Plant, Equipment, Site, Working Area, etc.
- **Note:** National Grid Safety Rules and Guidance document contains defined terms in bold text such as **System, Equipment, Danger, and Senior Authorised Person** etc. in the definitions section (D). These defined terms shall be applicable to these *works* under the following conditions:
 - (i) When items supplied in these *works* are commissioned and accepted onto the National Grid High Voltage Transmission System in accordance with TP106 and an Equipment Acceptance Certificate has been issued for the applicable items.
 - (ii) When items supplied in these *works* interface with existing commissioned National Grid assets that are already subject to the control of National Grid Safety Rules.
 - (iii) Where the *works* require the provision and use of specific Safety Rules Type Registered **Earthing Devices** in connection with the construction activities e.g. portable, drain or field equipment earths and application devices.

1.1 Description of the Works

The *works* are to construct a new replacement 400kV GIS substation offline to the south of the existing 400kV substation using surplus switchgear to be free-issued to the *Contractor* by the *Employer*. The new Littlebrook substation will comprise 9 feeder or transformer bays, two Bus Section bays and one Bus Coupler bay. Refer to the Site Information document for details of the existing and proposed site location.

The substation configuration shown on the development drawings is presented as a workable solution however the *Contractor* may offer their own solution.

The project scope includes, but is not limited to, the design, supply, construction and commissioning of:

- Temporary site access and construction accommodation
- Any additional temporary fencing to facilitate the *works*
- Construction power supplies and temporary utility supplies
- Construction welfare facilities
- New permanent fencing and site lighting
- New surface water drainage
- Construction of new GIS hall and associated foundations
- Temporary covered storage and laydown facilities
- Installation of new indoor 400kV GIS
- Civil works, foundations and structures for all new AIS and GIS equipment
- New outdoor AIS equipment and structures
- Re-location of four SGTs from the existing Littlebrook Substation to the new site
- Re-location AIS equipment from the existing Littlebrook Substation to the new site
- De-gas, de-energise and decommission redundant substation equipment
- Coordination of the delivery, installation and stage one commissioning of one new SGT (by bulk-purchase provider).
- New overhead line gantries and associated foundations for all circuits
- New overhead line downloads to the new substation
- Earthing systems for the new substation
- New LVAC and DC supplies to all equipment as required
- New permanent standby diesel generator
- Re-location of existing P&C equipment to the new substation
- New P&C equipment in the new substation
- Installation of temporary bus connectors & protection
- Remote end P&C works
- Drawing and label modifications at remote ends
- Temporary labelling
- New 400kV cable within the substation
- New 132kV cable systems from the new Substation to the existing Littlebrook 132kV GIS Substation.
- Draining and capping-off existing 132kV cable systems

The decommissioning scope is as follows:

Following enactment of the HVSCC to remove existing Littlebrook 400kV GIS circuits from the transmission system, the *Contractor* shall carry out the following decommissioning activities and equipment removal.

- De-gas all gas zones of the existing de-commissioned GIS switchgear
- Transfer all in-service and retained SCS alarm points from existing Littlebrook 400kV bay control units to bay control units at new Littlebrook 400kV. Including transfer of the remote alarm points from the Thurrock cable sealing end compound and Littlebrook cable sealing end compound.
- Install a temporary LVAC supply cable from new Littlebrook 400kV LVAC board to existing Littlebrook LVAC board, for decommissioning supplies
- Decommission the existing diesel generator, removal of fuel and offer to the *Project Manager* for reuse
- Decommission the existing LVAC change-over board and DNO Incoming supply
- Drain and clean redundant SGT bunds, ensuring no residual environmental risk with oil and contaminant leakage
- SGT bunds – following clean-up of the redundant bunds, an ongoing drainage method is required:
 - a) Bund pumps to remain operational; or,
 - b) If bund pumps are removed, then section(s) of bund walls can be removed or cored through to allow rainwater to drain out of the bund
- Oil separator to be drained and cleaned
- Drain site interceptor tanks
- Decommission the Foul Sceptic Tank
- Surface Water Outfall – Decommission/cap off/fill-in the old outfall pipe
- Isolate and cap off the Water Supply to the existing site
- Decommission site supplies to kiosks, pillars and heater rings
- Carry out a DSS to remove all redundant SCS alarm points, including redundant Gas Zone alarms, surface water pump alarms and biodigester (septic tank) high level alarm
- Decommission redundant SCS bay control units, master clocks and associated equipment and offer to the Project Manager for spares
- Coordinate with Vodafone for removal of all redundant telecom services and equipment
- Terminate the existing BT service to the site
- Decommission site electric fence
- Decommission 48V DC battery system 1 & 2 and offer redundant equipment to the *Project Manager*
- Decommission 110V DC battery system 1 & 2 and offer redundant equipment to the *Project Manager*
- Decommission LVAC distribution board and temporary supply

The demolition and removal of the remaining substation bunds, foundations etc, overhead line towers and the existing 132kV cables is not included in the scope of these *works*.

The station transformer circuits GIS switchgear is still fully commissioned.

The XLPE cables are still connected to the switchgear to the cable jointing bay (they are rated less than the SGT cables). The oil filled cables have been de oiled but not fully remove

The OHL routes terminating into the existing Littlebrook 400kV Substation shall be turned into the new Substation:

- VN 275kV OHL Littlebrook – Hurst.
- YL 400kV OHL Kemsley – Rowdown – Littlebrook.
- ZBG 400kV OHL West Thurrock – Littlebrook

The site is to be constructed on land purchased by National Grid (the *Employer*) and the new substation shall be constrained to being within the National Grid land ownership boundary. The *Employer* will obtain all necessary permissions and consents for the work to be undertaken – section 2.2 for further detail.

The following scope will be undertaken by others and therefore will not form part of the scope of these works:

- Removal of the existing concrete road, which will be broken up, tested and arisings stockpiled on site for potential re-use by the *Contractor*
- Diversion/removal of buried services crossing the site, including the 11kV cable and water main and provision of new route plans
- Full de-vegetation and ecological clearance of the site, including the area to the south of the existing access road and the welfare, CDM and laydown areas
- Installation of a chain link perimeter fence to secure the site. This shall be removed by the *Contractor* post installation of the permanent perimeter fence

The above scope does not extend to any vegetation or ecological clearance or utility diversions (if required) along the route of the new 132kV cable route.

The ex-Tilbury 400kV GIS Switchgear, Alstom type T155-2, is in storage at Didcot Substation, and the Contractor shall use this equipment for the new Littlebrook 400kV GIS Substation. The GIS switchgear shall be free-issued by the *Employer* to the *Contractor*.

In addition, some of the equipment in the existing Littlebrook substation shall be re-used for the new, including transformers and P&C equipment.

The existing circuits shall be turned into the new substation individually in a staged manner. The proposed sequence and programme is itemised in the Scheme Requirement Document (included in Appendix). The *Contractor* may propose alternative construction sequences if the outage requirements can be facilitated and are acceptable to the *Employer*.

The *Contractor* shall be responsible for ensuring that the detailed design of the whole of the works complies with the requirements identified within the *Employer's* Technical Specifications.

2 General Constraints on how the *Contractor* provides the Works

The following is a summary of the general constraints associated with the *works*:

- The outage start dates and high level of description of outage related *works* are described in the Outage Schedule appended to this document.
- The *Contractor* shall be responsible to validate the outage sequence to ensure that the relocation of the respective 400/132kV Supergrid Transformers (SGTs) from their existing location to the new can be done safely and in a workable manner. The *Contractor* shall undertake the required proximity and clearance checks with the respective OHL conductors.
- The *Contractor* shall be responsible to produce & update the stage by stage SLD and stage by stage layout drawings which will be in line with outage sequence. The *Contractor* shall be required to plan the *works* in line with these constraints. Any alternative proposals would be considered as part of the normal TP153 process which will be agreed with the *Project Manager*.
- The *Contractor* shall be responsible for the required reconfiguration of the ex-Tilbury equipment for the new 400kV Littlebrook substation. Therefore, the *Contractor* shall be responsible to clearly declare and manage any lead time related constraints within its proposed programme of works. For the avoidance of doubt the *Contractor* shall be responsible for managing all works relating to the reconfiguration of the ex-Tilbury equipment.
- There are Cable and OHL conductors which shall be considered for safety during construction. It is the responsibility of the *Contractor* to undertake the necessary proximity and clearance checks in respect of these.
- All deliveries shall be completed during working hours, except for the delivery of SGT1B as provided by the *Employer*, which may be outside of normal working hours
- Underground services around the construction area shall be considered by the *Contractor* within the design of all *works* within the site. The *Contractor* shall be responsible for updating and modifying the hazard register.
- The *Contractor* shall be responsible for coordinating and interfacing with Third Parties (not limited to RWE, Berricote, BAM and local housing developer) activities in the local vicinity.
- Planned Overhead Line “re-conductoring” to Littlebrook-Kemsley OHL route. Access will need to be maintained to accommodate these works, as well as maintained the *works* programme. Co-ordination to be via normal TP163 and TP153 meetings.
- The OHL works impacting the substation for the re-conductoring of Kemsley-Rowdown 2 circuit will be carried out between the 9th and 29th July 2020
- Cable routing corridor for the 132kV cable from the new 400kV GIS substation to the existing 132kV substation compound is defined; as indicated within Section 4.2.6 route information/history. Public Highway Crossing Points, public vehicle and pedestrian access shall always be maintained.
- Temporary Bus Connector 1 from new GIS 400kV substation to the existing Littlebrook 400kV substation via existing tower YL27. The design shall incorporate the re-use of the existing Overhead Line Conductors and Towers.
- Temporary Bus Connector 2 from the new GIS 400kV substation to the existing Littlebrook 400kV substation via existing tower VN3. The design shall incorporate the re-use of the existing Overhead Line Conductors and Towers.
- Access for the DNO local substation (at the main site entrance) shall always be maintained.
- All works shall be confined to within the perimeter of land owned by the *Employer*.

- The *Contractor* shall, as part of these works, offer redundant equipment to the *Project Manager* as spares and if deemed not required then they shall be disposed in a safe manner.

2.1 Access to Site

Details of the location of the substation and land ownership can be found in the Site Information. There is no space, within the operational site, for Contractor's laydown, storage, offices or welfare facilities. The Site Establishment plan on Berricote land is defined in this Work Information.

The Contractor shall undertake a full and comprehensive pre-access condition assessment of the land and infrastructure to complete the reinstatement of all working areas and accesses to the Site to a condition equivalent to or better than that existing prior to the commencement of the works.

Early access for site preparation may be requested from the Project Manager if required.

The CDM areas available to the Contractor are shown on the drawing appended. The Contractor shall review the areas and advise any issues as part of the Tender return.

Access to the site is via Rennie Drive which is a public highway. The Contractor shall ensure cleanliness is maintained and that this road is left fit for purpose during and at the end of the works.

Access to the existing 400kV Substation is managed by the Power Station Demolition Contractor, some liaison and co-ordination will be required.

The 132kV Substation Compound is unmanned and surrounded by National Grid standard electrified security fence. Access will need be arranged through the Project Manager.

2.2 Primary Consents

The new substation will be sited on land purchased by the *Employer*. As this is not operational land (and hence not considered permitted development), a full Town & Country Planning Application has been submitted by the *Employer*. In addition, Section 37 has been applied for the one of the OHL circuit turn-ins.

Due to the known presence of reptiles and Lizard orchid, these items will be initially relocated temporarily by Others to facilitate the works in land where existing overhead line towers are located. The *Contractor* will need to consider these protected species in their Environmental Management Plan for the duration of the works.

The following consents for the project will be applied for by the *Employer*:

- Town and Country Planning
- Existing Discharge Consent
- Environmental Licenses – the *Contractor* shall provide a reptile mitigation plan for the OHL construction works
- Permanent Easement for 132kV cable route
- Section 37 – OHL diversion
- Highways Approval for Road Crossings

For the 132kV cable route, the *Contractor* shall be responsible for obtaining the necessary consents from third parties such as Dartford Borough Council, Ocado, Prolongis and RWE. The 132kV cable route corridor is a potential feasible solution therefore the *Contractor* shall be responsible to provide an optimal route corridor which will take into consideration all factors such as the technical constraints as well as minimising the number of thirds party interactions.

The *Contractor* shall provide all necessary information to discharge all the consent requirements for the *works*.

2.3 Secondary Consents

The 132kV Cable route will require a temporary easement for construction purposes and this is based on the development stage cable drawings. This is being arranged by the *Employer* however the *Contractor* shall define the exact requirements no later than 12 weeks post contract award. The *Contractor* shall provide the as-built cable route drawing for the *Project Manager* to acquire the permanent easement as soon as the cable is installed.

2.4 Access and Egress

The *Contractor* shall consider the construction of the new permanent access road as one of the initial construction tasks to provide a main construction route to the site, which is then segregated from the current access road, currently used for the Power Station demolition. The *Contractor* shall undertake an overhead line clearance survey for the purposes of transporting existing transformers from the old 400kV substation to the new 400kV substation. As stated in the Site Information the access roads surrounding the existing Littlebrook 400kV substation has suffered from subsidence, therefore the *Contractor* shall ensure these roads are kept clean and remediated appropriately for the safe access and egress to the Site and Working Areas.

2.4.1 Provision of Roadways

Refer section 2.4 above.

2.5 Consideration of Others

For the duration of the *works* the *Contractor* is responsible for liaising and co-ordinating with the DNO, Berricote and its demolition contractor BAMS, and other third parties to allow progression of other site maintenance works as may be necessary. The occupiers of the respective areas may require emergency access to any area of the site at short notice and therefore the *Contractor* shall develop a plan, to be agreed with the *Project Manager*, for how this can be achieved, particularly for locations surrounding the construction areas of the project without impacting on the programme.

2.6 Working Hours

In all areas noise levels should be minimised as far as practicable and plant should be fitted with silencing devices wherever practicable. "Prior approval" may be sought under the Control of Pollution Act 1974 for noise emissions for activities such as those out of the hours of normal operation, the type of plant and equipment used or the methods of work and noise limits may then be placed on the demolition or construction activity.

Should the working hours extend beyond those provided within the Generic Works Information, these periods shall be agreed in advance with the *Project Manager* and the *Contractor* shall obtain consent from the local councils as necessary. The *Contractor* shall liaise with the *Project Manager* and the *Employer's* Communications representative prior to carrying out any consultation or notifications required.

2.6.1 Working Hours Specific to OHL Works

No further information is provided from that stated in the Generic Works Information

2.7 Occupied Premises and Users

The Site Occupier at the following sites is National Grid ET Operations:

- Littlebrook 400kV substation
- Littlebrook 132kV substation
- Littlebrook 132kV substation is also used by DNO
- The land surrounding the existing Littlebrook 400kV substation is owned by Berricote and is currently occupied by its demolition contractor BAMS.

The land ownership boundaries along the 132kV route corridor is shown on PDD-20696-HVC-002.

2.8 Pollution, Ecological, Archaeological or Environmental Impacts

The results of the asbestos and contamination reports show various types of contaminants in the made ground on the site. Small amounts of asbestos containing materials (ACM) were identified from the ground investigation (ref. PDD-20696-REP-102), in the south west corner of the site. The concentrations of Chrysotile ACM in the samples tested were below the threshold that would indicate the need for special remediation or waste disposal. The *Contractor* shall ensure suitable monitoring and testing is carried out throughout the groundworks.

The *Contractor* shall ensure the reptiles and Lizard Orchid are kept protected through the construction period.

2.8.1 Minimising Agricultural Impacts

No further information is provided from that stated in the Generic Works Information.

2.8.2 Minimising Land and/or Crop Damage

No further information is provided from that stated in the Generic Works Information.

2.8.3 Minimising Animal Disease

No further information is provided from that stated in the Generic Works Information.

3 Programme / Project Controls

In addition to the provision of the complete programme, as specified in the Generic Works Information, the *Contractor* shall prepare varying programme layouts for covering the below requirements within 6 weeks of contract award which will be then issued monthly in accordance to TP193 timescales via Primavera and the contract management tool, as a PDF:

- Design Programme showing interface dependencies with the GIS & SGT OEMs, especially the new free-issue SGT1B, and DNO LV supplies
- Design Programme split in to Design Packages for submission to the *Employer's* Technical Assurance
 - Packages to be shown as contained within the draft DID on the initial programme and then updated at DID Freeze.
 - The *Contractor* shall provide a design tracker for visibility purposes which provides assurance to the *Project Manager* that the design packages are going through the required *Contractor's* internal verification checks to ensure the dates for the design packages for submission to the *Employer's* Technical Assurance are maintained
 - This arrangement should be replicated to show the progression of As Built Drawing Records throughout the project to show the submission to NG Drawing Management post energisation is being managed as this information provides vital Health and Safety information to the *Employer*).
- Programme showing all activities that require the *Employer* to deliver or accept works to the *Contractor* before the *Contractor* can proceed allowing the contractor a minimum of 21 days or the contracted time whichever is greater.
- Programme showing all activities (including but not limited to design) showing interface dependencies with the DNO LV supplies, GIS installer, SGT's manufacturer/installer and the National Grid OHL re-conducting
- 6-week lookahead/Site Activity Programme showing all site activities including allowances for third parties to complete works and detailing activities that will need to be witnessed by the *Supervisor* (CIE); shall be submitted to the *Project Manager & Supervisor*.
- Programme showing all external third party activities (e.g. DNO LV supply, Vodafone fibre, Water (and foul connections) supply, planning condition discharge, consents application etc). Including regular interface programme and interface analysis including activities for all stakeholders/third parties.
- Programme Layout showing all the *Employer* required resources to facilitate the *Contractor's* delivery of the project. To include but not limited to CIE, Senior Authorised Person, Advanced Commissioning Engineer requirements for all disciplines of the works including the remote end works. This is critical to ensure all *Employer* resource required for witnessing and commissioning is allocated at year ahead plan freeze
- Critical Path activities, terminal float, time risk allowance and Float, including float erosion from first approved Baseline

The *Contractor* shall submit with the monthly programme for acceptance a schedule of variance report. The monthly schedule of variance report should show only the items in the programme that are affected by date changes from the previous programme submitted for acceptance. Any changes of 4 days or less may be omitted unless the activities are on the critical path or have 4 days or less float. The

format of this report would need to be tabulated and easy to read and not just an extract from P6. The headings should include P6 activity code, activity description, previous start and end dates, revised start and end date, explanation for change, impact assessment/mitigation measures.

When the *Contractor* is submitting a programme for re-baselining then a schedule of variance report (as above for the monthly accepted programme) shall be supplied covering all date changes from the previous base lined programme and all changes to the baseline will have an explanation for the changes.

The cost loading shall be at activities/deliverable level, not at a summary WBS level 4 level, to allow for Earned Value management reporting throughout the lifecycle of the project to the satisfaction of the *Project Manager*.

4 Design Management

4.1 Design Responsibility

The *Contractor* shall be responsible for the full design solution for the entire 400kV Substation, OHL diversion, 132kV cable, temporary bus connectors, protection and permanent switching and enabling works design manufacture, supply, delivery and installation acting as *Principal Designer* and *Principal Contractor* under the CDM Regs 2015.

The *Contractor* shall fulfil the Contractor Design Approval Engineer Role across all disciplines, in accordance with TP141.

All design changes must be notified to the *Project Manager*. The *Contractor* shall be responsible for ensuring design changes are reviewed comprehensively in advance of construction works. The *Contractor* shall include within their programme details of the planned design and hazard review meetings. All design work packages shall be fully detailed within the *Contractor's* programme submitted as part of the tender.

The *Contractor* shall detail in the programme the provision of as built information for the project within the TP135 specified timescales.

The *Contractor* shall carry out all temporary and permanent design work required to deliver the works as specified in the Works Information, including all third-party activities within the CDM area.

4.2 Employer's Design Requirements

Prior to commencing the detailed design the *Contractor* shall review all the onsite drawings/records to determine their accuracy and highlight any discrepancies to the *Project Manager*.

The *Contractor* shall identify all temporary works required as part of the tender submission. The *Contractor* shall update the temporary works register throughout the project and allow the *Supervisor* to review it in good time.

Due to the nature of the Electricity Transmission System Littlebrook substation is critical site and double busbar outages cannot be accommodated therefore the *Contractor* shall ensure that the key goal of the substation from both a design and quality perspective is that Zero Gas Leaks will occur post energisation. The *Contractor* shall demonstrate the measures it will undertake to achieve this goal to the *Project Manager*, the *Supervisor* and the Employer's Representatives. The *Contractor* shall pay focus on the design and installation quality of all the gas zone "T" points to ensure gas tight seals and no leakage occurs post energisation.

4.2.1 Design Specifications

The *Contractor* shall adhere to the DNO specification for the new LV transformer base including ducts, diameter, depths etc. The DNO will supply the transformer, 11kV connections and GRP enclosure at the entrance to the new site. The *Contractor* shall be responsible for confirming final location and design route for both 11kV and 415V LV supply routes.

4.2.1.1 Contractor's Detailed Design

No further information is provided from that stated in the Generic Works Information

4.2.2 Construction Design Specification: Substation (CDS-SUBS)

The *Contractor* shall be responsible for ensuring that the detailed design of the HV Substation *works*, as identified in the Project Specific Works Information, complies with the requirements identified within the *Employer's* Technical Specifications. The design process for all HV Substation *works* shall be in accordance with UKBP/TP188.

The *Contractor* shall take into consideration the construction, operation and maintenance requirements, as per the CDM Regs 2015 when developing the detailed design.

Temporary Bus Connector 1 shall be created using the existing Kemsley-Rowdown 1 line, while the new Kemsley-Rowdown 1 line is installed - circuit transfers will then occur over the next few outage seasons. This will include dropping downloads from existing towers into the new substation, and then removing the some of the old lines. New 132kV cables shall be installed to feed Littlebrook 132kV Substation. The existing 132kV cables will become redundant and shall be drained of oil and capped off by the *Contractor* – refer to the HV cable section of this document for further details.

Temporary Bus Connector 2 shall be created using the existing Hurst 1 line, while the new Hurst 1 line is installed - circuit transfers will then occur over the next few outage seasons. This will include dropping downloads from existing towers into the new substation, and then removing the some of the old lines. This will also include installation of a temporary gantry for Bus Connector 2 in the new GIS substation, utilising the AIS busbars which will be future SGT2B bay. Within the existing 400kV Substation, once the SGT3 is removed, temporary post insulators shall be installed in the associated SGT bund at same height as existing bushings to maintain connection length to existing surge arrestors. Refer to Appendix AH - Bus Connector 2 Indicative Layout.

The new Littlebrook substation will include 9 feeder or transformer bays, two Bus Section bays and one Bus Coupler bay. The *Contractor* is not required to make provision for spare bays in the design however the switchgear shall be designed to be extendible in accordance with the outage requirements of National Grid TS 2.1.

As part of the *Contractor's* detailed design phase the *Contractor* may propose additional AIS equipment to be reused for the new substation, such as switchgear, marshalling kiosks, LCCs, bund access steps, busbars and connectors and AIS HV plant. It is the responsibility of the *Contractor* to carry out a condition assessment and confirm suitability and technical compliance before dismantling for re-use.

The *Contractor* shall assess the condition of all equipment and structures during detailed design to confirm the existing equipment can be re-used in a technically compliant and will meet the *Employer's* design life for each respective NGTS. Where this is not the case the *Contractor* shall notify the *Project Manager* and submit a Technical Deviation for consideration during the detailed design stage.

The *Contractor* shall be responsible for the re-location of four existing Supergrid Transformers (SGTs) from the existing substation to the new site, including but not limited to all aspects of dismantling, moving, re-installation, re-testing and re-commissioning. The SGTs shall be tested before and after re-location in accordance with the *Employer's* Technical Procedures.

One new transformer shall be used for these *works*. The division of responsibilities between the *Employer*, transformer manufacturer and *Contractor* shall be as detailed in National Grid's TP211. The new Supergrid Transformer will be provided by the *Employer* and will be supplied, delivered and Stage 1 commissioned by the *Employer's* appointed supplier. The *Contractor* shall be responsible for the full decommissioning of the existing substation and removal of the primary and secondary equipment up to the agreed (with the *Project Manager*) point of isolations on existing substation. The *Contractor* shall provide his proposal to the *Project Manager*. The full demolition and removal of the remaining substation, overhead line towers and the existing 132kV cables is not part of this scope of works and therefore the *Contractor* shall provide all the drawings, the required Health & Safety (residual hazards) information

and final as-built condition for the existing substation to handover to the *Project Manager* for full demolition works.

GIS equipment

The ex-Tilbury 400kV GIS Switchgear, Alstom type T155-2, is in storage at Didcot Substation, and shall be used for the new Littlebrook 400kV GIS Substation. The GIS switchgear shall be free-issued by the *Employer* to the *Contractor*.

The *Contractor* may consider alternative connection arrangements, for example AIS busbar or cable in lieu of GIS busbar as identified in the FEED drawings if this presents a cost, program and reduced outage benefit.

The *Employer* has carried out a preliminary inventory check against the SLD and the ex-Tilbury Equipment packing list and is aware that four (3 phase) earth switches are deficient. The packing list of all crates procured for Tilbury is appended to this Works Information. The packing list has been colour coded with a key which identifies which crates are available at Didcot. The crates that are in Green will be sent to the OEM directly for the *Contractor* to use in its design solution. The *Contractor* shall review the entire inventory of ex-Tilbury Equipment provided by the *Employer* against its final substation design solution and indicate all the crates it intends to use for Littlebrook and what additional equipment may be required to be procured to the *Project Manager*. The *Contractor* will be responsible for the procurement of these additional items including provision of a warranty. The goal is to utilise all the ex-Tilbury equipment available in the packing list for the new Littlebrook substation however it is noted that there may be certain limitations therefore the *Contractor* shall be responsible to justify to the *Project Manager* highlighting why certain equipment cannot be used by taking into consideration technical, design, installation, cost and programme implications.

The *Contractor* shall be responsible to “call off” the free issue equipment for delivery in line with their build programme. The *Employer* will then be responsible for delivery of the equipment to site in line with the *Contractor*’s “call off” programme.

At the point of handover of the equipment at the Littlebrook site, the *Contractor* shall be responsible for the equipment. Any Defects or issues identified after the point of handover will be reviewed on a case by case basis to determine responsibility and action.

From the *Contractor*’s selection of non-Green crates (from the packing list) the *Contractor* shall be responsible to undertake a visual inspection of the crates to validate the content of the packing list prior to transportation from Didcot. The *Contractor* shall be responsible for the necessary design & condition assessment of the use of the equipment for the new substation and shall provide justification to the *Project Manager* for any equipment from the Packing List not being used in the new substation design. The *Contractor* shall be responsible for updating the content of Packing List accordingly and send a final validated version to the *Project Manager*.

The *Contractor* shall be responsible for producing the detailed design of the substation with technical input from the GIS OEM. The *Contractor* will be required to produce a specification of the GIS switchgear requirements, including Civil Guide Drawing, SLD, KLD, gas barrier requirements, layout and elevations, interface requirements, etc.

The *Contractor* shall be responsible for making any required modifications to the GIS equipment through the OEM based on the final substation design solution, including but not limited to, design and supply of blanking plates, modifications to gas barriers and gas monitoring systems. All CT & VT chambers were originally designed for and supplied with the ex-Tilbury GIS equipment not required for this project shall not be installed.

The *Contractor* shall confirm the proposed interface requirements for GIS connected transformers (both re-used and new bulk purchase) and ensure the GIS design is coordinated with the plant layout and specification. The *Contractor* shall confirm the proposed GIS/ cable interface for 400kV cables – where GIS / cable interfaces are used from the ex-Tilbury equipment the *Contractor* shall confirm the compatibility of the proposed cable system with the GIS cable termination.

The Contractor shall modify the existing Baywatch SF6 system to ensure that it performs only the SF6 continuous monitoring and trending functionality. During detailed design the Contractor shall review and supply any additional gas density/pressure sensors as necessary to achieve separate falling, low, and high gas alarms (where necessary) and trip & close lockout functionality.

The Contractor shall include for the design, supply and installation of a suitable access fixed platform arrangement for the 400kV GIS, for the purposes of operation, maintenance, and repair.

The Contractor shall confirm the specific installation requirements for the GIS equipment with the OEM, including but not limited, to build sequence, commissioning requirements and permanent access requirements. The Contractor shall be responsible for arranging all specialist installation tools, equipment and ancillary consumables required for the installation of the GIS equipment that are specified by the OEM.

The *Contractor* is responsible for producing the final design of the GIS including but not limited to mechanical loadings and details of support requirements of the switchgear, earthing requirements and installation sequence and procedures. The *Contractor* is responsible for the detailed design arrangements of the LCCs, gas monitoring systems, interlocking, AC and DC demands of the switchgear.

The *Contractor* is responsible for ensuring all interface designs and a fully compliant integrated substation design solution is provided.

The *Contractor* shall be responsible for receiving and offloading the switchgear in a staged manner. This will be considered the point of issue of the switchgear to the Contractor who shall therefore be responsible for unpacking, storing and organising the switchgear in the required configuration for transfer to the new switch hall for installation. The *Contractor* shall be responsible for the installation of all substation equipment including free issue GIS. The Employer has a separate contract in place for the warranty of the free-issue GIS equipment and the Contractor shall be responsible for discharging the conditions to maintain the warranty which includes but not limited to a watching brief and technical support during the installation, installation sequence requirements of installation procedures, testing & commissioning procedures.

The *Contractor* shall be responsible for the provision of the required SF6 gas for the GIS & GIB equipment.

The proposed division of responsibility between the *Contractor*, Free-issue material OEM (GIS & Bulk Purchase Supplier) and the *Employer* is outlined below:

	<i>Employer</i>	<i>Contractor</i>	OEM
CDM Client	✓		
CDM Principal Designer		✓	
CDM Principal Contractor		✓	
Transportation & delivery of all OEM equipment to Littlebrook site	*	*	✓

Detailed design of the substation layout and SLD		✓	*
Detailed design of the GIS and all its ancillary systems		✓	*
Modification of GIS equipment, LCCs and gas monitoring systems to match detailed design layout & SLD		✓	*
Design of interface between GIS equipment and new bulk purchase transformer		✓	*
Design of interface between HV cable and GIS equipment		✓	*
Type registration/FAT of free issue equipment	*	*	✓
Type registration/FAT of <i>Contractor</i> procured equipment & materials	*	✓	*
O&M manuals for all equipment free issue and <i>Contractor</i> procured		✓	*
Offload and storage of all equipment		✓	*
Coordination and transportation of all equipment from laydown area to site		✓	
Installation of all equipment including GIS equipment & SGTs		✓	*
Testing and Commissioning of all equipment including GIS equipment & SGTs		*	✓
All As-built drawings incorporated and return to the <i>Employer</i> as per TP135.		✓	*

✓ - Principal responsibility holder

* - Responsible for engineering support/ site supervision/coordination

GIS Requirements

The *Employer's* specific requirements for GIS equipment are outlined below.

1. The outage requirements of TS2.1 must be met, the requirement not to have more than one circuit out at a time.
2. Maintenance of or repair to the GIS circuit breaker and disconnectors shall be achievable using the GIS earth switches in accordance with the requirements of NSI2 and NSI10, and Safety Bulletin SB 464.
3. All regular maintenance, inspection and repair shall be carried out without having to defeat the interlock system.
4. The gas zone and interlocking design shall also consider the requirements for dissipation of trapped charge in the GIS modules.
5. The gas zone design (together with the SLD) shall be put forward to ENCC and TNCC, via the *Project Manager*, for approval to ensure compliance with the *Employer's* technical requirements and current

best practice. This shall be done prior to acceptance of the SLD being sought from Technical Assurance.

6. The earth switches associated with Bus Coupler and Bus Sections together with their gas zones shall be designed in such a way that they can remain in operation with full chamber pressure while the adjoining disconnectors (and all busbar selector disconnectors for the feeder and transformer bays) are being maintained, repaired, removed or replaced.
7. The design shall allow for any component of the GIS to be maintained, repaired, removed, or replaced without requiring more than one section of busbar to be switched out. The design shall not require the use of an Emergency HVSCC or simultaneous outages of two busbars for any of the aforementioned activities.
8. Where a GIS disconnector and its earth switches require to be removed or taken out of service (to be degassed) as part of the replacement of the circuit breaker, the design should allow for portable earthing device between all POIs and point of work. Where an appropriate disconnector cannot be used to create a POI this can be created with an appropriately located section of busbar that can physically be removed to create a POI. The location of the disconnectable busbar needs to be indicated on the SLD.
9. The GIS gas zone design shall have sufficient buffer zones at the end of the switchgear to allow the board to be extended with an additional bay whilst meeting the outage requirements of TS 2.1.
10. The *Contractor* shall comply with SB 464. The *Contractor* shall specify the equipment and tools necessary to construct and maintain the substation. The *Contractor* shall supply the required equipment to the *Employer* such the *Employer* can discharge his duties as the *Site Occupier* to do the mandatory maintenance and statutory requirements.

As the *works* specify the re-use of existing equipment some of the design standards and specifications may have been superseded since the equipment was manufactured. The *Contractor*, in conjunction with the OEM shall confirm any deviations from the above requirements and current *Employer's* standards during detailed design. The *Contractor* shall be responsible for obtaining derogations or deviations using the *Employer's* technical deviation request procedures.

Equipment Nomenclature

The nomenclature of the new substation has been selected to avoid the requirement to re-number existing bays in the existing Littlebrook 132kV Substation. Spare bay temporary nomenclature will be required to avoid duplication with the existing substation during the transition period, and for the temporary bus connectors. The extent of equipment renaming and labelling will need to be agreed in the Commissioning Panel meeting depending on the duration, but may include;

- Operation Diagrams
- Gas Zone nomenclature
- SCS HMI, I/O Schedule and DSS
- SF6 Gas Monitoring System configuration database
- Interlocking, keys, mimic boards etc

The *Contractor* shall produce a commissioning programme and staged single line diagram detailing the nomenclature at each stage of commissioning, to be agreed with the Commissioning Panel. The *Contractor* shall allow for temporary labelling of spare bay nomenclature and temporary nomenclature changes of the existing switchgear. It is assumed that site drawings shall be updated by way of hand

mark-ups during the transition period however this shall be confirmed at the commissioning panel and with the *Project Manager*.

KEY DESIGN ASSUMPTIONS

The site is categorised as Class e under DD IEC/TS 60815-1 2008 (class iv as detailed in NG TS 2.1). The layout has been developed in line with the outage and circuit transfer sequence. Any alternative layout options would need to be constructible within the agreed outage sequence and durations. Requests for alternative outage sequences will need to be confirmed with National Grid System Operator.

Further to noise assessments to be carried out, the *Contractor* shall assume that noise enclosures are required for all SGTs except for SGT1B and SGT2B. The diesel generator needs to be located at the far northern corner of the site with due consideration of the potential voltage drop. The *Contractor* shall confirm these requirements with the *Project Manager* during detailed design. The *Contractor's* design shall allow for the future installation of noise enclosures on SGT1B & SGT2B if required in the future.

SITE

Substation Name	Substation Voltage (kV)	Owner	Type Existing / New	Busbar Layout	Number of Additional Bays	Insulation Requirements	Ops Diagram Reference
Littlebrook	400	NG	Existing	GIS – double bus, AIS line entries	12	DD IEC/TS 60815-1 2008, Class e (AIS)	40/3220
Additional Information	<p>The existing Littlebrook 400kV substation is on leased land adjacent to the redundant Littlebrook D power station. A new substation shall be built offline to the south of the site to replace the existing.</p> <p>The new substation will also be called Littlebrook 400kV Substation, therefore during the changeover period the new and existing site shall operate as a single substation.</p> <p>The existing substation has suffered from significant subsidence, with foundations becoming exposed and roads fragmenting, requiring regular ground remediation works to ensure the stability of the installed equipment. The existing GIS equipment is predominantly Reyrolle YG GIS back parts with GEC MFC6 Circuit breakers which is known to have SF₆ leakage issues.</p> <p>Littlebrook 132kV GIS Substation is located approximately 300m to the South East of the 400kV site. Land that was previously occupied by the 132kV AIS site (now demolished) is owned by the <i>Employer</i> and may be used as a laydown area by the <i>Contractor</i> during the construction phase.</p>						

COMMON EQUIPMENT

Substation Name	LV Supplies (e.g. DNO/Diesel/tertiary)	48V and 110V Battery / Dist. Board	Firefighting Equipment	Oil/SF6 Handling Equipment
-----------------	--	------------------------------------	------------------------	----------------------------

Littlebrook	<p>A new DNO LV supply and a new diesel generator shall be provided.</p> <p>Refer to PDD-20696-REP-111-LVAC assessment report for further details.</p>	<p>New 110V DC systems, including DC distribution equipment shall be provided, installed and commissioned in the GIS hall annexe.</p>	N/A	<p>An additional SF₆ gas handling cart of suitable size shall be provided to the new site.</p>
Additional Information	<p>The <i>Contractor</i> shall confirm the required ratings for LVAC and DC supplies for the site, including battery loading calculations for all DC systems.</p> <p>New 110V dc systems A & B (batteries, charger panels, distribution boards etc.) shall be provided within the GIS hall Annexe to support the DC load of the new Substation in accordance with TS 3.12.04. The <i>Contractor</i> shall design battery racks to allow safe manual handling and removal/ installation of individual cells without the need for additional access or lifting equipment.</p> <p><u>DNO Supply</u></p> <p>The <i>Contractor</i> shall adhere to the DNO specification for the new LV transformer base including ducts, diameter, depths etc. (DNO will supply transformer, 11kV connections and GRP enclosure) at the entrance to the new site. The proposed area for the DNO substation is adjacent the main substation access gate however alternative locations of the DNO substation shall be investigated at detailed design following discussions with DNO. The <i>Contractor</i> shall be responsible for confirming final location and design route for both 11kV and 415V LV supply routes on providing the least cost, fit for purpose design taking into account the DNO and LVAC cable reticulation costs.</p> <p><u>Permanent diesel generator</u></p> <p>A new permanent diesel generator shall be installed with enhanced noise mitigation (75dB @1m).</p> <p>The <i>Contractor</i> shall take into consideration the relatively long distance between the proposed diesel generator location and LVAC room in their proposal and allow for increased LVAC cable sizes as required to meet the design requirements.</p> <p><u>LVAC Board</u></p> <p>A new LVAC board shall be provided for new Littlebrook 400kV substation with 4-pole ACBs provided for the DNO Incoming Supply, Permanent Diesel Generator Supply and Portable Diesel Generator Supply. The LVAC board shall have auto-changeover facilities and interlocking for the permanent incoming and standby supplies.</p> <p>During the staged works, both existing and new substations will be deemed operational sites and secure LVAC supplies will be required. The <i>Contractor</i> shall provide any temporary interconnecting LVAC supply cables to ensure secure supplies are maintained at both sites during the installation and decommissioning works.</p> <p>The existing Littlebrook 400kV substation Diesel Generator and LVAC Changeover Board were installed in 2016, following final decommissioning of the existing Littlebrook 400kV substation the redundant 800kVA diesel generator and LVAC Changeover Board</p>			

	<p>shall be offered to the <i>Project Manager</i> by the <i>Contractor</i> as spares and if deemed not required by the <i>Project Manager</i> then it shall be removed from site.</p> <p>The guidance included in National Grid Engineering Bulletin 19/2014 – Lessons Learnt replacing LVAC Boards shall be observed.</p> <p><u>Padlocks, key safes, operational key cabinets</u></p> <p>The <i>Contractor</i> shall review and outline his proposal to the <i>Project Manager</i>, including quantities, for the supply of:</p> <p>NG SE2 area locks & padlocks of appropriate access level, to include for the substation, including: operational switchgear, gates & doors, cabinets & marshalling kiosks, SF₆ gas zones.</p> <p>The <i>Contractor</i> shall also include for 20 operational key safes, and a wall mounted mimic style operational key cabinet, and a separate SF₆ gas zone padlock key cabinet.</p>
--	--

EARTHING		
Substation Name	Substation Voltage (kV)	Requirements / Linkage with other earth mats
Littlebrook	400	<p>New earth tape will be required for connection of all new plant and equipment to the existing earthing system.</p> <p>On completion of the works the existing substation earthing shall be disconnected from the new substation, however demolition of the existing substation and removal of existing tapes shall be completed under a separate contract.</p> <p>High Frequency earthing shall be in accordance with the requirements of TS3.1.2 and that includes appropriate arrangements for the GIS equipment.</p>
Additional Information	<p>Refer to PDD-20696-REP-110 - Earthing Design Report for further details and requirements for the new earthing system.</p> <p>As detailed in the above report, the hot zone is significantly larger than indicated in the ERM report of 2005 (ref: EFM R194), encompassing additional third parties. This is due to the increase in earth return current. The <i>Contractor</i> shall confirm the extent of the Hot zone based on the final design of the substation and inform the <i>Employer</i> of its extent.</p> <p>The <i>Contractor</i> shall consider the earthing of all temporary and permanent fencing required for the staged construction and ensure the integrity of the earthing system is maintained throughout the construction period.</p> <p>The <i>Contractor</i> shall confirm the earthing requirements of the GIS equipment with the OEM, for power frequency and high frequency earthing.</p>	

SETTLEMENT METERING

Substation Name	Substation Voltage (kV)	Circuit	Position of CT/VT	Metering Cubicle Requirements
Littlebrook	400	SGT1B		Existing cubicle to be dismantled
Littlebrook	400	SGT2B		Existing cubicle to be dismantled
Littlebrook	400	SGT4B		Existing cubicle to be dismantled
Additional Information	Metering is in service at the Littlebrook 132kV Substation only. There is no new Metering equipment required to be installed at new Littlebrook 400kV GIS substation.			

SCS & OPERATIONAL METERING REQUIREMENTS				
Substation Name	Location of Substation Control Point	SCS type	Location of Remote Control Point	General Indications Required at Remote Control Point
Littlebrook	Littlebrook 400kV Substation Control Room	BBES GE Harris	ENCC (Wokingham)	In accordance with DH20
Littlebrook	Littlebrook 132kV Substation Control Room	Extension of Littlebrook 400kV SCS	ENCC (Wokingham)	In accordance with DH20
West Thurrock	West Thurrock 400kV Substation Control Room	GE (ALSTOM)	ENCC (Wokingham)	In accordance with DH20
Kemsley	Kemsley 400kV Substation Control Room	INSTEM-GE HARRIS-CAPULA	ENCC (Wokingham)	In accordance with DH20
Rowdown	Rowdown 400kV Substation Control Room	SIEMENS	ENCC (Wokingham)	In accordance with DH20
Hurst	Hurst 275kV Substation Control Room	Alstom PACIS	ENCC (Wokingham)	In accordance with DH20
Additional Information	<p><u>Littlebrook 400kV Substation</u></p> <p>The existing Littlebrook 400kV Substation SCS, type BBES GE Harris, provides control facilities for both Littlebrook 400kV Substation and Littlebrook 132kV GIS Substation. The SCS has two local control point HMI's, one at Littlebrook 400kV Control Room and the second at the Littlebrook 132kV Control Room.</p> <p>The SCS will be extended and modified to provide substation control for the new Littlebrook 400kV Substation (by provision of new SCS at 400KV), including installation of new Central Units, Common RTUs, Local Control point HMI and Bay Control Units for all circuits.</p> <p>The existing SCS ATCC control for the three 400/132kV SGTs shall be retained.</p>			

The decision to extend the existing SCS was made due to Littlebrook 132kV substation remote terminal SCS equipment and large number GIS alarm points, which will be retained.

Following completion of the staged circuit transfers to the new 400kV GIS substation and decommissioning of the old GIS equipment, all redundant SCS equipment will be removed and offered for spares to the *Project Manager*.

The *Contractor* shall liaise with SCS supplier to create new facility schedules and '300 sheets' with the relevant information as required.

A new SCS with CCU, SCP, BCUs and Ethernet switches will be installed within the new 400kV GIS S/S. A new Viewer (with control Facility) HMI for the 132kV GIS S/S is included.

Four new IEC 870-5-101 EMS/EBU communication routes will be required at the new 400kV GIS Littlebrook substation so that communication to the NGCC remain uninterrupted through the existing 400kV Substation deconstruction phase.

The new 400kV GIS S/S will be Type registered against the latest National Grid specifications to support IEC61850 Ed2 communications.

A VOP will need to be established for the new 400kV SCS.

The new 400kV GIS S/S SCS will initially be FAT tested to the final substation layout as best possible whilst supporting temporary circuit configurations which will be updated during the stage DSS programme. This will also include the integration of the 132kV GIS Bay Control Units so that during the stages works these bays can be transferred without a DSS being required for the new 400kV GIS SCS.

Any subsequent changes will be managed through the 7 stage DSS programme.

It is envisaged that 1 x DSS will be required for each stage of work. However, this is subject to project execution methodology which shall be agreed at the TP153 panel and the *Project Manager*. The methodology and number of DSS is stated below:

Pre-Stage 1

- New SCS: Initial VOP Establishment and new SCS commissioning

Stage 1

- Old SCS: Change of KERO 1 to 400kV Bus connector No1
- New SCS: -

Stage 2

- Old SCS: Removal of SGT3 / HURS1 from HMI and 300 Sheets. Change of X310 to 400kV Interconnector No2
- New SCS: -

Stage 3

- Old SCS: Removal of KERO2 from HMI and 300 Sheets
- New SCS: -

Stage 4

- Old SCS: Removal of WTHU2, SGT2B, X310, 400kV Bus connector No2

	<p>- New SCS: Change of 400kV Interconnected No2 to X210B/SGT2B</p> <p><u>Stage 5</u></p> <p>- Old SCS: Removal of SGT4A / HURS2</p> <p>- New SCS: -</p> <p><u>Stage 6</u></p> <p>- Old SCS: Removal of SGT4B</p> <p>- New SCS: -</p> <p><u>Stage 7</u></p> <p>- Old SCS: None Required. Old SCS decommissioned</p> <p>- New SCS: Change of 400kV Bus connector No1 to WTHU1. Transfer of ATCC to new SCS</p> <p><u>Final Mop Up</u></p> <p>- New SCS: Resolution of any post upgrade issues if required.</p> <p><u>Hurst 275kV Substation</u></p> <p>The existing Substation Control System (SCS) is from Alstom PACIS.</p> <p>SCS database changes and HMI update shall be implemented as required.</p> <p>It is envisaged that 2 x DSS will be required for Hurst 275kV substation, one for each circuit.</p> <p>It is anticipated that there will be no requirement for SCS database changes at remote end substations, West Thurrock 400kV, Kemsley 400kV and Rowdown 400kV.</p>
--	---

CIRCUIT BREAKERS						
Substation Name	Equipment Voltage (kV)	Circuit Nomenclature	Continuous Rating (A)	1Ph & 3Ph. Fault Breaking/Making Current (kA)	Mods to Existing Switchgear	Special Requirements
Littlebrook	400	X210B – SGT2B	4000A	63kA, 1s	N/A	GIS
		X410B – SGT4B	4000A	63kA, 1s	N/A	GIS
		X1205 – West Thurrock 1	4000A	63kA, 1s	N/A	GIS
		X610 – SGT6 (Hurst 2)	4000A	63kA, 1s	N/A	GIS

	X1005 – Kemsley - Rowdown 2	4000A	63kA, 1s	N/A	GIS
	X420 - Main Bus Section 4	4000A	63kA, 1s	N/A	GIS
	X460 - Reserve Bus Section 4	4000A	63kA, 1s	N/A	GIS
	X530 – Bus Coupler 5	4000A	63kA, 1s	N/A	GIS
	X310 – SGT3 (Hurst 1)	4000A	63kA, 1s	N/A	GIS
	X1105 – West Thurrock 2	4000A	63kA, 1s	N/A	GIS
	X110B – SGT1B	4000A	63kA, 1s	N/A	GIS
	X1305 – Kemsley - Rowdown 1	4000A	63kA, 1s	N/A	GIS
Additional Information	GIS Circuit breakers shall be provided as detailed on the Single Line Diagram reference PDD-20696-SLD-001.				

DISCONNECTORS & EARTH SWITCHES				
Substation Name	Equipment Voltage (kV)	Circuit Nomenclature	Disconnecter Requirements	Earth Switch Requirements
Littlebrook	400	SGT2B	X213B, X214B, X216B	X211B2: Class E1 X211B1, X211B3, B211B4: Class E0
		SGT4B	X413B, X414B, X416B	X411B1: Class E1 X411B2, X411B3: Class E0
		West Thurrock 1	X1203, X1204, X1206	X1201B: Class E1 X1201A, X1201C, X1201D: Class E0
		SGT6 (Hurst 2)	X613, X614, X616	X611B: Class E1 X611A, X611C, X611D: Class E0
		Kemsley - Rowdown 2	X1003, X1004, X1006	X1001B: Class E1

				X1001A, X1001C, X1001D: Class E0	
		Main Bus Section 4	X424, X428	X521, X421C: Class E1 X421A, X421B: Class E0	
		Reserve Bus Section 4	X466, X469	X561, X461C: Class E1 X461A, X461B: Class E0	
		Bus Coupler 5	X534, X536	X531A, X531B: Class E0	
		SGT3 (Hurst 1)	X313, X314, X316	X311B: Class E1 X311A, X311C, X311D: Class E0	
		West Thurrock 2	X1103, X1104, X1106	X1101B: Class E1 X1101A, X1101C, X1101D: Class E0	
		SGT1B	X113B, X114B, X116B	X111B1: Class E1 X111B2, X111B3: Class E0	
		Kemsley - Rowdown 1	X1303, X1304, X1306	X1301B: Class E1 X1301A, X1301C, X1301D: Class E0	
		Reserve Bus 4	X461D	X461D: Class E1	
		Main Bus 4	X421D	X421D: Class E1	
		Reserve Bus 5	X561B	X561B: Class E1	
		Main Bus 5	X521B	X521B: Class E1	
	275	Hurst 2	T63	T61, L61: Class E0	
		Hurst 1	T33	T31, L31: Class E0	
	132	SGT2B		281B1: Class E0	
		SGT4B		481B1: Class E0	
		SGT1B		181B1: Class E0	
	Additional Information	All earth switches and disconnectors shall be provided in accordance with the requirements of TS3.2.2.			
		GIS earth switches and disconnectors shall be provided as detailed in SLD ref: PDD-20696-SLD-001. All busbar disconnectors shall be rated for bus transfer duty as detailed in the relevant section of TS 3.02.02.			
		The 275kV earth switch/disconnector/earth switch for the two Hurst circuits shall be re-located from the existing substation			

	<p>For cable feeder bays in the new GIS (for now it is assumed the SGT3 circuit unless the <i>Contractor</i> changes the layout design), removable links in the busbar shall be provided adjacent the Cable/ GIS bushing with facility for a temporary earth to be applied to facilitate cable testing. This shall be done without degassing additional equipment on the GIS side of the links. Any VTs connected to the GIS at this point shall be disconnectable via removable links or a disconnector to allow cable testing. The <i>Contractor</i> shall provide a layout plan for the positioning of HV test equipment.</p> <p>The new AIS earth switches on the Kemsley-Rowdown circuits shall be of the standard type (no overhead line induced current switching required) and shall be interlocked with the FES on the line side of the line disconnectors so that the FES must be closed before the line earth switches. Earth switches for the West Thurrock circuits shall be transferred from the existing substation – as these are also standard type, the interlocking arrangement detailed above shall also apply.</p>
--	---

BUSBARS			
Substation Name	Equipment Voltage (kV)	Busbar Requirements	Pollution Requirements
Littlebrook	400	New busbars and associated clamps & connectors shall be installed to connect all new equipment as shown on the associated layout & elevation drawings.	DD IEC/TS 60815-1 2008, Class e
	275		
	132		
Additional Information	<p>All busbars shall be designed and dimensioned in accordance with the requirements of TS 3.1.4</p> <p>Clamps and Components: Type registered fixed/expandable clamps/connectors shall be provided in accordance with TS 3.1.5 to connect all busbars to new and existing plant and equipment as necessary.</p> <p>All insulators associated with the plant and equipment shall be in accordance with National Grid TS 3.2.9 and of a rating to suit the required static and dynamic loads.</p> <p>The lengths of busbars/conductors, quantity of clamps and connectors shall be determined during Detailed Design Stage.</p> <p>Where the AIS busbars cross the proposed new access roads, sufficient clearance shall be provided for all anticipated vehicles (during construction and for all future maintenance).</p> <p>All GIB runs and associated support structures shall be designed to allow MEWP and crane access to all areas requiring maintenance in line with the TS safety clearances, and to allow replacement of any components in line with the outage requirements of TS 2.1.</p> <p>Any redundant busbar shall be identified for possible re-use during detailed design.</p> <p>The <i>Contractor</i> may consider alternative connection arrangements, for example AIS busbar or cable in lieu of GIS busbar as identified in the development drawings if this presents a cost, program and reduced outage benefit.</p> <p>The <i>Contractor</i> may consider using the ex-Tilbury GIB from the Packing List provided the <i>Contractor</i> undertakes the required design and conditional assessment. The</p>		

	<i>Contractor</i> is also responsible for transport of the GIB to be used and ordering any additional GIB required to complete the design.
--	--

SURGE ARRESTERS			
Substation Name	Equipment Voltage (kV)	Surge Arrester Location	Requirements
Littlebrook	400	West Thurrock 1	AIS (existing re-used)
		West Thurrock 2	AIS (existing re-used)
		Kemsley / Rowdown 1	AIS
		Kemsley / Rowdown 2	AIS
		SGT2B HV Side	AIS (existing re-used)
		SGT3 HV Side	AIS (existing re-used)
		SGT6 HV Side	AIS (existing re-used)
		SGT1B HV Side	GIS
		SGT4B HV Side	GIS
	275	SGT3 LV Side	AIS (existing re-used)
		SGT6 LV Side	AIS (existing re-used)
	132	SGT1B LV Side	AIS
		SGT2B LV Side	AIS (existing re-used)
		SGT4B LV Side	AIS
Additional Information	<p>Refer to TS 3.02.03 Table 1 for specific requirements. High frequency earth rods shall be installed for all Surge Arrestors.</p> <p>The existing 275kV surge arresters for SGT3 and SGT6 are underslung from the gantries, however shall be conventionally mounted on new structures for the new substation. The <i>Contractor</i> shall confirm that the surge arresters are suitable for installation in this configuration.</p>		

CT, VT & LINE TRAPS					
Substation Name	Equipment Voltage (kV)	Circuit Nomenclature	CT Requirements & Location	VT Requirements & Location	Line Trap Requirements
Littlebrook	400	SGT2B	7-Core GIS: The two 500/1 metering class CTs are not suitable for use on this circuit as the secondary current rating will be exceeded . The metering		

			CTs will either need to be removed from the CT pack, or alternatively used on another circuit such as a 240MVA SGT circuit.			
		SGT4B	5-Core GIS			
		West Thurrock 1	5-Core GIS	Three Phase GIS WVT		
		SGT6 (Hurst 2)	5-Core GIS	Single Phase GIS WVT		
		Kemsley - Rowdown 2	5-Core GIS	Three Phase GIS WVT		
		Main Bus Section 4	2-Core GIS (MBB4 Side) 2-Core GIS (MBB5 side)			
		Reserve Bus Section 4	2-Core GIS (RBB4 Side) 2-Core GIS (RBB5 side)			
		Bus Coupler 5	2-Core GIS (RBB5 Side) 2-Core GIS (MBB5 side)			
		SGT3 (Hurst 1)	7-Core GIS: The two 500/1 metering class CTs are not suitable for use on this circuit as the secondary current rating will be exceeded . The metering CTs will either need to be removed from the CT pack, or alternatively used on another circuit such as a 240MVA SGT circuit.	Single Phase GIS WVT		
		West Thurrock 2	5-Core GIS	Three Phase GIS WVT		
		SGT1B	5-Core GIS			
		Kemsley - Rowdown 1	5-Core GIS	Three Phase GIS WVT		
	275	Hurst 1	5 core AIS	Three phase AIS CVT		
		Hurst 2	5 core AIS	Three phase AIS CVT		

Additional Information	<p>All CTs shall be provided in accordance with TS 3.2.4 and VTs in accordance with TS 3.2.5. Refer to the KLD for specific requirements of CTs and VTs.</p> <p>Un-used CT cores shall be shorted out in accordance with TS 3.01.04.</p> <p>All CT & VT chambers were originally designed for and supplied with the ex-Tilbury GIS equipment. Any that are not required for this project shall not be installed. The <i>Contractor</i> shall be responsible to make the required modifications to the switchgear through the OEM, including but not limited to design and supply of blanking plates, modifications to gas barriers and gas monitoring systems.</p>
-------------------------------	--

SURPLUS SWITCHGEAR			
Substation Name	Equipment Voltage (kV)	Circuit / Equipment	Storage Location or Disposal Considerations
Littlebrook	400	X105 X120 X130 X190 X205 X220 X290 X310 X330 X390 X410 X605 X805	Left in situ
Additional Information	N/A		

ADDITIONAL TRANSFORMERS, REACTORS & QUADRATURE BOOSTERS				
Substation Name	Equipment			Voltage(s) (kV)
Littlebrook	SGT1B - New bulk purchase 7 transformers			400/132/13
Circuit Identity	Vector Group	Nominal Rating	Cyclic Rating	Phase Connections
SGT1B	YNa0d11	240MVA	To TS 2.3	
Tap Changer (On-Load / Off Load)	No. Of Taps	Tapping Range	% Reactance (on Nominal Rating at nominal Tap)	Impedance Variation Across Tapping Range
On-load	15	+15%/-5%	TBC	GIS (HV) AIS (LV)
Tertiary Rating (kV / MVA)	Tertiary Connections	Earthing Arrangements	Surge Arrester Requirements	Ferroresonance Requirements
13kV/ 60MVA	Open Delta	Standard	On HV and LV Sides.	N/A
Additional Information	SGT1B is identified on the development drawings as GIS connected			
	The development drawings identify SGT1B as a bulk purchase 6 design unit, however the unit will be a bulk purchase 7 Hyundai unit.			
	The transformer will be delivered to site, assembled and Stage one commissioned by the <i>Employer's</i> SGT Supplier as defined in TP211. Connection to the system and Stage two commissioning shall be completed by the <i>Contractor</i> . The <i>Contractor's</i> Commissioning Engineer shall also be responsible for overseeing stage 1 commissioning and signing the SCT sheet on behalf of the Bulk Purchase Supplier.			
	The <i>Contractor</i> shall be responsible for incorporating all the SGT drawings into its detail design as well as for the final as-built drawings submission.			
TRANSFORMER SPECIFICATION				
Additional Information	The <i>Employer</i> shall provide the <i>Contractor</i> with the generic transformer drawings (for SGT1B) which is being sourced through the Bulk Purchase Framework 7. The <i>Contractor</i> shall be responsible for confirming all transformer details as required to meet the requirements of the Substation detailed design.			
Requirement		Document Details	Details	
Schedule 9.19A: General And Technical Details (Technical Data)				
			Document Location	
Schedule 9.19B: General and Technical Details (Technical Data)				
			Document Location	

Schedule 9.19C: General and Technical Details (Test Data)		
		Document Location

RELOCATED TRANSFORMERS, REACTORS & QUAD BOOSTERS				
Substation Name	Equipment			Voltage(s) (kV)
Littlebrook	Existing SGT3 transferred from existing site Siemens MTAN8556 T7154			400/275/13
Circuit Identity	Vector Group	Nominal Rating	Cyclic Rating	Phase Connections
SGT3	YNa0d11	950MVA	TBC	AIS
Tap Changer (On-Load / Off Load)	No. Of Taps	Tapping Range	% Reactance (on Nominal Rating at nominal Tap)	Impedance Variation Across Tapping Range
n/a	n/a	n/a	25.3%	n/a
Tertiary Rating (kV / MVA)	Tertiary Connections	Earthing Arrangements	Surge Arrester Requirements	Ferroresonance Requirements
13kV/ 60MVA	Open Delta	Standard	On HV and LV Sides.	N/A
Additional Information	<p>SGT3 shall be re-located from the existing substation by the <i>Contractor</i> as part of the works.</p> <p>The <i>Contractor</i> shall review the Conservator/Bucholz access of the relocated SGTs to comply with clause 1.38.1.d of Issue 6 of TS2.03 and relevant IECs (and other clauses as applicable). The <i>Contractor</i> may adapt and re-use existing.</p>			

RELOCATED TRANSFORMERS, REACTORS & QUAD BOOSTERS				
Substation Name	Equipment			Voltage(s) (kV)
Littlebrook	Existing SGT4A transferred from existing site Siemens MTAN8556 T7153			400/275/13
Circuit Identity	Vector Group	Nominal Rating	Cyclic Rating	Phase Connections
SGT6	YNa0d11	950MVA	TBC	AIS
Tap Changer	No. Of Taps	Tapping Range	% Reactance (on Nominal Rating at nominal Tap)	Impedance Variation Across Tapping Range

(On-Load / Off Load)				
n/a	n/a	n/a	25.3%	n/a
Tertiary Rating (kV / MVA)	Tertiary Connections	Earthing Arrangements	Surge Arrester Requirements	Ferroresonance Requirements
13kV/ 60MVA	Open Delta	Standard	On HV and LV Sides.	N/A
Additional Information	<p>The <i>Contractor</i> shall relocate SGT4A from the existing substation as part of the works. The transformer shall be re-installed as SGT6 – all labelling and drawings associated with the transformer shall be updated to reflect the change in nomenclature by the <i>Contractor</i>.</p> <p>The <i>Contractor</i> shall review the Conservator/Bucholz access of the relocated SGTs to comply with clause 1.38.1.d of Issue 6 of TS2.03 and relevant IECs (and other clauses as applicable). The <i>Contractor</i> may adapt and re-use existing.</p>			

RELOCATED TRANSFORMERS, REACTORS & QUAD BOOSTERS				
Substation Name	Equipment			Voltage(s) (kV)
Littlebrook	Existing SGT2B transferred from existing site Siemens Type TAQ-185R44U9L-99 T7288			400/132/13
Circuit Identity	Vector Group	Nominal Rating	Cyclic Rating	Phase Connections
SGT2B	YNa0d11	240MVA	TBC	AIS
Tap Changer (On-Load / Off Load)	No. Of Taps	Tapping Range	% Reactance (on Nominal Rating at nominal Tap)	Impedance Variation Across Tapping Range
On-load	15	+15%/-5%	18.88%	AIS
Tertiary Rating (kV / MVA)	Tertiary Connections	Earthing Arrangements	Surge Arrester Requirements	Ferroresonance Requirements
13kV/ 60MVA	Open Delta	Standard	On HV and LV Sides.	N/A
Additional Information	<p>SGT2B shall be re-located from the existing substation by the <i>Contractor</i> as part of the <i>works</i>.</p> <p>The <i>Contractor</i> shall review the Conservator/Bucholz access of the relocated SGTs to comply with clause 1.38.1.d of Issue 6 of TS2.03 and relevant IECs (and other clauses as applicable). The <i>Contractor</i> may adapt and re-use existing.</p>			

RELOCATED TRANSFORMERS, REACTORS & QUAD BOOSTERS				
Substation Name	Equipment			Voltage(s) (kV)
Littlebrook	Existing SGT4B transferred from existing site Hawker Siddely ref. H871217 T6800			400/132
Circuit Identity	Vector Group	Nominal Rating	Cyclic Rating	Phase Connections
SGT4B	YNa0	240MVA	TBC	GIS (HV) AIS (LV)
Tap Changer (On-Load / Off Load)	No. Of Taps	Tapping Range	% Reactance (on Nominal Rating at nominal Tap)	Impedance Variation Across Tapping Range
On-load	15	+15%/-5%	TBC	AIS
Tertiary Rating (kV / MVA)	Tertiary Connections	Earthing Arrangements	Surge Arrester Requirements	Ferroresonance Requirements
N/A	n/a	Standard	On HV and LV Sides.	N/A
Additional Information	SGT4B shall be re-located from the existing substation by the <i>Contractor</i> as part of the works.			

SURPLUS TRANSFORMERS, REACTORS & QUAD BOOSTERS				
Substation Name	Equipment Voltage (kV)	Equipment Item	Circuit / Identity	Storage Location or Disposal Considerations
Littlebrook	400	SGT1B	T6645	Left in situ
Additional Information	As part of the replacement process, TGN(AR)007, TP217 and PS(T)094 require that the tear down analysis (post-mortem forensics) is carried out to validate the condition assessment that indicated replacement was required. The <i>Employer</i> will perform these tests and the <i>Contractor</i> shall coordinate these works within the programme.			

ADDITIONAL REACTIVE COMPENSATION – N/A				
Substation Name		Equipment Item	Equipment Voltage (kV)	Circuit / Identity
N/A				
Point of Connection		Rating (Lag / Lead VArS)	Damping Network Requirements	
Additional Information	N/A			

RELOCATED REACTIVE COMPENSATION – N/A				
Source Substation Name	Destination Substation Name	Equipment Item	Equipment Voltage (kV)	Circuit / Identity
N/A				
Point of Connection		Rating (Lag / Lead VArS)	Damping Network Requirements	
Additional Information	N/A			

4.2.3 Construction Design Specification: Protection, Control and Telecoms (CDS-PCT)

Summary of the works:

The *Contractor* shall provide new or modify existing protection and control equipment in line with PDD-20696-KLD-001, PDD-20696-KLD-002 sh.1 OF 2, PDD-20696-KLD-003 sh.2 OF 2, PDD-20696-KLD-003, PDD-20696-KLD-004, PDD-20696-KLD-005 and PDD-20696-KLD-006.

At the new Littlebrook 400kV Substation, the following new protection and control equipment shall be provided, installed and commissioned. All protection settings shall be produced in line with DH 29, TP107, PS(T)10 and other associated DHs, specifications and guidance.

Feeder Protection:

- 275kV Hurst 1 Feeder
- 275kV Hurst 2 Feeder

Transformer Protection:

- Super Grid Transformer 1B (SGT 1B) New 400/132kV 240MVA
- Super Grid Transformer 2B (SGT 2B) 400/132kV 240MVA (T7288)
- Super Grid Transformer 3 (SGT 3) 400/275kV 950MVA (T7154)
- Super Grid Transformer 4B (SGT 4B) 400/132kV 240MVA (T6800)
- Super Grid Transformer 6 (SGT 6) 400/275kV 950MVA (T7153)

Coupler/Section Protection:

- Main Bus Section 4
- Reserve Bus Section 4
- Bus Coupler 5

At Littlebrook 400kV Substation, the following Feeder Protection and control equipment shall be recovered from the existing substation, installed and commissioned in the new Substation:

- 400kV West Thurrock 1 Feeder
- 400kV West Thurrock 2 Feeder
- 400kV Kemsley-Rowdown 1 Feeder
- 400kV Kemsley-Rowdown 2 Feeder

It is acceptable that all feeder protections which are reused shall be compliant with legacy policy and technical specifications which were applicable at the time the Standard Bay Solutions were installed. There is no requirement to amend the protection solutions in line with current policy.

Common Systems at Littlebrook:

Busbar protection shall be either a brand new Distributed Busbar protection solution as per TS3.24.34 Issue 3 or a Centralised Busbar protection solution as per draft TS 3.24.34 Issue 4, which is attached at appendix BM. The *Contractor* shall provide details of their proposed solution as part of the tender return highlighting any reduction in number of IEDs, busbar protection panels and cost. If the *Contractor* opts to provide a new numerical Centralised Busbar protection it shall comply with the requirements of Draft TS 3.24.34 Issue 4.

- All the new protection panels provided shall be NG type registered standard bay solutions and installed in the new Littlebrook 400kV GIS central relay room.
- All new feeder protections shall be compatible with Optel network and latest version of PS(T)010, all relevant PS(T), TS / TGN / DH / EB's and all other respective addendums.
- Metering system, SCS and OTS shall be provided as specified under respective sections of this document.
- Remote Asset Management and Monitoring shall be installed in line with TS 3.24.23 requirement.
- New GIS bays LCC shall be installed at suitable locations in the GIS building.
- All multi-core cables for the entire substation project shall be provided.
- All fibre optic cables as required for Protection, SCS and communication shall be provided. Multicore cables and fibre optic cables shall be installed primarily in concrete cable troughs.

Remote end substations:

At the Hurst 275kV Substation, the following new protection and control equipment shall be provided, installed and commissioned:

Feeder Protection:

- 275kV Littlebrook 1
- 275kV Littlebrook 2

At the remote end substation, new settings shall be calculated and implemented on the following Feeder Protection Schemes:

At West Thurrock 400kV Substation:

- 400kV Littlebrook 1
- 400kV Littlebrook 2

At Kemsley 400kV Substation:

- 400kV Littlebrook-Rowdown 1
- 400kV Littlebrook-Rowdown 2

At Rowdown 400kV Substation:

- 400kV Kemsley-Littlebrook 1
- 400kV Kemsley-Littlebrook 2

KEY DESIGN ASSUMPTIONS

Setting changes are workable.

It is assumed the existing GPS receivers, antennas at West Thurrock, Kemsley and Rowdown can be reused for feeder protection time synchronisation.

The *Contractor* shall note that FAT is not required to be carried out on the P&C and /or relocated equipment from the existing Littlebrook Site.

FEEDER PROTECTION							
Main Protection							
Substation Name	Feeder Voltage (kV)	Feeder Name	1 st Main or 2 nd Main	New / Existing	Protection Type & Comms Link	Protection Signal Type & Comms Link	Intertrip Type & Comms Link
Littlebrook	275	Hurst 1	1 st Main	New	Numerical two ended – Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Littlebrook	275	Hurst 1	2 nd Main	New	Numerical two ended– Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Littlebrook	275	Hurst 2	1 st Main	New	Numerical two ended– Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Littlebrook	275	Hurst 2	2 nd Main	New	Numerical two ended– Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Littlebrook	400	West Thurrock 1	1 st Main	Existing	Numerical two ended– Unit protection, type P545	X21 over OPTEL network (see Notes)	Integral
Littlebrook	400	West Thurrock 1	2 nd Main	Existing	Numerical two ended Blocked – Non Unit protection, type P443	X21 over OPTEL network (see Notes)	Integral
Littlebrook	400	West Thurrock 2	1 st Main	Existing	Numerical two ended– Unit protection, type P545	X21 over OPTEL network (see Notes)	Integral
Littlebrook	400	West Thurrock 2	2 nd Main	Existing	Numerical two ended Blocked –	X21 over OPTEL	Integral

					Non Unit protection, type P443	network, (see Notes)	
Littlebrook	400	Kemsley-Rowdown 1	1 st Main	Existing	Numerical three ended–Unit protection, type 7SD522	X21 over OPTEL network, (see Notes)	Integral
Littlebrook	400	Kemsley-Rowdown 1	2 nd Main	Existing	Numerical three ended Blocked – Non Unit protection, type 7SA522	X21 over OPTEL network, (see Notes)	Integral
Littlebrook	400	Kemsley-Rowdown 2	1 st Main	Existing	Numerical three ended–Unit protection, type 7SD522	X21 over OPTEL network, (see Notes)	Integral
Littlebrook	400	Kemsley-Rowdown 2	2 nd Main	Existing	Numerical three ended–Blocked Non Unit protection, type 7SA522	X21 over OPTEL network, (see Notes)	Integral
Littlebrook	400/13 2	SGT1B (new Bulk purchase unit)	HV Connection Protection	New	Numerical	N/A	N/A
Littlebrook	400/13 2	SGT1B (new Bulk purchase unit)	Overall Differential Protection	New	Numerical	N/A	N/A
Littlebrook	400/13 2	SGT1B (new Bulk purchase unit)	Restricted Earth Fault	New	Numerical	N/A	N/A
Littlebrook	400/13 2	SGT2B (T7288)	HV Connection Protection	New	Numerical	N/A	N/A
Littlebrook	400/13 2	SGT2B (T7288)	Overall Differential	New	Numerical	N/A	N/A

			I & REF Protection				
Littlebrook	400/275	SGT3 (T7154)	HV Connection Protection	New	Numerical	N/A	N/A
Littlebrook	400/275	SGT3 (T7154)	Overall Differential I & REF Protection	New	Numerical	N/A	N/A
Littlebrook	400/132	SGT4B (T6800)	HV Connection Protection	New	Numerical	N/A	N/A
Littlebrook	400/132	SGT4B (T6800)	Overall Differential I & REF Protection	New	Numerical	N/A	N/A
Littlebrook	400/275	SGT6 (T7153)	HV Connection Protection	New	Numerical	N/A	N/A
Littlebrook	400/275	SGT6 (T7153)	Overall Differential I & REF Protection	New	Numerical	N/A	N/A
Hurst	275	Littlebrook 1	1 st Main	New	Numerical two ended – Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Hurst	275	Littlebrook 1	2 nd Main	New	Numerical two ended– Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Hurst	275	Littlebrook 2	1 st Main	New	Numerical two ended– Unit protection	Digital channels in accordance with TS 3.24.20.	Integral
Hurst	275	Littlebrook 2	2 nd Main	New	Numerical two ended–	Digital channels in accordance	Integral

					Unit protection	with TS 3.24.20.	
--	--	--	--	--	-----------------	------------------	--

Substation Name	Feeder Voltage (kV)	Feeder Name	Requirements
Littlebrook	275	Hurst 1	Non-unit protection with zone1 disabled, Backup Earth Fault Protection Integral in FM & SM Prot. relay or standalone equipment — New
Littlebrook	275	Hurst 2	Non-unit protection with zone1 disabled, Backup Earth Fault Protection Integral in FM & SM Prot. relay or standalone equipment — New
Hurst	275	Littlebrook 1	Non-unit protection with zone1 disabled, Backup Earth Fault Protection Integral in FM & SM Prot. relay or standalone equipment — New
Hurst	275	Littlebrook 2	Non-unit protection with zone1 disabled, Backup Earth Fault Protection Integral in FM & SM Prot. relay or standalone equipment — New
Littlebrook	400	West Thurrock 1	Backup Earth Fault Protection Integral in FM & SM Prot. Relay - Existing
Littlebrook	400	West Thurrock 2	Backup Earth Fault Protection Integral in FM & SM Prot. Relay - Existing
Littlebrook	400	Kemsley-Rowdown 1	Backup Earth Fault Protection Integral in FM & SM Prot. Relay - Existing
Littlebrook	400	Kemsley-Rowdown 2	Backup Earth Fault Protection Integral in FM & SM Prot. Relay - Existing
Littlebrook	400/275	SGT3	New HV Backup protection with 2 stage OC, HSOC
Littlebrook	400/275	SGT6	New HV Backup protection with 2 stage OC, HSOC
Littlebrook	400/132	SGT1B	New HV Backup protection with 2 stage OC, HSOC
Littlebrook	400/132	SGT2B	New HV Backup protection with 2 stage OC, HSOC
Littlebrook	400/132	SGT4B	New HV Backup protection with 2 stage OC, HSOC
Additional Information	<p>The existing feeder protection for West Thurrock 1 & 2 and Kemsley – Rowdown 1 & 2 has X21 interface to the MUX and the Unit protection is GPS synchronised. It is acceptable to retain the X21 interface to the new MUX and relocate the Communications converters to the new Telecommunications Room. Settings changes will be required on the Unit protection to change to Telegram mode, as per EMI instructions.</p> <p><u>At Littlebrook Substation:</u></p> <p><u>275kV Hurst 1 Feeder:</u></p>		

The following new protection and control equipment shall be provided for Hurst feeder circuit in accordance with TS 3.24.7, PS(T)10, other associated specifications, DHs and all other addendums:

- First Main protection (Unit Protection)
- Second Main Protection (Unit Protection)
- Integral Back-up Distance protection and Backup Earth Fault protection in the both the Unit Protection Relays
- Phases Unbalanced
- Integral Fault Recording
- Two separately routed communication channels

275kV Hurst 2 Feeder:

The following new protection and control equipment shall be provided for Hurst feeder circuit in accordance with TS 3.24.7, PS(T)10, other associated specifications, DHs and all other addendums:

- First Main protection (Unit Protection)
- Second Main Protection (Unit Protection)
- Integral Back-up Distance protection and Backup Earth Fault protection in both the Unit Protection Relays
- Phases Unbalanced
- Integral Fault Recording
- Two separately routed communication channels

400kV West Thurrock 1 Feeder:

The following existing protection and control equipment shall be dismantled from the existing relay room and re-installed in the relay room at the new GIS Substation:

- First Main protection (Unit Protection-P545) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (2-ended Blocked Non-Unit Protection-P443) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision
- Two separately routed communication channels

The following shall be a new protection for the feeder bay:

- Busbar Protection and integral Circuit Breaker Fail Protection
- Bay Control Unit, Sync, DAR

400kV West Thurrock 2 Feeder:

The following existing protection and control equipment shall be dismantled from the existing relay room and re-installed in the relay at the new GIS Substation:

- First Main protection (Unit Protection-P545) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision

- Second Main Protection (2-ended Blocked Non-Unit Protection-P443) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision
- Two separately routed communication channels

The following shall be a new protection for the feeder bay:

- Busbar Protection and integral Circuit Breaker Fail Protection
- Bay Control Unit, Sync, DAR

400kV Kemsley-Rowdown 1 Feeder:

The following existing protection and control equipment shall be dismantled from the existing relay room and re-installed in the relay room of the new GIS Substation:

- First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision
- Bay Control Unit (7SJ645), Sync, DAR, (CB Fail function to be disabled)
- Two separately routed communication channels

The following shall be a new protection for the feeder bay:

- Busbar Protection and integral Circuit Breaker Fail Protection

400kV Kemsley-Rowdown 2 Feeder:

The following existing protection and control equipment shall be dismantled from the existing relay room and re-installed in the relay room of the new GIS Substation:

- First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision
- Bay Control Unit (7SJ645), Sync, DAR, (CB Fail function to be disabled)
- Two separately routed communication channels

The following shall be a new protection for the feeder bay:

- Busbar Protection and integral Circuit Breaker Fail Protection

Supergrid Transformer 1B (SGT1B) New 400/132kV 240MVA:

The following new protection and control equipment shall be provided at the new GIS Substation for new SGT1B circuit in accordance with TS 3.24.8 and other associated specifications:

- Single Numerical Overall Protection Relay consisting of Biased Differential Protection, Restricted Earth Fault Protection and Fault Recorder functions

- Numerical HV Back-up Protection Relay consisting of HSOC, 2 Stage 3 phase Overcurrent, Phases Unbalanced and Fault Recorder functions
- Numerical HV Connections Protection Relay consisting of Low Impedance Current Differential Protection, CT Supervision and Fault Recorder functions.
- Mechanical Protections
- Busbar Protection and integral Circuit Breaker Fail Protection

The following existing protections shall be connected to the CTs associated with new SGT1B:

- LV Connections Protection (P634)

The following existing protection at Littlebrook 132kV Substation shall be retained and re-used for SGT1B. Relay setting calculations and drawings shall be revised, as required:

- LV Connections Protection (P634)
- LV Back-up Protection (P143), backup Earth Fault, Sync, Interlocked OC

Supergrid Transformer 2B (SGT2B) 400/132kV 240MVA (T7288):

The following new protection and control equipment shall be provided at the new GIS Substation for new SGT2B circuit in accordance with TS 3.24.8 and other associated specifications:

- Single Numerical Overall Protection Relay consisting of Biased Differential Protection, Restricted Earth Fault Protection and Fault Recorder functions
- Numerical HV Back-up Protection Relay consisting of HSOC, 2 Stage 3 phase Overcurrent, Phases Unbalanced and Fault Recorder functions
- Numerical HV Connections Protection Relay consisting of Low Impedance Current Differential Protection, CT Supervision and Fault Recorder functions.
- Mechanical Protections
- Busbar Protection and integral Circuit Breaker Fail Protection

The following existing protections shall be connected to the CTs associated with SGT2B:

- LV Connections Protection (P634)

The following existing protection at Littlebrook 132kV Substation shall be retained and re-used for SGT2B. Relay setting calculations and drawings shall be revised, as required:

- LV Connections Protection (P634)
- LV Back-up Protection (P143), backup Earth Fault, Sync, Interlocked OC

Supergrid Transformer 3 (SGT3) 400/275kV 950MVA (T7154):

The following new protection and control equipment shall be provided at the new GIS Substation for new SGT3 circuit in accordance with TS 3.24.8 and other associated specifications:

- Single Numerical Overall Protection Relay consisting of Biased Differential Protection, Restricted Earth Fault Protection and Fault Recorder functions
- Numerical HV Back-up Protection Relay consisting of HSOC, 2 Stage 3 phase Overcurrent, Phases Unbalanced and Fault Recorder functions

- Numerical HV Connections Protection Relay consisting of Low Impedance Current Differential Protection, CT Supervision and Fault Recorder functions.
- HV CB DAR Unit and Synchronisation
- Mechanical Protections
- Busbar Protection and integral Circuit Breaker Fail Protection

Protections on the LV side of the SGT have been listed under 275kV Hurst 1 circuit.

Supergrid Transformer 4B (SGT4B) 400/132kV 240MVA (T6800):

The following new protection and control equipment shall be provided at the new GIS Substation for new SGT4B circuit in accordance with TS 3.24.8 and other associated specifications:

- Single Numerical Overall Protection Relay consisting of Biased Differential Protection, Restricted Earth Fault Protection and Fault Recorder functions
- Numerical HV Back-up Protection Relay consisting of HSOC, 2 Stage 3 phase Overcurrent, Phases Unbalanced and Fault Recorder functions
- Numerical HV Connections Protection Relay consisting of Low Impedance Current Differential Protection, CT Supervision and Fault Recorder functions.
- Mechanical Protections
- Busbar Protection and integral Circuit Breaker Fail Protection

The following existing protections shall be connected to the CTs associated with SGT4B:

- LV Connections Protection (P634)

The following existing protection at Littlebrook 132kV Substation shall be retained and re-used for SGT4B. Relay setting calculations and drawings shall be revised, as required:

- LV Connections Protection (P634)
- LV Back-up Protection (P143), backup Earth Fault, Sync, Interlocked OC

Supergrid Transformer 6 (SGT6) 400/275kV 750MVA (T7153):

The following new protection and control equipment shall be provided at the new GIS Substation for new SGT6 circuit in accordance with TS 3.24.8 and other associated specifications:

- Single Numerical Overall Protection Relay consisting of Biased Differential Protection, Restricted Earth Fault Protection and Fault Recorder functions
- Numerical HV Back-up Protection Relay consisting of HSOC, 2 Stage 3 phase Overcurrent, Phases Unbalanced and Fault Recorder functions
- Numerical HV Connections Protection Relay consisting of Low Impedance Current Differential Protection, CT Supervision and Fault Recorder functions.
- Mechanical Protections
- Busbar Protection and integral Circuit Breaker Fail Protection

Protections on the LV side of the SGT have been listed under 275kV Hurst 2 circuit.

At Hurst 275kV Substation**275kV Littlebrook 1:**

The following new protection and control equipment shall be provided:

- First Main protection (Unit Protection)
- Second Main Protection (Unit Protection)
- Integral Back-up Distance protection and Backup Earth Fault protection in the both the Unit Protection Relays
- Phases Unbalanced
- Integral Fault Recording
- Two separately routed communication channels

275kV Littlebrook 2:

The following new protection and control equipment shall be provided:

- First Main protection (Unit Protection)
- Second Main Protection (Unit Protection)
- Integral Back-up Distance protection and Backup Earth Fault protection in the both the Unit Protection Relays
- Phases Unbalanced
- Integral Fault Recording
- Two separately routed communication channels

The new feeder protection panels provided shall be NG type registered standard bay solutions.

All feeder protections shall be compatible with Optel network and latest version of PS(T)010 complying to all relevant PS(T), TS / TGN / DH / EB's and all other respective addendums.

All protection settings shall be produced in line with DH 29, TP107, PS(T)10 and other associated DHs, specifications and guidance. The existing multi-core cables shall be reused as much as possible. Fibre optic cables, as required, for new Protection and communication shall be provided.

The following site modifications will be required:

- The existing Littlebrook 1 and Littlebrook 2 feeder protection panels to be dismantled.
- The existing connection to the standalone fault recorders shall be disconnected and the fault recording function shall be the internal function of numerical relays in the feeder SBS.
- The existing wall boxes of feeder protection panel shall be re-used as marshalling points.
- The existing VT fuse box to be retained but additional MCBs shall be installed in line with the requirement DH01.
- The *Contractor* shall assume that additional multicore cables and terminals can be accommodated in the existing marshalling boxes and wall boxes. The *Contractor* shall confirm this during detailed design.

BUS COUPLER AND BUS SECTION PROTECTION				
Substation Name	Voltage (kV)	Circuit / Bay	Details of New / replacement / Extensions	
			Bus Coupler	Bus Section
Littlebrook	400	Main Bus Section 4		Backup EF with 3-ph commissioning OC
Littlebrook	400	Reserve Bus Section 4		Backup EF with 3-ph commissioning OC
Littlebrook	400	Bus Coupler 5	Backup EF with 3-ph commissioning OC	
Additional Information	<u>Main Bus Section 4:</u> The following protection and control equipment shall be provided for the Bus Section Protection in accordance with TS 3.24.5 and other associated specifications: <ul style="list-style-type: none"> • Backup protection (Earth Fault Protection) • Commissioning Over Current Protection • CB Synchronisation • Phases Unbalanced • Integral Fault recording 			
	<u>Reserve Bus Section 4:</u> The following protection and control equipment shall be provided for the Bus Section Protection in accordance with TS 3.24.5 and other associated specifications: <ul style="list-style-type: none"> • Backup protection (Earth Fault Protection) • Commissioning Over Current Protection • CB Synchronisation • Phases Unbalanced • Integral Fault recording 			
	<u>Bus Coupler 5:</u> The following protection and control equipment shall be provided for the Bus Section Protection in accordance with TS 3.24.5 and other associated specifications: <ul style="list-style-type: none"> • Backup protection (Earth Fault Protection) • Commissioning Over Current Protection • CB Synchronisation • Phases Unbalanced • Integral Fault recording 			

BUSBAR PROTECTION & CIRCUIT BREAKER FAIL			
Substation Name	Voltage (kV)	Details of New / replacement / Extensions	
		Busbar Protection	Circuit Breaker Fail

Littlebrook	400	New Numerical Distributed Busbar protection solution as per TS 3.24.34 Issue 2 or a Centralised Busbar protection solution as per Draft TS 3.24.34 Issue 3 shall be offered for the new Littlebrook 400kV substation.	New CBF protection to be provided for the Circuit Breakers X1005, X1105, X1205, X1305, X210B, X410B, X610, X420, X460, X530, X310, X110B
Additional Information	<p>The CB Fail protection functionality shall be integral to the busbar protection.</p> <p>Existing Busbar protection at Littlebrook shall be de-commissioned.</p> <p>Existing CB Fail current check and timer relays at old Littlebrook 400kV Substation shall be de-commissioned. On the Kemsley–Rowdown 1 & 2 circuits, the Bay Control Units (7SJ645) are being relocated and re-used, the CB Fail protection shall be disabled in settings.</p>		

OTHER PROTECTION REQUIREMENTS

Substation Name	Voltage (kV)	Requirements
Littlebrook	400	<p>Temporary protection shall be provided for the Bus Connector 1 between the existing Substation and New Littlebrook GIS substation for the transfer of Kemsley-Rowdown 1 circuit and until the commissioning of West Thurrock 1.</p> <p>Temporary protection shall be provided for the Bus Connector 2 between the existing Substation Hurst 1/SGT3 circuit and New Littlebrook GIS substation SGT2B for the transfer of SGT3/Hurst 1 circuit and until the commissioning of SGT2B.</p>
Additional Information	<p>The <i>Contractor</i> shall provide temporary Low Impedance Current differential protection-1 and Current differential protection-2 with integrated Backup Earth Fault protection in both the protections at the new GIS Substation end, Section 4.</p> <p>At the existing Littlebrook Substation end, Section 2 (ex-Kemsley–Rowdown 1 bay), a new Circuit Breaker Unit relay shall be provided with Backup Earth Fault, and CB Fail.</p> <p>The Bus Connector 1 protection will be temporary protections for the duration of the circuit transfers. The <i>Contractor</i> shall consider the final removal of this protection and the installation of the relocated West Thurrock 1 feeder protection with regard to common marshalling point of secondary wiring, minimising disturbance of secondary wiring and re-testing and facilitating the protection change within outage duration.</p> <p>The Bus Connector 2 protection will be temporary protections for the duration of the circuit transfers. Existing HV connections will be connected to the new SGT2B bay as shown on the SLD/KLD. The <i>Contractor</i> shall consider the final removal of this protection and the installation of the new protections for the SGT2B minimising disturbance of secondary wiring and re-testing and facilitating the protection change within outage duration.</p> <p>Settings for the protections shall be provided by the <i>Contractor</i> for energisation of the Bus Connector 1 & 2 and shall be energised in accordance with approved</p>	

commissioning switching programmes which will be approved by the Commissioning Officer and ENCC in line with TP106. Commissioning Officer confirms acceptance of the Commissioning Strategy in DDD stage. These temporary protection panels shall be dismantled upon completion of the feeder. The Bus Connector 1 & 2 protection which becomes spare shall be offered to the *Project Manager* as spares.

Main Bus Section-4, Reserve Bus Section-4 and Bus Coupler-5 shall be provided with Backup protection (Earth Fault Protection), Circuit Breaker Fail Protection and Commissioning Over Current Protection.

At the remote end substations, new settings shall be calculated and implemented on the following Feeder Protection Schemes:

At West Thurrock 400kV Substation:

400kV Littlebrook 1:

Protection settings of the following existing protection Relays shall be carried out:

- First Main protection (Unit Protection-P545) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (2 ended Blocked Non-Unit Protection-P443) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision

400kV Littlebrook 2:

Protection settings of the following existing protection Relays shall be carried out:

- First Main protection (Unit Protection-P545) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (2 ended Blocked Non-Unit Protection-P443) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision

At Kemsley 400kV Substation:

400kV Littlebrook-Rowdown 1:

Protection settings of the following existing protection Relays shall be carried out:

- First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision

400kV Littlebrook-Rowdown 2:

Protection settings of the following existing protection Relays shall be carried out:

- First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision
- Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision

	<p><u>At Rowdown 400kV Substation:</u></p> <p><u>400kV Kemsley-Littlebrook 1:</u></p> <p>Protection settings of the following existing protection Relays shall be carried out:</p> <ul style="list-style-type: none"> • First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision • Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision <p><u>400kV Kemsley-Littlebrook 2:</u></p> <p>Protection settings of the following existing protection Relays shall be carried out:</p> <ul style="list-style-type: none"> • First Main protection (Three ended Unit Protection-7SD523) with integral Backup Earth Fault protection, Phases Unbalanced, Fault Recorder and VT Supervision • Second Main Protection (Three ended Blocked Non-Unit Protection-7SA522) with integral Backup Earth Fault protection, Switch On To Fault (SOTF), Fault Recorder, Phases Unbalanced, Fault Locator and VT Supervision.
--	--

AUTOMATIC CONTROL				
Function	Substation	Substation Voltage (kV)	Circuit / Identity	Requirements
DAR & Auto-switching	Littlebrook	400	West Thurrock 1	A new BCU shall be provided for Sync and DAR
	Littlebrook	400	West Thurrock 2	A new BCU shall be provided for Sync and DAR
	Littlebrook	400	Kemsley-Rowdown 1	The CB Fail & DAR relay (7SJ645) will be relocated from the existing Substation and reused at the new GIS Substation (See note 1).
	Littlebrook	400	Kemsley-Rowdown 2	The CB Fail & DAR relay (7SJ645) will be relocated from the existing Substation and reused at the new GIS Substation (See note 1).
	Littlebrook	400	SGT3	A new BCU shall be provided for Sync and DAR In accordance with TS3.24.16
	Littlebrook	400	SGT6	A new BCU shall be provided for Sync and DAR

				In accordance with TS3.24.16
Synchronising	Littlebrook	400	West Thurrock 1	A new BCU shall be provided for Sync and DAR
	Littlebrook	400	West Thurrock 2	A new BCU shall be provided for Sync and DAR
	Littlebrook	400	Kemsley-Rowdown 1	The CB Fail & DAR relay (7SJ645) will be relocated from the existing Substation and reused at the new GIS Substation (See note 1).
	Littlebrook	400	Kemsley-Rowdown 2	The CB Fail & DAR relay (7SJ645) will be relocated from the existing Substation and reused at the new GIS Substation (See note 1).
	Littlebrook	400	SGT3	A new BCU shall be provided for Sync and DAR in accordance with TS3.24.60
	Littlebrook	400	SGT6	A new BCU shall be provided for Sync and DAR in accordance with TS3.24.60
	Littlebrook	400	Main Bus Section 4	A new BCU shall be provided for Sync in accordance with TS3.24.60
	Littlebrook	400	Reserve Bus Section 4	A new BCU shall be provided for Sync in accordance with TS3.24.60
	Littlebrook	400	Bus Coupler 5	A new BCU shall be provided for Sync in accordance with TS3.24.60
Interlocking	Littlebrook	400	All	Interlocking system in accordance with TS 3.1.1 and TS 3.2.14
ATCC	Littlebrook	400	SGT1B, SGT2B and SGT4B	The existing SCS ATCC control function for the three 400/132kV SGT's shall be retained in the BBES GE Harris system and settings shall revised for the new SGT1B unit.
ARS	N/A			
OTS	Littlebrook	400	Grain - OTS1 and OTS2	

Additional Information	<p>The existing Grain OTS has remote monitoring of equipment at existing Littlebrook 400kV GIS Substation, type Siemens BC1703, monitors the status of four circuits, 400kV West Thurrock 1, 400kV West Thurrock 2, 400kV Kemsley-Rowdown 1 and 400kV Kemsley-Rowdown 2. The <i>Contractor</i> shall modify the Grain OTS scheme for this project and enable continued operation during the stage by stage works. The Grain OTS scheme will need to monitor status of equipment for all the four circuits in the new Littlebrook 400kV GIS Substation. The <i>Contractor</i> shall relocate the existing Littlebrook Substation OTS to new Littlebrook GIS Substation and recommission it. The <i>Contractor</i> shall note that planned depletion for duration required for relocation would not be permitted and the interim interfacing during circuit transfers would be deemed high risk. New OTS equipment should be provided at the new Littlebrook 400kV Substation, and operate in parallel (or overlay) with the existing site.</p> <p>OTS monitoring for the Bus Connectors is not required.</p> <p>Limited depletion of around 1 to 2 days would be required to update the master for new OTS.</p> <p>On the Kemsley-Rowdown 1 & 2 circuits, the CB Fail & DAR relay (7SJ645) is located on the 1st Main Protection panel and will be relocated and re-used. Setting changes will be required to disable CB Fail and enable Sync functions.</p>
-------------------------------	--

RECORDING & MONITORING EQUIPMENT				
Function	Substation	Substation Voltage (kV)	Circuit / Identity	Requirements
Cable Monitoring	Hurst	275	Littlebrook 1	Existing
	Hurst	275	Littlebrook 2	Existing
Transformer Monitoring	N/A			
Fault Recorder	Littlebrook	400	SGT1B	Shall be provided integral to protection relays in accordance with TS 3.24.71
	Littlebrook	400	SGT2B	Shall be provided integral to protection relays in accordance with TS 3.24.71
	Littlebrook	400	SGT3	Shall be provided integral to protection relays in accordance with TS 3.24.71
	Littlebrook	400	SGT4B	Shall be provided integral to protection relays in accordance with TS 3.24.71
	Littlebrook	400	SGT6	Shall be provided integral to protection relays in accordance with TS 3.24.71
	Littlebrook	400	275kV Hurst 1	Shall be provided integral to protection relays in accordance with TS 3.24.71

	Littlebrook	400	275kV Hurst 2	Shall be provided integral to protection relays in accordance with TS 3.24.71
Other (Describe)				
Additional Information	<p>The <i>Contractor</i> shall relocate and re-use the existing feeder protection for West Thurrock 1 & 2 and Kemsley-Rowdown 1 & 2, which has fault recording functions enabled.</p> <p>GPS timestamping signals shall be provided to all relay IEDs which have fault recording function. The <i>Contractor</i> shall install GPS antennas required for the time sync scheme at new Littlebrook 400kV Substation. Consideration shall be given to distribution of timestamping signals via one common scheme.</p>			

TELEPHONY SYSTEM

Substation Name	Voltage (kV)	Control Telephony	Data Links	PSTN Requirements
Littlebrook	400	Yes. New facility (Services details shall be determined during DDD)	Yes. New facility (Services detailed shall be determined during DDD)	Yes. New facility (Service details shall be determined during DDD)
Additional Information	Vodafone will need to provide the Business telephony for Littlebrook 400kV site incl. 1 x Business telephone exchange cabinet in the telecoms room. The <i>Employer</i> will engage Vodafone and the <i>Contractor</i> shall be responsible for interfacing and coordinating the design and site works.			

COMMUNICATION LINKS

Substation Name	Voltage (kV)	New Communication Link Requirements	Redundant / Surplus Communication Links
Littlebrook	400	<p>New protection, data, CTN, PSTN, LAN & WAN services shall be provided, including:</p> <ul style="list-style-type: none"> • Data Services – SCS IEMS/ DBU Main & Alternate • Protection Services for protection signalling and DTT channels between Littlebrook and West Thurrock 400kV. • Protection Services for protection signalling and DTT channels between Littlebrook and Kemsley 400kV. • Protection Services for protection signalling and DTT channels 	Existing communication links with Littlebrook-West Thurrock, Littlebrook-Kemsley, Littlebrook-Rowdown and Littlebrook-Hurst Substations shall be decommissioned and dismantled.

		<p>between Littlebrook and Rowdown 400kV.</p> <ul style="list-style-type: none"> Protection Services for protection signalling and DTT channels between Littlebrook and Hurst 275kV <p>New Protection service shall be provided in accordance with TS3.24.20 and Optel with AIS signal as per TS 3.24.18</p>	
Additional Information	<p><u>The <i>Employer's</i> list of scope to Others</u></p> <ol style="list-style-type: none"> Vodafone to provide the bulk of the Operational Telecommunications (Optel) installation for Littlebrook 400kV site including fibre from ODFs to 2 x MUX cabinets, 2 x Optel Miscellaneous cabinets and one cabinet for the Control Telephony system. Vodafone to provide the Control telephony for Littlebrook 400kV site incl. 1 x Control telephone exchange cabinet in the telecoms room. Vodafone to provide Control and Admin telephones, sounders and External Gate Phone. Vodafone to provide Business WAN links to Wokingham and Warwick Vodafone to provide the WAN links Verizon to install all business network WAN Router, and LAN infrastructure incl. all associated ducting, cabling and connection points. <p><u>The <i>Contractor's</i> list of scope and shall:</u></p> <ol style="list-style-type: none"> Design and install 110V DC supplies for the Operational Telecommunications equipment and business WAN services. Design and install all ducting, and install all data cabling, telemetry cabling, DC supplies cabling, 240V AC cabling in the substation, alarm and security systems incl. cabling, distribution points and line jacks for the work for Vodafone. NG will provide the outline design via TP133 App B drawings, modified as necessary to reflect the site specific installation. Design and install all ducting, and install business telephones, sounders and associated distribution points. Verify the status of communication links with Vodafone for Littlebrook-West Thurrock, Littlebrook-Kemsley, Littlebrook-Rowdown and Littlebrook-Hurst Substations <p>The <i>Employer</i> will engage Vodafone & Verizon and the <i>Contractor</i> shall be responsible for interfacing and coordinating the design and site works.</p>		

SURPLUS P&C EQUIPMENT

Following final decommissioning and de-gassing of the existing substation, the following secondary equipment shall be decommissioned and removed by the *Contractor*:

- Redundant SCS D25 & D20 BCUs
- 4 off 110V DC battery and chargers
- 4 off 48V DC battery and chargers
- Redundant diesel generator and station transformer protection panels
- Old high impedance busbar protection panels

- Vodafone MUXs and telemisc panels (assumed to be Vodafone works)
- LVAC boards

All redundant equipment shall be offered to the *Project Manager* as spares and if deemed not required by the *Project Manager* then it shall be removed from site.

Substation Name	Circuit	Equipment	Storage Location / Disposal Considerations
Littlebrook	275kV Hurst 1	Feeder Protection First Main and Feeder Protection Second Main including associated auxiliary relays, protection signalling equipment.	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Littlebrook	275kV Hurst 2	Feeder Protection First Main and Feeder Protection Second Main including associated auxiliary relays, protection signalling equipment.	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Littlebrook	SGT1B	HV Conns-1, HV Conns-2, Overall Protection-1, Overall Protection-2, 2 stage 3-ph OC, HSOC, Transducer Cubicles, SCS Analogue Inputs BCU Panel, Busbar Protection Relays, CBF-1, CBF-2 Relays	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Littlebrook	SGT2B	HV Conns-1, HV Conns-2, Overall Protection-1, Overall Protection-2, 2 stage 3-ph OC, HSOC, Transducer Cubicles, SCS Analogue Inputs BCU Panel, Busbar Protection Relays, CBF-1, CBF-2 Relays	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Littlebrook	SGT3	HV Conns-1, HV Conns-2, Overall Protection-1, Overall Protection-2, 2 stage 3-ph OC, HSOC, Transducer Cubicles, SCS Analogue Inputs BCU Panel, Busbar Protection Relays, CBF-1, CBF-2 Relays	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Littlebrook	SGT4A	HV Conns-1, HV Conns-2, Overall Protection-1, Overall Protection-2, 2 stage 3-ph OC, HSOC, Transducer Cubicles, SCS Analogue Inputs BCU Panel, Busbar Protection Relays, CBF-1, CBF-2 Relays	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.

Littlebrook	SGT4B	HV Conns-1, HV Conns-2, Overall Protection-1, Overall Protection-2, 2 stage 3-ph OC, HSOC, Transducer Cubicles, SCS Analogue Inputs BCU Panel, Busbar Protection Relays, CBF-1, CBF-2 Relays	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Hurst	275kV Littlebrook 1	Feeder Protection First Main and Feeder Protection Second Main including associated auxiliary relays, protection signalling equipment, CBF Protection, Autoreclose and Synchronising.	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Hurst	275kV Littlebrook 2	Feeder Protection First Main and Feeder Protection Second Main including associated auxiliary relays, protection signalling equipment, CBF Protection, Autoreclose and Synchronising.	The existing relays mounted in outdoor cabinet shall be recovered and the relays sent to NG Didcot stores for spares.
Additional Information			

4.2.4 Construction Design Specification: Civil (CDS-CIV)

The *Contractor* shall undertake the design and installation of all civil work associated with the scheme. This involves the construction of the new 400kV GIS substation at the National Grid Littlebrook 400kV site and the associated cable works to the Littlebrook 132kV site.

The *Contractor* shall be responsible for ensuring that the detailed design of the Civil Works complies with the requirements identified within the *Employer's* Technical Specifications.

The Civil Works section details prescriptive and functional requirements for specified Civil, Structural and Building Engineering elements forming a permanent part of the *Works* under the Contract (herein after referred to as Civil Works).

The design process for all Civil Works shall be in accordance with UKBP/TP188 and UKBP/TP184, as identified in the Project Specific Works Information.

Examples of work elements requiring this design include, but are not limited to:

- Access roads (e.g. haul road)
- Footpaths
- Temporary & Permanent Drainage
- Permanent access roads
- Temporary Fencing & Temporary Access Arrangements
- Thrust boring / Micro-Tunnel / Horizontal Directional Drilling (HDD)
- Surfacing
- Ducts & trenches
- Buildings
- Foundations
- Managing/storage of spoil (e.g. top soil)
- Enabling infrastructure (Operational & Non-operational) – e.g. retaining structures, bridges, culverts etc.
- Temporary works - Timbering, shoring & shuttering, Scaffolding
- Piling works
- Earthworks
- Ground Improvement/Stabilisation
- Plant support structures
- Holding down systems
- Surface concrete troughs
- Compound fences & gates
- Site Lighting
- Landscaping, Tree & Vegetation replanting (if required)
- Drilling
- Bridge works
- Site and Building services (excluding electricity and telecommunications services) Joint Bays, Link Pits/Manholes, Link Pillars, Backfilling [CBS] and bentonite filling.

The scope of the Civils *works* shall also include all surveys, site investigations, condition assessments and temporary works necessary to facilitate the construction of the *works*.

OHL foundation works and cable excavation works outside of the substation shall fall under the respective disciplines and therefore not be covered by the Civil works.

KEY DESIGN ASSUMPTIONS

The geotechnical investigation indicated an approximate 2-3m band of made ground across the site at surface level, comprising well graded granular material (Sand & Gravel), with some areas of PFA. Underlying this is soft estuarine Alluvium with bands of peat. It has been assumed that this surface band of granular material, when excavated, is suitable for reuse on site for earthwork regrading and re-profiling. This will require suitable testing/confirmed by the *Contractor*. Excess surplus excavated material shall be disposed of off-site at a licensed waste facility, where it cannot be accommodated on-site.

It has been assumed that all buildings, plant structures, bunds, roads and fencing etc will need to be supported on piled foundations.

The surface water drainage is proposed to be discharged to the Littlebrook drain via connection to the existing manhole. It is assumed that the gravity discharge conditions will be achieved at the existing manhole where the surface water drainage system is proposed to connect.

EARTHWORKS / ENABLING WORKS

A full UXO Magnometer & below ground void surveys shall be conducted by the *Contractor* prior to commencing any ground penetrating works.

The substation finished level shall be suitable for the site design flood conditions defined the Level 2 Flood Risk Assessment and Drainage Strategy. Any surplus excavated material shall be disposed of off-site at a licensed waste facility, where it cannot be accommodated on-site.

Flood assessment and flood resilience level have been calculated for a finished substation level of 2.6mAoD. If this level changes then the resilience level will need to be revisited.

The earthworks are to be designed taking the following into consideration:

- Suitable and appropriate maintenance access around the site
- A suitable drainage system to maintain the integrity of the site during construction and subsequent operation
- The design is to minimise the amount of material taken off site, where practicable.
- A capping surface layer that is suitable for both the permanent works and temporary piling works as appropriate
- Cut and fill slopes to be geotechnically stable and protected from erosion
- Area around OHL tower YL26 to remain a grassed area with levels to match existing.

The *Contractor* shall remove all excess excavated material from site to a suitably licensed waste facility. The expected amounts shall be clearly stated in the tender submission. Small amounts of asbestos containing materials (ACM) were identified from the ground investigation (ref. PDD-20696-REP-102), in the south west corner of the site. The concentrations of Chrysotile ACM in the samples tested were below the threshold that would indicate the need for special remediation or waste disposal. The *Contractor* shall ensure suitable monitoring and testing is carried out throughout the groundworks.

Any live services crossing the site of the new substation will be diverted by others prior to the main civil works commencing on site. For the avoidance of doubt any services on the route of the new 132kV Cable will be the responsibility of the *Contractor* to remove/divert as necessary. The *Contractor* shall acquire the appropriate statutory liaison and consents for removal/relocation of these services if required. Refer to the Site Information for buried service plans. The *Contractor* shall provide a services

diversion strategy and clearly state which services are to be removed or abandoned, and which are to be diverted.

Additional Information

DRAINAGE (Foul & Storm Water, Flood Precautions etc.)

The *Contractor* shall design and install a suitable foul water drainage system to remove foul water from the 2 No. amenity blocks and the battery room. The facilities shall contain toilets, hand basins, urinals, shower units and sinks in accordance with the requirements of TS2.10.10. The foul system is to discharge to the gravity section of the sewage pumping main to the south of the site adjacent to Rennie Drive, the connection is to be installed by the *Contractor* as part of the works. The *Contractor* is to confirm the suitability of the pumping main and should obtain all necessary consents.

The *Contractor* shall design and install a suitable and appropriate surface water drainage system to cater for surface water run-off from the entire development site, including SGT bunds, hardstandings, roads, buildings, etc. The drainage system shall consider necessary earthworks profiles and groundwater levels. and ensure that surface runoff discharge from the development site does not exceed greenfield runoff rate design criteria. This shall be for a range of design storms up the 100-year return period (1% Annual Exceedance Probability) event including a suitable allowance for climate change.

The developed design is based upon a substation level such that surface runoff under design storm conditions is attenuated in the granular fill that forms the sub-base for the substation. Filter drains intersect the sub-base to allow attenuated runoff to drain away at a controlled rate towards a flow-controlled outfall. To prevent runoff from discharging from the site as overland flow under storm conditions, a low wall (approx. 130mm high) is required around sections of the site. All critical infrastructure is to be protected from extreme event floodwater at substation level + 300mm.

Additional Information

ENVIRONMENTAL WORKS

All SGTs shall be installed within Type 1 oil containment bunds, fitted with bund water pumps and discharged via an oil separator. The existing Bund Water Control Units may be re-used if deemed suitable by the *Contractor*.

The diesel generator shall incorporate an internal secondary oil containment system to negate the need for a separate oil containment bund.

The surface water run-off from the development site shall be discharged to the Littlebrook Drain at no more than the 2-year return period (50% AEP) peak greenfield rate for all events up to the 100-year return period (1% AEP) event including an allowance for climate change. This ensures compliance with peak runoff rate and flood volume requirements. Once planning permission has been obtained, consent will be required from the relevant regulator (discharge consent for non-main rivers from the Lead Local Flood Authority, Kent CC or flood defence consent for main rivers from the Environment Agency).

Additional Information

ACCESS ROADS & PATHS

The *Contractor* shall undertake all necessary upgrade work on the access roads that approach the site to ensure that the construction can be undertaken safely. The *Contractor* shall ensure that the final condition of the access road is no worse than existing.

It is assumed all access roads and footpaths will be piled.

It is envisaged that internal compound roads will typically be 5m wide surfaced to cater for transformer installation vehicle access. Over-run areas may be needed across bends. All roads are to be constructed in accordance with TS2.10.08.

The substation shall incorporate suitable concrete access paths, ramps and steps to serve the substation buildings and plant/equipment.

Suitable surfaced car parking shall be provided adjacent to the Amenity facilities, in accordance with TS2.10.10.

Additional Information	
-------------------------------	--

BUNDS

The *Contractor* shall provide new concrete oil containment bunds for all 5 No. transformers on the substation site, in accordance with TS2.10.01. The transformer oil containment design shall be as Type 1, above ground oil retention area. A fluid draw-off system shall be provided in all cases.

A coalescer washdown area shall be provided above the oil separator, to dimensions and details provided in TS2.10.01.

Additional Information	
-------------------------------	--

NOISE MITIGATION

The *Contractor* shall design the substation layout to minimise the noise impact on surrounding developments and consider the future developments in the land adjacent to the site, placing noisy plant items where they will have least impact.

There are currently five SGTs on the site at Littlebrook; these are SGT1B, SGT2B, SGT3, SGT4A and SGT4B. Four of the existing units will be reused and relocated to the new site. SGT3, SGT4A (to be renamed SGT6) and SGT4B are currently in noise enclosures. Noise enclosures are not required for the new site however the bunds for SGT1B and 2B shall be designed to accept a retrofitted noise enclosure.

- New Noise enclosures shall be provided for SGT3, SGT4B and SGT6

- SGT2B is to be relocated, but does not have an existing Noise enclosure. A Noise enclosure is not required to be provided in the scope of these works for SGT2B, however it's bund shall be designed to accommodate installation of a Noise enclosure in the future.

- New SGT1B does not require a Noise enclosure, however it's bund shall be designed to accommodate installation of a Noise enclosure in the future.

All transformer bunds shall be, designed in accordance with TS2.10.07.

The diesel generator shall be positioned at the site to limit noise impact as far as practically possible with due consideration to LV voltage drop and shall have enhanced noise attenuation surround (75dB @1m). The *Contractor* shall design noise enclosure in line with requirements for noise enclosures in oil retaining areas in TS2.10.07.

**Additional
Information****FIRE PROTECTION**

The *Contractor* shall install firefighting provisions for the site and building in accordance with TS 2.10.06. The Local Fire Authority shall be consulted and the design shall take due consideration of their recommendations and requirements. A suitable mains water supply is located in the adjacent Rennie Drive.

An alternative may be developed for the use of quad hydrants, with agreement from Kent Fire and Rescue Service, as a cost saving activity if viable.

Fire protection systems and fire detection and alarm systems for the GIS building and amenities blocks shall be in accordance with TS 2.10.10.

**Additional
Information****BUILDINGS**

The GIS Switch Hall and ancillary plant rooms shall be provided in accordance with the detailed requirements of TS 2.10.10 GIS and Other Substation Buildings Design. The Switch Hall shall be suitable for 12 bays of the GIS plant (9 feeder, 1 bus-coupler) and associated equipment. The envelope of the building shall be sized to suit the installation and subsequent operation and maintenance of the GIS plant. The workshop facilities as required by TS 2.10.10 are also to be provided within the GIS hall.

The building shall feature an annex of suitable envelop to house associated substation rooms including:

- Control room
- Relay room
- Telecoms room
- LVAC room
- Battery room

The requirements for all of the above are to be in accordance with TS 2.10.10.

The GIS Switch Hall shall utilise appropriate foundations with finished floor level to suit the flood resilience level. The walls and roof shall both incorporate a composite cladding system, external colour to suit planning requirements.

2 No. modular amenities blocks shall be provided in accordance with standard guide drawings for a 4 Unit block and a 2 Unit block in TS2.10.10.

The *Contractor* shall provide all HVAC, power and building services to the GIS switch hall and modular buildings in accordance with the requirements of NG TS2.10.10. This shall include fire and intruder detection and alarm systems.

2 No. 20ft containers are to be positioned in the HV compound for storage purposes.

**Additional
Information**

FOUNDATIONS & SUPPORT STRUCTURES

The *Contractor* shall provide suitable foundations for all buildings, AIS/GIB plant, transformers, gantries and associated substation equipment. Given the nature of the underlying ground conditions, the foundation solutions shall pay particular regard to differential settlements.

Based on the ground conditions encountered at the site, it is anticipated that a piled solution will typically be required for all foundations. All foundations shall be designed in accordance with TS2.10.03, and piles are to be designed in accordance with recommendations outlined in geotechnical report PDD-20696-REP-102. The chosen piling method should take into consideration vibration effect on adjacent National Grid and third party assets. It is noted that a representative number of piles will be tested in accordance with ICE Specification for Piling and Embedded Retaining Walls and CIRIA Report PG7.

The SGT3 400kV cable route should be designed to mitigate any differential settlement which may occur and it is anticipated that the cable troughs may also require a piled solution.

It is anticipated that the modular amenities blocks and diesel generator may utilise ground bearing raft type foundations.

The fence and associated cill detail foundations shall be designed and constructed in accordance with guidance given in TS2.10.02, but taking into account the requirements for a raised cill in areas of fill around the site, as defined in the Level 2 flood risk assessment.

The *Contractor* shall provide suitable steelwork support structures for all AIS/GIB and GIS plant in accordance with TS2.10.12. Special consideration will be given to ensure that the structures can accommodate mechanism boxes, interlock mounts, fuse boxes, earth tape, cable trays, etc. as appropriate.

Existing equipment structures shall be re-located for some plant items as identified on the development drawings. Refer to CDS-SUB section for further details. The *Contractor* shall confirm the suitability for re-use of all structures during detailed design.

For the DNO LV supply the *Contractor* shall construct the foundation and plinth for the 11kV/415V transformer and suitably fence the compound for security measures.

**Additional
Information****CABLE DUCTS & TROUGHS**

The *Contractor* shall provide all cable troughs/ducts and draw pits for the substation. These are to include but not limited to the following;

- Substation GIS building and associated Annex
- HV Cable connections
- Modular amenities building
- Oil separator
- Transformers
- AIS equipment
- Electrified security fencing
- Site lighting
- Telecommunications
- DNO connections
- Pumped drainage connections

Wherever practicable the *Contractor* shall install auxiliary cables in buried ducts. Where this is not possible a covered trench system is to be used with GRP covers, in accordance with TS2.10.05.

The number of vehicle crossing points shall be kept to a minimum. Where troughs cross the access road the *Contractor* shall provide heavy duty covers in accordance with TS2.10.05 and the trench labelling as per RS3.10.02. Crossing areas are also to be marked on site by the provision of bollards or other suitable method of delineation.

Suitable MEWP crossing points above troughs or buried cables shall also be provided to allow adequate access around the site.

All troughs within GIS Hall and Annex where MEWP access is required to have suitable Heavy Duty covers.

Additional Information	
-------------------------------	--

FENCING & GATES

The *Contractor* shall install a Category 2 'Standard' security fence system around the perimeter of the substation, as defined in TS2.10.02. This shall consist of a 2.4m high (above substation level) palisade fence with anti-burrow sill. A combined perimeter intrusion detection (PID) and electric fence system shall be installed on the internal side of the palisade fence.

The *Contractor* shall install a Category 3 'reduced' security fence system for all internal fencing, as defined in TS2.10.02.

A, manually operated hinged double leaf gate shall be installed at the main site entrance, also fitted with PID and electric fence. A PAC entry system shall be installed in accordance with NG requirements as well as a substation entry gate phone with all applicable connections. An access gate shall also be provided to the internal Category 3 fencing, to allow vehicular access into the HV compound.

A vehicle height restriction barrier is required, suitably positioned to control access to the HV compound.

2 No. personnel gates shall also be provided in the perimeter fence at suitable locations for emergency escape purposes. These gates are to be openable from the inside only and will not feature PAC controls. In addition, a pedestrian gate shall be provided in the internal Category 3 fence, to allow access into the HV compound.

Suitable access shall be provided all around and to both sides of the perimeter fence for maintenance purposes.

For the DNO LV supply the *Contractor* shall suitably fence the 11kV/415V transformer compound for security measures.

Additional Information	
-------------------------------	--

LIGHTING

The *Contractor* shall design and install site lighting system to allow safe movement and operation of people and equipment in accordance with TS.2.10.04. This should include appropriate zoning of the site lighting systems and appropriate access gate lighting.

Where practical external lighting may be mounted on the GIS switch hall to illuminate the substation compound in lieu column mounted lighting.

Externally rated electric power sockets shall be installed around the site to enable the installation of temporary lighting during maintenance works.

Lighting within the GIS building and to the modular units shall be in accordance with the requirements of TS 2.10.10.

Additional Information	
-------------------------------	--

SECURITY

The proposed construction area and associated CDM areas are located in non-secure compounds therefore the *Contractor* shall provide adequate site security & protection for the duration of the construction works.

Where the operational substation fence is removed during the works or when works are undertaken to enter the existing 132kV tunnel or at any other times during the works when existing security of the operational sites are compromised, the *Contractor* shall provide suitable 24hr security arrangements.

Additional Information	
-------------------------------	--

LANDSCAPING

All earthwork embankments are to be top-soiled and appropriately seeded in line with the site landscape plan that is to be produced by the *Contractor*.

A minimum 2m wide clear area is to be provided around the external perimeter of the security fence to allow maintenance access.

Additional Information	
-------------------------------	--

SITE SERVICES

The *Contractor* shall provide a suitable potable water supply to serve the Amenity Blocks and Battery Room. This connection is to be agreed with the local Authority, Thames Water. Provision of the water meters shall be in accordance with CESWI 7th edition and TS 3.10. It is anticipated that the new supply will be derived from the existing water main located in Rennie Drive.

Low voltage small power shall be provided within the GIS switch hall and to all 'building services' loads' around the site and auxiliary buildings.

Additional Information	
-------------------------------	--

ENVISAGED TEMPORARY WORKS

The *Contractor* shall provide all necessary temporary works for the construction of the scheme. Temporary works are currently envisaged for the following activities;

- Earthworks activities
- Piling activities
- Construction of the GIS and amenities buildings

- Oil interceptor installation
- Transformer installation
- Crane for plant installation
- OHL re-stringing
- HV cabling

Additional Information	
-----------------------------------	--

4.2.5 Construction Design Specification: Overhead Lines (CDS-OHL)

The OHL scope of work is as follows:

- Supply and installation of new 2x500mm² AAAC Rubus downloads from both circuits of the VN route on VN003 to the new Littlebrook gantries, including all fixtures and fittings.
- Removal of existing 2x400mm² ACSR Zebra conductor from spans VN004-VN003, VN004 – VN003A and downloads from VN003 and VN003A to existing gantry structures.
- Reuse & relocate of the to be existing 2x620mm² GZTACSR Matthew (GAP) downloads from both circuits of the YL route on YL026 from the existing substation gantry to the new Littlebrook gantries, including all fixtures and fittings.
- Removal of the to be existing 2x620mm² GZTACSR Matthew (GAP) conductor from spans YL026-Y027
- Construction of new 2x850mm² AAAC Redwood downloads from both circuits of the ZBG route on ZBG013 to the new Littlebrook gantries, including all fixtures and fittings.
- Removal of existing 2x850mm² AAAC Redwood downloads from ZBG013 to existing gantry structures.

KEY DESIGN ASSUMPTIONS

The existing towers VN3A, VN3 and YL27 will become redundant as part of these works however shall be left in-situ for demolition under a separate Contract. Consequently, YL26 & VN 4 will become terminal towers.

The new downloads to be supplied by the *Contractor* shall be installed in a staged manner over the course of the works – refer to the Stage by Stage drawings for details.

The interfacing OHL uprating project for the Kemsley-Rowdown circuits 1 & 2 shall be undertaken by *Others* and they shall be replacing the current existing 2x400mm² ACSR Zebra conductor from spans YL026-YL027 and 2x500mm² AAAC Rubus downloads from YL027 to existing gantry structures with 2x620mm² GZTACSR Matthew (GAP) conductor.

NEW LINES – N/A**UPRATED LINES – N/A****LINE CONNECTION ALTERATIONS**

End Points / Circuit Identifier	Voltage (kV)	Details
Kemsley- Rowdown 1	400	2x620mm ² GZTACSR Matthew Downloads to new gantry
Kemsley- Rowdown 2	400	2x620mm ² GZTACSR Matthew Downloads to new gantry
Hurst 1	275	2x500mm ² AAAC Rubus Downloads to new gantry

Hurst 2	275	2x500mm2 AAAC Rubus Downleads to new gantry
West Thurrock 1	400	2x850mm2 AAAC Redwood Downleads to new gantry
West Thurrock 2	400	2x850mm2 AAAC Redwood Downleads to new gantry
Additional Information		

LINES BECOMING SURPLUS					
End Points / Circuit Identifier	Voltage (kV)	Approximate Length (km)	Construction Type	Conductor Type	Disposal Considerations
VN004-VN003A	275	0.14		2x400mm2 ACSR	
VN004-VN003	275	0.18		2x400mm2 ACSR	
VN003A Downleads	275	0.05		2x500mm2 AAAC	
VN003 Downleads	275	0.05		2x500mm2 AAAC	
YL026 – YL027	400	0.15		2x620mm ² GZTACSR	
ZBG013 Downleads	400	0.10		2x850mm2 AAAC	
Additional Information					

CONDUCTOR REQUIREMENTS	
Additional Information	No further information.

WIRE CLEARANCES
The <i>Contractor</i> shall ensure that vegetation underlying all downlead spans on the VN, YL and ZBG routes at Littlebrook substation shall be cleared, prior to construction, to ensure external clearances are maintained throughout the course of the <i>works</i> .

Additional Information	
-------------------------------	--

CROSSING PROTECTION REQUIREMENTS

The *Contractor* shall provide protection for the existing underlying substation fence and internal substation road during removal of existing downloads on the VN, YL and ZBG routes. The *Contractor* shall ensure protection for the proposed substation fence during installation of proposed downloads on the VN, YL and ZBG routes.

Spans VN004-VN003, VN004-VN003A and YL026 – YL027 are to be removed by the *Contractor* after construction of the new Littlebrook substation underlying the spans. The *Contractor* shall ensure that all substation equipment is protected during removal of the conductors.

Additional Information	
-------------------------------	--

DUCK-UNDER DESIGN

Additional Information	No further information.
-------------------------------	-------------------------

TEMPORARY OHL ARRANGEMENTS

The *Contractor* shall install 2 single circuit temporary connections:

- Bus Connector 1, between YL27 to the proposed West Thurrock 1 gantry
- Bus Connector 2 between VN3 to the proposed temporary SGT2B gantry

The *Contractor* shall ensure the underlying proposed substation fence is protected during installation and removal of the temporary connection.

The *Contractor* shall confirm the clearances, rating and conductor type of the bus connectors with the *Project Manager*. This *Contractor* shall offer this conductor as spares to the *Project Manager* and if not deemed required by then the *Contractor* shall dispose of it.

Additional Information	
-------------------------------	--

ACCESS ARRANGEMENTS

Additional Information	No further information.
-------------------------------	-------------------------

SUBSTATION TERMINATION STRUCTURES

The *Contractor* shall provide climatic and short circuit loadings for the proposed gantries on the VN, YL and ZBG OHL routes at Littlebrook Substation.

Additional Information	
-------------------------------	--

TOWER EARTHING

Additional Information	No further information.
-------------------------------	-------------------------

FIBRE REQUIREMENTS

Additional Information	No further information.
-------------------------------	-------------------------

AERIAL INSTALLATION

Additional Information	No further information.
-------------------------------	-------------------------

SITE INSTALLATION CONSIDERATIONS

Additional Information	<p>The <i>Contractor</i> shall ensure that the new West Thurrock gantry is constructed straight after both the existing over sailing conductors for the Kemsley Rowdown circuits 1 & 2 spans YL026-YL027 are removed.</p> <p>Due to the OHL uprating works for the Kemsley-Rowdown circuits 1 & 2, being undertaken by <i>Others</i>, the <i>Contractor</i> shall give access to the OHL team with a circa working area of 10-15m either end of each circuit and the <i>Contractor</i> shall plan its <i>works</i> around this accordingly. This OHL team will do multiple site visits to do the tower painting so the <i>Contractor</i> shall provide access and coordinate its <i>works</i> accordingly.</p>
-------------------------------	--

TOWER REQUIREMENTS

The *Contractor* shall confirm suitability of towers VN004, YL026, YL027 and ZBG013 to support both temporary and final downlead configurations.

Additional Information	
-------------------------------	--

FOUNDATIONS

The *Contractor* shall ensure the existing foundations on VN004, YL026, YL027 and ZBG013 are adequate to support both temporary and final downlead configurations.

Additional Information	
-------------------------------	--

OTHER CONSIDERATIONS

Additional Information	No further information.
-------------------------------	-------------------------

4.2.6 Construction Design Specification: Cable (CDS-CAB)

The *Contractor* shall undertake the cable works required to re-route the three existing 132kV circuits into the new substation. The existing cables are connected between the existing 400kV substation and the 132kV substation located approximately 1km away.

An outline design for the cable route has been proposed and is shown on drawing PDD-20696-HVC-001, 002, 003 & 004. This outline design requires new XLPE 132kV cables to be provided from the cable joint shown on the drawing. The *Contractor* shall decommission the fluid filled cables up to this joint, cut and cap, and remove the above ground redundant cable and the associated troughs.

The *Contractor* may propose other solutions within the constraints of the available land, and noting the significant number of services as indicated in the Hazard Plan.

Additionally, the proposed substation configuration contains a short 400kV cable route connecting SGT3 with the GIS switchgear. This CDS assumes that this cable route is required. The *Contractor* shall agree with the *Project Manager* if there is an alternative fit for purpose and cost effective solution to the proposed substation configuration.

The *Contractor* shall prepare the detail design of the cable systems with attention to:

- The planned circuit outages (both 400 and 132kV) as detailed in the SBS
- Minimising construction risks
- Minimising disruption to local impacted businesses

KEY DESIGN ASSUMPTIONS

It is the *Employer's* intention to release the usage of the land where the existing 132kV cable routes are located, and therefore any future cable route using such land shall be avoided.

The *Contractor* shall install additional ducts along the 132kV cable route for P&C and communications cables between the 400kV and 132kV Substations.

The *Contractor* shall perform appropriate Ground Investigation (GI) surveys and settlement calculations to finalise the Horizontal Directional Drilling (HDD) design for the 132kV cable route road crossings.

Information on the cables on the DNO side of the joint bay is only available for one of the three circuits. This shows that the conductors are 1000mm² Copper. It is assumed that all three circuits use this conductor. The *Contractor* shall be responsible to confirm this prior to detailed design of the transition joints.

The 400kV cable route connecting SGT3 and the GIS switchgear is assumed to be required unless the *Contractor* can provide an alternative fit for purpose and cost effective solution to the proposed substation configuration.

The *Contractor* shall note that Cable spares are not required to be provided for these *works*.

No fibre or DTS equipment required for the 132kV cable route.

NEW CABLES

End Points / Circuit Identifier	Voltage (kV)	Approx. Length of proposed routes (km)	Continuous Ratings (Amps/MVA)	Cyclic Ratings (Amps/MVA)
SGT3	400	0.085	1372 / 950	n/a

SGT4B	132	0.612	1050 / 240	n/a
SGT2B	132	0.690	1050 / 240	n/a
SGT1B	132	0.570	1050 / 240	n/a
Additional Information	Cable ratings above are applicable to all seasonal ambient temperatures as defined in TS 2.05 Table 2.			

NEW GAS INSULATED LINE (GIL) – N/A				
End Points / Circuit Identifier	Voltage (kV)	Approx. Length (km)	Continuous Ratings (Amps/MVA)	Cyclic Ratings (Amps/MVA)
Additional Information				

CABLES BECOMING SURPLUS					
End Points / Circuit Identifier	Voltage (kV)	Approx. Length (km)	Type	Earthing	Disposal Considerations
S747	132	tbc			Part Fluid Filled cable/ part XLPE
S746	132	tbc			Part Fluid Filled cable/ part XLPE
S748	132	tbc			Part Fluid Filled cable/ part XLPE
Additional Information	<p>The Fluid filled sections of the existing 132kV cables are to be decommissioned as per TP106 and NG PST 093. Cables and joints are to be purged of the oil, cut, capped and transported offsite for further processing.</p> <p>The XLPE insulated section of the existing circuits is also to be decommissioned, and shall be cut and transported off site.</p> <p>The existing “transition joint bays” buildings shall be removed, along with any ancillary equipment (link boxes, bonding cables, ECC, etc.).</p> <p>Additionally, the <i>Contractor</i> shall investigate any potential contamination of the land and execute any remedial actions required.</p>				

ROUTE INFORMATION / HISTORY
<p>The proposed 132kV cable route is on land purchased by the <i>Employer</i>. It has been selected to minimise risks related with the crossing of numerous other cable circuits in the area.</p> <p>During the development of the works, the following reports were produced, which the <i>Contractor</i> shall reference:</p> <ul style="list-style-type: none"> PDD-20696-REP101 – Geotechnical factual report PDD-20696-REP102 - Geotechnical interpretative report PDD-20696-REP103 - Cable Route analysis report 132kV

- PDD-20696-REP104 - Cable Route analysis report 400kV
- PDD-20696-HVC001 – Cable route drawing (132kV and 400kV)
- PDD-20696-HVC002 – Cable route drawing (132kV and 400kV)
- PDD-20696-HVC003 – Cable route drawing (132kV and 400kV)
- PDD-20696-HVC004 – Cable route drawing (132kV and 400kV)
- PDD-20696-LAY102 - Hazard plan

The following reports are also available:

- RPS Littlebrook power station UXO report no. EES0593 R-01-03
- RPS Littlebrook power station services report no. BRM07878 / RT1-2
- DNO services records, with map centring at TQ5576SE

The *Contractor* shall undertake the required topographical and GPR surveys of the areas which have not been surveyed due to tree & vegetation growth. As stated in the Earthworks/Enabling works section the *Contractor* shall undertake the necessary tree cutting and vegetation clearance to undertake these surveys.

During the development phase, the foreseeable areas of engineering difficulties (AED) are:

- The 400kV cable crossing
- Presence of HV equipment fire damage zones
- The 2 trenchless crossings of the public roads
- The transition joint bays

Several 11/132kV DNO cable routes are impacted by the *works*, in particular in the vicinity of the roundabouts on Rennie Drive. The *Contractor* shall perform any further investigation necessary to ascertain the exact position of all other existing cable circuits. The suggested route minimises risk by adopting two separate trenchless technologies solutions to cross the roundabouts along the route

A very short section of 400kV cable connects the AIS with the GIS termination.

The identified areas of engineering difficulties are:

- The 132kV cable route crossing
- The approach to the GIS termination, where the circuit may require going deeper underground to achieve minimum bending radius below the termination

Additional Information	Both the 132kV and 400kV routes cross transformers “fire damage” zones. The <i>Contractor</i> shall demonstrate that with the chosen lay/trench solution, the cable circuits are adequately protected.
-------------------------------	--

CABLE SYSTEM DESIGN

As part of the detailed design, the *Contractor* shall produce the following documentation:

For both the 400kV and 132kV circuits, design of the cable systems including:

- Cable rating calculations (including crossings where applicable).
- Induced voltage calculations
- Short circuit calculations
- Static and dynamic force calculations (e.g. short circuit)

- v. Bonding and earthing design (including bonding schematics)
 - vi. Section lengths and joint bay locations
 - vii. Cable phase transitions to match circuit end phase positions
 - viii. Cable electrical, thermal and thermo-mechanical loading.
1. Design of trench general arrangement including:
 - i. Trench depth & width
 - ii. Cable separation
 - iii. Cable circuits separation;
 - iv. Thermal rated backfill types;
 - v. Thickness of thermal rated backfill bed, cover and surround;
 - vi. Cable protective tiles depth;
 - vii. Cable warning tape depth and trench soil reinstatement;
 - viii. Communications & pilot cable ducts;
 2. Design of Trenchless technology solution adopted including:
 - i. Settlement calculations.
 - ii. Cable arrangement and circuits separation
 - iii. Communications and pilot cable ducts
 3. Design of general arrangement for utility, road, rail, watercourse, heat source and obstacle crossings including:
 - i. open cut profiles
 - ii. ducted crossing profiles
 - iii. trough profiles
 - iv. trenchless technologies crossings (ie Horizontal Directional Drilling) profiles
 - v. cable bridges or other elevated support structures
 4. Design of jointing arrangements including:
 - i. cable joints
 - ii. joint bay layout accounting for thermal, mechanical, installation, maintenance, security and land use requirements
 - iii. support structures, cleats & fixings to manage thermo-mechanical forces in joint bay, with consideration of any thermo-mechanical force differential because of jointing different size cables.
 - iv. link pillar locations
 - v. Routing of bonding and earthing leads
 - vi. Equi-potential earthing including consideration of rise in earth potential along the cable route during fault conditions.
 5. Design of termination arrangements including:
 - i. Cable Sealing Ends (CSE)

ii. iii.	CSE support structures accounting for thermal, mechanical, installation and maintenance requirements Mountings for link boxes, pillars, Current Transformers, fluid tanks
Additional Information	As the 3 x 132kV circuits are energised at different times, the <i>Contractor</i> shall consider the design of the joint bays to allow for safe working in proximity of live circuits. Terminations pollution level (400kV and 132kV AIS) shall match the new plant defined level (class e).

CABLE SEALING END DESIGN

The *Contractor* shall design in accordance with *Employer's* standards, procedures and policies. The main design elements are, but not limited to:

- i. fixing and installation requirements into the CSEC including communications and pilot cable ducts
- ii. Cable Sealing Ends and their arrangement
- iii. phase arrangements
- iv. all electrical clearances including for vehicle movements
- v. space for all testing and commissioning requirements
- vi. maintenance requirements of the CSEC and Cable System

Additional Information**CONSIDERATIONS****Additional Information**

No further information.

COOLING**Additional Information**

N/A

INSTALLATION CONSTRUCTION

- Design of cable installation requirements include:
 - i. Pulling tensions;
 - ii. Side thrust calculations;
 - iii. Winch positions;
 - iv. Drum stand positions;
 - v. Caterpillar, roller and other installation aids requirements;
- Design of all in-route cable handling equipment
- Design the installation sequence for cable sections;
- Design of duct blocks (where required)
- Design of earthing extension (where required)
- Design of temporary scaffold, lifting beams and tents for jointing works
- Design of temporary scaffold, lifting beams and tents for CSE works

- | | |
|--|--|
| <ul style="list-style-type: none">• Design of commissioning test facilities;• Design of installation requirements for the communications and pilot cable systems. | |
| Additional Information | |

4.3 Design Submission Procedures

The *Contractor* shall ensure that a joined up and complete design is delivered in terms of both the Technical Assurance packages and the construction on site.

All submission to the *Employer's* Technical Assurance shall be managed by a document transmittal process that requires confirmation of receipt. It is the *Contractor's* responsibility to ensure that the information is received.

The *Contractor* shall act as the sole submission route for all designs. The *Contractor* shall propose a design management process to ensure that the *Project Manager* has visibility of all design interfaces at any point in time. An electronic Collaborative Project Management Tool would be an acceptable solution.

4.3.1 Design Delivery Programme

The *Contractor* shall provide a programme of design package submissions for Technical Assurance. The *Contractor* shall develop the Technical Assurance package to suit their delivery programme and shall include details in the programme submitted as part of the tender. These packages will be subject to review and approval with the *Employer's* Technical Assurance representatives. The *Contractor* shall submit a monthly report to the *Project Manager*, which shall provide, but not be limited to, the following:

- Drawings issued to the *Employer's Technical Assurance*
- Dates submitted and returned
- DCAAR approval dates.

The *Contractor* shall allow a period of four working days between issuing packages to Technical Assurance and the commencement of the Technical Assurance time for review.

The *Contractor* shall allow for adequate time within the programme to allow for all DCAAR(s) to be signed off and accepted at least four weeks before the respective Site Work commencement dates (to comply with TP135 Appendix E - Item 7).

4.3.2 Design Compliance Audits

4.3.2.1 Design Compliance Audit – Satisfactory Outcome

No further information is provided from that stated within the Generic Works Information.

4.3.2.2 Design Compliance Audit – Unsatisfactory Outcome

No further information is provided from that stated within the Generic Works Information.

4.3.3 Design Re-Submissions

No further information is provided from that stated within the Generic Works Information.

4.4 Design Coordination

The *Contractor* shall chair and record the minutes of monthly design coordination & hazard review meetings between themselves and the *Project Manager* and other *Employer's* representatives, as well as producing an overall hazard plan. These design coordination meetings shall be held as required by either party but as a minimum once a month ideally in the first week of every month subject to change by mutual consent and should commence following contract award. The *Principal Designer* shall invite as a minimum, the *Project Manager*, the, the *Employer's* ETO Site Manager, *Employer's* appointed third parties as required by subject of discussion, and *Employer's* Technical Assurance representatives for the relevant elements of design to be discussed at the specific meeting.

Divisions of Responsibility are in principle as per Appendix C of DH30.

4.5 Requirements of Others

No further information is provided from that stated within the Generic Works Information.

4.6 Design Approval from Others

National Grid is responsible for obtaining Planning Permission and any permanent primary consents. Any temporary consents required for Construction works to proceed are the responsibility of the *Contractor* to obtain.

The *Contractor* shall discharge any planning conditions by obtaining approval from the local planning authority as stipulated within the planning permission. Any changes to the design already agreed with the local planning authority will need to be reviewed, discussed and agreed with the local planning authority prior to contract award.

The *Contractor* shall be responsible for obtaining all necessary licences and consents to complete the *works*.

4.7 Emergency Return to Service (ERTS) Requirements Strategy

The *Contractor* shall confirm if the ONCOMM ERTS strategy can be improved upon provided within the latest SRD, appended to this document. The Strategy shall detail the *Contractor's* resource requirements to enable the *Project Manager* to identify the costing strategy.

5 *Employer's Work Specification and Drawings*

5.1 Applicable Standards

For the LV supplies, the *Contractor* shall adhere to the DNO drawings and specification of the Auxiliary Transformer plinth, fencing perimeter and 11kV cabling works.

5. 2 Drawings

The *Contractor* shall provide the use of Electronic Collaborative Project Management Tool for the *Employer* to view, access, and download the submission of drawings during design stage. To access the system, the appropriate user license(s) must be provided, as well as undertaking the appropriate user training. For clarity, the final as-built drawing submission to the *Employer* will still be in accordance with TP135.

6 Working with the *Employer* and Others

The *Contractor* shall co-ordinate via the *Project Manager* with the *Employer's* ETO site Occupier of Littlebrook 400kV, for the remote end works, Littlebrook 132kV, for the cable works and the *Employer's* ETO OHL Occupier for the OHL works.

During the delivery stage the *Project Manager* will call and chair TP153 meetings to include representation from UKPN & OHL Team. The *Contractor* shall attend these meetings monthly. The *Contractor* shall be required to attend monthly interface meetings with the existing surrounding area developer (Berricote).

6.1 Sharing the work area with the *Employer* and Others

The Site establishment areas are to be shared between the *Contractor*, their sub-contractors, and *Employer* appointed third parties working on the project including third parties' sub-contractors. Within the area shown for the *Contractor's* site establishment in the draft CDM plan appended to this document, the *Contractor* shall set aside a suitable area for use by third parties.

The overall construction areas and access roads will be very congested; therefore the *Contractor* shall provide adequate traffic management and undertake the role of Principal Contractor for all working areas including works by *Employer* appointed third parties.

CDM Plans & Site boundaries

During the *works*, if space allows, there may be segregated working areas, but there will be a single *Principal Contractor* for the entire site, which shall be the *Contractor*. Parking areas and emergency routes within the compound shall also be included by the *Contractor*.

A single overall CDM Plan shall be maintained by the *Contractor* for the substation, OHL and cables works identifying the CDM areas. Any changes required to individual CDM Plans shall be communicated to the *Contractor* which shall then be updated in the overall CDM Plan.

6.1.1 Authorities and Utilities Providers

The *Contractor* shall be responsible for the management and integration of the following services:

- LVAC supply to the proposed Littlebrook 400kV GIS substation
- Potable water and for fire hydrant (if applicable) use.
- Surface water drainage connection
- Foul water drainage connection

The *Employer's* designated supplier (Vodafone) will provide the Optel connection. The *Contractor* is responsible for liaising with the Optel provider (i.e. Vodafone), with the involvement of the *Project Manager*, to ensure that its requirements are considered during the detailed design.

7 Management of the Works

The *Contractor* shall ensure that the Construction Phase SHES & Emergency Plan takes into consideration the requirements of the site developer (Berricote) and its demolition contractor, to cover all aspects of construction management. The *Contractor* shall liaise and agree with BAMS the working arrangements.

The *Contractor* shall manage the CDM 2015 Regs & TP137 duties for the management of the bulk purchase SGT1B works, Vodafone (Optel works), DNO LV supply works and the OHL re-conducting works.

7.1 *Contractor's* Project Resources

No further information is provided from that stated within the Generic Works Information.

7.1.1 Project Commissioning Resource

The *Contractor's* Commissioning Engineer shall be responsible for overseeing the Stage 1 commissioning and signing the SCT sheet of SGT1B on behalf of the Bulk Purchase SGT Supplier.

The *Contractor* shall also provide the required Commissioning Engineer resource(s) for the remote end protection works. The *Contractor* shall ensure there is a Lead Commissioning Engineer to manage the Littlebrook and the associated remote end works.

7.1.2 Project Temporary Works Coordinator

No further information is provided from that stated within the Generic Works Information.

7.2 *Contractor* Procurement

No further information is provided from that stated within the Generic Works Information.

7.3 Site Establishment / *Contractor's* and *Employer's* Accommodation

An, indicative CDM drawing is appended for the main site however the *Contractor* shall provide a proposed CDM plan as part of the Tender submission to illustrate the proposed CDM arrangements for all work areas including but not limited to: proposed 400kV GIS substation site, Cable route between proposed 400kV GIS substation site and 132kV substation, the OHL circuit turn ins and DNO LV supply work.

The *Contractor* shall be responsible for providing all site establishment and welfare facilities including all services (potable water, foul water, electricity, internet, telecoms etc), to its site in accordance with the CDM Regulations, prior to site work commencing. No services are being provided by the Employer.

The *Project Manager*, in conjunction with the *Supervisor*, shall notify the *Contractor* that the arrangements are satisfactory and the *Contractor's* Site Manager shall record such notification on the CDM summary log.

As part of his site establishment, the *Contractor* shall provide exclusively for use by the *Project Manager* and/or Employer's representatives, suitable accommodation for two people with internet access. If this is being provided via 4G then the *Employer* will use its own network, which will not be available for use by the *Contractor*.

The *Contractor* shall provide a meeting room for 15 people suitable for holding all relevant meetings as required by the Works Information. The meeting room shall be made available for use by the *Project Manager*, when required.

The *Contractor* should note that the site establishment area is within a flood risk area so consideration should be given to the provision for storage of materials and substances. Detail of flood levels can be found in Site Information.

7.3.1 Site Establishment Plan

No further information is provided from that stated within the Generic Works Information.

7.4 Contractor's Site Emergency Plan

As stated above in section 7, the *Contractor* shall produce a site emergency plan which will incorporate and be agreed with the *Project Manager*, *Supervisor*, *Employer's Site Occupier Representative* and BAMS Site Representative.

7.5 Security

No further information is provided from that stated within the Generic Works Information.

7.5.1 Protection of the Site

The main security is managed by BAMS however the *Contractor* shall be responsible for the security & protection of the land for the new substation, the existing 400kV & 132kV substations, and for all other working areas to prevent unauthorised access. The *Contractor* shall also be responsible for liaising with BAMS on the working arrangements for the security of the overall site.

The *Contractor* shall establish a construction fence perimeter around the *Employer's* purchased land area and maintain it throughout the project until site demobilisation.

The *Contractor* shall provide temporary lighting as required during the works. Particular consideration shall be given to the surrounding environmental area. Any lighting shall comply with the planning application and constraints. These requirements shall apply to all site perimeter fencing and gates, access roads, verges, footpaths, designated walkways and areas occupied by Plant and Materials or other Equipment (whether in service or not) contained by the site perimeter fencing.

Where the operational substation fence is removed during the works or when works are undertaken to enter the existing 132kV tunnel or at any other times during the works when existing security of the operational sites are compromised, the *Contractor* shall provide 24hr security arrangements.

The *Contractor* shall be responsible for providing security point(s) at the access to the construction site during the hours of site operation as a minimum.

The *Contractor* shall reinstate all Working Areas and accesses to the Site to a condition equivalent to that existing prior to the commencement of the works. All such reinstatement shall be to the satisfaction of the *Project Manager* and *Supervisor*. This shall include but not be limited to, provision of new field boundaries where required, reseeding, weed control, land damage including panning (compression of the ground), and reinstatement of hedges and trees taking into account National Grid's policy of 4:1 tree replacement.

7.5.2 Identification of People

In addition to the Generic Works Information for accessing the existing 400kV substation the *Contractor* shall provide form of identification to BAMS security at the Gate House.

7.5.3 Control of Site Personnel

The *Contractor* and any sub-contractors shall be restricted to accessing the CDM area only. All other buildings adjacent to the substation shall be deemed “no-go”, including the areas of BAMS demolition work.

The *Contractor* shall be responsible for ensuring the competency of all staff in accordance with the *Employer's* requirements, including training, safety briefings etc.

The *Contractor* shall also be responsible for the induction and safety of all visitors, including all *Employer's* staff, who will be inducted and signed prior to access the CDM areas.

The *Contractor* shall fulfil the role of Principal Contractor for the entire site including those areas where the *Employer's* ETO Operations staff or its contractors are working at the same time. Any CDM working interfaces shall be agreed through TP163 meetings.

7.6 *Contractor's* Traffic Management Plan

The *Contractor* shall be fully responsible for all traffic management and where possible plan their *works* to minimise the impact of their traffic on the local community.

The *Contractor* shall produce a Traffic Management Plan (TMP) during detailed design, which shall detail how the *Contractor* shall comply with the requirements and regulations of the Police and Local and County Authorities concerning the routing of vehicles, Plant and Materials and Equipment and access to and from the Site.

6 week prior to commencing the *works* on site the *Contractor* shall produce and share a traffic management plan with the *Project Manager* and the local authority if required for approval.

The parking arrangements and traffic movements to and from the site shall be agreed with the *Project Manager* and *Supervisor* at the inaugural SHES meeting. There shall be a prohibition of any vehicles being parked or waiting on the public highway.

The *Contractor* shall use specified routes which, where possible, shall avoid narrow or height/weight restricted sections of road, schools, hospitals, community areas. Deliveries and activities expected to put pressure on the local road networks shall be subject to liaison and management from a site level and with the *Project Manager* and *Supervisor*.

All traffic related to the *works* shall be subject to a site traffic management plan. All heavy/large load transportation including cable drum deliveries shall be included in these works and heavy load routes from point of delivery to the UK shall be identified. All other transport logistics from the point of manufacture to site shall also be the responsibility of the *Contractor*.

The Local Highways Authority and Highways England shall be consulted if there are concerns over unusual loads, or if deemed that an escort shall be required, particularly in the case of abnormal indivisible loads (AIL) such as SGT's.

The *Contractor* shall be responsible for liaising with and arranging any required road, lane or public right of way closures/diversion, AIL route approval with statutory authorities.

The *Contractor* shall consider the local traffic constraints especially the entry and exit off from the M25 and any impact on Rennie Drive and shall be responsible for liaising with and arranging any required permits with the Local Highways Authority.

7.7 Site Cleanliness

No further information is provided from that stated within the Generic Works Information.

7.8 Protection of Existing Structures and Services

The *Contractor* shall implement specific measures to:

- Protect the existing SGTs while the re-location works take place
- Protect the 132kV cables and above ground troughs until they are decommissioned
- Protect the integrity of the cable tunnel especially when the 132kV cable jointing works takes place
- Protect or divert any other services found to still be live and/or in service; including existing fibre optic cable which is currently above ground
- Protect and not infringe safety electrical clearances with the overhead line and associated towers

Where the *works* are to be carried out in proximity to other National Grid assets, which may contain live HV Equipment, the *Contractor* shall ensure that any such equipment and services are protected from the *works* where necessary to minimise damage. The *Contractor* shall be responsible for any remedial works associated with any repairs caused by damage incurred by the *Contractor* throughout the course of the *works*.

The *Contractor* must fully identify any adjacent live circuits which may require the application of hazard mitigation in order to carry out the *works*, whether this shall be the scheduling of works to utilise existing booked outages to increase safety clearances or temporary works to protect such assets.

The *Contractor* shall also employ ground scanning methods to verify the location of these and all other buried services in accordance with HSG47 prior to any ground breaking activity.

Buried services shall be fully identified by the *Contractor* during delivery through the production of an accurate buried services plan and conducted of GPR survey as deemed necessary by the *Contractor*, the extent of any other buried services which may otherwise be encountered during the course of the *works*, highlighting all crossings and circuit diversion requirements/outage requirements.

Before any temporary or permanent work commences near assets owned by the *Employer* or third parties e.g. UKPN, the *Contractor* shall demonstrate to the satisfaction of the *Project Manager* and or the third-party plant protection departments that the *Contractor's* proposals will not cause damage or operational restrictions to those assets during or after the proposed works.

For working near the *Employer's* assets, the *Contractor* shall prepare the following for acceptance:

Reports – For each interface an appropriately detailed Approval in Principal (AIP) report and, where appropriate, an Engineering Assessment (EA) report shall be prepared.

- a. The AIP report shall state what the *Contractor's* works proposals are; the purpose of them; how it is proposed to undertake the works (outline method statement); what effect if any the works will have on the *Employer's* assets (imposed load / deflection / implications for the *Employer* etc); what mitigation measures will be undertaken; condition assessments and monitoring.
- b. The Engineering Assessment report with a Category 3 independent check shall be submitted by the *Contractor* where the *Employer* determines the interface to be significant and requiring a more detailed analysis and justification of the effects, and possibly including the design of significant damage mitigation measures.

Contents of the Reports – The AIP and Engineering Assessment reports shall address as appropriate, but shall not necessarily be limited to, the following issues:

- a. Effects of Vibration – The *Contractor's* attention is drawn to DH10 Clause 2.4.4 and the accompanying note for guidance. The term 'buildings' in this clause shall include all buried structures and infrastructure including, but not limited to, OHL towers. The vibration limits stated in this clause shall also apply to vibrations generated from sources other than piling works.
- b. Effects of Loads - The magnitude and effects of loads or relaxation of loads on the asset, and an assessment of the capacity of the asset to accept the load may also be required.
- c. Effects of Ground Movement - The magnitude and effects of ground movement on the asset, and an assessment of the capacity of the asset to accept the ground movement may also be required.
- d. HAZID/RAMS – Hazards in the proposed design, Risk Assessments, Method Statements and any system operation implications.
- e. Damage/Effect Mitigation Proposals
- f. Monitoring – proposals for condition surveys of the assets, and monitoring of the assets before, during and after the *works*.

7.9 Hazard Register/Risk Management

The Hazard Register is appended to this Work Information.

7.10 Reporting and Documentation

No further information is provided from that stated within the Generic Works Information.

7.10.1 General

The *Contractor* shall provide the "Verification Reporting Requirements" (appended) for the land remediation works and ensure the report is provided to the *Project Manager* as soon as the works are complete.

7.10.2 Contract Status Report

No further information is provided from that stated within the Generic Works Information.

7.10.3 Photographic Records

In addition to the Generic Works Information, photographic evidence shall be compiled by the *Contractor* for the relocations of the following re-used existing Equipment but not limited to:

- SGTs
- Protection and Control Panels

7.10.4 Installation, Operation and Maintenance Documentation (IOM)

The *Contractor* shall be responsible for collating and compiling all the respective equipment including the interfaces such Bulk Purchase and DNO Transformers. The *Contractor* shall provide the relevant documentation after each successive item of equipment is commissioned.

7.10.5 Asset Technical Data and Financial Reporting

For the purposes of capturing financial costs on the relocation works of the existing Equipment the *Contractor* shall identify these assets on the Asset Data Template as “modified/upgraded” as detailed in UKBP/TP221.

7.10.6 Project Handover Documentation

In addition to the Generic Works Information the *Contractor* shall be responsible to provide a division of responsibility document on the warranty for each component/equipment used for these *works*, which needs to be agreed with the *Project Manager*, *Supervisor* and the respective OEMs.

7.10.6.1 Additional Requirements for Final Records

No further information is provided from that stated within the Generic Works Information.

7.10.6.2 Health and Safety (H&S) File Information

No further information is provided from that stated within the Generic Works Information.

7.11 Meetings

The *Contractor* shall attend meetings as and when required by the *Project Manager* including meetings such as risk reduction meetings and work coordination interface monthly meetings.

The *Contractor* shall chair and record minutes of monthly design coordination and hazard review meetings between themselves and *Employer* appointed third party designers as well as producing an overall hazard plan. These design coordination and hazard review meetings shall be held as required by either party but as a minimum once a month ideally in the first week of every month subject to change by mutual consent and should commence following contract award. The *Principal Designer* shall invite as a minimum the *Project Manager*, *Supervisor*, *Employer's* ETO Site Representative, *Employer's* appointed third parties as required by subject of discussion, *Employer's* Technical Assurance representatives for the elements of design to be discussed at the specific meeting.

The *Contractor* shall ensure exchange of all necessary design information between Bulk Purchase Supplier, DNO and the *Employer* is adequate and provided in a timely manner.

Principal Contractor Cooperation and Coordination

The day to day construction interface and coordination items shall be managed by the *Contractor* through the TP163 Weekly SHESQ meetings. The *Contractor* shall ensure a representative from each affected party (e.g. BAMS, DNO, Bulk Purchase Supplier, OHL re-conducting team) attends these meetings to ensure there is a common understanding of potential challenges and that a suitable approach is undertaken during delivery of the *works*.

In addition, the *Contractor* shall hold monthly interface coordination meetings with the affected parties (e.g. BAMS, DNO, Bulk Purchase Supplier, OHL re-conducting team) to discuss coordination items for plans of work which are beyond the six 6-week plan so that interface challenges are managed effectively. The *Contractor* may choose to hold these meetings pre-or post TP153 meetings.

8 Health, Safety, Environmental and Sustainability (SHES)

The *Employer's* goal is to achieve an accident and injury free, healthy workplace. Below are some specific safety goals for these *works*:

- To complete the *works* without causing harm or injury to any person.
- To complete the *works* without causing any pollution or unintended harm to the environment.
- To encourage the reporting of SHES Hazards and SHES incidents and a proactive approach close out culture.
- To ensure that all Near Misses, Accidents, and Incidents (including both safety related and environmental issues) are recorded on the National Grid IMS database, are closed out, and lessons learnt communicated as required.
- To support National Grid's "Road to Zero" policy through their 8 Golden Rules. The Golden Rules are a fundamental building block for the National Grid Road to Zero. They focus on critical areas of the business where safety behaviours by managers, employers, contractors and agency staff are essential to safeguard ourselves and the public.
- To develop a no blame 'Safety Culture'.
- To be managed by Principal Contractor; suitable information to be included within Construction Phase SHES Plan.

The *Contractor* shall also adhere to the BAMS SHES Policy for areas shared with them.

8.1 General Requirements

The *Contractor* shall coordinate with the *Project Manager* to ensure that all hazards from all activities are understood and mitigated during the *works*.

The *Contractor* shall ensure that appropriate communication shall be in place with BAMS, DNO, Bulk Purchase Supplier and OHL re-conducting works to identify any challenges related to its work.

The *Contractor* shall provide an impressed voltage management plan during the detailed design stage. And shall also provide drain earths to manage the impressed voltages until the substation is under National Grid Safety rules.

It is the sole responsibility of the *Contractor* to manage all Health and Safety including CDM until such areas are handed back to the Employer's Site Occupier Representative (SAP).

Confined Spaces

The *Contractor* shall identify and manage any confined space working, as required and it is envisaged it will be required for the 132kV Cable jointing works.

8.1.1 Safety Leadership

The *Contractor* shall review, adopt and be encouraged to further develop the Employer's Good Practises as well as its own internal Good Practises. The *Contractor* shall also share its good practises to the *Project Manager* and the *Supervisor*.

8.1.2 Communication and Consultation

No further information is provided from that stated within the Generic Works Information.

8.1.3 Health, Safety and Environment Notice Boards

No further information is provided from that stated within the Generic Works Information.

8.1.4 *Employer's* Safety Communication

No further information is provided from that stated within the Generic Works Information.

8.2 SHE Management Plan

No further information is provided from that stated within the Generic Works Information.

8.2.1 Health and Safety Handover Records

No further information is provided from that stated within the Generic Works Information.

8.2.2 Environmental Handover Records

The *Contractor* shall notify and provide copies of the hazardous waste consignment notes, especially in relation to disposing of assets which contain Asbestos, PCB and HBCD to the *Project Manager* and the *Employer's* Site Occupier Representative.

8.3 Method statement, Risk Assessments and Safe Systems of Work

The *Contractor* shall hold TP163 weekly site meetings at which look-ahead reviews are conducted where Safety from the System aspects are considered with a Senior Authorised Person and requirements for National Grid Safety Documents identified. The *Contractor* shall submit a verified application for a National Grid safety document, together with its associated Risk Assessment and Method Statement at least 21 days in advance of the date that the safety document is required. The *Contractor* shall be responsible to coordinate and cooperate with the SAP to ensure the project is delivered safely and in a timely effective manner.

8.3.1 *Contractor's* Work Permit Management System

No further information is provided from that stated within the Generic Works Information.

8.3.2 The use of Radio Detection Cable Avoidance Tool

No further information is provided from that stated within the Generic Works Information.

8.3.1.2 Excavations

No further information is provided from that stated within the Generic Works Information.

8.4 Training and Competency

No further information is provided from that stated within the Generic Works Information.

8.4.1 Training and Competency of the Employer's Staff

The *Contractor* shall make allowance for the provision of training and familiarisation of the equipment (both Primary & Secondary) for the *Employer's* Site Operational Staff (up to 10 staff, over three shifts).

The *Contractor* shall identify all equipment that is being supplied under the contract and provide a schedule of *Employer* training requirements identifying the type and level of training, the estimated duration and training location for each equipment item.

The schedule shall be submitted, reviewed and agreed as part of the TP106 Commissioning Panel Meetings.

8.5 Hazardous Substances and Occupational Health

There is no existing permanent or temporary storage of SF₆ that will be available for use by the *Contractor*.

The *Contractor* shall provide temporary SF₆ storage during the construction phase. This shall be highlighted within the *Contractor's* CDM plan.

The *Contractor* shall confirm the intention to use hazardous materials. The use thereof shall be agreed with the *Project Manager* and *Supervisor* in advance of the proposed use.

8.6 Sensible Monitoring Site Inspections and Audits

No further information is provided from that stated within the Generic Works Information.

8.7 Personal Protective Equipment

No further information is provided from that stated within the Generic Works Information.

8.8 Incident Reporting

No further information is provided from that stated within the Generic Works Information.

8.9 SF₆ Gas Usage and Leakage

No further information is provided from that stated within the Generic Works Information.

8.10 Sustainability

1	Carbon Footprint shall be produced by the <i>Contractor</i> using the Carbon Interface Tool (CIT) at end of construction
2	Sustainability opportunities register as part of the Sustainable Options Assessment Tool sustainability reviews prior to project mobilisation and during construction reviews
3	Monthly reporting on Environmental Performance in line with the SCIP reporting requirements
4	All site office/welfare cabins shall be Eco Cabins - Band B rated
5	If generators are required for energy production - Energy efficient – load variable generators shall be used
6	Sustainability included as a standard agenda item in Design Review meetings
7	Record in form of a register of inclusion and non-inclusion of Good/Mandatory Practices to be used in agreement with the Employers Project Manager
8	Project Environment and Sustainability Targets and Objectives to be aligned and monitored as a minimum with the annual SCIP targets

9	Register a review of MARkit tool and a register of products uploaded
10	A site waste management plan shall be produced prior during design and maintained during the lifecycle of the project and submitted for filing in project close-out documents

8.10.1 Sustainability Review and Good Practice

The *Contractor* shall review, adopt and be encouraged to further develop the *Employer's* Good Practises as well as its own internal Good Practices. The *Contractor* shall also share its good practises to the *Project Manager* and the *Supervisor*.

8.10.2 Mandatory practice

No further information is provided from that stated within the Generic Works Information.

8.10.3 Carbon Management

No further information is provided from that stated within the Generic Works Information.

8.10.4 Management of Waste and Resources

No further information is provided from that stated within the Generic Works Information.

8.11 Nuisance

The *Contractor* shall screen any noisy plant appropriately to prevent nuisance and use silenced equipment wherever possible. When in use, static noisy plant should be located as far away from noise sensitive receptors as is feasible for the activity and properly maintained.

- Any light lit tasks shall be kept to a minimum.
- The *Contractor* shall minimise light, noise and vibration levels as far as is reasonable practicable.

8.12 Water Management

The Ground Water Table at Littlebrook is high and the *Contractor* shall put in place appropriate measures for managing this especially during excavation work. It is envisaged that water pumps will be required and the *Contractor* shall ensure the Environmental Management Plan is robust and sufficient to manage and safely dispose the potentially contaminated ground water as a consequence of its own civil ground works.

The *Contractor* shall ensure that no water courses or potential water aquifers are contaminated during the works.

8.13 Contaminated Land

The *Contractor* shall refer to details of the ground contamination within the Site Information.

The *Contractor* shall undertake the land remediation works and provide the "Verification Reporting Requirements" (appended) to the *Project Manager* as soon as the works are completed.

8.14 Concrete

No further information is provided from that stated within the Generic Works Information.

8.15 Refuelling

No further information is provided from that stated within the Generic Works Information.

8.16 Pollution Prevention

No further information is provided from that stated within the Generic Works Information.

9 CDM

As Principal Contractor, the *Contractor* will be responsible for updating, reviewing and controlling the overall CDM plan.

The *Contractor* shall provide a proposal of the CDM strategy document at the first inaugural SHES meeting.

The *Contractor* shall be required to liaise with other affected parties situated on the Littlebrook Substation sites to discuss any additional key hazards as well as to discuss revisions being made to the CDM Plan and Hazard Plan.

The frequency of the site liaisons shall be weekly at the TP163 site weekly coordination meetings or as agreed prior to the commencement of any works on site.

10 Quality Management

Due to the nature of the Electricity Transmission System Littlebrook substation is critical site and double busbar outages cannot be accommodated therefore the *Contractor* shall ensure that the key goal of the substation from both a design and quality perspective is that Zero Gas Leaks will occur post energisation. The *Contractor* shall demonstrate the measures it will undertake to achieve this goal to the *Project Manager*, the Supervisor and the *Employer's* Representatives. The *Contractor* shall pay focus on the design and installation quality of all the gas zone "T" points to ensure gas tight seals and no leakage occurs post energisation.

10.2.4 Site Quality Plan

No further information is provided from that stated within the Generic Works Information.

10.2.5 Site Inspection and Test Plans

The *Contractor* shall provide & implement robust methods for managing both the Civil and M&E installations.

10.2.5.1 Check Sheets, Technical Reports, Technical Records etc.

No further information is provided from that stated within the Generic Works Information.

10.2.6 Subcontractor/Supplier Quality Plans

No further information is provided from that stated within the Generic Works Information.

10.2.7 *Contractor's* Manufacturing Assurance

The *Contractor* shall notify the *Project Manager* a minimum of 8 weeks before FAT tests are scheduled and request the nominated *Employer's* witness.

10.2.7.1 Manufacturing Quality Assurance Inspection Reports

No further information is provided from that stated within the Generic Works Information.

10.2.7.2 Manufacturer/Supplier's Certificate of Conformity

No further information is provided from that stated within the Generic Works Information.

10.2.7.3 *Project Manager's* Manufacturing Quality Assurance Audits

No further information is provided from that stated within the Generic Works Information.

10.3 Quality Audits

No further information is provided from that stated within the Generic Works Information.

10.4 Inspection by the *Employer*

No further information is provided from that stated within the Generic Works Information.

10.5 Inspection by the *Contractor*

No further information is provided from that stated within the Generic Works Information.

10.6 Quality Documentation

The *Contractor* shall review, adopt and be encouraged to further develop the Employer's Good Practises as well as its own internal Good Practices. The *Contractor* shall also share its good practises to the *Project Manager* and *Supervisor*.

10.7 Site Defects and Non-Conformance during the Works

No further information is provided from that stated within the Generic Works Information.

10.7.1 Defects

The *Contractor* shall produce a single Defects Register based on the relevant *Employer's* Transmission Procedure template on all Defects arising from the Installation and Commissioning Stages. The Register shall be updated by the *Contractor* on a weekly basis and the progress of defect clearance should be tabled at the weekly SHESQP Meeting. A copy of the latest Defect Register shall be provided to the *Project Manager* and *Supervisor* monthly via the use of Conject (Contractor Communications). The *Contractor* shall be responsible for managing and clearing any defects in a reasonably time manner which will be agreed with the *Project Manager* and *Supervisor*. This process will continue until the Equipment Acceptance Certificate has been completed. At this point any defects not rectified shall be transferred to the Outstanding Works Schedule. The *Contractor* shall be responsible for clearing the Outstanding Works Schedule unless agreed otherwise with the *Project Manager* which will then be managed via the NEC contractual mechanism.

10.7.2 Non-Conformance Reporting

The *Contractor* shall produce a Non-Conformance Report. The Report shall be updated by the *Contractor* on a weekly basis and the progress of Non-Conformance clearance should be tabled at the weekly SHESQP Meeting. Furthermore, a copy of the Non-Conformance Report shall be provided to the *Project Manager* and *Supervisor* monthly via the use of Conject (Contractor Communications). The *Contractor* shall be responsible for managing and clearing any Non-Conformance in a reasonably time manner which will be agreed with the *Project Manager* and *Supervisor*. This process will continue until the Equipment Acceptance Certificate has been completed. At this point any Non-Conformance not rectified shall be transferred to the Outstanding Works Schedule. The *Contractor* shall be responsible for clearing the Outstanding Works Schedule unless agreed otherwise with the *Project Manager* which will then be managed via the NEC contractual mechanism.

11 Commissioning

11.1 Tests and Inspections

The *Contractor* shall be responsible for compiling test results, and making available for inspection by the *Employer's* representative, all on site and Factory testing results.

The *Contractor* shall provide a programme of works from which the *Employer's* Commissioning Engineer shall identify the activities they wish to witness.

The *Contractor* shall notify the *Project Manager* of when FAT tests are scheduled and request who from the *Employer's* organisation is attending these, a minimum of 8 weeks before they are scheduled.

The *Supervisor* shall notify the *Contractor* not less than 7 days' notice of the activity commencing, based on the 6 week look ahead dates given at the weekly SHESQ meeting, if any other activities are to be witnessed by the *Employer*.

The *Contractor* is responsible for providing Commissioning Engineers with overall responsibility for Commissioning all equipment including any *Employer's* free-issued equipment.

11.1.1 Commissioning Programme

The *Contractor* shall ensure that its commissioning programme incorporates all the required interfaces such as the DNO for the 132kV works and Bulk Purchase Supplier stage 1 commissioning.

11.1.2 Commissioning Risk Assessment and Method Statements

No further information is provided from that stated within the Generic Works Information.

11.1.3 Acceptance Testing Requirements

No further information is provided from that stated within the Generic Works Information.

11.1.4 Acceptance Testing Resources

No further information is provided from that stated within the Generic Works Information.

11.1.5 Commissioning File

The *Contractor's* Commissioning Engineer(s) is responsible for the overall Commissioning File at Littlebrook site, including all free issued equipment, as well as updating the remote end Commissioning files.

11.2 Management of Tests and Inspections

No further information is provided from that stated within the Generic Works Information.

11.3 Covering up Completed Work

No further information is provided from that stated within the Generic Works Information.

11.4 Type Registration

As mentioned in the relevant CDS the SF₆ gas monitoring system and the cable joints & accessories for the 132kV works will need to be programmed in by the *Contractor*, and the *Contractor* shall provide a robust plan for managing the Type Registration to ensure it is completed before it becomes a critical programme activity.

12 Other Requirements

No further information is provided from that stated within the Generic Works Information.

12.1 Software Provision

No further information is provided from that stated within the Generic Works Information.

12.2 Accounts and Records

No further information is provided from that stated within the Generic Works Information.

13 Completion

No further information is provided from that stated within the Generic Works Information.

13.1 Introduction

The *Contractor* shall ensure all final as-builts drawings & records including all free issued equipment is incorporated and submitted to the *Employer*.

13.2 Pre-completion arrangements

No further information is provided from that stated within the Generic Works Information.

13.3 Take Over

No further information is provided from that stated within the Generic Works Information.

13.3.1 Technical Completion Statement

No further information is provided from that stated within the Generic Works Information.

13.3.2 Completion Certificate

No further information is provided from that stated within the Generic Works Information.

Appendices

REF.	DOCUMENT TITLE
A	Drawing: PDD-20696-LAY-001 Proposed Site Location Plan
B	Drawing: PDD-20696-LAY-002 Hazard Plan
C	Drawing: PDD-20696-LAY-003 Proposed CDM Plan
D	Drawing: PDD-20696-LAY-004 Proposed Civil Layout Plan
E	Drawing: PDD-20696-LAY-005 Proposed Earthworks and Foundations
F	Drawing: PDD-20696-LAY-006 Proposed GIS Hall Plans and Elevations
G	Drawing: PDD-20696-LAY-007 Proposed Drainage Plan
H	Drawing: PDD-20696-LAY-008 Proposed Switch Gear Layout & Annexe Drawing - 400kV GIS Hall
I	Drawing: PDD-20696-LAY-009 Proposed Overall Layout - 400kV Substation
J	Drawing: PDD-20696-LAY-010 Proposed MEWP Access Drawings - Sheet 1
K	Drawing: PDD-20696-LAY-011 Proposed MEWP Access Drawings - Sheet 2
L	Drawing: PDD-20696-LAY-012 Proposed MEWP Access Drawings - Sheet 3
M	Drawing: PDD-20696-LAY-013 Proposed MEWP Access Drawings - Sheet 4
N	Drawing: PDD-20696-LAY-014 Proposed MEWP Access Drawings - Sheet 5
O	Drawing: PDD-20696-LAY-015 Proposed Annex Layout
P	Drawing: PDD-20696-LAY-016 Proposed Earthing Layout
Q	Drawing: PDD-20696-ELE-002 Proposed Elevations of Bays – Sheet 1
R	Drawing: PDD-20696-ELE-003 Proposed Elevations of Bays – Sheet 2
S	Drawing: PDD-20696-ELE-004 Proposed Elevations of Bays – Sheet 3
T	Drawing: PDD-20696-ELE-005 Proposed Elevations of Bays – Sheet 4
U	Drawing: PDD-20696-SLD-001 Single Line Diagram
V	Drawing: PDD-20696-KLD-001 Key Line Diagram
W	Drawing: PDD-20696-KLD-002 Key Line Diagram – Remote Ends – Sheet 1
X	Drawing: PDD-20696-KLD-003 Key Line Diagram – Remote Ends – Sheet 2
Y	Drawing: PDD-20696-KLD-004 Key Line Diagram – Remote Ends
Z	Drawing: PDD-20696-KLD-005 Key Line Diagram – Remote Ends
AA	Drawing: PDD-20696-KLD-006 Key Line Diagram – Remote Ends
AB	Drawing: PDD-20696-HVC-001 Cable Route Drawing 132kV
AC	Drawing: PDD-20696-OHL-001 WCD for terminal tower/gantry – Sheet 1
AD	Drawing: PDD-20696-OHL-002 WCD for terminal tower/gantry – Sheet 2
AE	Drawing: PDD-20696-OHL-003 WCD for terminal tower/gantry – Sheet 3
AF	Not used
AG	Not used
AH	Bus Connector 2 Indicative Layout
AI	Report: PDD-20696-REP-104 Cable Route Analysis Report 132kV
AJ	Report: PDD-20696-REP-105 Cable Route Analysis Report 400kV
AK	Report: PDD-20696-REP-106 Proposed Gantry Download Clearance
AL	Not used
AM	Report: PDD-20696-REP-108 Short Circuit Loading Report
AN1	DH01 Survey Reports - Hurst
AN2	DH01 Survey Reports - Kemsley
AN2	DH01 Survey Reports - Rowdown

AN2	DH01 Survey Reports – West Thurrock
AO	Report: PDD-20696-REP-110 Earthing Study Report
AP	Report: PDD-20696-REP-111 LVAC Load Assessment
AQ	Report: Utility Report (with appendices)
AR	Drawing: Tilbury 400kV GIS 304_F001057
AS	Drawing: Tilbury 400kV GIS 303_F103040
AT	List: GE T155-2 Tilbury Packing List
AU	Verification Reporting Requirements
AV	SB464
AW	LITT Outage Schedule v2
AX	OHL Chainage Plans x 5 docs
AY	Switchgear Inspection Reports x 2 docs
AZ	Engineering Bulletin_2018_35_TA
BA	PDD-20696-3D-001
BB	PDD-20696-3D-002
BC	TS 3.24.034 Issue 4
BD	PDD-20696-HVC-002-00
BE	PDD-20696-HVC-003-00
BF	PDD-20696-HVC-004-00
BG	2019-25-01 WGTE Crates at GE Cosley Store.xls
BH	2019-25-01 WGTE Crates at NG Didcot Store.xls
BI	Littlebrook 400kV.nwd (Modelling info in Navisworks format)

Links Table

[DELETE: Include any links within this table and reference within the document. Procurement will check the links are suitable for inclusion prior to the Works Information being released on Ariba.]

REF.	LINK
1	
2	
3	
4	
5	

Amendment Record

Issue	Date	Summary of changes / reasons	Author(s)	Authorised by	Approved by
6	09/01/19	For Event Tender Launch	Richard Morris – Project Engineer Ali Khan – Development Engineer	Emma Groves – Senior Buyer	
8	31/05/19	Contract Award draft	Richard Morris – Project Engineer	Emma Groves – Senior Buyer	
9	31/05/19	Contract Award - Agreed	Richard Morris – Project Engineer	Emma Groves – Senior Buyer	