Competition in connection electricity distribution systems

Appendix Document

June 2004 124/04b

Summary

In December 1998, OFFER issued a consultation concerning the introduction of competition within connections. This consultation received a wide response, with over 100 responses being received. A further consultation was undertaken by Ofgem in July 2000 entitled 'Competition in Connections to Electricity Distribution Systems: Ofgem's Proposals', which also received numerous responses, the majority of which requested that the regulator introduce competition as soon as possible to counter the effects of high prices and poor levels of service provided by Distribution Network Operators (DNOs) to customers. In October 2000 the Electricity Connection Steering Group (ECSG) and the Unmetered Connections Steering Group (UCSG) were formed. Specific tasks were allocated to the ECSG and UCSG in order to develop detailed policies and procedures on aspects of work outlined within the July 2000 document.

In August 2002, Ofgem published a document entitled 'Competition in connections to electricity distribution systems – Final Proposals'.[1] This document outlined Ofgem's view on policies and procedures which would assist in the facilitation of competition in the provision of connections, initially in respect of new housing/light commercial developments and unmetered connections, such as streetlighting. The document also highlighted that a number of policies and procedures could not be finalised at that time due to the pending enactment of the Electricity, Safety, Quality and Continuity Regulations (ESQC) 2002. These Regulations came into effect on 31 January 2003.

A Connections Workshop was held on 18 July 2003 to develop further initiatives which would assist in the development of competition within the connections sector. A wide number of stakeholders took part in this workshop and the following way forward was agreed:

- The proposals outlined within the August 2002 document should be implemented by all DNOs, and would form the foundation of any further initiatives designed to develop competition in the connections sector.

- The Energy Networks Association (ENA) would produce a report, which would take into account the impact of the recently enacted ESQC

[1] This document is available on the Ofgem website www.ofgem.gov.uk

Regulations, developing the initiatives in the August 2002 document to further develop competition in the connections sector.

- Formation of a Metered Connections Customer Group, consisting or ICPs and contractors. This group would develop initiatives in relation to the following areas of work:
    - Consent to connect;
    - Adoption Agreements;
    - Inspection Regimes;
    - Standards of Service;
    - Extending the technical framework to cover Brownfield sites and 11kV connected Industrial and Commercial Loads;
    - Live Working on Greenfield sites; and
    - Live Working on Brownfield sites.
- Formation of the Unmetered Connections Customer Group, comprising of Local Authorities contractors and ASLEC. This group would develop initiatives in relation to the following areas of work:
    - Development of competition in live working; and
    - Formulation of a National Service Level Agreement with regard to unmetered connections.
- Representatives from the ENA, Metered Connections Customer and Unmetered Connections Customer Groups would form the membership of a new Electricity Connections Steering Group (ECSG).[2]

This document outlines all the proposals developed by the ENA. The contents of this document should be read in conjunction with the document entitled 'Competition in connections to electricity distribution systems – Consultation Document – May 2004'.

[2] The minutes of the ECSG can be found on the Ofgem website www.ofgem.gov.uk

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Appendix 1 – Response times prepared by UCCG for Connections

1.1 The tables below show a range of response times which are presently being achieved. The minimum times are in line with the recommendations to be included in the new Street lighting Code of Practice presently being finalised. The response times commence upon receipt of the notification by the DNO.

Figure 1 – Standard 1 Emergency/Fault Repair

Service	**Response time (min)**	**Response time (max)**
Emergency	2 hours	4 hours
High Priority Fault Repair	1 day	1 day
Fault repair – Single Unit	8 days	14 days
Fault Repair – Multiple Units	1 day	3 days

Figure 2 – Standard 2 New/Transferred Connections

Service	**Response time (min)**	**Response time (max)**
Works 1-10	15 days	35 days
Works 11-50	15/25 days	35 days
Works >50	By agreement	By agreement

Figure 3 – Standard 3 Providing Quotations

Service	**Response time (min)**	**Response time (max)**
Quotation for Non-standard works	15 days	15 days

Figure 4 – Provision of Information by Lighting Authority

Service	Notice Period
New Works 2-10 Connections	2 days
New Works 11-50	10 days
New Works > 50	By agreement

1.2 The ENA has provided a definition of what they regard as a working day, which is classified as 08.00 am to 16.30 p.m., Monday to Friday inclusive, but excluding public holidays.

Appendix 2 – Consent to Connect Process

Examination of Alternative Options for Consent to Connect

Aims

2.1 The DNO Working Group Competition in Connections Consent to Connect sub-group undertook to consider and develop a Consent to Connect process for LV connections on Greenfield sites. The work required consideration of the impact of the Electricity Safety Quality and Continuity Regulations 2002 ("ESQC") and a number of options were considered. It was concluded that adoption at the instant of connection was the preferred option.

Key Principles and assumptions

2.2 The ESQC Regulation 25 states:

> *25. - (1) No person shall make or alter a connection from a distributor's network to a consumer's installation, a street electrical fixture or to another distributor's network without that distributor's consent, unless such consent has been unreasonably withheld.*
>
> *(2) A distributor shall not give his consent to the making or altering of the connection referred to in paragraph (1), where he has reasonable grounds for believing that –*
>
> > *(a) The consumer's installation, street electrical fixture or other distributor's network fails to comply with British Standard Requirements or these Regulations; or*
> >
> > *(b) the connection itself will not be so constructed, installed, protected and used or arranged for use, so as to prevent as far as is reasonably practicable, danger or interruption of supply.*
>
> *(3) Any dispute between a person to whom paragraph (1) refers and the distributor, arising from delay in giving or refusal to give the consent required by paragraph (1) by virtue of the provisions of paragraph (2),*

which cannot be resolved between them may be referred by either of them to the Secretary of State who shall appoint a suitably qualified person to determine the dispute and to order as he thinks fit whether the costs (or any part of them) associated with the determination should be borne by one or other of the parties

2.3 The principle objectives in requiring a Consent of Connect process are to minimise the possibility of illegal connection and to facilitate the DNO with the opportunity to verify the safety and quality of the proposed installation from a safety perspective and to ensure that there is no interference with or interruption of supply.

2.4 For the avoidance of doubt embedded networks and embedded generation are out of scope.

Options for Consent to Connect

2.5 The sub-group considered a number of options in which Consent to Connect might be given:

- General consent given to an ICP across a DNO area.
- General site-specific consent associated with a named project or list of connections. This option would include the facility to remove general consent and move to connection specific consent. General consent would be time constrained in addition to project constrained and there would be a process for withdrawal of consent following project completion.
- Connection specific consent with the option to move to general consent based for example on number of connections successfully completed over a defined time period/project in a DNO area.
- Connection specific consent.

2.6 Option 1 was rejected as it was felt that it would result in loss of control and knowledge of where and when ICPs were operating on DNO networks. Option 3 was rejected as it is anticipated that processes and controls will achieve a robust process to facilitate general consent. There would therefore be

no additional benefit in further control by implementing a connection specific consent process.

2.7 Option 4 was rejected as it would put the DNO on the critical path for ICP connections, could be seen as being overly bureaucratic with no added value. It is also likely to be complex and prone to error. Option 2 was therefore considered to be the most appropriate.

Proposed Process for Consent to Connect

General Consent to Connect

2.8 In applying for consent for either a specific project or list of connections an ICP will be required to complete an application in two parts in advance of connection, with a third part completed after each connection and held as a record :

- Part A must be satisfactorily completed by the ICP with respect to the site in advance of any live connections being made by the ICP. The form will normally be completed at the time the adoption agreement is signed i.e. when the design / layout of the development has been finalised and an outline work programme has been agreed with the DNO. The DNO will inspect the completed Part A, endorse the form and return the form to the ICP as confirmation that "General Consent" has been granted for the site.

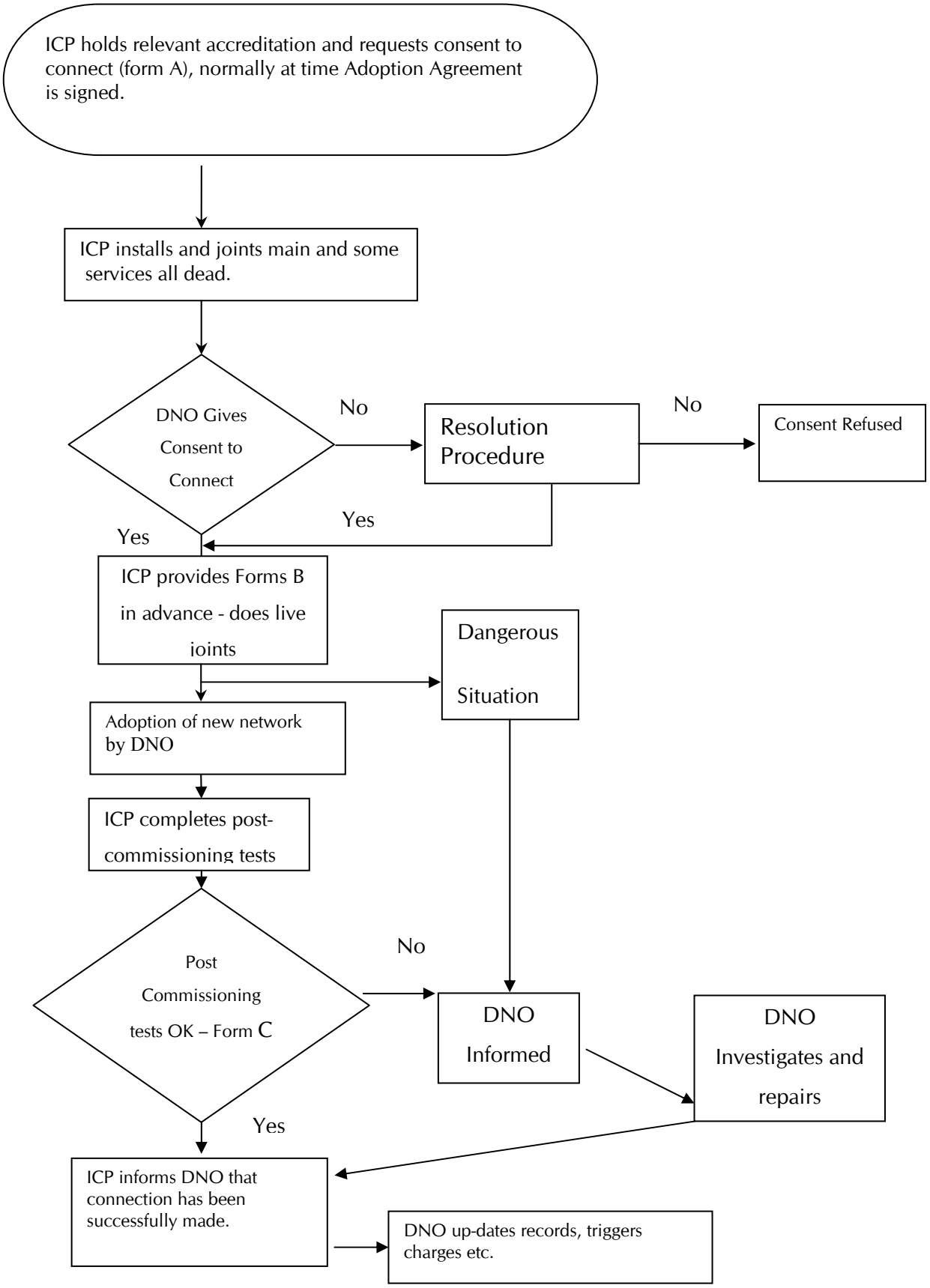
- Part B must be satisfactorily completed in advance of each batch of connections, typically covering one week's work with one week's notice and provided to the DNO, but PRIOR to making the connections. The form will provide confirmation to the DNO that "conditions precedent" defined in Part A of the form (i.e. at the time General Consent was given) are still applicable. In this circumstance the DNO will use the form "for information only" e.g. to facilitate inspection & audit etc. If the ICP is unable to complete Part B because "conditions precedent" have changed (or for any other reason), the ICP must not proceed with the connection without the agreement of the DNO.

- Part C of the form must be completed by the ICP for each and every connection, and provides confirmation that post commissioning tests have been carried out and are satisfactory. The copies of these forms shall be retained by the ICP and made available for inspection on demand by the DNO.

Connection specific consent

2.9 In exceptional circumstances where general consent has not been given or has been withdrawn, the same forms may be used to provide connection specific consent to connect. Part A AND Part B will need to be satisfactorily completed by the ICP and provided to the DNO immediately PRIOR to making the live connection. In this situation the form constitutes a *request* for consent to connect and the live connection must not be made without the DNOs agreement. The DNO will receive the form and subject to verification that it has been satisfactorily completed it will be sent back as positive and specific consent to connect granted for that specific connection. Part C of the form will be completed by the ICP and retained as above.

Adopt at Connection (Recommended Option)



NOTICE OF APPLICATION FOR CONSENT TO CONNECT – Part A

(TO BE COMPLETED BY AN ACCREDITED ICP)

Enquiry Reference:

Name of ICP:

ICP Accreditation Ref:

ICP Address: Post Code:

Work/Site Address: Post Code:

Telephone No.

This Part A Form must be satisfactorily completed with respect to the site in advance of any live connections being made by the ICP – typically at time Adoption Agreement is signed.

	To be Completed by ICP	Checked by DNO
Adoption Agreement signed including confirmation of compliance with G81 and host DNO Framework Appendices	Y/N	
Are sub-contractors to be used	Y/N	
Confirmation that the ICP together with any appointed sub-contractors hold relevant accreditation	Y/N	
Confirmation that the ICP will be able to demonstrate if requested that all individuals have appropriate competence for the work involved	Y/N	

Confirmation that the proposed connection are in accordance with the network design/layout and work programme specified in the adoption agreement	Y/N	
Confirmation that as constructed records will be provided prior to energisation	Y/N	

Declaration

I certify that the information contained in this Notice of Application for Consent to Connect is correct and complete; and

I will carry out all post 'making live; commissioning test immediately following completion of the new connections; and

This connection will comply with the Electricity Safety, Quality and Continuity Regulations 2002, BS-7671, and all relevant Statutory Instruments; and

All persons involved in making the connection are technically competent and will comply with DNO safety requirements.

Authorised Signatory:	Date:
Name (printed)	
Address: Post Code:	
Telephone No:	Mobile:

Part A Consent to Connect granted.

Authorised Signatory:	Date:
Name (printed)	

NOTICE OF APPLICATION FOR CONSENT TO CONNECT – Part B

(TO BE COMPLETED BY AN ACCREDITED ICP)

DNO Enquiry Reference:

Name of ICP:

ICP Address: Post Code:

Work/Site Address: Post Code:

Telephone No.

This Part B Form must be satisfactorily completed and provided to the DNO in advance of connections being made – typically covering one weeks connection activity and at one weeks notice.

	To be Completed by ICP
Confirmation that the proposed connections are in accordance with the network design / layout and work programme specified in the adoption agreement or an alternative subsequently agreed with the DNO.	Y/N
Pre-"making live" commissioning tests and checks will be satisfactorily completed and documents available.	Y/N
Confirmation that the ICP together with any appointed sub-contractors hold relevant accreditation and that individuals have appropriate competence for the work involved.	Y/N
All necessary wayleaves and consents granted in the name of [DNO]	Y/N

Week commencing	*[insert date]*
Addresses / plot numbers	

Declaration

I certify that the information contained in this Notice of Application for Consent to Connect is correct and complete; and

I will carry out all post "making live" commissioning tests immediately following completion of the new connection; and

This connection will comply with the Electricity Safety, Quality and Continuity Regulations 2002, BS-7671, and all relevant Statutory Instruments; and

All persons involved in making the connection are technically competent and will comply with [DNO] safety requirements

Authorised Signatory:	Date:

Name (printed)	
Address: Post Code:	
Telephone No:	Mobile:

NOTICE OF APPLICATION FOR CONSENT TO CONNECT – Part C

(TO BE COMPLETED BY AN ACCREDITED ICP)

DNO Enquiry Reference:

Name of ICP:

ICP Address: Post Code:

Work/Site Address: Post Code:

Telephone No.

This Part C Form to be completed after satisfactory testing for each and every connection, and the Form retained by the ICP and available for inspection on demand by the DNO.

	To be Completed by ICP
Location / Address / plot number of connection	
Confirmation that the connection is in accordance with the network design / layout and work programme specified in the adoption agreement or an alternative subsequently agreed with the DNO.	Y/N
Post commissioning tests and checks have been satisfactorily completed	Y/N
Insulation resistance	Value
Continuity	Correct?

Phase rotation / polarity	Correct?
Earth loop impedance	Value

Declaration

I certify that the information contained in this Notice of Application for Consent to Connect is correct and complete; and

This connection complies with the Electricity Safety, Quality and Continuity Regulations 2002, BS-7671, and all relevant Statutory Instruments; and

Authorised Signatory:	Date:
Name (printed)	
Address: Post Code:	
Telephone No:	Mobile:

Appendix 3 – Adoption Agreement Framework

3.1 This paper provides a list of features that should be captured within the Adoption Agreement(s) between the Host Distribution Network Operator (DNO) and others for the DNO to adopt assets constructed by an accredited Independent Connections Provider (ICP) on behalf of a Developer or other party under Competition in Electricity Connections.

3.2 The Agreement(s) utilised should address a number of fundamentals:

- Transfer of title of the Constructed Asset from the Asset Owner to the DNO. The Asset Owner will depend on the relationship between Materials supplier / Asset Constructor (ICP) and Developer.
- The safety of the Adopted Asset
- The quality of the Adopted Asset with surety as required
- Land and Property Rights matters (wayleaves, easements, transfers etc.) both on and off site. These must be in place with the DNO at adoption.
- Planning Permissions as required (The right for the asset to be constructed in the first place)

3.3 To address these fundamentals the framework for agreements should be flexible allowing the needs of all stakeholders to be considered and accommodated wherever possible. The structure and content of the agreement(s) will vary as will the number of parties involved. Bilateral, multiple Bilateral and Trilateral arrangements are all acceptable with the final choice being dependant upon: Project Specific Issues; Local Circumstances and DNO preferences. For example, the DNO may elect to have an agreement with the Developer because the Developer has title to the Constructed Asset. Alternatively the DNO may elect to have the agreement with the ICP conditional on the ICP proving "retention of title" of the constructed Asset.

3.4 The principles contained in this paper can be applied for Competitions in both Metered and Un-Metered Connections.

3.5 Agreements between the ICP and the Developer such as the Asset Construction Contract are outside of the scope of this paper. The DNO however should be mindful that these agreements may exist when selecting the appropriate adoption agreement.

Table 1 – Features of an Adoption Agreement

Title Page	**The Agreement**
Names of Parties	Details of all parties
Agreement Title	Purpose of the Agreement (i.e.) the undertaking of each party
Project Location	Specific Terms of the Agreement
	Signatures of all parties

3.6 Contents (Part 1) – Definitions – as appropriate.

3.7 Interpretation (Part 2) - Confirmation on the interpretation of words, terms and phrases within the agreement.

3.8 Design - Confirms ICP's responsibility to undertake the contestable design in accord with specs as listed in part 3. Confirms Distributor's right to enhance or modify the design for Distributors benefit at Distributors cost. Confirms ICP's obligation to seek approval of Contestable Design by the Distributor. Confirms ICP Liability for the Contestable Design is not relieved by Distributor's Approval.

3.9 Statutory Consents and Land Rights - Confirms who is responsible for acquisition and associated costs of Statutory Consents and Land Rights as detailed in Part 4. Confirms the position on the use of statutory powers. Confirms these consents and rights as a condition precedent of adoption of the Contestable Works. Includes Developer responsibility in Tripartite Agreements.

3.10 Distributor's Works - Details the terms under which the Distributor will undertake the Distributor's Works as described in Part 5.

3.11 Construction of the Contestable Works Prior to Making Live - Details the terms under which the ICP will undertake the Contestable Works as described in Part 6. Referencing the specifications in Part 3. as appropriate.

3.12 Initial Connection of Contestable Works to the Distributor's System and Making Live - Details the process and conditions precedent to effect connection and making live (and adoption if as agreed by the CiNC Group adoption occurs on connection and making live).

3.13 Making Live of Contestable Assets by the ICP - Details process and conditions precedent referencing Part 3 as necessary.

3.14 Adoption / Handover - Details the Process and conditions precedent for adoption / handover of the Contestable Works.

3.15 Defects - Sets down the conditions on defects liability, defects correction and the Distributors right to carry out repairs and recover costs from the ICP.

3.16 Payments - Sets down the general terms associated with payments between parties with reference to Part 7.

3.17 Interest on Late Payment - Standard clause confirming percentage rate as appropriate.

3.18 Insurance and Security - Details the level and type of surety required by the Distributor for due performance by the ICP under the terms of this Adoption Agreement.

3.19 Intellectual Property - Details the terms in connection with Intellectual Property.

3.20 ICP's Liability - Provide details of ICP Liabilities. Where live working is involved any relevant Distributor liability should be set against the ICP.

3.21 Limitation of Liability - Confirms limitation of liability at say £1m (Distributor to specify) and includes standard exclusion clauses.

3.22 Force Majeure and System Emergencies - Confirms the obligations of all parties in respect of system emergencies and Force Majeure circumstances.

3.23 Sub-Contracting and Assignment - Standard clauses plus confirmation all subcontractors to be accredited in relevant modules and ICP to be accredited in Control and Mgmt for relevant modules.

3.24 Confidentiality - Standard Clauses.

3.25 Termination of Agreement - Standard Clauses on failure of parties to fulfil obligations plus in the case of Tripartite Agreement, failure at Developer / ICP level. Party ceasing to trade etc.

3.26 Severance - Standard Clauses.

3.27 Waivers, Amendments and Variations - Standard Clauses plus agreement that variations due to Ofgem Determinations and Changes to applicable law will be binding on all parties.

3.28 Entire Agreement - Standard Clause. This is it in its entirety, supersedes all others etc.

3.29 Notices - Details the communication media allowable under the agreement e.g. letter, fax, e-mail etc together with any associated terms.

3.30 Dispute Resolution – Escalation – Adjudication - Contains details and terms for dealing with disputes. Note – Distributor's right to repair (see "Defects") should be subject to exclusion clause.

3.31 Construction Contract - For Tripartite Agreements and describes interdependence of Construction Contract (between ICP and Developer) and this agreement.

3.32 Indemnities - Standard clauses. e.g. The ICP / Developer shall indemnify the DNO against any loss, damage or penalty including any legal or safety risk, incurred by the DNO as a result of any act, omission or default of the ICP / Developer or their sub contractors. This section should also describes the process of the indemnified party to benefit from any contractual indemnities.

3.33 Third Party Rights - Standard Clauses

List of Distributor Standards and Specifications with which the Contestable Works must comply (Part 3)

3.34 This part will contain a full list of Distributor Specifications with which the Contestable Works must comply. The list will include the relevant design specification and material standards etc for the type of asset involved, construction and installation requirements, commissioning and record requirements, live working procedures, distribution safety rules etc.

Land Rights (Part 4)

3.35 This part will contain the detail as referred to in the definition of land rights in the general conditions together with any project specific terms and conditions

Specification of Non-Contestable Distributor Works (Part 5)

3.36 This part will provide details of the non-contestable works eg Diversions, Upstream Reinforcement etc. to be carried out by the Distributor. It may include plans and layouts etc. alternatively it could merely be a written description of the works if appropriate.

3.37 The specification would also include an indication of timescale for completion of the work by the Distributor.

3.38 If phased payments are allowed, the specification should be defined in relation to each defined phase of the work.

3.39 If it the policy of the Distributor to undertake contestable work that the ICP is not accredited for, then the reference to "Non-Contestable" should be removed and the specification should include all work to be undertaken by the Distributor.

Specification of the Contestable ICP Works (Part 6)

3.40 This part will provide details of the contestable works to be carried out by the ICP and the assets to be adopted by the Distributor. It will include where appropriate site plans, plans of any live working area, list and layout plans for assets to be adopted, the electrical design including any network enhancements to the contestable works agreed with the Distributor. The

specification should also include an indication of timescale for the completion of the contestable work by the ICP including any phasing and co-ordination plans.

Payment and Allowance Schedule (Part 7)

3.41 This section will include all payment criteria to include the following:

- Distributor Payments to the ICP for enhancements to the Contestable Work;
- Distributor payments to the ICP on adoption of the network;
- ICP payments to the DNO towards the cost of non-contestable works by the Distributor; and
- ICP payments to the Distributor for inspections, testing, approvals and administration.
-

3.42 **Please Note**: As an alternative to parts five and seven, a copy of the non-contestable terms could be referenced or included as section five provided it contained the necessary details.

Contacts

3.43 The section will contain Distributor and ICP contact details.

Appendix 4 – Memorandum of Understanding with Lloyds Register

4.1 The purpose of this Memorandum of Understanding (MOU) is to set out the governance arrangements between the NERSAP and LR, the appointed Accreditation Body.

4.2 Any reference in this MOU to this MOU or any other agreement, scheme, or document is to be construed as a reference to that document in the form in which it has been or may from time to time be amended revised, varied, restated, or supplemented.

4.3 The NERSAP has been established to oversee and perform an ongoing review of the performance of the Scheme and the Accreditation Body which owns and operates the Scheme under the terms of this MOU. The Scheme is operated in accordance with the guidance document; 'Scheme for the Assessment of Competence of Service Providers carrying out contestable work', available on the LR website. A glossary of terms applied throughout this MOU is included in the Appendix to this document.

4.4 This MOU will come into effect on the date of issue and will continue in force for 5 years unless terminated by either party. Termination may be effected by LR by providing notice in writing of their intent to withdraw from the Scheme and withdrawal would be effected once the NERSAP were satisfied that a replacement organisation was in a position to effectively perform the Accreditation role. Termination may be effected by the NERSAP by advising LR in writing that they propose to introduce a further Accreditation Body into the Scheme, LR will be required to withdraw from the Scheme once the NERSAP are satisfied that the introduced Accreditation Body can effectively perform the Accreditation role and this will be signified by providing one month's notice in writing.

4.5 LR commits to fulfilling the role of the Accreditation Body. LR shall not relinquish the role except under the terms as described above and only then provided that the replacement Accreditation Body could demonstrate to the satisfaction of the NERSAP that it was in a position to effectively take over the

responsibilities associated with owning and operating the Scheme. LR shall be directed and positively respond to the advice of NERSAP. Such advice and direction shall be based upon a majority voting process.

4.6 The role of the NERSAP will be as follows:

- To establish and maintain an overall view of the performance of LR as the
- Accreditation Body and its compliance with the Scheme guidance documents and standards
- To provide guidance to the Accreditation Body as to the resolution of disputes that may arise with Service Providers seeking registration and DNO's seeking the withdrawal of such registrations, should they remain unresolved, having exhausted the disputes and appeals procedures defined in the Scheme guidance document.
- To establish a process, as necessary, to resolve disputes that may arise between the Advisory Panel and the Accreditation Body.
- To act as a forum for feedback from both DNO's and Service Providers as to the Scheme performance and advice as to how the Scheme may be revised in the light of such feedback.
- To review and accept Scheme guidance documentation, assessment procedures and practices and provide guidance and advice on subsequent revisions thereto
- The NERSAP members will be responsible for informing their respective stakeholder interests of Scheme changes etc.

4.7 Each individual member of NERSAP will be responsible for all costs and expenses incurred in the performance of that role.

4.8 NERSAP members will not be held individually liable for any advice and direction provided to the Accreditation Body and which the Accreditation Body may have acted upon. Advice and direction provided to the Accreditation Body by NERSAP will be based upon majority decisions.

4.9 The NERSAP will be able to maintain an awareness of the performance of the Accreditation Body by the following means:

- Each member will be able to gain access to the assessment reports which will be posted on the LR intranet for restricted access by members only. These reports will be sanitised as some members may be considered competitors of Service Providers who are the subject of the reports. NB - DNO Panel representatives will be provided with details of the Service Providers being reported upon, upon request

- DNO Panel representatives will have access to the assessment processes and checksheets

- The NERSAP will be provided with the job description for the role of Scheme Assessor, which will detail the minimum qualifications and experience of the Accreditation Body's staff who would be assigned to this role, for agreement.

- NERSAP members may perform audits on the Accreditation Body as part of their ongoing performance assessment

4.10 The role of the Accreditation Body is to:

- Own and operate the Scheme and associated guidance and assessment documents

- To modify the processes and procedures associated with the Scheme as advised by the NERSAP

- To ensure that the Service Provider seeking registration under the Scheme is financially sound, competent to perform the scopes of work sought in a safe and consistent manner, prior to registration.

- The provision of detailed reports to support and record the assessment activity and provide transparency of assessment to the NERSAP

- Perform ongoing surveillance assessments of registered Service Providers

- Maintain the web site based register of registered Service Providers

- Report on a 2 monthly basis to the NERSAP as to the Scheme performance
- Respond positively to the advice provided by the NERSAP
- Seek the NERSAP acceptance of proposed increases in assessment costs
- To record the minutes of the NERSAP meetings and to post them on the LR website
- To present any proposed changes to the Scheme or associated assessment processes, to the NERSAP for their review and recommendations.

4.11 The NERSAP will, through the regular 2 monthly NERSAP meetings, keep the Accreditation Body aware of their views on the performance of the Scheme. If however the Accreditation Body fail to demonstrate a commitment to address ongoing concerns relating to the operation of the Scheme and which is considered by the members to adversely impact upon the perceived integrity of the Scheme, then NERSAP may introduce a further Accreditation Body into the Scheme with a view to replacing the incumbent, over a period to be determined by the NERSAP, but which would not exceed 6 months.

4.12 The Scheme is defined in the 'Scheme for the assessment of Competence of Service Providers carrying out contestable work' guidance document which is posted on the LR web site. The guidance document was devised and worded such that any organisation, considered competent by the NERSAP may act as the Scheme Accreditation Body and may access and use the guidance document to assist them in this endeavour.

4.13 The principles of the guidance document 'Scheme for the Assessment of Service Providers carrying out Contestable Work,' were assessed and accepted in principle by the following bodies:

- EA Technical Support Group
- Ofgem Competition in Connections working Group

4.14 The guidance document has been accepted for use by the NERSAP.

4.15 The membership of the Panel currently comprises 7 DNO representatives and 3 Service Provider representatives and it is proposed that this ratio be maintained. Additionally Ofgem will be represented on the Panel, as an observer and there will also be representatives from the Accreditation Body. In the event that a DNO representative withdraws then it shall be incumbent upon the DNO concerned to make arrangements for a replacement. In the event that a Service Provider representative withdraws then the replacement panel member will be drawn from other registered Service Providers who have an interest in being represented. The process for election of Service Providers will be determined by the Panel members.

4.16 Whilst acting as the Accreditation Body for the Scheme, LR will enter into a contract with the Service Provider seeking registration whereby LR will agree to provide certain services.

4.17 This MOU is not legally binding and does not create any legal or equitable rights or any legally binding relationship or agreement between the parties, or between them and third parties. Neither party shall incur any liability whatsoever as a result of entry into the MOU or any action, task, obligation, omission or default under it.

4.18 This Memorandum of Understanding is signed for and on behalf of each party as an acknowledgement that the MOU reflects its intentions and understandings in relation to governance arrangements between NERSAP and LR.

Glossary

4.19 **Accreditation Body** – an organisation which undertakes the assessment of the competence of Service Providers in accordance with the Scheme and has been approved for doing so by the National Electrical Registration Scheme Advisory Panel.

4.20 **Accreditation Certificate** – a certificate awarded to a Service Provider by the Accreditation Body for a scope of work assessed under the Scheme.

4.21 **Accredited Service Provider** – an organisation, which has been assessed in accordance with the Scheme, as competent and has been issued with a valid and current Certificate of Accreditation.

4.22 **A Service Provider –** Any person or organisation applying for accreditation.

4.23 **Assessment** – objective and detailed evaluation of a Service Provider to determine their competence in accordance with the Scheme criteria.

4.24 **DNO** – Distribution Network Operator which is the electricity company responsible for the electrical distribution network in a particular area.

4.25 **NERSAP** - National Electricity Registration Scheme Advisory Panel– the Panel which comprises representatives of the DNO's, Ofgem, Accredited Service Providers and representatives of the Accreditation Body, are responsible for overseeing the development, implementation and reviews of the Scheme performance. The Panel would also provide advice to the Accreditation Body over the adjudication of appeals.

4.26 **Ofgem –** The Energy Regulator, being the Gas and Electricity Markets Authority established under section1 of the Utilities Act 2000.

Appendix 5 – Audit and Inspection Regime Best Practice

5.1 Purpose:

- To discharge DNO obligations under ESQC Regulations
- To provide assurance that ICPs are complying with policies, procedures etc for installation methods & materials and to an approved design ie EA G81 compliant.

5.2 Purpose is not to:

- Replace ICP's own safety or quality assurance processes.
- Provide total reassurance to DNO, i.e. a sample approach will apply.

5.3 Best Practice features – Frequency:

- Reduced level of audit based on successful track record [both time and volume aspects reduce frequency] in line with attached table.
- Criteria defined that trigger an escalation in inspection levels if performance found to be deteriorating. Based on the severity of the deterioration, typically this would be based on repetition of defects ('two strikes and you're out') but could be based on a single event.
- Minimum level of physically witnessing actual work ie not just the completed installation.

5.4 Scope:

- Defined and explicit check list
- Categorisation of defects e.g. High/Medium/Low, [low may not require rectification].
- Applies to both internal & external service providers in each DNO licensed area.

5.5 Defect Rectification:

- Defects notified to ICP both on site and via email/letter.
- Agreed solution verified by audit.
- Defects do not always result in 100% audit if agreed resolution e.g. type fault, rogue jointer etc.

5.6 Arbitration:

- Agreed arbitration process to resolve disputes on audit findings, two stages defined [first escalation to "Connections Manger", then onto a "Senior manager"].

5.7 Charges:

- A charging mechanism is required which enables DNOs to recover the full cost of the audit & inspection activity necessary to facilitate competition in connections.
- Ofgem are intending to issue a policy statement and proposals for cost recovery in the Distribution Price Control Review document, due for publication on 22 March 2004.

5.8 Other:

- Audit records retained [not just defects]
- Performance monitored centrally

Audit Levels						
	Activity	**First Audit Level**	**Qualifying Count and Period to Move Second Level**	**Second Audit Level**	**Qualifying Count and Period to Move to Third Level**	**Third Audit Level**
Site Inspections	Mains cable installation	50% per site	10 inspections across a minimum of 5 sites within 6 months	10%	5 inspections across a minimum of 5 sites within 6 months	5%
	Service cable installation	10%	20 installations across a minimum of 5 sites within 6 months	2%	-	2%
	Mains jointing	50%	10 inspections across a minimum across a minimum of 5 sites within 6 months	10%	5 inspections across a minimum of 5 sites within 6 months	5%

	Service jointing	20%	20 joints across a minimum of 5 sites within 6 months	5%	20 joints across a minimum of 5 sites within 6 months	2%
	Service termination	20%	20 terminations across a minimum of 5 sites within 6 months	2%	-	2%
	HV pre-commissioning tests	100%	5 tests within 6 months	20%	5 tests within 6 months	5%
	Transformers and switchgear	100%	-	100%	-	100%
	Civil Works	100%	-	100%	-	100%

Note: Polarity checks EXCLUDED.

Appendix 6 – Records Information – Greenfield LV Housing Estates

Table 2 – Records Information

No	Record Item	From who?	When	Notes
1	Initial request from NE with site location for point of connection information – site location plan, no of dwellings, heating type or ADMD/dwelling	NE	At start	
2	Provision of point of connection information	DNO	By SOP date	
3	Provision of Accreditation references for contested elements	NE	Before start of work, involving that element, but ideally before	
4	Design information data from NE – input and output from design package, statement of parameters used – max voltage unbalance, ADMDs/annual consumption by Customer class, demand profile class listing (DPC5.2.1), individual max power kW/kVA, type and loading of equipment, diversity %, economic rating £/kW fixed and variable, maximum PSCCs at point of connection service	NE	Before start of work	As listed in Appendix A (+DLH specific) of G81 pt 1

	main, PSCC at LV busbars of HV/LV t/f, rating criteria for cables, max earth loop resistance to end of service/end of main, max no of services per jt. For each feeder – nos of customers and connections each phase, max deader load Amps, Fuse selected and max clearance time ph – earth fault at cut out, max voltage regulation at cust out +/- %, max earth loop resistance. Unmetered supplies – classes and demands per BSCP 520			
5	Request for design additions and design approval	DNO	Before start of work	NOTE – SOP time period from last item
6	Provision of information on materials to be used – compliant with DNO list or details of proposed alternative meeting host DNO requirements	NE		
7	Provision of works programme, with updates subsequently issued when programme changed	NE		
8	Public liability insurance – evidence that in place if requested by DNO	NE	Before construction	
9	Planning consents obtained	NE	Before	Ref G81 pt 1 Cl. 9.37

			construction*	(*DNO would only need to see before adoption)
10	Other consultations/consents obtained (e.g.) English Heritage, Environment Agency etc	Ref G81 pt 1 Cl. 9.37 (*DNO would only need to see before adoption)	Before construction*	Ref G81 pt 1 Cl. 9.37 (*DNO would only need to see before adoption)
11	Planning consents obtained for non-contestable elements on land owned by Developer	DNO	Before construction	
12	Other consultations/consents obtained (e.g.) English Heritage, Environment Agency etc for non-contestable elements	DNO	Before construction	
13	Easements/wayleaves provided to DNO for non-contestable elements on land owned by Developer	NE	Before construction	
14	Wayleaves and easements requiring use of compulsory powers	DNO	Before construction	
15	Wayleaves and easements not requiring use of compulsory powers	NE	Before adoption	If intended that DNO adopts, terms of these have to be

				prior agreed with DNO.
16	MPANS issue	DNO	Before customers connected	Can DNO issue MPANs for connection to a network it neither owns or operates prior to adoption
17	Registration with Supplier(s)	NE	Before customers exit points made live	
18	BSCP 520 inventory complete, submitted, accepted and registered	NE	Before unmetered connections energised	
19	Inspection defects reports	DNO	Stages during construction and post energisation	
20	Substation risk register classification – ESQC Regs	NE		G81 pt 3 10.1 (e.g.) location make type rating and serial numbers. The risk register and actions to mitigate risk are required under Reg

				3(2)(b) of the ESQC Regs and will require discussion and agreement between NE and DNO at design stage – see G81 pt 1 Cl 9.17
21	HV/LV substation numbering/name and signage	DNO	Before energisation	NOTE- will vary depending on timing of Adoption
22	Commissioning Test info. Test and compliance certification - mains and service insulation resistances and continuity, pme electrode earth resistance, s/s overall earth resistance - combined / non combined HV/LV and overlap, LV fuse cabinet insulation resistance, HV/LV transformer insulation resistances, pressure test, tap setting check, oil moisture content, oil electric breakdown strength, statement on pcb content, HV switchgear insulation resistance, pressure test, protection test, functional checks, gas pressure etc. HV cables insulation resistance,	NE	Before energisation	For each part of network to be energised by DNO, or adopted by DNO, confirmation of conformance to G81 (+DLH specific) requirements, and certified, acceptable, test results.

	Continuity.			
23	Accurate as laid map plans showing cable route, depth, types, sizes, ducts lengths and sizes, joint locations, joint and service phasing and earth rod locations**. Plant location, maker, tye ref, rating and serial numbers, records of installation	NE	Before energisation	Ref G81 Pt 3 Cl. 10.1 and Reg 15 of ESQC Regs. If DNO has not adopted new network at this point, the NE has legal duty to have these. From a practical viewpoint, the DNO would need to see these to confirm compliance with Regs, and there would still be value in having knowledge of unadopted network map record to identify that DNO was NOT responsible for that unadopted, energised network. ** Note

				requirements on pme earth rod location w.r.t. end of main during the phases of construction / energisation .
24	IR and pressure tests from DNO adjacent s/s into new HV equipment	DNO	Before energisation	
25	Completion certificate	NE	Before energisation	
26	Making live certification	NE	Before energisation	
27	Live working area statement	DNO	After energisation	Should this DNO or NE?
28	Service polarity / phase rotation and earth loop impedance.. Voltage and phasing checks on HV/LV transformer.	NE	After energisation	
29	Further completion certificates, making live certificates, live working area certificates as further stages ensue	NE	After initial energisation	Depends on Adoption Agreement and arrangements for subsequent live jointing
30	Title of land (e.g. s/s sites) and all legal permissions vested in DNO.	NE		

31	CDM file relevant sections passed to DNO	NE		
32	ADOPTION - Hand over document	NE*	At adoption	*Raised by NE but not valid until countersigned by DNO. Subject to terms of adoption agreement. For the avoidance of doubt and reduction of risk, the hand over document must include clear indication, probably in the form of a marked up map, of the boundaries of adopted and unadopted network. Copies of this documentation will need to be retained by both DNO, NE and copies readily available of site

				for NE staff during construction phases of work.
33	Ongoing record of contested works	DNO	At adoption	DNO will need to be able to identify which parts of their network were adopted from who and when (noting staged works), for ongoing reference back to guarantees within adoption agreement. There is likely therefore to be some need for cross reference between mains records and adoption agreement files, test and hand over documentation.

Note: The above list is primarily aimed at technical and construction elements of the works. Other internal records may be required for SOP purposes.

Appendix 7 – Live LV Jointing High Level Proposals

7.1 LV Joint:

- establish ENA assessment panel
- Specify assessment criteria
  - Overall joint type approved to G81 or:
  - Components type approved to G81 and service history or;
  - Other?
- Establish register of approved joints
- Specify criteria for assessment of jointing procedure
  - Assembly instructions, safe working practice and PPE
- Compatibility of procedure with joint design and EMS assessed by NERS (Lloyds).

7.2 ICP (Employer):

- Electrical Management System (EMS) assessed NERS against criteria agreed by Advisory Panel
- EMS includes:
  - Employee trade skills and safe working training
  - Issue and control of PPE, tools and equipment
  - Employee competence assessment
  - Procedure for control of documentation and records
  - Safety rule, codes of practice and live working procedures

- Large ICP may choose to develop its own safety rules and procedures or procure from host DNO

7.3 ICP (Employee) Working Across Several DNO Areas:

- Trade skills and competence
  - Assessed by employer
  - RESETS certificate
- Authorised against ICP safety rules by ICP
- Interview by DNO to assess competence
- Provided with network access certificate by DNO
  - Specify scope and zone of work
  - Network restrictions
  - Operational liaison and emergency procedures
- Ad-hoc on-site audits by DNO

7.4 ICP (Employee) Working in One DNO Area

- Trade skills and competence
  - Assessed by employer
  - Employer provides DNO with evidence of competence
  - RESETS certificate
- Training on DNO safety rules by DNO
- Interview by DNO to assess competence
- Authorised against DNO safety rules by DNO
- Provided with Authorisation certificate by DNO

- Ad-hoc on-site audits by DNO

7.5 ICP options:

Option 1	**Option 2**
Large ICP working across several DNO areas	Small ICP working in one DNO area
Develop or procure an LV joint and submit to ENA panel for assessment	Procure host DNO LV joint and jointer skills training
Develop EMS and submit to NERS for approval	
ICP authorises employee against ICP safety rules	DNO authorises employee against DNO safety rules
DNO interviews employee and provides network access certificate	DNO interviews employee and provides authorisation certificate
Ad-hoc on-site audits by DNO	

Notes – ICP funds costs of assessment by ENA Panels, and viability of option 1 subject to all DNOs accepting LV joints assessed by ENA Panel and ICP EMS/Safety Rules accredited by NERS.

Appendix 8 – G81 Technical Framework Document Part 1 – Design and Planning (inc Brownfield)

8.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Framework for design and planning, materials specification and installation and record for low voltage housing development installations and associated, new, HV/LV distribution substations - Part 1: Design and Planning.

8.2 This framework document is the property of The Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of The Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from this document.

8.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004. This revision extends the scope to include previously developed ("brownfield") sites as well as the "Greenfield" sites previously covered.

8.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from the Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

8.5 The document sets out the minimum requirements for design of low voltage underground cable electricity networks, including their new associated HV/LV distribution substations, for housing developments undertaken under the Ofgem Competition in Connections regime. It is one of the following suite of documents governing this work:

- Adoption Agreement
- Design and Planning framework
- Materials Specifications framework

- Installation and Records framework
- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed. **NB This suite of documents applies only to NEW installations and is not to be applied retrospectively**

8.6 It is intended to set out or make reference to design and planning requirements which have to be met for a Host DLH to adopt contested LV networks and their associated new HV/LV distribution substations on housing developments.

8.7 This document is intended to supplement but not amend, abridge or override any statutory legislation referred to within this document.

8.8 This suite of documents only applies to connections to single-occupied premises and street lighting installations. For design issues associated with multi-occupied premises (eg blocks of flats) please see Host DLH Appendix.

8.9 This suite of documents does not include any requirements in respect of generator connections. These are subject to separate consideration

8.10 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the Host DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the Host DLH.

Energy Networks Association / ESI publications - Engineering Recommendations (ER)

8.11 G5/4 - Planning levels for harmonic voltage distortion and connection of non-linear equipment to transmission and distribution networks in the UK.

8.12 G12/3 - Requirements for the application of protective multiple earthing to low voltage networks.

8.13 G14 - Protective multiple earthing recommended principles of testing to ensure correct polarity.

8.14 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture.

8.15 G74 - Procedure to meet the requirements of IEC 909 for the calculation of short-circuit currents in three-phase AC power systems.

8.16 G77 - Recommendation for the connection of inverter connected single phase photovoltaic (PV) generators up to 5kVA to public distribution networks.

8.17 P2/5 - Security of Supply.

8.18 P17 - Current rating guide for Distribution Cables.

8.19 P25/1 - The short circuit characteristics of PES low voltage distribution networks and the co-ordination of over-current protective devices on 230v single phase supplies up to 100A.

8.20 P26 - The estimation of maximum prospective short-circuit current for three phase 415v supplies.

8.21 P28 - Planning limits for voltage fluctuations caused by Industrial, Commercial and Domestic equipment in the United Kingdom.

8.22 P29 - Planning limits for voltage unbalance in the United Kingdom for 132 kV and below.

Energy Networks Association Technical Specifications (ENATS)

8.23 ENATS 12-08 - The application of fuselinks to 11kV/415v and 6.6kV/415v Underground Distribution Networks.

8.24 ENATS 41-24 - Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

National Joint Utilities Group (NJUG) publications

8.25 NJUG 6 - Service entries for new dwellings on residential estates.

8.26 NJUG 7 - Recommended positioning of Utilities apparatus for new work on new developments and in existing streets.

8.27 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

8.28 HS (G) 47 - Avoiding danger from underground services.

8.29 GS 6 - Avoidance of danger from overhead electric power lines.

Pooling & Settlement Agreement

8.30 Agreed Procedure – Unmetered Supplies Registered in PRS Vol 5 AP 520 Issue 3 - now BSCP 520.

Ofgem agreed publications

- Distribution Code; and
- Distribution Licence Conditions.

National and International Standards

8.31 IEC 909 - Short circuit current calculations in 3 phase ac systems.

8.32 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations 16th edition).

8.33 BS EN 50160 - Voltage characteristics of electricity supplied by public distribution systems.

8.34 BS 88 Part 5 - Cartridge fuses for voltages up to and including 1000 V and 1500 V DC – Supplementary requirements for fuse links for use in ac electricity supply networks.

8.35 All requirements of all statutory legislation must be met. The following is a list of **some** of the relevant legislation:

- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it.
- Electricity Safety, Quality and Continuity Regulations 2002 (and associated Guidance issued by DTI dated 22 October 2002).
- Electricity at Work Regulations 1989.
- The Building Regulations.
- The New Roads and Street Works Act.
- Town & Country Planning Act – General Development Order 1990.
- Environmental Protection Act 1990 & 1995.
- Contaminated Land (England) Regulations 2000.
- Asbestos at Work Regulations 2002.
- The Electricity and Pipe-line Works (assessment of Environmental Effects) Regulations 1990.
- The Electricity Works (Environmental Impact Assessment) (England & Wales) Regulations 2000.
- Wildlife and Countryside Act 1981.
- Construction (Design Management) Regulations 1994.
- The Management of Health & Safety at Work Regulations 1999.
- Health & Safety at Work etc Act 1974.

Abbreviations

- OFGEM – Office of Gas and Electricity Markets.
- ADMD – After Diversity Maximum Demand
- BSI – British Standards Institution

- BS – British Standard
- BS EN – A European Standard adopted as a British Standard
- CNE – Combined neutral and earth (of cable construction)
- Applicant – The Company wishing to undertake the contestable work
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1 Sept. 2001
- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003)
- ENATS – Energy Networks Association Technical Specification
- ENA – Energy Networks Association
- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- Housing estate – a development consisting of domestic dwellings
- HSE – Health & Safety Executive
- IEC – International Electrotechnical Commission
- NRSWA – New Roads and Street Works Act
- PSCC – Prospective Short Circuit Current

8.36 This framework document describes requirements for design and planning of low voltage underground cable networks including their new associated HV/LV

distribution substations for housing developments. Networks must be such that they are developed and maintained to provide an efficient, secure and co-ordinated system of electricity supply that is both economical and safe.

8.37 This framework is subject to some local variation between DLH's because, for example, of differences in:

- substation specification, network design and impact on fault levels
- environment and impact on ratings, insulation, corrosion etc
- compatibility with existing equipment.

8.38 Where a deviation from this framework is identified, it will be stated in the Appendices to this document.

8.39 The Applicant shall develop a network design which complies with the engineering standards specified in section 5.0 above and all applicable statutory legislation, examples of which are included in 6.0 above. In particular, the principles of sound health and safety management shall be taken fully into account to ensure that the system can be constructed, maintained and operated safely and effectively.

8.40 The Applicant shall ensure that equipment is within design rating and shall state the assumptions that have been made in deriving ratings and operating duty.

8.41 Network electrical design shall comply with the requirements of this section, employing the data listed in the Appendices. It is important to note that these data may vary between DLH's, for reasons such as described above.

Design approval

8.42 It is necessary for the Host DLH to approve the design against this document prior to construction. Each DLH will define the information requirements necessary to support the approval process. Use of the same design tool as the Host DLH will simplify the design approval process and it is recommended that Applicants discuss with the Host DLH the manner in which information is provided.

8.43 Submission of designs by the Applicant to the DLH for approval shall include copies of input and output from the design package used by the appropriate DLH:

- a statement of the design parameters used and - see Appendix A for list
- a drawing showing the network layout to a suitable scale showing, routes, joint positions, cable sizes, link boxes and LV phase connections
- confirmation that the design meets the requirements of this framework as supplemented in the Appendices.

8.44 The Host DLH may elect to opt for a design which exceeds the requirements of this document, for example to provide additional LV linking facilities or to increase conductor sizing to permit later network extension not covered by the Applicant's programme. If there are generic issues such as provision of mobile generator connection facilities, these will often be set out in the DLH specific details in Appendix B. Issues which are relevant to individual designs would be discussed with the Applicant during the design process, as provided for under the terms of the Adoption Agreement.

Voltage Regulation and Voltage unbalance and fluctuating loads

8.45 The allocation of voltage regulation limits between the LV busbars of the HV/LV substation and the end of any service, including the maximum proportion of regulation in the service, shall not exceed the limits stated by the Host DLH in the Appendices.

8.46 Connections shall be balanced to fall within the voltage unbalance limits of National Engineering Recommendation P29, taking existing network connections into account.. Limits for voltage fluctuations caused by industrial commercial and domestic equipment (eg sewage pumps sometimes found on new housing estates) are set out in National Engineering Recommendation P28.

Losses/ Earth loop resistance/ Low voltage underground cable network

8.47 Systems must be developed to be efficient, co-ordinated and economical. The design shall minimise lifetime cost of installation and operation and shall include evaluation of system losses using loss £/kWh as used and stated by the Host DLH in the Appendices. (Detailed requirements may be subject to review when the Ofgem Environmental Action Plan is finalised).

8.48 The maximum earth loop resistance (LV Main plus service cable loop) shall be as stated by the Host DLH in the Appendices.

8.49 The low voltage underground cable network shall be of CNE construction utilising the standard sizes of cable employed by the Host DLH as specified in Appendix B.

8.50 The network shall be earthed using the PME system in accordance with ER G12/3.

8.51 The voltage drop on the low voltage underground cable network between the substation LV busbars and all extremities of the network shall not exceed the limits specified in Appendix B. This voltage drop shall be calculated assuming that all customers are taking their design ADMD with allowance for unbalance and diversity. Host DLH-specific design ADMDs for different classes of customer are listed in Appendix B.

High voltage network/Substations

8.52 The high voltage network shall utilise the standard design of overhead line or type of underground cable and conductor sizes employed by the Host DLH as specified in Appendix B. Where work falling within the scope of this document entails modification of an existing DLH circuit, the design, for example in selection of conductor materials and sizes, shall be such that existing ratings are maintained.

8.53 The hv/lv distribution substation(s) shall utilise the standard sizes of transformer employed by the Host DLH as specified in Appendix B.

8.54 Transformer sizing shall be based on the aggregated ADMDs for all customers fed from the substation and the permissible cyclic rating of the transformer as specified in Appendix B, and minimising lifetime cost criteria as set out in 9.9 above.

8.55 The substation location shall take into account access and environmental factors such as: noise pollution, flooding risk and vandalism. (See also ESQCRs and associated DTI Guidance). Early discussion is required between the Applicant and the Host DNO over the substation ESQCR risk assessment and the proposed design features which take account of this.

8.56 Substation earthing shall be such as to prevent danger from rise of potential during system earth faults and shall take account of touch potentials, step potentials and transferred potentials. See ENATS 41-24 for further information.

Services/Design of unmetered supplies/Ratings

8.57 Service cables shall be of CNE construction using standard sizes of cable employed by the Host DLH as specified in Appendices to the Materials framework document.

8.58 See - National Joint Utilities Group Publication Number 6.

8.59 Service entry policy may vary between DLH's – see information in Appendix B for details.

8.60 Only supplies covered by BSCP 520 may be unmetered supplies, and require prior approval of the Host DLH.

8.61 Loads shall be calculated in accordance with BSCP 520, where this provides information on the class of load.

8.62 The network design shall otherwise follow LV network design practice described in this Framework.

8.63 The design shall be such that equipment design ratings including any appropriate cyclic or short term ratings as defined in the appropriate specification or Engineering Recommendation P17 are not exceeded, and must take into account the load profile characteristics and DLH specific criteria, such as ambient temperatures, soil thermal resistivity etc as listed in the Appendices.

8.64 It is important to note that these factors are likely to differ between DLH's and so application of rating information in Engineering Recommendation P 17 will not produce common ratings throughout UK. See Appendices for Host DLH data.

8.65 Ratings employed shall be appropriate to the duty and environment in which the equipment is used. An example of this is the rating of an LV house service cut out in a meter cabinet; the cut out may have a maker's rating of 100A, but this is de-rated when used in the environment of a cabinet. Cables in ducts shall be de-rated in accordance with ER P17.

8.66 The short circuit rating of equipment provided shall not be less than the design fault level of the DLH Distribution network to which it is to be connected (as specified in Appendix B).

Fault levels

8.67 Fault levels shall be sufficient to ensure operation of protection but shall not exceed the limit stated in Appendix B for the design PSCC at the substation LV busbars. Maximum design Prospective Short Circuit Current (PSCC) at LV busbars of HV/LV substation.

8.68 Networks shall be designed not to exceed the following PSCCs. The design PSCC at the LV busbars of the HV/LV transformer shall be as stated by the Host DLH in Appendix B, unless otherwise agreed in writing.

8.69 Allowance for fault infeed from the LV system shall be included in accordance with IEC 909. The parameters used shall be stated by the Applicant.

8.70 Engineering Recommendations P25/1 and P26 give the following figures as maximum design values of PSCCs at the point of connection of the service line to the DLH main lv distributor -

230v 1ph	16kA
230/400v 3ph	25kA
230/460v 2ph	25kA

8.71 The short circuit rating of equipment provided shall not be less than the design fault level of the DLH Distribution network to which it is to be connected. (Distribution Code - DPC 6.5).

8.72 Maximum PSCC shall be quoted in kilo Amperes (kA) to avoid confusion arising from assumptions about nominal voltages.

LV protection

8.73 The protection of LV feeder circuits shall meet the following requirements:

- Feeder circuits supplying more than one customer shall be protected by fuses to BS88 part 5.
- LV supply cables to single customer shall be protected by fuses or circuit breakers, dependent on supply capacity and customer's protection.
- Fuses must provide short-circuit protection for the whole length of the circuit up to the service cut out. Phase to neutral fault clearance time shall be as stated by the Host DLH in Appendix B
- Fuse ratings must allow for the cyclic overload rating of the circuit.
- For discrimination, the minimum pre-arcing I^2t of a feeder circuit fuse must exceed maximum total I^2t of any individual fuse downstream.
- Excess current protection shall be provided at the point of supply.
- LV fuses shall be sized to ensure discrimination with the transformer HV protection in accordance with ENATS 12-08.

8.74 Generation is not likely on Greenfield housing estates, small inverter connected PV are already referenced – ER G77.

Provision of information required under Electricity Safety Quality and Continuity Regulations

8.75 Regulation 28 of The ESQCRs require that the distributor shall provide in respect of the existing or proposed installation of a consumer a written statement of:

- the maximum prospective short circuit current at the supply terminals;
- for low voltage installations, the maximum earth loop impedance of the earth fault path outside the consumer's installation;

- the type and rating of the supplier's fusible cut-out or switching device nearest to the supply terminals,

- the type of earthing system applicable to the connection; and

- in accordance with Regulation 27 (1)) the number of phases, the frequency and the voltage at which it is proposed to supply electricity which apply, or will apply, to that installation to any person who has reasonable cause for requiring that information. This information shall be provided to the Host DLH by the Applicant.

Planning applications and consents

8.76 Attention is drawn to the requirements of various legislation for extended periods of statutory consultation with bodies such as English Heritage, English Nature, the Countryside Commission, Environment Agency, Highways Authorities (NRSWA etc), which will impact upon finalisation of proposed installations and work, where such statutory consultation applies.

8.77 It is the Applicant's responsibility to obtain planning and other consents.

Previously developed sites

8.78 There are a number of issues which are more likely to arise on previously developed ("brownfield") sites, and which will require discussion and resolution between the Applicant and the Host DNO at an early stage in the planning process. The following are the more common:

Existing electricity infrastructure in place; -

- Whether the site is to be totally cleared of existing infrastructure to create a "blank sheet" starting point.

- If not – how will existing DNO infrastructure, and supplies to existing connected Customers inside / outside the development, be safeguarded at all stages of the development?

- Where will existing infrastructure "end up" in new development having regard to ongoing access and consents

- Where existing infrastructure, or part of it, is to remain in place, there will in consequence be a mix of cable types, ages and designs on site. This will have an impact on subsequent live working requirements.

Access and obstructions:

- Preferred access for cables may not be via site entrance
- Cable routes outside development area may also be on previously developed and
- Cable routes need to take account of obstructions – early survey by Applicant needed, to determine such obstructions, other utility services, abandoned works etc.

Contaminated land , including asbestos:

- The Applicant shall, unless otherwise agreed with Host DNO, provide a Contaminated Land survey
- Works on site, and in particular trenching, may require special measures to be taken to protect the ongoing reliability of buried assets and to avoid the creation of "pathways" allowing contamination off site.

Conversion of existing buildings:

- Suitability for rising and lateral mains will need to be discussed
- Impact of current fire regulations on conversion
- Suitability for location of internal substations

APPENDIX A *(Typical only - subject to Host DLH variation)* DESIGN INFORMATION – DATA REQUIRED FROM APPLICANT

8.79 For each feeder:

Number of Customers and connections on each phase
Maximum feeder load in Amps
Fuse selected and maximum clearance time – ph to earth fault at cut out

Maximum voltage regulation at a cut out position + and - %

Maximum earth loop resistance

Connected motor loads / disturbing loads

Maximum voltage unbalance %

ADMDs / Annual consumptions by customer class

a listing of demand profile classes + ADMDs/ annual consumption used for each category of service, together with information (as required in Distribution Code - DPC 5.2.1), on individual maximum power requirements kVA or kW type and electrical loading of equipment to be connected, e.g. number and size of motors, cookers, showers, space and water heating arrangements including details of equipment which is subject to switching by the Supplier.

Diversity %

Economic rating - fixed losses £ / kW

- variable losses £ / kW

[subject to requirements of Ofgem Environmental Action Plan]

Maximum design PSCCs **at connection of service to main**

1ph 230v kA

3ph 230/400v kA

2ph 230/460v kA

Design PSCC at LV busbars of HV/LV transformer kA

Unmetered supplies

Classes and max demands per BSCP 520 .

Rating criteria – u/g - List of cable tyDLH, sizes and ratings employed. – see Appendix B for DLH specific rating criteria.

APPENDIX B - DATA SPECIFIC TO HOST DLH - Typical Only

8.80 This is an example of the type of data that would be inserted into Appendix B by the Host DLH and is included only for indicative purposes:

Maximum voltage regulation from LV busbars of HV/LV s/s

To end of service + % -%

To end of main, where no service exists. + % -%

Maximum earth loop resistance

To end of service Ohms

To end of main, where no service exists Ohms

Design PSCCs at LV busbars of HV/LV substation

1000kVA t/f kA

800kVA t/f kA

500kVA t/f kA

etc

Loss evaluation criteria employed

Economic rating - fixed losses £ / kW

- variable losses £ / kW

ADMD information

Maximum number of services per joint

Use of looped services

Service entries

8.81 On new housing developments the preferred method of service entry to a customers electrical installation is via an external meter cabinet. See NJUG 6.

Underground cable ratings/Underground cable ratings - criteria for LV cables

- Soil resistivities to be employed
- Ground ambient temperatures – winter and summer
- Maximum conductor temperatures
- Definition of cyclic and distribution ratings
- Ducts – maximum lengths without de-rating
- Short circuit rating requirements
- Etc.

Appendix 9 - G81 Technical Framework

Document Part 2 – Materials (inc Brownfield)

9.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Framework for design and planning, materials specification, installation and record for low voltage housing development underground network installations and associated, new, HV/LV distribution substations. Part 2: Materials Specification.

9.2 This framework document is the property of The Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of The Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from this document.

9.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004 . This revision extends the scope to include previously developed ("brownfield") sites as well as the "Greenfield" sites previously covered.

9.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from the Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

9.5 This document sets out the materials specifications requirements for low voltage underground cable electricity networks and associated new HV/LV Distribution substations for housing developments undertaken under the Ofgem Competition in Connections regime. This document is one of the following suite governing this work:

- Adoption Agreement
- Design and Planning framework
- Materials Specifications framework
- Installation and Records framework

- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed. **NB This suite of documents applies only to NEW installations and is not to be applied retrospectively**.

9.6 It is intended to set out or make reference to materials specification requirements which have to be met for a host DLH to adopt contested LV networks and associated new HV/LV distribution substations on housing developments.

9.7 This document is intended to supplement but not amend, abridge or override any legislation referred to within this document.

9.8 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the host DLH.

Energy Networks Association / ESI publications - Engineering Recommendations (ER)

9.9 C81/4 - Type approval tests for accessories for 600/1000 volt cable systems.

9.10 C89 - Performance specification for terminations on polymeric insulated cables rated at 12kV and 36kV maximum voltage.

9.11 C90/1 - Type approval tests for straight joints for 6350/11000 volt three core MIND paper insulated solid type cables.

9.12 C92 part 1 - Performance specifications for pole top terminations on 6350/11000 volt paper insulated cables.

9.13 C93 - Type approval for mechanical connectors to metallic sheaths of cables.

9.14 G12/3 - Requirements for the application of protective multiple earthing to low voltage networks.

9.15 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture.

9.16 G77 - Recommendation for the connection of inverter connected single phase photovoltaic (PV) generators up to 5kVA to public distribution networks.

9.17 P17 - Current rating guide for Distribution Cables.

Energy Networks Association Technical Specifications (ENATS)

9.18 ENATS 09-07 PVC and XLPE insulated concentric service cables with stranded copper or solid aluminium phase conductors and copper concentric neutral conductors.

9.19 ENATS 09-12 Impregnated paper insulated corrugated aluminium sheathed 6350/11000 volt cable **

9.20 ENATS 09-17 Single core cables for use in substations having extruded insulation and rated voltages of 6350/11000 and 19000/33000 volts (note used outside substations too) **

9.21 ENATS 12-03 - Outdoor meter cupboards.

9.22 ENATS 12-23 - Polythene protection tape for buried electricity supply cable.

9.23 ENATS 12-24 - Plastic ducts for buried electric cable.

9.24 ENATS 35-1 - Distribution transformers (from 16 kVA to 100 kVA).

9.25 ENATS 37-2 - LV distribution fuseboards.

9.26 ENATS 41-24 - Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

9.27 ENATS 41-26 - Distribution Switchgear for service up to 36kV (Cable Connected) or *

9.28 ENATS 41-36 - Distribution Switchgear for service up to 36kV (Cable and Overhead Conductor Connected)*

9.29 ENATS 43-94 - Earth rods and their connectors.

* Note 1 – ENATS 41-36 is a recently published Technical Specification. Consequently designs of switchgear made to comply with ENATS 41-26 are still in manufacture and would not be assessed for compliance with ENATS 41-36. Unless otherwise specified, designs of equipment made to ENATS 41-26 shall also be acceptable.

** Note 2 – HV Cables (complying with appropriate selection of options from the documents) may be selected from the listed ENATS, HD or IEC documents

National Joint Utilities Group (NJUG) publications

9.30 NJUG 6 - Service entries for new dwellings on residential estates.

9.31 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

9.32 HS (G) 47 - Avoiding danger from underground services.

9.33 GS 6 - Avoidance of danger from overhead electric power lines.

Pooling & Settlement Agreement

9.34 Agreed Procedure Unmetered Supplies Registered in PRS Vol. 5 AP 520 Issue 3 - now BSCP 520.

Ofgem agreed publications

- Distribution Code; and
- Distribution Licence Conditions

National and International Standards

9.35 BS 31 - Specification steel conduit and fittings for electrical wiring.

9.36 BS 88 - Cartridge fuses for voltages up to and including 1000.V ac & 1500 V DC.

9.37 Pts 1 & 5 - Specification of supplementary requirements for fuse links for use in electricity supply networks.

9.38 BS 731 - Flexible Steel Conduit.

9.39 BS 1361 - Specification for cartridge fuses for ac circuits in domestic and similar premises.

9.40 BS 1858 - Specification for bitumen based filling compounds for electrical purposes Pt 2.

9.41 BS4533 – Luminaries.

9.42 BS 4648 - Cable Trunking, part 1: Steel Surface Trunking and part 2: Steel Underfloor Trunking.

9.43 BS 6099 - Conduits for electrical installations, part 1: Specification of General Requirements and part 2: Specification for rigid non-flame propagating conduits of insulating materials.

9.44 BS 6910 - Cold pour resin compound and heat shrink cable joints in the voltage Pt 1 range up to 1000V ac and 1500V dc.

9.45 BS 6946 - Specification for metal channel cable support systems for electrical installation.

9.46 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations. 16 edition).

9.47 BS 7654 - Specification for single phase street lighting fuses (cut outs) for low voltage public electricity distribution systems. 25A rating for highway supplies and street furniture. (read with BS EN 60947 pt 1).

9.48 BS 7657 - Specification for fuses (cut outs), ancillary terminal blocks and interconnecting units up to 100A rating, for power supplies to buildings. (read with BS EN 60947 Pt 1).

9.49 BS 7870 - Polymeric insulated, combined neutral/earth (CNE) cables with solid Pt 3.4 aluminium phase conductors and concentric copper or aluminium wire waveform neutral/earth conductor.

9.50 BS 7888 - LV and MV accessories for power cables with rated voltage from 0.6/1kV up to and including 20.8/36kV.

9.51 BS EN 60947 Specification for low voltage switchgear and controlgear**.** Pt 1.

9.52 HD 620 - Distribution cables with extruded insulation for rated voltages from 3.6kV to 36kV**

9.53 IEC 60502 - Power cables with extruded insulation and their accessories for rated voltages from 1kV up to 30kV **

9.54 IEC 60947 - Link boxes (see also, at present, ERs C81, C79 and BS 88)

** Note – HV Cables (complying with appropriate selection of options from the documents) may be selected from the listed ENATS, HD or IEC documents.

9.55 All requirements of all relevant legislation must be met. The following is a list of **some** of the relevant legislation:

- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it;
- Electricity Safety Quality and Continuity Regulations 2002 (and associated Guidance issued by DTI dated 22 October 2002);
- Electricity at Work etc Regulations 1989;
- The New Roads and Street Works Act and all related Codes of Practice and Specifications;
- The Building Regulations;
- Town & Country Planning Act – General Development Order 1990;
- Construction (Design Management) Regulations 1994;
- The Management of Health & Safety at Work Regulations 1999;
- Health & Safety at Work Act 1974;
- Provision and Use of Work Equipment Regulations 1998;

- Control of Substances Hazardous to Health Regulations 1999;
- Manual Handling Operations Regulations 1992;
- Noise at Work Regulations 1989;
- Confined spaces regulations 1997;
- Lifting Operations and Lifting Equipment Regulations 1998;
- Construction Health, Safety & Welfare Regulations;
- Workplace Health, Safety and Welfare Regulations; and
- EC Utilities Directive 93/38/EEC and UK SI 1996 No 2911

Abbreviations

- OFGEM – Office of Gas and Electricity Markets
- BSI – British Standards Institution
- BS – British Standard
- BS EN – A European Standard adopted as a British Standard
- Applicant – The Company wishing to undertake the contestable work
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1st Sept. 2001
- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003
- ENATS – Energy Networks Association Technical Specification
- ENA – Energy Networks Association

- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- HD – Harmonised Document (IEC standard adopted as a European reference document)
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- Housing estate – A development consisting of domestic dwellings
- HSE – Health & Safety Executive
- IEC – International Electrotechnical Commission
- NRSWA – New Roads and Street Works Act

9.56 This framework document describes the materials specification requirements for low voltage underground cable networks and associated new HV/LV distribution substations for housing developments. Networks must be such that they are developed and maintained to provide an efficient, secure and co-ordinated system of electricity supply that is both economical and safe.

9.57 This framework is subject to some local variation between DLH's because, for example, of differences in:

- substation specification, network design and impact on fault levels
- environment and impact on ratings, insulation, corrosion etc
- compatibility with existing equipment.

9.58 Where a deviation from the national document is identified, it will be stated in the Appendices to this document.

9.59 Materials shall be new, meet the requirements of the listed references, all applicable legislation, and the duty and rating requirements imposed by the design. See also notes in "Design and planning requirements Technical Framework" document on equipment ratings, and the need to protect buried assets in contaminated land. Such protection may be by agreed means, such as

removal of contaminant or creation of barriers, and / or the selection of specific resistant materials.

9.60 Due to differences in DLH networks, there will be variations on type and ratings of equipment employed. See Appendix A for further information on specifications and host DLH variations.

9.61 Multi-occupancy dwellings - There are a number of different approaches which are employed in various DLH service areas on requirements for connections to multi-occupancy dwellings such as flats and maisonettes. Meter cabinets shall be fire resistant and of a type approved by the Host DLH . Where employed by the Host DLH, cables shall be low smoke fume type.

9.62 DLHs are currently seeking to establish programmes with their cable suppliers for the managed introduction of the new European harmonised cable colours (Black, Brown, Grey phases with Blue Neutral). This should be discussed with the Host DLH.

9.63 The Applicant shall arrange for procurement of materials which meet Host DLH requirements (in accordance with an agreed list of manufacturers and equipment). For materials proposed to be provided of a currently non agreed source, information shall be provided to the host DLH that allows compliance and quality assessments to be made. The level of information required will be pertinent to the complexity of the equipment and/or materials being considered, and will follow European Public Procurement type criteria.

9.64 It should not normally be necessary to provide copies of material specifications to the Applicant or their proposed Supplier, as the Supplier will normally have copies of relevant specifications. If it is necessary to provide an ENA Technical Specification, this can be purchased from Energy Networks Association, 18 Stanhope Place, London W2 2HH. If a DLH uses its own specification, a copy will be provided to the Supplier.

9.65 Plant delivered from manufacturers shall be unloaded and stored in a way that avoids damage or exposure to moisture.

APPENDIX A - DLH SPECIFIC DATA – DLH ABCD TYPICAL ONLY

9.66 Below is an example only of some data that might be included here, for example a list of suppliers already agreed. This appendix to be populated and updated as necessary by each DLH.

Table 3

Item		**National spec**	**Agreed suppliers**	
Earth Rods		EATS 43-94	W Furse - Nottingham CBS Products - Oakham	
Fuses (LV)		BS88 Part 5	Cooper UK Ltd - Bourton On Wold, Leics GEC Alsthom - Liverpool MEM - Tyseley, Birmingham	82mm & 92mm slot sizes – ratings as agreed

Etc.

FOR EXAMPLE ONLY

Appendix 10 - G81 Technical Framework Document Part 3 – Installation and Records (inc Brownfield)

10.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Framework for design and planning, materials specification, installation and record for low voltage housing development underground networks and associated, new, HV/LV distribution substations - Part 3: Installation and Records.

10.2 This framework document is the property of the Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of the Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from, this document.

10.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004. This revision extends the scope to include previously developed ("brownfield") sites as well as the "Greenfield" sites previously covered.

10.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

10.5 This document sets the installation and record requirements for low voltage electricity underground cable networks and associated new HV/LV distribution substations for housing developments undertaken under the Ofgem Competition in Connections regime.

10.6 It is one of the following suite of documents governing this work –

- Adoption Agreement
- Design and Planning framework
- Materials Specifications framework

- Installation and Records framework
- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed. **NB This suite of documents applies only to NEW installations and is not to be applied retrospectively.**

10.7 It is intended to set out or make reference to installation requirements which have to be met for a Host DLH to adopt contested LV networks and associated, new HV/LV distribution substations for housing developments.

10.8 This document is intended to supplement but not amend, abridge or override any legislation referred to within this document.

10.9 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the DLH.

Energy Networks Association / ESI publications/Engineering Recommendations (ER)

10.10 G12/3 - Requirements for the application of protective multiple earthing to low voltage networks.

10.11 G17/3 - Leakage of flammable gases recommendations.

10.12 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture.

10.13 G77 - Recommendations for the connection of inverter-connected single phase Photovoltaic (PV) generators up to 5kVA to public distribution networks

Energy Networks Association Technical Specifications (ENATS)

10.14 ENATS 12-03 - Outdoor meter cupboards.

10.15 ENATS 12-23 - Polythene protection tape for buried electricity supply cable.

10.16 ENATS 12-24 - Plastic ducts for buried electric cable.

10.17 ENATS 37-2 - LV distribution fuseboards.

10.18 ENATS 41-24 - Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

National Joint Utilities Group (NJUG) publications

10.19 NJUG 4 - The identification of small buried mains and services.

10.20 NJUG 6 - Service entries for new dwellings on residential estates.

10.21 NJUG 7 - Recommended positioning of Utilities apparatus for new work on new developments and in existing streets.

10.22 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

10.23 HS (G) 47 - Avoiding danger from underground services.

10.24 GS 6 - Avoidance of danger from overhead electric power lines

Pooling & Settlement Agreement

10.25 Agreed Procedure – Unmetered Supplies Registered in PRS Vol 5 AP 520 Issue 3 - now BSCP 520.

Ofgem agreed publications

- Distribution Code; and
- Distribution Licence Conditions

British Standards

10.26 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regs 16th edition).

10.27 All requirements of all relevant legislation must be met. The following is a list of **some** of the relevant legislation:

- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it;
- Electricity Safety Quality and Continuity Regulations 2002 (and associated Guidance issued by DTI dated 22nd October 2002);
- Electricity at Work Regulations 1989;
- The Building Regulations;
- The New Roads and Street Works Act and all related Codes of Practice and Specifications (note draft Records Code of Practice has been issued for comment in May 2001);
- Town & Country Planning Act – General Development Order 1990;
- Construction (Design Management) Regulations 1994;
- The Management of Health & Safety at Work Regulations 1999;
- Health & Safety at Work etc Act 1974;
- Provision and Use of Work Equipment Regulations 1998;
- Control of Substances Hazardous to Health Regulations 1999;
- Contaminated Land (England) Regulations 2000;
- Asbestos at Work Regulations 2002;
- Manual Handling Operations Regulations 1992;
- Noise at Work Regulations 1989;
- Confined spaces regulations 1997;
- Lifting Operations and Lifting Equipment Regulations 1998;

- Construction Health, Safety & Welfare Regulations;
- Workplace Health, Safety and Welfare Regulations;
- EC Utilities Directive 93/38/EEC and UK SI 1996 No 2911;
- The Ancient Monuments and Archaeological Areas Act 1979;
- Land Drainage Act 1991;
- The Electricity Works (Environmental Impact Assessment) (England & Wales) Regulations 2000;
- Wildlife and Countryside Act 1981;
- Water Resources Act 1991; and
- EU Habitats Directive 92/43/EEC – Special Areas of Conservation

Abbreviations

- OFGEM – Office of Gas and Electricity Markets
- BSI – British Standards Institution
- BS – British Standard
- Applicant – The Company wishing to undertake the contestable work
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1st Sept. 2001
- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003)
- ENATS – Energy Networks Association Technical Specification

- ENA – Energy Networks Association
- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- Housing estate – a development consisting of domestic dwellings
- HSE – Health & Safety Executive
- NRSWA – New Roads and Street Works Act

10.28 This framework describes installation test and records requirements for low voltage underground cable networks and associated, new, HV/LV distribution substations for housing developments.

10.29 This document is subject to some local variation between DLHs because, for example, of differences in:

- substation specification
- environment and impact on ratings, insulation, corrosion etc
- compatibility with existing equipment.

10.30 Where a deviation from this framework is identified, it will be stated in the Appendices to this Technical Framework document.

10.31 The installation of all plant and equipment to be adopted by the Host DLH shall meet the requirements of the listed references, all applicable legislation and the details in this section. It must be noted that ratings will be influenced by the installation arrangement and reference shall be made to the "Design and planning requirements "framework" document regarding equipment ratings.

10.32 All plant and equipment installed shall comply with the requirements of the "Materials specification framework" document.

10.33 The installation shall be such as to permit future live working on the asset by the DLH.

10.34 There shall be no material change to routes (to the extent that it affects design criteria) detailed in previously submitted plans unless otherwise agreed in writing with the Host DLH and other interested parties.

10.35 Cable laying depths shall be as NJUG 7, unless otherwise agreed, and shall be recorded.

10.36 Trenches shall be prepared so that the bottom of the trench is free of rubble, sharp stones, flint etc , and an adequate layer of stone dust or other suitable bedding has been laid. Where a change of level is necessary, the bottom of the trench shall rise or fall gradually.

10.37 Ducts shall be laid at least 300 mm below the carriageway construction and shall extend to the outer extremities of the kerb haunchings. Checks shall be made that all installed ducts are undamaged and are not obstructed (including any ducts laid as spare for future use). Duct mouths shall be sealed to prevent ingress of water, noxious or explosive liquids or gases. Ducts shall be suitably spaced to avoid congestion at either end to facilitate future jointing. Spare ducts shall be installed by the Applicant at positions agreed with the Host DLH.

10.38 Wherever possible, cables should be laid by hand. If a winch is employed to pull the cable, rollers and skid plates shall be used in the trench to ensure that the cable does not touch the ground during pulling. A cable stocking, fitted with a swivel, must be used to connect the bond to the cable and a dynamometer used to check that the maximum pulling tension for the cable is not exceeded. Cable laying shall only take place when the ambient temperature is above 0º C and has been above this temperature for the previous 24 hours. Alternatively, special precautions shall be taken to maintain cables above this temperature to avoid risk of damage during handling.

10.39 Cables shall not be bent further than their minimum bending radius.

10.40 The cable shall be correctly spaced from other cables and other utility services, in accordance with NJUG specifications.

10.41 Earth conductors and rods shall be laid in accordance with the previously submitted plans. Note should be taken of the requirements of ESQC Regulation 9 (2) (a) on the need for earths at the remote end of the main, during each stage of the energisation programme.

10.42 Before backfilling a visual inspection shall be carried out to ensure the cable is free from damage. After laying the cable shall be backfilled with suitable graded fine fill material to tape level and the correct marker tape laid, in compliance with The Electricity Safety Quality and Continuity Regulations 2002 and Host DLH policy.

10.43 Jointing materials comply with Host DLH specification or an agreed equivalent.

10.44 Jointing practice shall be in accordance with a specification agreed with the Host DLH.

10.45 LV Mains joints shall be made 'Colour True' or R - 1, Y - 2, B - 3, unless agreed otherwise with the Host DLH. DLHs are currently seeking to establish programmes with their cable suppliers for the managed introduction of the new European harmonised cable colours (Black, Brown, Grey phases with Blue Neutral). This should be discussed with the Host DLH.

10.46 Cable terminations shall be made with correct phase connections.

10.47 Service connections shall be made to the correct phase as shown on network drawings. The numbers of services taken from a single joint shall not exceed the number agreed with the Host DLH; that number being the maximum the Host DLH would accept for work undertaken directly on its own behalf.

10.48 Where a DLH employs such a system, a unique permanent labelling system shall be applied to the joint giving the jointers name.

10.49 The Applicant must provide a Completion Certificate, signed by the jointer, for each joint made. These shall be kept in the Construction File, together with copies of the inspection forms.

10.50 Specifications of HV/LV distribution substations shall follow Host DLH standards detailed in Appendix B. This may include such issues as layout, enclosure

type, Electricity Safety Quality and Continuity Regulations and associated Guidance security requirements, internal arc relief etc.

10.51 Plant delivered from manufacturers shall be unloaded and stored in a way that avoids damage or exposure.

10.52 The Host DLH shall supply plant and substation numbering signage, property ownership and Danger of Death signs prior to energisation.

Service entries

10.53 Service entry policy may vary between DLH's – see information in Appendix B of "Design and planning framework" document for details.

10.54 NJUG 6 shall be implemented unless otherwise stated by the Host DLH. Cavity service entry shall not normally permitted as this de-rates the service cable.

10.55 If alternative arrangements are considered the following shall be taken into account:

- The air temperature surrounding the cut out must not exceed 30°C.
- All meter cabinets must be installed in a way that maintains the manufactured fire resistance values.

10.56 Service ducting shall be installed from the service position to the point where the service cable will be jointed onto the main. The service cable shall be drawn by hand into this duct. Black duct shall be used for electrical service cables, to prevent confusion with other utility services.

10.57 The Applicant shall provide phase marking on cut out terminals.

Multi- occupancy dwellings

10.58 The following additional clauses apply to installations for multi-occupancy dwellings. There are a number of different approaches which are employed in various DLH service areas on the design of connections to multi-occupancy dwellings such as flats and maisonettes. The following paragraphs describe the most common practices, not all will necessarily be accepted by Host DLH; refer to Appendix A for any Host DLH variations.

10.59 Cable entry to building – approved rigid black duct or fireclay duct with slow radius bend, minimum bending radius 900mm, 150mm inside diameter, with drawcord for each incoming mains cable to area clear of building and any concreted area, buried with minimum 450mm cover overlaid with marker tape and into drawpit in termination enclosure 700mmD, 1000mmL 450mmW. Some DLHs do not employ drawpits and use duct as described above to area clear of building and any concreted area.

10.60 Intake position accommodation - Developer to provide suitable secure and fire proof enclosure for cut out and distribution board (when required) in suitable common access location on ground floor minimising route length to exterior and which provides suitable cable routes, meter position and exit points for each dwelling.

10.61 Communal meter / service enclosures shall not be used for other purposes posing increased risk to equipment, risk of fire or risks to operatives.

10.62 The size of the enclosure is dictated by the equipment installed and the need for adequate working space. There shall be a minimum of 300mm separation to any gas meter or gas pipe joints. The average temperature shall not exceed 30C.

10.63 Where the building entrance is closed for security reasons or there is no alternative means of escape, the enclosure should be sited adjacent to an external wall and be accessible from outdoors. If outside doors are used these shall be lockable, weatherproof and vandal resistant. See Appendix A for Host DLH requirements on locks.

10.64 Lateral connections - The developer is responsible for the design, construction and installation of the service cable routes within the building. The design route / cable length used to calculate voltage drop shall not be exceeded.

10.65 Service cables must not be routed through dwellings other than the one being served. Mains shall not be routed through dwellings. The routes selected within the building must ensure that after installation cables are accessible for withdrawal / replacement without damage to the building.

10.66 Mains and service cables must not be in the same duct as non electrical services. Where not ducted it must be clipped to cable tray. Where a multi-service shaft is provided, the electrical installation must be compartmented to provide a fire barrier from the other services. Every vertical duct, shaft or trunk must have internal barriers to prevent excessive heat rise at the top. The maximum separation between barriers is 1 floor or 5 metres, whichever is less. After installation of cabling the developer shall carry out fire stopping using materials such as cement mortar, gypsum based plaster, cement or gysum based vermiculite / perlite mixes, intumescent mastics, proprietary sealing systems, rockwool or as specified differently by the Host DLH in Appendix A. The method of ducting should be agreed with the Host DLH taking account of the derating factor of the current carrying capacity of the cables.

10.67 If service or mains cables pass through a part of the building required to have a minimum fire resistance period, the installation must maintain the integrity of the fire resistance. Minimum fire resistance periods are listed in the Building Regulations, to which reference must be made.

10.68 Meter positions - Meter cabinets shall be fire resistant, and of a type approved by the Host DLH. Meter positions shall be accessible from communal areas. Meters should be positioned so that they are installed not less than 450mm and not more than 1800mm from the floor.

10.69 Meter positions shall either be separated by 2 metres, effectively screened or effectively bonded against the risk of electric shock by simultaneous touch under earth fault conditions.

10.70 Group meters and switchgear must be clearly identified to the appropriate dwelling by a secure label supplied and installed by the Developer.

10.71 Bonding - Bonding of electrical installations must be in accordance with BS 7621. The Developer shall ensure that PME bonding shall include bonding to metal services as close a possible to their point of entry into the building and to accessible steelwork.

10.72 Each dwelling shall be regarded as separate and treated in the same way as individual houses, irrespective of any bonding carried out elsewhere, eg where communal services enter the building.

Work in contaminated land

10.73 Where work is to take place in contaminated land, special precautions will need to be established, to cover in particular, the following:

- Prevention of the creation of pathways, for example by trenching, allowing the movement of contamination
- Prevention of damage or reduction in normal life of assets as a result of contamination, e.g. by the removal of contamination, creation of barriers or use of specific resistant materials
- Inclusion in CDM file the details of the contamination survey, worker risk mitigation both during installation and during subsequent service life to asset removal.

Records/Test

10.74 It shall be the responsibility of the Applicant to provide the Host DLH with accurate records of the installation. These records shall include:

- For all installed cables and joints: plans showing route, depth, cable types and sizes, ducts lengths and sizes, joint locations, joint and service phasing and earth rod location. (Note that there are also draft requirements set out in NRSWA Records Code of Practice)
- For all installed plant: location, maker, type, rating and serial numbers.

10.75 The accuracy requirements and means by which plans are provided to the Host DLH shall be the same as would apply if the work was undertaken directly for the Host DLH. The Host DLH shall provide the Applicant with information in Appendix B to facilitate this.

10.76 The Applicant shall perform tests on the complete installation to verify that it has been correctly installed, it is safe to energise and customers may be safely connected. Appendix A provides a list of typical test requirements.

10.77 The extent of tests required and the format for recording test results will be specified by the Host DLH in Appendix B.

APPENDIX A - TEST REQUIREMENTS

Each service	- polarity / phase rotation (3ph) - insulation resistance 500/1000V - earth loop impedance
Each new section of main	- insulation resistance ph-ph and ph-n/earth 500/1000V - continuity
Each p.m.e. electrode	- earth resistance
Earthing resistance	- overall value measured at substation - at HV/LV substation – combined HV/LV / not combined and overlap (depends on achieving < 1 Ohm)
LV fuse cabinet	- insulation resistance 500/1000V
HV/LV transformer	- insulation resistances HV- LV winding/earth - pressure test - voltage and phasing checks - tap setting check - oil moisture content - oil electric breakdown strength - statement on pcb content < 2ppm new oil
HV Switchgear	- insulation resistance 5kV - pressure test - protection test, secondary injection or dummy HV fuse tester (e.g. B&S device) - functional test of interlocks and operation - insulation test any loose test devices - busbar resistance if work includes connection of busbars , new to new or new to existing - gas pressure if gas filled

HV Cables - insulation resistance 5kV
- pressure test RYB-E, RY-B, BR-Y
- continuity

APPENDIX B – HOST DLH REQUIREMENTS

10.78 The following is only provided as an indication of the type of information which would be included by the Host DLH in this Appendix.

Service entries

10.79 National Joint Utilities Group Publication Number 6 - Service Entries for New Dwellings on Residential Estates (NJUG 6) shall be implemented with one exception, (a) Cavity service entry shall not normally permitted as this de-rates the service cable.

10.80 The meter cabinet and installation arrangement shall be one of the type agreed with the Host DLH [ongoing need to hold spare doors etc]. These arrangements shall be agreed in advance and documented, with appropriate drawings.

10.81 If alternative arrangements are considered the following shall be taken into account, the air temperature surrounding the cut out must not exceed 30^0c. All meter cabinets must be installed in a way that maintains the manufactured fire resistance values.

HOST DLH REQUIREMENT - ASSET RECORDING – Typical only

- Principles of recording cables
- Taking measurements using triangulation
- Extended sight lines and right angles
- Chain Lines
- Same feature recording
- Other data to be recorded on site

- Recording of cable sections
- Process of cable recording
- Example of cable sketch

Appendix 11 – Industrial and Commercial Technical Framework Part 4 – Design and Planning

11.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Part 4 – Framework for design and planning of industrial and commercial underground connected loads up to and including 11kV.

11.2 This framework document is the property of The Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of The Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from this document.

11.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004.

11.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from the Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

11.5 The document sets out the minimum requirements for design of low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations. It is one of the following suite of documents governing this work:

- Adoption Agreement
- Design and Planning framework (ER G81 Part 4)
- Materials Specifications framework (ER G81 Part 5)
- Installation and Records framework (ER G81 Part 6)
- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed.

11.6 For requirements relating to underground connected housing developments, see Engineering Recommendation G81 parts 1,2 and 3. **NB This suite of documents applies only to NEW installations and is not to be applied retrospectively**.

11.7 It is intended to set out or make reference to design and planning requirements which have to be met for a Host DLH to adopt contested HV and LV networks and their associated new HV and HV/LV distribution substations supplying industrial and commercial loads connected up to and including 11kV.

11.8 This document is intended to supplement but not amend, abridge or override any Statutory legislation referred to within this document.

11.9 This suite of documents only applies to connections to single-occupied premises and street lighting installations. For design issues associated with multi-occupied premises (eg blocks of offices or shops) please see Host DLH Appendix.

11.10 This suite of documents does not include any requirements in respect of generator or traction supply connections. These are subject to separate consideration.

11.11 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the Host DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the Host DLH.

Energy Networks Association/ESI publications/Engineering Recommendations (ER)

11.12 G5/4 - Planning levels for harmonic voltage distortion and connection of non-linear equipment to transmission and distribution networks in the UK.

11.13 G12/3 - Requirements for the application of protective multiple earthing to low voltage networks.

11.14 G14 - Protective multiple earthing recommended principles of testing to ensure correct polarity.

11.15 G17/3 - Leakage of flammable gases: recommendations.

11.16 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture.

11.17 G74 - Procedure to meet the requirements of IEC 909 for the calculation of short-circuit currents in three-phase AC power systems.

11.18 G78 - Recommendations for low voltage connections to mobile phone base stations with antennae on high voltage structures.

11.19 P2/5 - Security of Supply.

11.20 P16 - EHV or HV supplies to induction furnaces.

11.21 P17 - Current rating guide for Distribution Cables.

11.22 P25/1 - The short circuit characteristics of PES low voltage distribution networks and the co-ordination of over-current protective devices on 230v single phase supplies up to 100A.

11.23 P26 - The estimation of maximum prospective short-circuit current for three phase 415v supplies.

11.24 P28 - Planning limits for voltage fluctuations caused by Industrial, Commercial and Domestic equipment in the United Kingdom.

11.25 P29 - Planning limits for voltage unbalance in the United Kingdom for 132 kV and below.

11.26 S3/1 - Metering current transformers for use in switchgear.

11.27 S15 - Standard schematic diagrams (it is likely that Host DLHs will have their own standards).

Energy Networks Association Technical Specifications (ENATS)

11.28 ENATS 12-08 - The application of fuselinks to 11kV/415v and 6.6kV/415v Underground Distribution Networks.

11.29 ENATS 41-24 - Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

11.30 ENATS 41-36 - Distribution switchgear for service up to 36kV (cable and overhead conductor connected),

National Joint Utilities Group (NJUG) publications

11.31 NJUG 7 - Recommended positioning of Utilities apparatus for new work on new developments and in existing streets.

11.32 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

11.33 HS (G) 47 - Avoiding danger from underground services.

11.34 GS 6 - Avoidance of danger from overhead electric power lines

Pooling & Settlement Agreement

11.35 Agreed Procedure – Unmetered Supplies Registered in PRS Vol 5 AP 520 Issue 3 - now BSCP 520.

Ofgem agreed publications

- Distribution Code; and
- Distribution Licence Conditions

National and International Standards

11.36 IEC 909 - Short circuit current calculations in 3 phase ac systems.

11.37 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations 16th edition).

11.38 BS EN 50160 - Voltage characteristics of electricity supplied by public distribution systems.

11.39 BS EN 61508 Functional safety of electrical / electronic / programmable electronic safety related systems.

11.40 BS 88 Part 5 - Cartridge fuses for voltages up to and including 1000 V and 1500 V DC – Supplementary requirements for fuse links for use in ac electricity supply networks.

11.41 All requirements of all Statutory legislation must be met. The following is a list of **some** of the relevant legislation:

- Asbestos at Work Regulations 2002;
- Building Regulations (and its related current Approved Documents) Construction (Design Management) Regulations 1994;
- Contaminated Land (England) Regulations 2000;
- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it.
- Electricity Safety Quality and Continuity Regulations 2002 (and associated Guidance issue by DTI dated 22 October 2002);
- Electricity at Work Regulations 1989;
- Electricity and Pipe-line Works (assessment of Environmental Effects) Regulations 1990;
- Electricity Works (Environmental Impact Assessment) (England & Wales) Regulations 2000;
- Environmental Protection Act 1990 & 1995;
- Fire Precautions Act 1971;

- Fire Precautions (Workplace Regulations 1997 as amended 1999);
- Health & Safety at Work etc Act 1974;
- Management of Health & Safety at Work Regulations 1999;
- New Roads and Street Works Act and all related Codes of Practice and Specifications;
- Town & Country Planning Act – General Development Order 1990; and
- Wildlife and Countryside Act 1981.

Abbreviations

- ADMD – After Diversity Maximum Demand
- Applicant – The Company wishing to undertake the contestable work
- BSI – British Standards Institution
- BS – British Standard
- BS EN – A European Standard adopted as a British Standard
- CDM- Construction (Design Management) Regulations 1994
- CNE – Combined neutral and earth (of cable construction)
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1 Sept. 2001
- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003)
- ENATS – Energy Networks Association Technical Specification

- ENA – Energy Networks Association
- ER- National Engineering Recommendation issued by ENA or EA
- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- HSE – Health & Safety Executive
- IEC – International Electrotechnical Commission
- NRSWA – New Roads and Street Works Act
- OFGEM – Office of Gas and Electricity Markets
- PSCC – Prospective Short Circuit Current

11.42 This framework document describes requirements for design and planning of low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations. Networks must be such that they are developed and maintained to provide an efficient, secure and co-ordinated system of electricity supply that is both economical and safe.

11.43 This framework is subject to some local variation between DLH's because, for example, of differences in:

- substation specification, network design and impact on fault levels
- environment and impact on ratings, insulation, corrosion etc
- compatibility with existing equipment.

11.44 Where a deviation from this framework is identified, it will be stated in the Appendices to this document.

Design

11.45 The Applicant shall develop a network design which complies with the engineering standards specified in section 5.0 above and all applicable statutory legislation, examples of which are included in 6.0 above. In particular, the principles of sound health and safety management shall be taken fully into account to ensure that the system can be constructed, maintained and operated safely and effectively.

11.46 The Applicant shall ensure that equipment is within design rating and shall state the assumptions that have been made in deriving ratings and operating duty.

11.47 Network electrical design shall comply with the requirements of this framework document, employing the data listed in the Appendices. It is important to note that these data may vary between DLH's, for reasons such as described above.

11.48 There are, depending on the nature of the scheme, are significant number of preliminary issues which need to be considered and discussed with the relevant parties at the initial stages of developing a proposed design. Many of these issues are inter-dependent.

Issues directly affecting the Host DLH, Applicant, End Customer and Principal Contractor/ Issues primarily directly affecting Applicant and Host DLH

11.49 To best serve the interests of the End Customer, they must be advised that it may be possible to increase the level of security of supply above that provided under the ER P2/5 "minimum scheme", at greater cost, if this is technically feasible. This might take the form of duplicate off load transferable supplies at low voltage. At high voltage this might mean use of a ring main equipment or a circuit breaker switchboard loop in / out arrangement, or some form of auto changeover scheme. As the availability of many of these options interact with and are dependent on the Host DLH network, it is important that the Applicant, discusses these with the Host DLH at an early stage.

11.50 A risk assessment on a proposed substation is required under the ESQCRs, but risk assessment of the installation also forms part of duties imposed on the overall development and Principal Contractor under CDM, Building and Fire Regulations This may affect siting, routing and access.

11.51 If "joint use" of a substation is to be required after it has been put into service; for example by use of a common switch room housing both Host DLH and Customers own equipment, those future arrangements need to be discussed at the planning stage. They may entail the provision of physical barriers between parts of switchrooms, and the establishment of "responsibility schedules" under The Management of Health & Safety at Work Regulations. It may also impact on the need for Customers staff to hold appropriate formal Operational Authorisations from the Host DLH.

11.52 If the Customer has expressed a desire to seek optional enhanced security of supply above the "minimum scheme", it will be necessary to discuss the available options taking account of the constraints imposed by, for example, network open points, automation / change over schemes, protection and future outage co-ordination (eg work or faults which would adversely impact on the selected "enhanced security" option).

11.53 Policy on the maximum load supplied and termination arrangements at LV, standard ratings of HV/LV transformer and metering will vary between DLHs and Meter Operators, and need to be discussed.

11.54 An accurate assessment of the proposed demand, load profile and any loads falling under ERs G5/4 or P28 is required. Loads of more than 1 MW may have an impact on the network at a voltage above that at the point of connection. HV network connections may require upstream reinforcement. Additional load that requires reinforcement may result in increased fault levels with subsequent impact upon existing and proposed equipment. A proposed load may impact on the load transfer capability of the network, thus reducing network security.

11.55 Larger developments may be part of a long term strategy or infrastructure agreement which encompass the needs of an area not just a particular site. The principles will have been discussed with the Local Authority and so liaison between the developer the Host DLH and the Local Authority may be required at the outset.

11.56 The loading of networks and need for diversionary / reinforcement work, together with the lead times for ordering and installing non-stock equipment

may impact on the timescale of the proposed works and need to be considered at the outset.

11.57 Section 10 includes further requirements affecting previously developed sites.

Design approval

11.58 It is necessary for the Host DLH to approve the design against this document prior to construction. Each DLH will define the information requirements necessary to support the approval process. Use of the same design tool as the Host DLH will simplify the design approval process and it is recommended that Applicants discuss with the Host DLH the manner in which information is provided.

11.59 Submission of designs by the Applicant to the DLH for approval shall include:

- copies of input and output from the design package used by the appropriate DLH;
- a statement of the design parameters used and - see Appendix A for list;
- a drawing showing the network layout to a suitable scale showing, routes, joint positions, cable sizes, link boxes and LV phase connections; and
- confirmation that the design meets the requirements of this framework as supplemented in the Appendices

11.60 The Host DLH may elect to opt for a design which exceeds the requirements of this document, for example to provide additional LV linking facilities or to increase conductor sizing to permit later network extension not covered by the Applicant's programme. If there are generic issues such as provision of mobile generator connection facilities, these will often be set out in the DLH specific details in Appendix B. Issues which are relevant to individual designs would be discussed with the Applicant during the design process, as provided for under the terms of the Adoption Agreement.

Voltage Regulation/Voltage unbalance, disturbing and fluctuating loads

11.61 The allocation of voltage regulation limits between the LV busbars of the HV/LV substation and the end of any service, including the maximum proportion of regulation in the service, shall not exceed the limits stated by the Host DLH in the Appendices.

11.62 Connections shall be balanced to fall within the voltage unbalance limits of ER P29, taking existing network connections into account.. Limits for voltage fluctuations caused by industrial commercial and domestic equipment (eg for motors or sewage pumps) are set out in ER P28. Planning requirements for harmonic voltage distortion and the connection of non-linear equipment are set out in ER G5/4.

11.63 Systems must be developed to be efficient, co-ordinated and economical. The design shall minimise lifetime cost of installation and operation and shall include evaluation of system losses using loss £/kWh as used and stated by the Host DLH in the Appendices. (Detailed requirements may be subject to review when the Ofgem Environmental Action Plan is finalised).

11.64 The maximum earth loop resistance (LV Main plus service cable loop) shall be as stated by the Host DLH in the Appendices.

11.65 The low voltage underground cable network shall be of CNE construction utilising the standard sizes of cable employed by the Host DLH as specified in Appendix B.

11.66 The network shall be earthed using the PME system in accordance with ER G12/3.

11.67 The voltage drop on the low voltage underground cable network between the substation LV busbars and all extremities of the network shall not exceed the limits specified in Appendix B. This voltage drop shall be calculated assuming that all customers are taking their design ADMD with allowance for unbalance and diversity. Host DLH-specific design ADMDs for different classes of customer are listed in Appendix B.

High voltage network/Substations

11.68 The high voltage network shall utilise the standard design of overhead line or type of underground cable and conductor sizes employed by the Host DLH as

specified in Appendix B. Where work falling within the scope of this document entails modification of an existing DLH circuit, the design, for example in selection of conductor materials and sizes, shall be such that existing ratings are maintained.

11.69 The hv/lv distribution substation(s) shall utilise the standard sizes of transformer employed by the Host DLH as specified in Appendix B.

11.70 Transformer sizing shall be based on the aggregated ADMDs for all customers fed from the substation and the permissible cyclic rating of the transformer as specified in Appendix B, and minimising lifetime cost criteria as set out in 9.9 above.

11.71 The substation location shall take into account access and environmental factors such as: noise pollution, flooding risk and vandalism. (See also ESQCRs and associated DTI Guidance).

11.72 Substation earthing shall be such as to prevent danger from rise of potential during system earth faults and shall take account of touch potentials, step potentials and transferred potentials. See EATS 41-24 for further information.

Services/Design of unmetered supplies/Ratings

11.73 Service cables shall be of CNE construction using standard sizes of cable employed by the Host DLH as specified in Appendices to the Materials framework document.

11.74 Service entry policy may vary between DLH's – see information in Appendix B for details.

11.75 Only supplies covered by BSCP 520 may be unmetered supplies, and require prior approval of the Host DLH.

11.76 Loads shall be calculated in accordance with BSCP 520, where this provides information on the class of load.

11.77 The network design shall otherwise follow LV network design practice described in this Framework.

11.78 The design shall be such that equipment design ratings including any appropriate cyclic or short term ratings as defined in the appropriate specification or ER P17 are not exceeded, and must take into account the load profile characteristics and DLH specific criteria, such as ambient temperatures, soil thermal resistivity etc as listed in the Appendices.

11.79 It is important to note that these factors are likely to differ between DLH's and so application of rating information in ER P 17 will not produce common ratings throughout UK. See Appendices for Host DLH data.

11.80 Ratings employed shall be appropriate to the duty and environment in which the equipment is used. An example of this is the rating of an LV house service cut out in a meter cabinet; the cut out may have a maker's rating of 100A, but this is de-rated when used in the environment of a cabinet. Cables in ducts shall be de-rated in accordance with ER P17. The ambient temperatures of substations located inside buildings will be influenced by transformer losses and care is required that these temperatures do not infringe ratings of other equipment such as switchgear.

11.81 The short circuit rating of equipment provided shall not be less than the design fault level of the DLH Distribution network to which it is to be connected (as specified in Appendix B).

Fault levels

11.82 Fault levels shall be sufficient to ensure operation of protection but shall not exceed the limit stated in Appendix B for the design PSCC at the substation LV busbars. Maximum design Prospective Short Circuit Current (PSCC) at LV busbars of HV/LV substation.

11.83 Networks shall be designed not to exceed the following PSCCs. The design PSCC at the LV busbars of the HV/LV transformer shall be as stated by the Host DLH in Appendix B, unless otherwise agreed in writing.

11.84 Allowance for fault infeed from the LV system shall be included in accordance with IEC 909. The parameters used shall be stated by the Applicant.

11.85 ERs P25/1 and P26 give the following figures as maximum design values of PSCCs at the point of connection of the service line to the DLH main lv distributor:

230v 1ph	16kA
230/400v 3ph	25kA
230/460v 2ph	25kA

11.86 The short circuit rating of equipment provided shall not be less than the design fault level of the DLH Distribution network to which it is to be connected. (Distribution Code - DPC 6.5).

11.87 Maximum PSCC shall be quoted in kilo Amperes (kA) to avoid confusion arising from assumptions about nominal voltages.

LV protection

11.88 The protection of LV feeder circuits shall meet the following requirements:

- Feeder circuits supplying more than one customer shall be protected by fuses to BS88 part 5.
- LV supply cables to single customers shall be protected by fuses or circuit breakers, dependent on supply capacity and customer's protection.
- Fuses must provide short-circuit protection for the whole length of the circuit up to the service cut out. Phase to neutral fault clearance time shall be as stated by the Host DLH in Appendix B
- Fuse ratings must allow for the cyclic overload rating of the circuit.
- For discrimination, the minimum pre-arcing I^2t of a feeder circuit fuse must exceed maximum total I^2t of any individual fuse downstream.
- Excess current protection shall be provided at the point of supply
- LV fuses shall be sized to ensure discrimination with the transformer HV protection in accordance with EATS 12-08

HV Protection

11.89 This will be interdependent with Host DLH protection of the feeder. See Appendix B for Host DLH generic policy and discuss the scheme specific requirements.

Provision of information required under Electricity Safety Quality and Continuity Regulations

11.90 Regulation 28 of The ESQCRs require that the distributor shall provide in respect of the existing or proposed installation of a consumer a written statement of:

- the maximum prospective short circuit current at the supply terminals; and
- for low voltage installations, the maximum earth loop impedance of the earth fault path outside the consumer's installation;
- the type and rating of the supplier's fusible cut-out or switching device nearest to the supply terminals,
- the type of earthing system applicable to the connection and
- in accordance with Regulation 27 (1)) the number of phases, the frequency and the voltage at which it is proposed to supply electricity which apply, or will apply, to that installation to any person who has reasonable cause for requiring that information. This information shall be provided to the Host DLH by the Applicant.

Planning applications and consents

11.91 Attention is drawn to the requirements of various legislation for extended periods of statutory consultation with bodies such as English Heritage, English Nature, the Countryside Commission, Environment Agency, Highways Authorities (NRSWA etc), which will impact upon finalisation of proposed installations and work, where such statutory consultation applies.

11.92 It is the Applicant's responsibility to obtain planning and other consents.

11.93 If the site, or the route by which connections are made to the site, are subject to Compulsory Purchase Order(s), the process of managing the terms and conditions to safeguard existing plant / cables shall be undertaken by the Host DLH.

Previously developed sites

11.94 There are a number of issues which are more likely to arise on previously developed ("brownfield") sites, and which will require discussion and resolution between the Applicant and the Host DNO at an early stage in the planning process. The following are the more common:

Existing electricity infrastructure in place;–

- Whether the site is to be totally cleared of existing infrastructure to create a "blank sheet" starting point.
- If not – how will existing DNO infrastructure, and supplies to existing connected Customers inside / outside the development, be safeguarded at all stages of the development?
- Where will existing infrastructure "end up" in new development having regard to ongoing access and consents
- Where existing infrastructure, or part of it, is to remain in place, there will in consequence be a mix of cable types, ages and designs on site. This will have an impact on subsequent live working requirements.

Access and obstructions:

- Preferred access for cables may not be via site entrance
- Cable routes outside development area may also be on previously developed land
- Cable routes need to take account of obstructions – early survey by Applicant needed, to determine such obstructions, other utility services, abandoned works etc.

Contaminated land, including asbestos:

- The Applicant shall, unless otherwise agreed with Host DNO, provide a Contaminated Land survey
- Works on site, and in particular trenching, may require special measures to be taken to protect the ongoing reliability of buried assets and to avoid the creation of "pathways" allowing contamination off site.

Conversion of existing buildings:

- Suitability for rising and lateral mains will need to be discussed
- Impact of current fire regulations on conversion
- Suitability for location of internal substations

APPENDIX A *(Typical only - subject to Host DLH variation)* DESIGN INFORMATION – DATA REQUIRED FROM APPLICANT

11.95 For each feeder –

Number of Customers and connections on each phase
Maximum feeder load in Amps
Fuse selected and maximum clearance time – ph to earth fault at cut out
Maximum voltage regulation at a cut out position + and - %
Maximum earth loop resistance
Connected motor loads / disturbing loads

Maximum voltage unbalance %

ADMDs / Annual consumptions by customer class a listing of demand profile classes +

11.96 ADMDs/ annual consumption used for each category of service, together with information (as required in Distribution Code - DPC 5.2.1), on individual

maximum power requirements kVA or kW type and electrical loading of equipment to be connected, eg number and size of motors, cookers, showers, space and water heating arrangements including details of equipment which is subject to switching by the Supplier.

11.97 Any fluctuating or disturbing loads falling under ER G5/3 or P 28

Diversity %

Economic rating - fixed losses £ / kW

- variable losses £ / kW

[subject to requirements of Ofgem Environmental Action Plan]

Maximum design PSCCs **at connection of service to main**

1ph 230v kA

3ph 230/400v kA

2ph 230/460v kA

Design PSCC at LV busbars of HV/LV transformer kA

Unmetered supplies

Classes and max demands per BSCP 520 .

Rating criteria – u/g - List of cable tyDLH, sizes and ratings employed. – see Appendix B for DLH specific rating criteria.

APPENDIX B - DATA SPECIFIC TO HOST DLH - Typical Only

11.98 This is an example of the type of data that would be inserted into Appendix B by the Host DLH and is included only for indicative purposes.

Maximum voltage regulation from LV busbars of HV/LV s/s

To end of service + % -%

To end of main, where no service exists. + % -%

Maximum earth loop resistance

To end of service Ohms

To end of main, where no service exists Ohms

Design PSCCs at LV busbars of HV/LV substation

1000kVA t/f kA

800kVA t/f kA

500kVA t/f kA

etc

Loss evaluation criteria employed

Economic rating - fixed losses £ / kW

- variable losses £ / kW

ADMD information

Maximum number of services per joint

Use of looped services

Service entries

11.99 Preferred method of service entry to a customers electrical installation

Termination arrangements

Standard intake arrangements

- Maximum LV metered loads, protection arrangements
- HV intake arrangements, including metering

Underground cable ratings/Underground cable ratings - criteria

- Soil resistivities to be employed
- Ground ambient temperatures – winter and summer

- Maximum conductor temperatures
- Definition of cyclic and distribution ratings
- Ducts – maximum lengths without de-rating
- Short circuit rating requirements
- Etc.

Appendix 12 - Industrial and Commercial Technical Framework Part 5 – Materials

12.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Part 5– Framework for materials specification for industrial and commercial underground connected loads up to and including 11kV.

12.2 This framework document is the property of The Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of The Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from this document.

12.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004.

12.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from the Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

12.5 This document sets the materials specification requirements for low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations. It is one of the following suite of documents governing this work:

- Adoption Agreement
- Design and Planning framework (ER G81 Part 4)
- Materials Specifications framework (ER G81 Part 5)
- Installation and Records framework (ER G81 Part 6)
- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed.

12.6 For requirements relating to underground connected housing developments, see Engineering Recommendation G81 parts 1,2 and 3. NB This suite of documents applies only to NEW installations and is not to be applied retrospectively.

12.7 It is intended to set out or make reference to materials specification requirements which have to be met for a Host DLH to adopt contested HV and LV networks and their associated new HV and HV/LV distribution substations supplying industrial and commercial loads connected up to and including 11kV.

12.8 This document is intended to supplement but not amend, abridge or override any legislation referred to within this document.

12.9 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the host DLH.

Energy Networks Association/ESI publications/Engineering Recommendations (ER)

12.10 C81/4 - Type approval tests for accessories for 600/1000 volt cable systems.

12.11 C89 - Performance specification for terminations on polymeric insulated cables rated at 12kV and 36kV maximum voltage.

12.12 C90/1 - Type approval tests for straight joints for 6350/11000 volt three core MIND paper insulated solid type cables.

12.13 C92 part 1 - Performance specifications for pole top terminations on 6350/11000 volt paper insulated cables.

12.14 C93 - Type approval for mechanical connectors to metallic sheaths of cables.

12.15 G12/3 - Requirements for the application of protective multiple earthing to low voltage networks.

12.16 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture.

12.17 P17 - Current rating guide for Distribution Cables.

Energy Networks Association Technical Specifications (ENATS)

12.18 ENATS 09-07 - PVC and XLPE insulated concentric service cables with stranded copper or solid aluminium phase conductors and copper concentric neutral conductors.

12.19 ENATS 09-12 - Impregnated paper insulated corrugated aluminium sheathed 6350/11000 volt cable **

12.20 ENATS 09-17 - Single core cables for use in substations having extruded insulation and rated voltages of 6350/11000 and 19000/33000 volts (note used outside substations too) **

12.21 ENATS 12-03 - Outdoor meter cupboards

12.22 ENATS 12-23 - Polythene protection tape for buried electricity supply cable

12.23 ENATS 12-24 - Plastic ducts for buried electric cable

12.24 ENATS 35-1 - Distribution transformers (from 16 kVA to 100 kVA)

12.25 ENATS 37-2 - LV distribution fuseboards

12.26 ENATS 41-24 - Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

12.27 ENATS 41-26 - Distribution Switchgear for service up to 36kV (Cable Connected) or *

12.28 ENATS 41-36 - Distribution Switchgear for service up to 36kV (Cable and Overhead Conductor Connected)*

12.29 ENATS 43-94 - Earth rods and their connectors

* Note 1 – ENATS 41-36 is a recently published Technical Specification. Consequently designs of switchgear made to comply with ENATS 41-26 are still in manufacture and would not be assessed for compliance with ENATS 41-36. Unless otherwise specified, designs of equipment made to ENATS 41-26 shall also be acceptable.

** Note 2 – HV Cables (complying with appropriate selection of options from the documents) may be selected from the listed EATS, HD or IEC documents

National Joint Utilities Group (NJUG) publications

12.30 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

12.31 HS (G) 47 - Avoiding danger from underground services.

12.32 GS 6 - Avoidance of danger from overhead electric power lines.

Pooling & Settlement Agreement

12.33 Agreed Procedure Unmetered Supplies Registered in PRS Vol. 5 AP 520 Issue 3 - now BSCP 520

Ofgem agreed publications

- Distribution Code; and
- Distribution Licence Conditions

British Standards

12.34 BS 31 - Specification steel conduit and fittings for electrical wiring.

12.35 BS 88 - Cartridge fuses for voltages up to and including 1000.V ac & Pts 1 & 5 1500 V DC - Specification of supplementary requirements for fuse links for use in ac electricity supply networks.

12.36 BS 731 - Flexible Steel Conduit.

12.37 BS 1361 - Specification for cartridge fuses for ac circuits in domestic and similar premises.

12.38 BS 1858 - Specification for bitumen based filling compounds for electrical Pt 2 purposes.

12.39 BS4533 – Luminaries

12.40 BS 4648 - Cable Trunking, part 1: Steel Surface Trunking and part 2: Steel Underfloor Trunking.

12.41 BS 6099 - Conduits for electrical installations, part 1: Specification of General Requirements and part 2: Specification for rigid non-flame propagating conduits of insulating materials.

12.42 BS 6910 - Cold pour resin compound and heat shrink cable joints in the Pt 1 voltage range up to 1000V ac and 1500V dc.

12.43 BS 6946 - Specification for metal channel cable support systems for electrical installation.

12.44 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations. 16 edition).

12.45 BS 7654 - Specification for single phase street lighting fuses (cut outs) for low voltage public electricity distribution systems. 25A rating for highway supplies and street furniture. (read with BS EN 60947 pt 1).

12.46 BS 7657 - Specification for fuses (cut outs), ancillary terminal blocks and interconnecting units up to 100A rating, for power supplies to buildings. (read with BS EN 60947 Pt 1).

12.47 BS 7870 - Polymeric insulated, combined neutral/earth (CNE) cables with 3.4 solid aluminium phase conductors and concentric copper or aluminium wire waveform neutral/earth conductor.

12.48 BS 7888 - LV and MV accessories for power cables with rated voltage from 0.6/1kV up to and including 20.8/36kV.

12.49 BS EN 60255 - Specification for electrical protection relays.

12.50 BS EN 60688 - Electrical measuring transducers for converting A.C. electrical quantities to analogue or digital signals.

12.51 BS EN 60898 - Circuit breakers for overcurrent protection for household and similar installations.

12.52 BS EN 60947 - Specification for low voltage switchgear and controlgear Pt 1

12.53 BS EN 61508 - Functional safety of electrical / electronic / programmable electronic safety related systems.

International and European Standards

12.54 HD 620 - Distribution cables with extruded insulation for rated voltages from 3.6kV to 36kV**

12.55 IEC 60502 - Power cables with extruded insulation and their accessories for rated voltages from 1kV up to 30kV **

12.56 IEC 60947 - Link boxes (see also, at present, ERs C81, C79 and BS 88)

** Note – HV Cables (complying with appropriate selection of options from the documents) may be selected from the listed ENATS, HD or IEC documents.

12.57 All requirements of all relevant legislation must be met. The following is a list of **some** of the relevant legislation:

- Building Regulations (and its related current Approved Documents);
- Confined spaces regulations 1997;
- Construction (Design Management) Regulations 1994;
- Construction Health, Safety & Welfare Regulations;
- Control of Substances Hazardous to Health Regulations 1999;
- EC Utilities Directive 93/38/EEC and UK SI 1996 No 2911;
- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it;

- Electricity Safety Quality and Continuity Regulations 2002 (and associated Guidance issued by DTI dated 22 October 2002);
- Electricity at Work etc Regulations 1989;
- Health & Safety at Work Act 1974;
- Lifting Operations and Lifting Equipment Regulations 1998;
- Management of Health & Safety at Work Regulations 1999;
- Manual Handling Operations Regulations 1992;
- New Roads and Street Works Act and all related Codes of Practice and Specifications;
- Noise at Work Regulations 1989;
- Provision and Use of Work Equipment Regulations 1998;
- Town & Country Planning Act – General Development Order 1990;
- Workplace Health, Safety and Welfare Regulations;

Abbreviations

- Applicant – The Company wishing to undertake the contestable work
- BSI – British Standards Institution
- BS – British Standard
- BS EN – A European Standard adopted as a British Standard
- CDM- Construction (Design Management) Regulations 1994
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1 Sept. 2001

- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003
- ENATS – Electricity Association Technical Specification
- ENA – Energy Networks Association
- ER- National Engineering Recommendation issued by ENA or EA
- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- HD – Harmonised Document (IEC standard adopted as a European reference document)
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- HSE – Health & Safety Executive
- IEC – International Electrotechnical Commission
- NRSWA – New Roads and Street Works Act
- OFGEM – Office of Gas and Electricity Markets

12.58 This framework describes the materials specification requirements for low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations.

12.59 This document is subject to some local variation between DLHs because, for example, of differences in:

- substation specification
- environment and impact on ratings, insulation, corrosion etc
- compatibility with existing equipment

12.60 Where a deviation from this framework is identified, it will be stated in the Appendices to this Technical Framework document.

12.61 Trials shall be new, meet the requirements of the listed references, all applicable legislation, and the duty and rating requirements imposed by the design. See also notes in ER G81 Part 4 on equipment ratings, and the need to protect buried assets in contaminated land. Such protection may be by agreed means, such as removal of contaminant or creation of barriers, and / or the selection of specific resistant materials.

12.62 Due to differences in DLH networks, there will be variations on type and ratings of equipment employed. See Appendix A for further information on specifications and host DLH variations.

12.63 Multi-occupancy premises - There are a number of different approaches which are employed in various DLH service areas on requirements for connections to multi-occupancy premises such as offices and shops. LV meter cabinets shall be fire resistant and of a type approved by the Host DLH . Where employed by the Host DLH, cables shall be low smoke fume type.

12.64 DLHs are currently seeking to establish programmes with their cable suppliers for the managed introduction of the new European harmonised cable colours (Black, Brown, Grey phases with Blue Neutral). This should be discussed with the Host DLH.

12.65 Particular care is required in the specification, testing and certification of CTs and VTs for metering application, to meet the requirements of BSCP 520, which in some instances impose extended range accuracy requirements. Another important feature of BSCP 520 is that it's requirements are based on the rating of the connection not the size of the load.

12.66 Host DLHs will require evidence that proposed HV switchgear to be supplied has demonstrated compliance with the relevant specification, such as ENATS (41-26 or 41-36). It is important to note that manufacturers may make a range of equipment types of the same or similar designation and that not all versions will necessarily be compliant with these ENATSs. Assessment will be simpler if the equipment proposed has a current certificate of conformity issued by the ENA Switchgear Assessment Panel against the relevant ENATS, though this

does not preclude other designs being offered. Should such other design be offered, it must be noted that additional time will be needed for the Host DLH to undertake a conformity assessment, and that this timescale will also be governed by the manufacturer's speed in providing information such as evidence of relevant type testing of the equipment actually being offered. Any Host DLH specific requirements, for example on HV test access, cable or VT isolation, are detailed in Appendix A.

12.67 "Systems" (in their broadest sense) which include electrical / electronic / programmable electronic features having a safety related function, may require assessment against BS EN 61508, to meet HSE requirements. In the context of this Framework Document, such systems might include:

- protection relays
- switchgear interlocking, including test access points
- automation systems

12.68 The determination of applicability of BS EN 61508 is dependent upon both the equipment under consideration and the situation in which it is employed. Consequently there will be a need for discussion with the Host DLH to determine what requirements of BS EN 61508, if any, are applicable.

12.69 Details of applicable SCADA controls, analogues, indications, RTUs and Meter Operator data collections systems etc shall be discussed with the Host DLH if not fully detailed in Appendix A.

Provision of materials

12.70 The Applicant shall arrange for procurement of materials which meet Host DLH requirements (in accordance with an agreed list of manufacturers and equipment). For materials proposed to be provided of a currently non agreed source, information shall be provided to the host DLH that allows compliance and quality assessments to be made. The level of information required will be pertinent to the complexity of the equipment and/or materials being considered, and will follow European Public Procurement type criteria.

12.71 It should not normally be necessary to provide copies of material specifications to the Applicant or their proposed Supplier, as the Supplier will normally have copies of relevant specifications. If it is necessary to provide an ENA Technical Specification, this can be purchased from Energy Networks Association , 18 Stanhope Place, London W2 2HH. If a DLH uses its own specification, a copy will be provided to the Supplier.

12.72 Plant delivered from manufacturers shall be unloaded and stored in a way that avoids damage or exposure to moisture.

APPENDIX A - DLH SPECIFIC DATA – DLH ABCD TYPICAL ONLY

12.73 Below is an example only of some data that might be included here, for example a list of suppliers already agreed. This appendix to be populated and updated as necessary by each DLH.

Table 4

Item		**National spec**	**Agreed suppliers**	
Earth Rods		ENATS 43-94	W Furse - Nottingham CBS Products - Oakham	
Fuses (LV)		BS88 Part 5	Cooper UK Ltd - Bourton On Wold, Leics GEC Alsthom - Liverpool MEM - Tyseley, Birmingham	82mm & 92mm slot sizes – ratings as agreed

Etc.

FOR EXAMPLE ONLY

Appendix 13 - Industrial and Commercial Technical Framework Part 6 – Installation and Records

13.1 ENGINEERING RECOMMENDATION G81 - ISSUE: March 2004. Part 6– Framework for installation and records of industrial and commercial underground connected loads up to and including 11kV.

13.2 This framework document is the property of the Energy Networks Association. Copying or reproduction of this document in whole or in part by any means is not permitted without the prior written consent of the Energy Networks Association. The Energy Networks Association accepts no responsibility for any inaccuracies in, or omissions from, this document.

13.3 This document was agreed by the Ofgem Electricity Connections Steering Group on March 8th 2004.

13.4 If there are queries about this document please discuss them with the Host DLH in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

13.5 This document sets the installation and record requirements for low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations. It is one of the following suite of documents governing this work:

- Adoption Agreement
- Design and Planning framework (ER G81 Part 4)
- Materials Specifications framework (ER G81 Part 5)
- Installation and Records framework (ER G81 Part 6)
- Underground unmetered connections framework

and must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent both on specification and the manner in which their use is designed or installed.

13.6 For requirements relating to underground connected housing developments, see Engineering Recommendation G81 parts 1, 2 and 3. NB This suite of documents applies only to NEW installations and is not to be applied retrospectively.

13.7 It is intended to set out or make reference to design and planning requirements which have to be met for a Host DLH to adopt contested HV and LV networks and their associated new HV and HV/LV distribution substations supplying industrial and commercial loads connected up to and including 11kV.

13.8 This document is intended to supplement but not amend, abridge or override any legislation referred to within this document.

13.9 This document makes reference to the documents listed below, which must be complied with unless otherwise agreed in writing with the DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the DLH.

Energy Networks Association/ESI publications/Engineering Recommendations (ER)

13.10 G12/3 Requirements for the application of protective multiple earthing to low voltage networks.

13.11 G17/3 - Leakage of flammable gases recommendations.

13.12 G39/1 - Model code of practice covering electrical safety in the planning installation commissioning and maintenance of public lighting and other street furniture

Energy Networks Association Technical Specifications (ENATS)

13.13 ENATS 12-03 - Outdoor meter cupboards.

13.14 ENATS 12-23 - Polythene protection tape for buried electricity supply cable.

13.15 ENATS 12-24 - Plastic ducts for buried electric cable.

13.16 ENATS 37-2 - LV distribution fuseboards.

13.17 ENATS 41-24 Guidelines for the design, installation, testing and maintenance of main earthing systems in substations.

National Joint Utilities Group (NJUG) publications

13.18 NJUG 4 - The identification of small buried mains and services.

13.19 NJUG 7 - Recommended positioning of Utilities apparatus for new work on new developments and in existing streets.

13.20 NJUG 10 - Guidelines for the planning, installation and maintenance of utility services in proximity to trees.

Health & Safety Executive (HSE) publications

13.21 HS (G) 47 - Avoiding danger from underground services.

13.22 GS 6 - Avoidance of danger from overhead electric power lines.

Pooling & Settlement Agreement

13.23 Agreed Procedure – Unmetered Supplies Registered in PRS Vol 5 AP 520 Issue 3 - now BSCP 520.

Ofgem approved publications

- Distribution Code; and
- Distribution Licence Conditions

British Standards

13.24 BS 7671 - Requirements for Electrical Installations (IEE Wiring Regs 16 edition).

13.25 All requirements of all relevant legislation must be met. The following is a list of **some** of the relevant legislation:

- Ancient Monuments and Archaeological Areas Act 1979;

- Asbestos at Work Regulations 2002;
- Building Regulations (and its related current Approved Documents);
- Confined spaces regulations 1997;
- Construction (Design Management) Regulations 1994;
- Construction Health, Safety & Welfare Regulations;
- Contaminated Land (England) Regulations 2000;
- Control of Substances Hazardous to Health Regulations 1999;
- EC Utilities Directive 93/38/EEC and UK SI 1996 No 2911;
- Electricity Act 1989 as amended by the Utilities Act 2000 and the Distribution Code which is given legal authority by the provisions of the Public Electricity Supply Licence issued under it;
- Electricity Safety Quality and Continuity Regulations 2002 (and associated Guidance issued by DTI dated 22 October 2002);
- Electricity at Work Regulations 1989;
- Electricity and Pipe-line Works (assessment of Environmental Effects) Regulations 1990;
- Electricity Works (Environmental Impact Assessment) (England & Wales) Regulations 2000;
- Environmental Protection Act 1990 & 1995;
- EU Habitats Directive 92/43/EEC – Special Areas of Conservation;
- Fire Precautions Act 1971;
- Fire Precautions (Workplace Regulations 1997 as amended 1999);
- Health & Safety at Work etc Act 1974;
- Land Drainage Act 1991;

- Lifting Operations and Lifting Equipment Regulations 1998;
- Management of Health & Safety at Work Regulations 1999;
- Manual Handling Operations Regulations 1992;
- New Roads and Street Works Act and all related Codes of Practice and Specifications;
- Noise at Work Regulations 1989;
- Provision and Use of Work Equipment Regulations 1998;
- Town & Country Planning Act – General Development Order 1990;
- Water Resources Act 1991;
- Wildlife and Countryside Act 1981; and
- Workplace Health, Safety and Welfare Regulations

Abbreviations

- Applicant – The Company wishing to undertake the contestable work
- BSI – British Standards Institution
- BS – British Standard
- CDM- Construction (Design Management) Regulations 1994
- DLH – Distribution Licence Holder – defined in Standard Licence Conditions for
- Electricity Distributors, issued under the Utilities Act and effective from 1st Sept. 2001
- DSA – Distribution Service Area – the service area of a DLH
- EA – Electricity Association (replaced by ENA for Networks issues post Oct 2003)

- ENATS – Energy Networks Association Technical Specification
- ENA – Energy Networks Association
- ER- National Engineering Recommendation issued by ENA or EA
- ESQCRs – The Electricity Safety, Quality and Continuity Regulations 2002
- Host DLH – The DLH in whose licensed area (DSA) the works are to take place
- HSE – Health & Safety Executive
- NRSWA – New Roads and Street Works Act
- OFGEM – Office of Gas and Electricity Markets

13.26 This framework describes installation test and records requirements for low voltage, 6.6kV and 11kV underground industrial and commercial connections, including their new associated HV and HV/LV distribution substations.

13.27 This document is subject to some local variation between DLHs because, for example, of differences in

- substation specification
- environment and impact on ratings, insulation, corrosion
- compatibility with existing equipment

13.28 Where a deviation from this framework is identified, it will be stated in the Appendices to this Technical Framework document.

13.29 The installation of all plant and equipment to be adopted by the Host DLH shall meet the requirements of the listed references, all applicable legislation and the details in this section. It must be noted that ratings will be influenced by the installation arrangement and reference shall be made to the "Design and planning requirements framework" document (ER G81 Part 4 and Appendices) regarding equipment ratings.

13.30 All plant and equipment installed shall comply with the requirements of the "Materials specification framework" document.

13.31 The installation shall be such as to permit future live low voltage working on the asset by the Host DLH.

13.32 There shall be no material change to routes (to the extent that it affects design criteria) detailed in previously submitted plans unless otherwise agreed in writing with the Host DLH and other interested parties.

13.33 Cable laying depths shall be as NJUG 7, unless otherwise agreed, and shall be recorded.

13.34 Trenches shall be prepared so that the bottom of the trench is free of rubble, sharp stones, flint etc , and an adequate layer of stone dust or other suitable bedding has been laid. Where a change of level is necessary, the bottom of the trench shall rise or fall gradually.

13.35 Ducts shall be laid at least 300 mm below the carriageway construction and shall extent to the outer extremities of the kerb haunchings. Checks shall be made that all installed ducts are undamaged and are not obstructed (including any ducts laid as spare for future use). Duct mouths shall be sealed to prevent ingress of water, noxious or explosive liquids or gases. Ducts shall be suitably spaced to avoid congestion at either end to facilitate future jointing. Spare ducts shall be installed by the Applicant at positions agreed with the Host DLH.

13.36 Wherever possible, cables should be laid by hand. If a winch is employed to pull the cable, rollers and skid plates shall be used in the trench to ensure that the cable does not touch the ground during pulling. A cable stocking, fitted with a swivel, must be used to connect the bond to the cable and a dynamometer used to check that the maximum pulling tension for the cable is not exceeded.

13.37 Cable laying shall only take place when the ambient temperature is above 0º C and has been above this temperature for the previous 24 hours. Alternatively, special precautions shall be taken to maintain cables above this temperature to avoid risk of damage during handling.

13.38 Cables shall not be bent further than their minimum bending radius.

13.39 The cable shall be correctly spaced from other cables and other utility services, in accordance with NJUG specifications.

13.40 Earth conductors and rods shall be laid in accordance with the previously submitted plans. Note should be taken of the requirements of ESQC Regulation 9 (2) (a) on the need for earths at the remote end of the main, during each stage of the energisation programme.

13.41 Before backfilling a visual inspection shall be carried out to ensure the cable is free from damage. After laying the cable shall be backfilled with suitable graded fine fill material to tape level and the correct marker tape laid, in compliance with The Electricity Safety Quality and Continuity Regulations 2002 and Host DLH policy.

13.42 Jointing materials comply with Host DLH specification or an agreed equivalent.

13.43 Jointing practice shall be in accordance with a specification agreed with the Host DLH.

13.44 Joints shall be made 'Colour True' or R - 1, Y - 2, B - 3, unless agreed otherwise with the Host DLH. DLHs are currently seeking to establish programmes with their cable suppliers for the managed introduction of the new European harmonised cable colours (Black, Brown, Grey phases with Blue Neutral). This should be discussed with the Host DLH.

13.45 Cable terminations shall be made with correct phase connections.

13.46 Service connections shall be made to the correct phase as shown on network drawings. The numbers of services taken from a single joint shall not exceed the number agreed with the Host DLH; that number being the maximum the Host DLH would accept for work undertaken directly on its own behalf.

13.47 Where a DLH employs such a system, a unique permanent labelling system shall be applied to the joint giving the jointers name.

13.48 The Applicant must provide a Completion Certificate, signed by the jointer, for each joint made. These shall be kept in the Construction File, together with copies of the inspection forms.

13.49 Specifications of HV/LV distribution substations and HV switchboards and other equipment such as protection , SCADA, and battery systems shall follow Host DLH standards detailed in Appendix B. This may include such issues as layout, enclosure type, Electricity Safety Quality and Continuity Regulations and associated Guidance security requirements, internal arc relief etc.

13.50 LVAC supply arrangements to substations shall be agreed with the Host DLH.

13.51 Requirements on batteries such as location, ventilation, type, sizing, life and nominal voltages shall be discussed with the Host DLH unless these are fully set out in Appendix B.

13.52 Requirements for accuracy testing of metering CTs and VTs , certification and hand over of documentation need to be agreed at an early stage, having regard to the requirements of BSCP 520. Care is required to ensure necessary testing and certification requirements are met before CTs and VTs are built into equipment as long delays may otherwise be caused.

13.53 Plant delivered from manufacturers shall be unloaded and stored in a way that avoids damage or exposure.

13.54 The Host DLH shall supply plant and substation numbering signage, property ownership and Danger of Death signs prior to energisation.

Service entries

13.55 Service entry policy may vary between DLH's – see information in Appendix B of "Design and planning framework" document for details. Cavity service entry shall not normally permitted as this de-rates the service cable.

13.56 If alternative arrangements are considered the following shall be taken into account:

- The air temperature surrounding the cut out must not exceed 30°C.
- All meter cabinets must be installed in a way that maintains the manufactured fire resistance values.

13.57 Service ducting shall be installed from the service position to the point where the service cable will be jointed onto the main. The service cable shall be

drawn by hand into this duct. Black duct shall be used for electrical service cables, to prevent confusion with other utility services.

13.58 The Applicant shall provide phase marking on cut out terminals.

Multi- occupancy dwellings

13.59 The following additional clauses apply to installations for multi-occupancy premises such as offices, and shops. There are a number of different approaches which are employed in various DLH service areas on the design of connections to multi-occupancy premises The following paragraphs describe the most common practices, not all will necessarily be accepted by Host DLH; refer to Appendix A for any Host DLH variations.

13.60 LV cable entry to building – approved rigid black duct or fireclay duct with slow radius bend, minimum bending radius 900mm, 150mm inside diameter, with drawcord for each incoming mains cable to area clear of building and any concreted area, buried with minimum 450mm cover overlaid with marker tape and into drawpit in termination enclosure 700mmD, 1000mmL 450mmW. Some DLHs do not employ drawpits and use duct as described above to area clear of building and any concreted area.

13.61 LV intake position accommodation - Developer to provide suitable secure and fire proof enclosure for cut out and distribution board (when required) in suitable common access location on ground floor minimising route length to exterior and which provides suitable cable routes, meter position and exit points for each dwelling.

13.62 Communal LV meter / service enclosures shall not be used for other purposes posing increased risk to equipment, risk of fire or risks to operatives. The size of the LV enclosure is dictated by the equipment installed and the need for adequate working space. There shall be a minimum of 300mm separation to any gas meter or gas pipe joints. The average temperature shall not exceed 30C.

13.63 Where the building entrance is closed for security reasons or there is no alternative means of escape, the LV enclosure should be sited adjacent to an external wall and be accessible from outdoors. HV substations shall be

arranged to be in a separate building or on an outside wall unless otherwise agreed with the Host DLH. Outside doors shall be lockable, weatherproof and vandal resistant. See Appendix B for Host DLH requirements on locks.

13.64 Lateral connections - The developer is responsible for the design, construction and installation of the service cable routes within the building. The design route / cable length used to calculate voltage drop shall not be exceeded.

13.65 Service cables must not be routed through individual (non common space) premises other than the one being served. Mains shall not be routed through premises. The routes selected within the building must ensure that after installation cables are accessible for withdrawal / replacement without damage to the building.

13.66 Mains and service cables must not be in the same duct as non electrical services. Where not ducted it must be clipped to cable tray. Where a multi-service shaft is provided, the electrical installation must be compartmented to provide a fire barrier from the other services. Every vertical duct, shaft or trunk must have internal barriers to prevent excessive heat rise at the top. The maximum separation between barriers is 1 floor or 5 metres, whichever is less. After installation of cabling the developer shall carry out fire stopping using materials such as cement mortar, gypsum based plaster, cement or gysum based vermiculite / perlite mixes, intumescent mastics, proprietary sealing systems, rockwool or as specified differently by the Host DLH in Appendix B. The method of ducting should be agreed with the Host DLH taking account of the derating factor of the current carrying capacity of the cables.

13.67 If service or mains cables pass through a part of the building required to have a minimum fire resistance period, the installation must maintain the integrity of the fire resistance. Minimum fire resistance periods are listed in the Building Regulations, to which reference must be made.

13.68 LV Meter positions - Meter cabinets shall be fire resistant, and of a type approved by the Host DLH. Meter positions shall be accessible from communal areas. Meters should be positioned so that they are installed not less than 450mm and not more than 1800mm from the floor.

13.69 Meter positions shall either be separated by 2 metres, effectively screened or effectively bonded against the risk of electric shock by simultaneous touch under earth fault conditions.

13.70 LV group meters and switchgear must be clearly identified to the appropriate dwelling by a secure label supplied and installed by the Developer.

13.71 Bonding - Bonding of electrical installations must be in accordance with BS 7621. The Developer shall ensure that PME bonding shall include bonding to metal services as close a possible to their point of entry into the building and to accessible steelwork.

13.72 Each premises shall be regarded as separate and treated in the same way as individual houses, irrespective of any bonding carried out elsewhere, eg where communal services enter the building.

Work in contaminated land

13.73 Where work is to take place in contaminated land, special precautions will need to be established, to cover in particular, the following:

- Prevention of the creation of pathways, for example by trenching, allowing the movement of contamination
- Prevention of damage or reduction in normal life of assets as a result of contamination, e.g. by the removal of contamination, creation of barriers or use of specific resistant materials
- Inclusion in CDM file the details of the contamination survey, worker risk mitigation both during installation and during subsequent service life to asset removal.

Records/Test

13.74 It shall be the responsibility of the Applicant to provide the Host DLH with accurate records of the installation. These records shall include:

- For all installed cables and joints: plans showing route, depth, cable types and sizes, ducts lengths and sizes, joint locations, joint and service

phasing and earth rod location. (Note that there are also draft requirements set out in NRSWA Records Code of Practice)

- For all installed plant and protection: location, maker, type, rating and serial numbers.

13.75 The accuracy requirements and means by which plans are provided to the Host DLH shall be the same as would apply if the work was undertaken directly for the Host DLH. The Host DLH shall provide the Applicant with information in Appendix B to facilitate this.

13.76 The Applicant shall perform tests on the complete installation to verify that it has been correctly installed, it is safe to energise and customers may be safely connected. Appendix A provides a list of typical test requirements.

13.77 A programme of tests shall be agreed between Host DLH and Applicant in respect of HV equipment including HV protection and any remote control / automation/ SCADA facilities. The extent of tests required and the format for recording test results will be specified by the Host DLH in Appendix B.

APPENDIX A - TEST REQUIREMENTS

Each service	- polarity / phase rotation (3ph) - insulation resistance 500/1000V - earth loop impedance
Each new section of main	- insulation resistance ph-ph and ph-n/earth 500/1000V - continuity
Each p.m.e. electrode	- earth resistance
Earthing resistance	- overall value measured at substation - at HV/LV substation – combined HV/LV / not combined and overlap (depends on achieving < 1 Ohm)
LV fuse cabinet	- insulation resistance 500/1000V

HV/LV transformer	- insulation resistances HV- LV winding/earth - pressure test - voltage and phasing checks - tap setting check - oil moisture content - oil electric breakdown strength - statement on pcb content < 2ppm new oil
HV Switchgear	- insulation resistance 5kV - pressure test - protection test, secondary injection or dummy HV fuse tester (e.g. B&S device) - functional test of interlocks and operation - insulation test any loose test devices - busbar resistance if work includes connection of busbars , new to new or new to existing - gas pressure if gas filled
HV Cables	- insulation resistance 5kV - pressure test RYB-E, RY-B, BR-Y - continuity
HV Protection	- functional testing including injection testing - insulation resistance

APPENDIX B - HOST DLH REQUIREMENTS

13.78 The following is only provided as an indication of the type of information which would be included by the Host DLH in this Appendix.

Service entries

13.79 Cavity service entry shall not normally permitted as this de-rates the service cable.

13.80 LV meter cabinet and installation arrangements shall be one of the type agreed with the Host DLH [ongoing need to hold spare doors etc]. These arrangements shall be agreed in advance and documented, with appropriate drawings.

13.81 If alternative arrangements are considered the following shall be taken into account, the air temperature surrounding the cut out must not exceed 30^0c. All meter cabinets must be installed in a way that maintains the manufactured fire resistance values.

HOST DLH REQUIREMENT - ASSET RECORDING – Typical only

- Principles of recording cables
- Taking measurements using triangulation
- Extended sight lines and right angles
- Chain Lines
- Same feature recording
- Other data to be recorded on site
- Recording of cable sections
- Process of cable recording
- Example of cable sketch

Appendix 14 – Unmetered Connections Service Level Agreement

14.1 This arrangement has been developed, within the framework of the DNO CiC workgroup, as an alternative for Lighting Authorities who do not wish to venture down any potential path of competition in electrical connections but who do wish for greater levels of surety in the service they receive from their local DNO.

14.2 The National SLA has been developed with extensive input from the Customers CiC group, and a number of basic principals were agreed, at the outset of the process, by both DNO and Customer elements of CiC workgroups. These were:

- That any SLA should cover all UMS activities i.e. New works, Fault Repair and Emergency Response.
- That standard service categories would be applied equally across the country
- That all service standards would have documented, agreed and unambiguous definitions, including trigger points for standards initiation.
- That the SLA may contain penalties for poor performance and these will be applied equally to the DNO and LA as appropriate i.e. the agreement would seek to be symmetrical in its obligations.
- That there would need to be an effective and agreed force majeure process for suspension.

14.3 The document attached represents the output of this process and it is proposed that the document is put forward to Ofgem to form part of the wider consultation to take place on the output of the ECSG, via the DNO CiC Workgroup. In putting the document forward for further consultation, the DNO CiC workgroup would ask Ofgem to note:

- While standard service categories have been identified, based on existing best practice in place around the country, no specific targets have been

identified within the document. These targets are to be proposed through wide and effective consultation.

- As with service levels, no specific penalty payment levels have been identified and again this should be a matter for wider consultation. DNOs would, however, consider that any penalty payment coming due under the NSLA should be proportionate to the level of DUOS income derived from a typical lighting installation annually.

- Before any actual penalties are applied to either party, there should be a 12 month *shadow period* where the NSLA is in place but no financial penalties are applied. This is to allow all parties to understand the potential liabilities resulting from operation of the NSLA. If necessary, service targets would need to be amended to take account of experience gained during this period of shadow running, after consultation with the ECSG.

- The document has not been subject to any formal legal scrutiny.

Introduction

14.4 [DNO] whose registered office is [xxx] Company Number [xxx] is the Distribution Network Operator ("[DNO]") serving the area covered by the Lighting Authority ("[LA]") named on the front page to this Service Level Agreement [LA] owns and maintains equipment, which includes street lighting columns, traffic signs, traffic signals, feeder pillars and their own underground cables. This Service Level Agreement is made between the [DNO] and [LA] it sets out the Standard of Service the [DNO] will provide to [LA] and the information which [LA] will provide to the [DNO] to achieve the required standards whereas:

a) [LA] and [DNO] have entered into an Unmetered Connection Agreement, and

b) [LA] holds and maintains an accurate, detailed inventory which also, where applicable, is in accordance with the requirements of BSCP (Balancing and Settlement Code procedure) 520.

Criteria for acceptance of unmetered supplies

14.5 Except under exceptional circumstances, points of connection to DNO's distribution systems shall be metered. These exceptions, known as Unmetered Connections, shall be at the discretion and approval of the Unmetered Supplies Operator (UMSO) of the DNO. The UMSO will consider providing an Unmetered Connection where:

a) the load is of a predictable nature, and either;

b) the load is less than 500W or;

c) it is not practical that a supply of electricity is given through an appropriate meter due to –

(i) the expected metering costs in that particular case being significantly higher than the usual metering costs associated with that size of load;

(ii) the technical difficulties associated with providing such a meter in that particular case; or

(iii) the operation of law prohibiting or making excessively difficult the provision of such a meter in that particular case.

14.6 The provision of such a connection is dependent upon the Applicant entering into an Unmetered Connection Agreement with the DNO and providing and maintaining an accurate, auditable inventory in a format agreed with the DNO. This document and its contents shall apply regardless of who the energy supplier shall be.

Definitions

14.7 Working Day - 08.00 am to 16.30 p.m., Monday to Friday inclusive, but excluding public holidays.

14.8 Starting Date – The first Working Day following the date of receipt of order by [DNO] from [LA] or their designated contractor. For Emergency Work, the time and date [DNO] received the call from [LA].

14.9 Completion Date - The date of transmission of the information from [DNO] to the[LA] indicating that the electrical work is completed.

14.10 Completion - The distribution system returned to normal operational conditions.

14.11 Response Time – for Emergency Work the Response Time will be the date and time [DNO] received the call from the [LA] and start on site. All other Response Times shall be the number of Working Days between the Starting Date and the Completion Date.

14.12 Emergency Work - Work necessary to remove immediate danger to the public or property arising from the [DNO]'s electricity distribution network associated with Street Furniture.

14.13 High Priority - Work that is urgent but would not require attendance out of normal working hours to restore or remove electricity supplies to the Street Furniture.

14.14 Public Lighting Schedule Quotation – The provision of a price for works falling inside the scope of the Public Lighting Schedule.

14.15 Public Lighting Schedule – A published schedule of prices setting out standard charges for the provision of connections to Public Lighting unmetered installations.

14.16 Non-standard quotation – A quotation for the provision of electrical services to unmetered installation outside the scope of the standard Public Lighting Schedule.

Communication

14.17 For normal day to day communication between [DNO] and [LA], the contact person will be as agreed locally. The use of e-mail may be utilised to enhance communications where practical.

14.18 To be able to maintain the aims of this SLA both parties will work closely together to ensure communications and exchange of information are such that work is effectively progressed.

Quality of Information

14.19 In order to provide, fault location and repair, and maintain electricity supplies to Street Furniture, [DNO] require certain information from the [LA]. The form of this information will be as detailed below:

(a) Repair and Maintenance Activities

A Public Lighting Supply Fault Report giving the following information: -

(i) An [LA] identification reference with date issued. Upon receipt by [DNO], [LA] will be issued with [DNO]'s identification number.

(ii) An accurate location of the equipment involved. This typically could include post code, asset number and position (for example, side of, rear of, outside house number, road name) or other means as agreed between [DNO] and [LA], and when necessary, supported by a map of the area, usually at 1/1250 scale with the equipment highlighted.

(iii) A description of the work involved, and the number of consuming points affected.

(iv) The priority of the work involved. (See section 6).

(v) Type of Work:-

(1) Work for which the [DNO] will normally bear the costs:-

Fault on Service e.g. (a) No Current

(b) Low Voltage

(c) Faulty cut-out (i.e. electrically distressed)

(d) Loss of Neutral

(e) High earth loop impedance

(2) Work for which the [LA] will normally bear the costs:-

(a) Make Safe (including vandalism or damage)

(b) Permanent Disconnection

(c) Reconnect after Make Safe

(b) New Work / Refurbishment Work

14.20 The [DNO] will actively promote the use of standard schedule price work wherever possible, as per the [DNO]'s Schedule of Street Lighting Charges, in order to minimise administration and timescales. These prices are subject to review.

14.21 The [LA] may request an estimate of the cost for new work or refurbishment work.

14.22 This will be supported by similar information to that detailed above:

(i) A plan showing the extent of their works and any civil works required from [LA] and

(ii) A Public Lighting Schedule detailing the estimated cost based on the standard schedule of prices.

(iii) After having accepted the estimate, [LA] will provide an order for the new work or refurbishment work, and a programme followed subsequently by a Notice of Erection, indicating that their site works are complete and the work is ready for completion by [DNO].

14.23 Any order for new work / refurbishment work will quote the reference of any estimate [DNO] has provided for the works. If [DNO] seek to amend the price stated on the order, the consent of [LA] must be obtained before the work is commenced.

14.24 New work and refurbishment work may include the following:-

(a) New Capital Lighting Schemes

(b) Road Improvement Schemes

(c) Provision of Connections / Disconnections

(d) Transfers

(e) New Services

(f) Disconnections

Priority and Response Times

14.25 The [LA] will assign a priority to its orders to [DNO] in accordance with the following table:-

Service	Description	Response time (within)
Standard 1 – Emergency/Fault Repair		
A. Emergency	As defined in Section 3(f)	X hours
B. High Priority Fault Repair	As defined in Section 3(g)	X days
C. Fault Repair – Single Unit	Faults as defined in Section 5.1(a)(1)	X days
D. Fault Repair – Multiple Units	Faults as defined in Section 5.1(a)(1)	X days
Standard 2 – New/Transferred Connections		
A. New Works 1-10 Jobs	As defined in Section 5.1(b)	X days
B. New Works 11-50 Jobs	As defined in Section 5.1(b)	X days
C. New Works > 50 Jobs	As defined in Section 5.1(b)	By agreement
Standard 3 – Providing Quotations		
A. Quotation for non-standard works – timetable to be agreed within	As defined in Section 3(j)	X days
B. Quotation based on published schedule of prices	As defined in section 3(h)	X days

14.26 In order for [DNO] to comply with response times defined in 6.1 [LA] will be required to provide timely information as defined in 5.1(b)(i)(ii) and (iii) within timescales defined as follows:

Service	Notice Period (At least)
New Works (inc Disconnections and Transfers)	
A. New Works 1-10 Jobs	X days
B. New Works 11-50 Jobs	X days
C. New Works > 50 Jobs	X days

14.27 The volume of new works presented by the [LA] to the [DNO] in any month is not to exceed 12% of total volume of new works received by [DNO] for [LA] in the preceding 12 months.

Work to be carried out

14.28 [DNO] will provide and maintain a connection to its low voltage distribution network to be used for Street Furniture. This will be via [DNO]'s service cutout including an HRC fuse of the appropriate rating, supplied and initially fitted by [DNO].

14.29 If, in the course of their work [DNO] discover that the protective door is missing from a consuming unit, [DNO] will secure it with a temporary door provided by [LA]. [DNO] will notify [LA] of this action and [LA] will subsequently remove the temporary door and replace it with a permanent door. [LA] will provide [DNO] with a supply of temporary protective doors for this purpose.

Transmission of Information

14.30 In order to achieve the Response Times set out in this Service Level Agreement, it is essential that there is a regular and frequent exchange of information between the two parties. This will usually take the form of orders from [LA] to [DNO] and notification of Completion of work from [DNO] to [LA]. It is recognised that while [LA] will use all endeavours to supply [DNO] with a regular flow of work, on occasions, the workflow will be irregular. In these exceptional circumstances, [DNO] may not be able to attain the Response Times given in section 6.

14.31 The timescale for new works as referred to in section 5.1 (b) (a) and (b) to be agreed by both parties as and when the schemes are initiated.

14.32 In normal circumstances, [DNO] will transmit by fax weekly or use other agreed means, details of all work completed. For new work this will be confirmed by invoice later.

Information provided to third parties

14.33 When it is necessary to provide details of [LA] or [DNO] street lighting operations to third parties, [LA] order number will be quoted to identify accurately the work concerned.

Abortive calls and payments

14.34 [DNO] will endeavour to achieve the Response Time performance standard for each category of work.

14.35 In requesting [DNO] to carry out work on Street Furniture, [LA] will take all practical steps to ensure that the information supplied to [DNO] is accurate and correct. Where incorrect or inaccurate information results in [DNO] staff attending work locations at which they cannot carry out the work, an abortive call will be registered. [DNO] and [LA] will, as far as is reasonably practicable, give advance notice if the agreed programme cannot be met with reasons and proposed revised programme.

14.36 A charge for this abortive call will be made to [LA] detailing the reason why it is abortive.

14.37 Similarly, if [DNO] advise [LA] that work has been completed and this proves to be incorrect and [LA] staff or their contractors visit site and cannot complete their work, [LA] will charge [DNO] for an abortive call and give the reasons why the charge is being levied.

Standard payments for failure to perform

14.38 Except in the case of a planned supply interruption where [DNO] fail to complete the works described in 6.1 within the Response Time specified in this

Service Level Agreement then the Local Authority shall be entitled to a payment of £X per failure. A further payment of £Y shall be made if the repair is not completed within Z working days, these entitled payments must be claimed.

14.39 The above payments shall not apply:

a) If any of the Force Majeure circumstances defined within Clause 14 apply.

b) If the provisions of clauses 6.2 and 6.3 are not met.

c) If the information exchange is not as described within Clause 5.1 (a) and (b).

Energisation of [LA]'s Street Furniture

14.40 When the connection between the [LA]'s Street Furniture requires to be energised this may, by local agreement, be carried out in one of two ways:-

(a) The [LA] may subject to the conditions below remove the fuse from the cut out, and connect its installation and replace the fuse thereby energising the connection .The conditions are:

i. The [LA] shall not allow any persons other that "competent persons" as defined in the Electricity at Work Regulations 1989 to do the work

ii. The [LA] shall test the [DNO]'s equipment at the point of connection to ensure a safe connection / energisation can be made.

iii. If the test is satisfactory the [LA] may remove the fuse from the [DNO]'s cut out.

iv. Provided the [LA] is satisfied that its electrical installation at the Street Furniture is constructed, installed, protected and used or capable of being used so as to prevent so far as practicable danger or interference with the [LA] installation or the [DNO]'s network or any third party installation or the supply of electricity to any other consumer's installation or street electrical fixture then the [LA] may connect up the

[LA] electrical installation and replace the fuse in the cut out thereby energising the connection; or

(b) [DNO] may, subject to the following conditions below, connect [LA]'s electrical installation at the Street Furniture to the [DNO]'s cut out and energise that connection. The conditions are:-

i. The [LA] installation must have an inspection label on it or other evidence satisfactory to the [DNO] that it has been tested. (The expression "tested" shall mean that [LA] is satisfied that its electrical installation at the Street Furniture is constructed, installed, protected and used or capable of being used so as to prevent so far as practicable danger or interference with the [LA]'s or the [DNO]'s or any third party installation or the supply of electricity to any other consumer's installation or street electrical fixture).

ii. If the [LA] installation has an inspection label on it or such other evidence as the [DNO] considers satisfactory then the [DNO] will energise the connection.

iii. If there is no inspection label or other evidence then the [DNO] will not energise the connection and will report the matter to the [LA]

14.41 The [LA] hereby gives the [DNO] a warranty to the effect that:

(a) any persons employed or engaged by the [LA] to remove or fit a fuse to the [DNO]'s cut out or carrying out the [LA] works shall be a "competent person" as defined in the Electricity at Work Regulations 1989.

(b) where there is a inspection label (or other evidence is provided as outlined above) on the [LA] installation then that installation complies with the current edition of the IEE regulations.

14.42 The [LA] agrees that it will indemnify the [DNO] from and against any claims for all loss injury or damage caused by or arising out of any breach of its obligations in this section 12 or the warranty set out above but excluding any

liability for death or personal caused by the negligence of the [DNO] or its employees.

Force Majeure and System Emergencies

14.43 DNO shall not be responsible for any delay or prevention in the performance of the service levels by reason of circumstances beyond DNO's control including (without limitation) any act of God, strike, lock-out or other industrial disturbance (whether of DNO's workforce or that of the Customer or any third party), lack of instruction by the Customer or its agent, act of the public enemy, war declared or undeclared, threat of war, terrorist act, blockade, revolution, riot, insurrection, civil commotion, public demonstration, sabotage, act of vandalism, fire, adverse weather conditions, flood, earthquake, explosion, accident, shortage of material or delays in deliveries.

Limitation of Liabilities

14.44 The exclusions and limitations of liability in this Clause override any other provision in this Agreement.

14.45 Save in respect of the death of or personal injury to any person caused by its negligence neither [DNO] nor any of its officers, employees or agents shall be liable to the [LA] for any loss costs damages or expenses arising from any breach of the Agreement, in tort (including negligence) for breach of statutory duty or otherwise other than for loss directly resulting from such breach which at the date hereof was reasonably foreseeable as not unlikely to occur in the ordinary course of events from such breach and which results in physical damage to the property of the [LA] its officers employees or agents.

14.46 The liability of [DNO] in respect of claims for loss referred to at Clause 14.2 shall not exceed £100,000 or the cost of [DNO] Works in providing the Connection up to a limit of £1,000,000 whichever is the greater.

14.47 Nothing in this Agreement shall exclude or limit the liability of a Party liable for death or personal injury resulting from negligence of the Party liable or any of its officers, employees or agents and the Party liable shall indemnify and keep indemnified the other Parties their officers, employees or agents from and against all such and any loss or liability which the other Parties may suffer or

incur by reason of any claim on account of death or personal injury resulting from negligence of the Party liable or any of its officers, employees or agents.

Termination Clause

14.48 Either party upon giving the other party three month's notice of their intention to do so may terminate this Agreement.

General Conditions

14.49 No variations to this Service Level Agreement shall be effective unless agreed in writing and signed by both parties.

14.50 This Service Level Agreement is not intended to be for the benefit of any persons not a party to it.

Dispute Resolution

14.51 The Customer shall immediately refer any disputes arising from the application of this Service Level Agreement to the DNO's designated representative.

14.52 If DNO's representative is unable to resolve any dispute the Customer may refer the dispute to the XXXX [Senior DNO Manager/Director ?].

14.53 Either Party may at any time refer a dispute regarding the Contract to adjudication in accordance with the provisions of Clauses 17.4 to 17.9.

14.54 The wording of Part 1 of the Schedule to the Scheme for Construction Contracts (England and Wales) Regulations 1998 (the "Adjudication Scheme") is incorporated into these Conditions amended as follows:

References to a "construction contract" or "the contract" in the Adjudication Scheme shall be read as "the Contract".

14.55 Every decision of an adjudicator shall be implemented without delay. The parties shall be entitled to such relief's and remedies as are set out in the adjudicator's decision and shall be entitled to summary enforcement of the decision regardless of whether or not it is or is to be the subject of any challenge or review. No party shall be entitled to raise any right of set-off, counterclaim or abatement in connection with any enforcement proceedings. No issue decided

by an adjudicator may be subsequently referred for decision by another adjudicator unless agreed by the parties.

14.56 For the purposes of paragraph 2(1)(b) of the Adjudication Scheme the specified nominating body shall be the President of the Institute of Electrical Engineers.

14.57 No legal proceedings arising under or in any way connected with this Service Level Agreement may be commenced by either of the Parties unless the dispute or difference between the Parties has been referred to an adjudicator who has given a decision on that dispute or difference.

14.58 Any referral to adjudication shall not relieve either Party from any liability for the due and punctual performance of its obligations pending the outcome of such referral.

Review of this Service Level Agreement

14.59 It is acknowledged that this Service Level Agreement, while not comprehensive, provides the base for a working arrangement between staff from [LA] and [DNO]. The primary objective of this Service Level Agreement is to standardise the response and performance, to regularise interface operations and communication between the two parties.

14.60 To support those intentions meetings will be held as necessary to review progress. In case of dispute, both parties will use their best endeavours to resolve the dispute with the needs of the general public being the major consideration.

Appendix 15 – Unmetered Connections Contract – Triangular Arrangements

15.1 This arrangement has been developed to facilitate competition in unmetered connections and mitigate the liability issues associated with HAs contracting directly with ICPs.

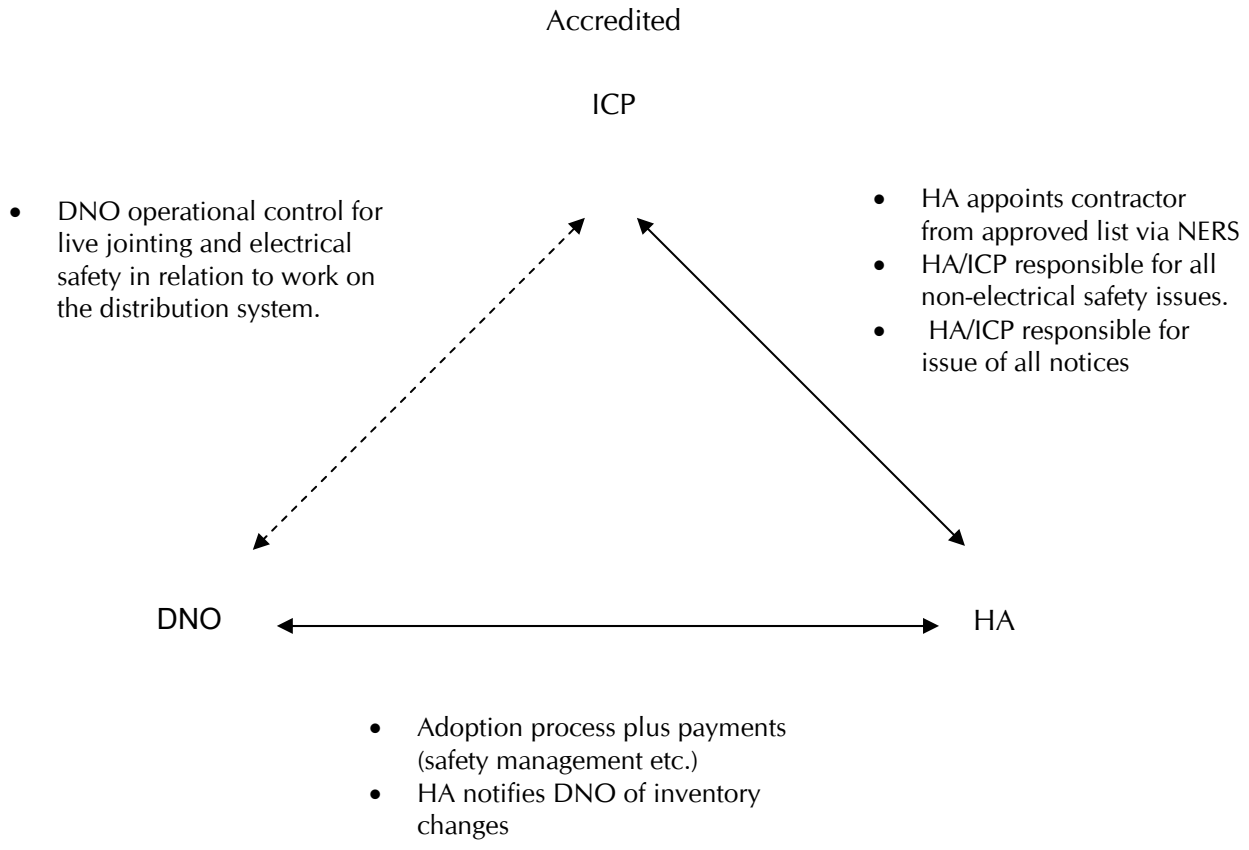
15.2 It is intended that these arrangements will only apply to work on the service cable and that work on mains cables will still be non-contestable and undertaken by the DNO. For clarity, live jointing associated with this process is restricted to service cables to underground, unmetered, single phase 230V connections more than 1m from the main cable as measured along the service cable. All other work will continue to be carried out by the DNO.

15.3 For the purposes of live jointing the successful contractor will be under the operational control of the DNO that is consistent with the initial proposal as described by the ECSG.

15.4 Fundamental to this process is the requirement for physical work to be carried out by a competent workforce in a safe manner to agreed standards and specifications and not to the detriment of other users of the DNO's distribution network.

15.5 It is expected that initially ICPs involved will be those that are currently employed as contractors to DNOs. This will need to be reviewed when the form of the arrangements are developed as the additional services may be required eg project and work management may not be provided by some contractors currently working for some DNOs. However, there will be no constraint on the number of contractors that will be allowed to compete in this market subject to them meeting the agreed criteria.

15.6 The diagram below summarises the proposed arrangements:

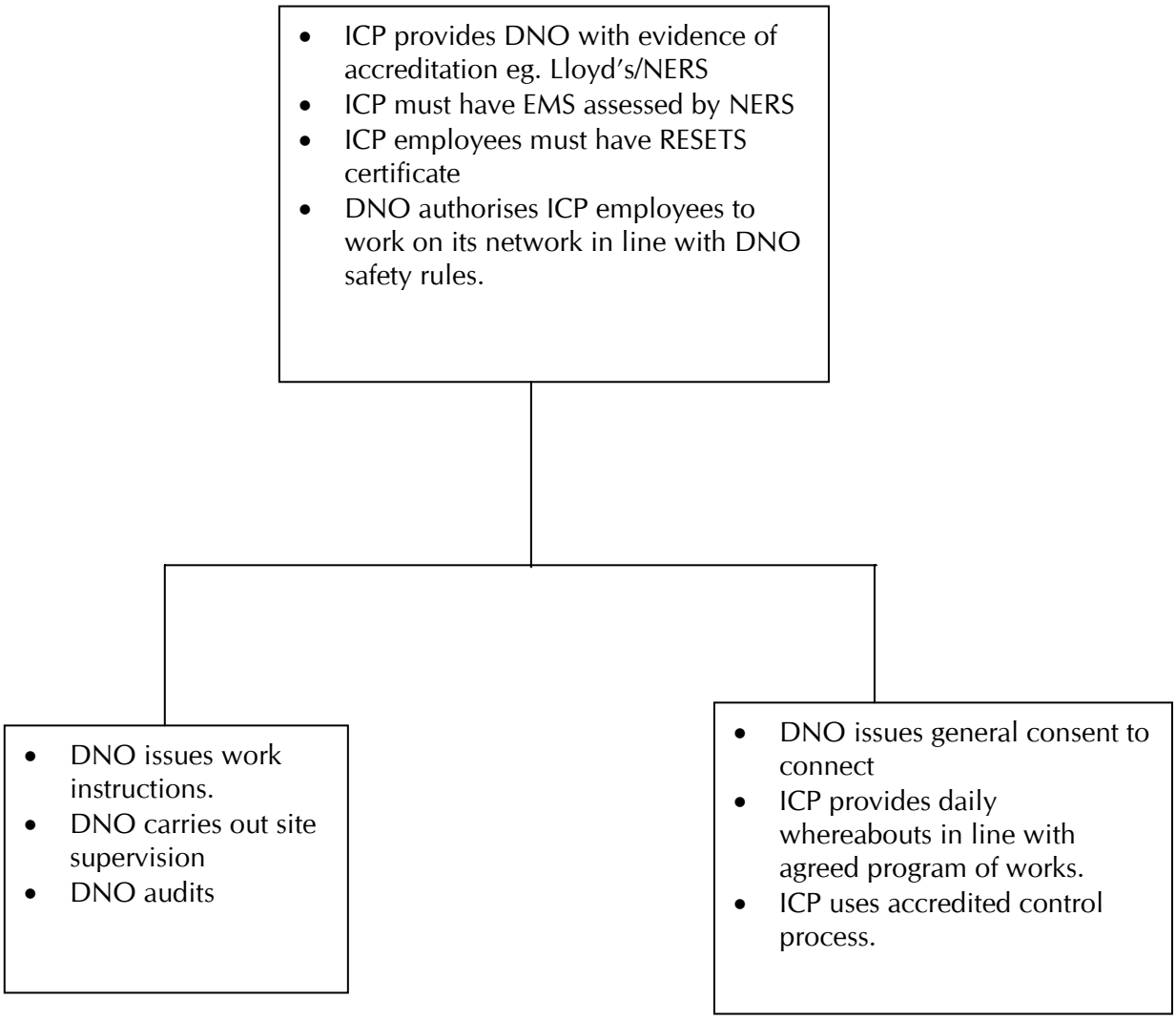


DNO - ICP

15.7 The contractual arrangements between the DNO and the ICP are to facilitate arrangements for network access and ensure that all operational work on the DNO network is carried out safely and with minimum disruption to other parties connected to the DNO network.

15.8 It is recognised that individual DNOs will operate within the ethos of their respective organisations that will result in the development of a variety of different business processes and requirements in relation to the control of those parties operating on their networks.

15.9 The DNO needs to retain a degree of control as the ICP is working on the DNO network and is therefore required to have consent to connect for making or altering a connection to that network. The DNO is also required to have the ability to withdraw that consent.



HA - ICP

15.10 This contract will be subject to competitive tender and will be a material and services contract. Materials shall meet the requirements of DNO specifications but due to differences in individual DNO networks there may be variations on type and ratings of equipment employed.

15.11 The HA will appoint a contractor from an approved list via NERS. In order to facilitate the live jointing aspects of this process it is essential that the appointed ICP has an agreement in place with the respective DNO to carry out live jointing on the DNOs' behalf at no cost to the DNO.

15.12 The HA will be responsible for organising and scheduling work and will also be responsible for all NRSWA responsibilities. All risks and liabilities associated

with the work will need to be included in this contract. This will include all risks to the public (eg signing, lighting and guarding) and to the ICP's jointer (eg a safe excavation and working environment). Clearly, the commercial terms covering the work scheduling etc will also need to be covered including the impact of the loss of authorisation of the ICP to work live on the DNO network.

15.13 The ICP will construct assets on behalf of the HA that will own those assets prior to adoption.

DNO – HA

15.14 This contract will be in the form of an adoption agreement in which the DNO will agree to adopt assets upon their satisfactory completion. Though the following is not intended as an exhaustive list, the agreement should address the following fundamentals:

- Transfer of title of the constructed asset from the HA to the DNO. The Asset Owner will depend on the relationship between Materials supplier / Asset Constructor (ICP) and Developer.
- The safety of the Adopted Asset
- The quality of the Adopted Asset with surety as required
- Land and Property Rights matters (wayleaves, easements, transfers etc.) both on and off site. These must be in place with the DNO at adoption.
- Planning Permissions as required (The right for the asset to be constructed in the first place).