WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE: SD5B

Relating to Low Voltage Connections with Minimal Network Analysis

Policy Summary

This document specifies the procedure for permitting the acceptance of small LV connections with little or no network analysis.

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Implementation Date: August 2015

Approved by:

Policy Manager

Date: 31 July 2015

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Implementation Plan

Introduction
This document specifies the requirements to permit the installation of Low Voltage connections with minimal Network Analysis.

Main Changes
This is a new Policy that has been created to permit the connection of balanced Low Voltage connections without the requirement of in depth network analysis with computer based software. The procedure will be available for WPD staff and by ICP's who wish to determine the point of connection to WPD's network.

Impact of Changes
This is a new document.

Implementation Actions
Managers responsible for staff involved in the design and installation of low voltage connections shall brief them on the document.

Implementation Timetable
This policy is implemented with immediate effect.

Document Revision & Review Table		
Date	**Comments**	**Author**
August 2015	• New Document	Seth Treasure

1.0 INTRODUCTION

1.1 This document specifies WPDs requirements for the connection of balanced loads of up to 200kVA onto WPDs Low Voltage networks, removing the requirement for WPD staff or ICPs undertaking such work to complete in depth network analysis. Installations will be permitted to connect if they comply with the set criteria detailed within this document.

1.2 This document is applicable to WPD staff and also to Independent Connection Providers (ICPs) who wish to determine the most appropriate and cost effective Point of Connection (that adheres to company and industry standards) to WPD's network.

1.3 Where all the criteria specified in this document cannot be satisfied further detailed analysis shall be carried out to determine the point of connection before any load can be connected, and will be undertaken in all cases for loads in excess of those identified in the scope of this document.

1.4 Where further detailed analysis is required, the appropriate Low Voltage design software (i.e. WinDebut), transformer and customer load data and profiles must be considered / consulted.

2.0 SCOPE

2.1 The principle of this document is to enable the quick determination of additional load onto existing three phase Low Voltage networks without the requirement of an in depth network analysis with computer based software.

2.2 If the proposed connection does not comply with one or more of the criteria detailed within this document, a full network analysis will be required in accordance to Standard Technique: SD5K.

2.3 No allowance has been made within this document for the derating of cables due to installations within a duct length greater than the specified amount detailed within Standard Technique: SD8B part 1. Any circuit with a duct length greater than the requirements stated within this clause will require detailed network analysis.

2.4 No allowance has been made for the derating factor due to grouping of underground cables as detailed within Standard Technique: SD8B part 1. Any circuit that is deemed to be in close proximity for a continuous length (not crossing) to another low voltage or high voltage circuit will require detailed network analysis.

3.0 REQUIREMENTS

The individual customer's connection or development Point of Connection (POC) may be connected to WPD's existing LV network, without further detailed analysis if the criteria detailed within this document are satisfied:

3.1 General Requirements

3.1.1 This document shall be read in conjunction and adhere with ST:SD5A and ST:SD6B which specifies the general requirements for LV connection design, ST:SD6J which specifies the connection design for potentially disturbing loads and ST:NC1P which specifies the basis of charging for connections and reinforcement of the existing distribution system. The connection design must also adhere to ST:TP21D and ST:TP21E relating to system and customer connection earthing.

3.2 Maximum Demand (MD) and Load requirements

3.2.1 New installations connected at LV with a maximum demand up to 200kVA / 290A per phase evenly balanced over the three available phases where the Primary network is 11,000 volts.

3.2.2 New installations connected at LV with a maximum demand up to 150kVA evenly balanced over the three available phases where the Primary network is 6,600 volts.

3.2.3 The maximum single point load to be connected to a LV mains cable fed from a 315kVA transformer where the Primary network is 11,000 volts is 172kVA / 250A per phase to ensure adequate grading between the transformer and termination fuses.

3.2.4 The maximum single point load to be connected to a LV mains cable fed from a 315kVA transformer where the Primary network is 6,600 volts is 138kVA / 200A per phase to ensure adequate grading between the transformer and termination fuses.

3.2.5 For the purpose of connecting development sites with multiple single and three phase connections, the site After Diversity Maximum Demand (ADMD) must not exceed the ratings in the above clauses.

3.2.6 Multiple single phase connections up to the above rating must be balanced over the three available phases.

3.2.7 The transformer must have sufficient spare capacity without exceeding the name plate rating (summation of maximum demands including Agreed Supply Capacities (ASC)). The capacity shall be determined by historic load data and customer consumptions.

3.2.8 The maximum permissible load on the LV fuse way must not exceed 217kVA / 315A per phase (existing summated load including ASC's + Proposed load) where the Primary network is 11,000 volts.

3.2.9 The maximum permissible load on the LV fuse way must not exceed 172kVA / 250A per phase (existing summated load including ASC's + Proposed load) where the Primary network is 6,600 volts.

4.0 DESIGN REQUIREMENTS

4.1.1 The connection must be made onto an existing continuous underground three phase network.

4.1.2 The proposed load must be evenly balanced as reasonably practicable across the three available phases.

4.1.3 The connection must be made onto an underground network having a continuous minimum size conductor of 185mm² Aluminium or equivalent rating of 373 amps per phase (Autumn Cyclic rating) between the proposed point of connection and the feeding transformer.

4.1.4 The maximum length of the Low Voltage mains cable from the Low Voltage cabinet to the point of connection or the furthest service joint on a development site of multiple connections must not be greater than 250m.

4.1.5 For loads greater than 150kVA, the maximum length of mains cable (Autumn Cyclic rating $\geq$ 373 A) must not be greater than 200m.

4.1.6 The distribution transformer must have a name plate rating of 315kVA or greater.

4.1.7 The overall service length must not be greater than 30m, for avoidance of doubt this is a measurement from the connection point on the shared mains cable to the termination equipment.

4.1.8 Any generation must comply with Engineering Recommendation G83, any area clauses, embargos and procedures must still be followed.

4.1.9 The network must not have any warning 'hand' symbols present on the Low Voltage distribution system relevant to new connections e.g. Potential Refund or Apportionment of Cost. Hand symbols are found on the EMU mapping system.

4.2 Power Quality Requirements

4.2.1 <u>Voltage Disturbances and Flicker</u>

Customer equipment must comply with:

- BSEN 61000-3-3: Limitation of voltage changes and flicker in public low-voltage systems, for equipment with rated current $\leq$ 16A per phase, not subject to a conditional connection), or;

- BSEN 61000-3-11 Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current $\leq$75 A and subject to conditional connection.

Where equipment complies with BSEN 61000-3-11 (and not with all aspects of BSEN 61000-3-3) the manufacturer must include one of the following three statements within the equipment manual / documentation. These statements dictate whether or not the equipment may be connected without a detailed investigation.

Where the manual states:

- "The equipment meets the technical requirements of BSEN 61000-3-3" it may be connected without further investigation.

- "The equipment meets the requirements of BSEN 61000-3-11 and is intended for use only in premises having a service current capacity 100 A per phase, supplied from a distribution network having a nominal voltage of 400/230V" it may be connected without further detailed analysis.

- "The equipment meets the requirements of BSEN 61000-3-11 where the source impedance at the supply terminals is ≤Zmax" the equipment may be connected without detailed investigation if the declared value of Zmax is:

  - ≥ 0.17Ω for single phase equipment.
  - ≥ 0.1Ω for three phase equipment.

4.2.2 Voltage Distortion / Harmonics

Customer equipment must comply with:

- BSEN 61000-3-2: Limits for harmonic current emissions (equipment input current ≤16A per phase), or;

- BSEN 61000-3-12 Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase.

Where equipment complies with BSEN 61000-3-12 (and not with BSEN 61000-3-2) its product documentation must include one of the following two statements. These statements dictate whether or not the equipment may be connected without a detailed investigation.

Where the manual states:

- "This equipment complies with BSEN 61000-3-12" it may be connected without detailed investigation as long as the rating of the equipment is:

  - ≤ 9.4kVA (i.e. 41A) for single phase equipment.
  - ≤48.3kW (i.e. 70A per phase) for 3 phase equipment.

- "This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to "xx" at the interface point between the user's supply and the public system", the equipment may be connected without detailed investigation as long as the value of SSc satisfies the following requirements:

- For single phase equipment the required value of Ssc is ≤ 930kVA
- For three phase equipment the required value of Scc is ≤ 1580kVA

5.0 CONNECTION ARRANGEMENTS

5.1 The connection arrangements and design will comply with Standard Technique: SD5A as amended.

5.2 The connection materials will comply with ENA Engineering Recommendation G81 and the associated WPD framework appendices as amended.

6.0 CONNECTION PROCESS

6.1 The competent electrical designer will assess the Western Power Distribution record maps to evaluate the electrical circuit length / size and to identify any warning 'hand' symbols.

6.2 Western Power Distribution's electronic database or ICP access information guide will be consulted to establish the rating of the supplying transformer and its loading/ASC values.

6.3 The competent electrical designer will assess the compliance of the proposed connection with the criteria set out within this document. Any non-compliance of one or more of the criteria detailed within this policy will require a full network analysis study which can be undertaken by WPD or an Independent Connection Provider.

Connection Process Flow Diagram

7.0 NOTIFICATION PROCESS

7.1 If the works are to be designed and installed by an Independent Connection Provider (ICP), Western Power Distribution shall be informed of the connection via the Network Access and Adoption Agreement process. Western Power Distribution shall have an opportunity to check for known engineering concerns and or conflict with accepted connection offers.

7.2 The ICP shall confirm that they have accreditation under the National Electricity Registration Scheme (NERS) with the appropriate modules covering the work they wish to undertake.

7.3 The ICP will confirm in writing that the proposed connection adheres to the criteria set out within this document.

7.4 The ICP will provide notification of the stages of progression; Point of Connection Notice, Point of Connection Issue and Point of Connection Acceptance.

7.5 For works involving an ICP where WPD will adopt the connection the ICP shall complete Appendix A to enable the creation of a Meter Point Administration Number (MPAN).

8.0 RECORDING CONNECTIONS

8.1 For works involving an ICP where WPD will adopt the connection the ICP shall forward WPD an appropriately scaled and accurate clear plan detailing the location of assets and jointing for inclusion onto the WPD mapping system.

9.0 RESPONSIBILITIES

9.1 The use of this procedure is conditional on the electrical designer confirming to the criteria set out within this document and any non-compliance may result in poor supply characteristics or interruption to supply.

9.2 This document enables the user to connect load onto the distribution network without detailed analysis and the use of network design software but crucial information must still be gathered. The minimum information required for compliance to this policy are transformer maximum demands, transformer size, low voltage circuit record plans / maps detailing type, size and length and any details relating to Agreed Supply Capacities.

9.3 Western Power Distribution will provide the ICP with all of the required network information to the same standard and level that is available to internal staff.

9.4 The ICP accepts that the electrical designer must have suitable accreditation for the self determination of point of connection.

9.5 The ICP accepts responsibility for any remedial works that are required due to non-compliance of the criteria set out within this document.

9.6 Western Power Distribution reserves the right to prohibit the use of the connection procedure by ICP's for non-compliance of this policy.

9.7 The designer will complete the checksheet in Appendix B to confirm that the requirements of the Standard Technique have been met.

Data collection sheet to be used by ICP's to enable WPD to create a Meter Point Administration Number

ICP Ref. No.: – – – – – – –	**WPD Ref.No. – to be completed by WPD** _____
ICP Name	
ICP Correspondence Address	…….. …….. ……..
Customer Name	
Customer Address	…….. …….. ……..
Requested Load **(ADMD or ASC)**	.....
Other Information to be Enclosed:	
• Location plan and development plan • Connection details (Substation Name and Number, Line Loss Factor code and applicable CT ratios.	

Please also confirm	
The electrical designer for this connection has been granted NERS accreditation for the determination of low voltage connections	

Signed by ICP	
Please PRINT name	

APPENDIX B

Check list for confirmation of compliance to Standard Technique: SD5B

Enquiry Number	
Address	_____ _____

Does the connection conform to the following requirements?	**Y/N**
The requested load is ≤ 200kVA and evenly balanced	
The Distribution transformer is rated ≥ 315kVA	
The requested load is ≤ 150kVA for a single point load onto a 315kVA distribution transformer	
The Distribution Transformer has sufficient capacity (Existing load including ASC + Proposed load)	
The Maximum load on the individual transformer fuse way is ≤ 217kVA / 315A per phase	
The existing network has a continuous three phase conductor with a minimum conductor size of 185mm² aluminum or equivalent rating for a copper conductor	
The maximum length of conductor from the Low Voltage cabinet to the point of connection of the furthest service joint is ≤ 250m for loads ≤ 150kVA	
The maximum length of conductor from the Low Voltage cabinet to the point of connection of the furthest service joint is ≤ 200m for loads ≥ 150kVA	
The service length is ≤ 30m	
Any Generation complies to Engineering Recommendation G83	
The Low Voltage Network does not have any warning hand symbols present	
Any voltage disturbance / flicker contributions adhere to clause 5.2.1	
Any voltage distortion / harmonic contributions adhere to clause 5.2.2	
The connection arrangements comply with standard technique: SD5A	
The connection materials comply with ENA Engineering Recommendation G81	

Signed	
PRINT name	

APPENDIX C

SUPERSEDED DOCUMENTATION

This is a new document.

APPENDIX D

ASSOCIATED DOCUMENTATION

- Electricity Act 1989
- Electricity, Safety, Quantity and Continuity Regulations 2002
- ST:SD5A - Design of Low Voltage Domestic Connections
- ST:SD5C - Design of Low Voltage connections to Mutiple Occupancy buildings
- ST:SD5D - Arrangement of Low Volatge Cut outs
- ST:SD5K - Relating to the use of Windebut computer software
- ST:SD5P - Design of Unmetered Connections
- ST:SD5R - Earth Fault loop Impedances and Phase to Neutral Loop Impedances at LV installations
- ST:SD6B - Relating to connection design between 69 & 1000Kva
- ST:SD6J - Connection Design – Potentially disturbing Electrical Equipment rated up to 75A
- ST:SD8B - Relating to Cable Ratings
- ST:TP4B - Relating to the protection of Distribution Substations
- ST:TP21D - 11kV, 6.6kV and LV earthing
- ST:TP21E - Provision of WPD earth terminals to customer LV installation

APPENDIX E

IMPACT ON COMPANY POLICY

This document includes substantial changes to the connection design requirements for small low voltage connections.

APPENDIX F

IMPLEMENTATION OF POLICY

For WPD staff this Standard Technique is to be implemented with immediate effect for new small scale low voltage connections. Managers shall ensure that all staff involved in the design, of the LV system are familiar with, and follow, the requirements of this document.

Where any difficulty is encountered in the application of this Standard Technique the author shall be notified who will determine whether a variation is appropriate.

APPENDIX G

KEY WORDS

Small Scale Connections, Permitted Connections, Minimal Network Design.