WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE: SD5G/5 (Part 1)

Relating to the Connection of Low Carbon Technology (Electric Vehicle Charge Points and Heat Pumps) with a Capacity ≤ 32A per phase

Policy Summary
This document defines Company policy for processing notifications and applications from customers or installers for the connection of individual or multiple Electric Vehicle Charge Points and/or Heat Pumps each with a rating ≤32A per phase onto WPD's distribution system.

Author: **Seth Treasure**

Implementation Date: **October 2020**

Approved by

Paul Jewell

DSO Development Manager

Date: **8th October 2020**

Target Staff Group	**Staff responsible for low voltage network design**
Impact of Change	**Amber – Significant change to the charging methodology and standard design of services**
Planned Assurance checks	**None**

IMPLEMENTATION PLAN

Introduction

This document details the approach for managing Electric Vehicle (EV) Charge Point and/or Heat Pump (HP) installation notifications and applications for individual or multiple equipment (installed beyond the same point of supply) rated up to 32A per phase onto Western Power Distribution's (WPD's) distribution network (low and high voltage).

Main Changes

The charging methodology for cutout replacement and service cable overlays has been changed.

When a service cable is being overlaid due to a low capacity, the cable shall be overlaid with a three phase cable.

Impact of Changes

Western Power Distribution (WPD) will provide free of charge service upgrade costs for domestic installations (profile 1 or 2) where each item of low carbon technology has a rating $\leq$ 32A.

Target Staff Group	**Staff responsible for low voltage network design**
Impact of Change	**Amber – Significant change to charging methodology and standard design of services**

Implementation Actions

Team Managers shall ensure that appropriate staff are aware of, and follow, the requirements of this document.

Implementation Timetable

This Standard Technique shall be implemented with immediate effect for modified / augmented connections involving Low Carbon Technology.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
October 2020	• Cutout replacement and Service cable overlay charging methodology and associated flow chart have been updated • EV & HP spreadsheet updated to utilise ENA EREC G5/5 equation 1B-1 math • Clause 13.1.3 added – insufficient single phase service cables shall be overlaid with three phase cables • Clause 13.7 & 13.8 added – clarification on minimum works required to resolve insufficient service capacities • Section 14 – Hydrogen storage tanks and generators included within the scope of 'fuel filling station' • Mapping Centre LCT form added to section 17	Seth Treasure
May 2020	• Clause 1.5 removed – document now includes HV metered supplies • Clause 2 - Definitions page added • Requirements for the provision of PME have been amended • Charging methodology updated • Clause 10.10 added – prescriptive requirements for street furniture connections • Rsce=15 spreadsheet amended to include HV metered supplies • Clause 14.4 – 14.6 added – prescriptive requirements for substations at fuel filling station sites	Seth Treasure
November 2019	• Amendment Page 10 Section 8.2 'This is currently set at a 50%' changed to 'The diversity factor for EV charging is 50%'	Seth Treasure
June 2019	• Revised ENA EV & HP Application form added • Clause 6.1 amended to align with ENA EREC G12 • Clause 6.6 added – Class II construction • Clause 6.7 amended – touch potential issue removed • E5 numbers added to clause 12 for warning signs • Appendix E added – table of electrode resistivities per soil resistance • Clause 8.3 amended with more detail • Clause 9 added – requirements for unmetered connections	Seth Treasure
February 2019	• Amended to comply with the new ENA EV & HP simplified Application and Notification process • Heat pumps with a rating $\leq$ 32A have been included • New impedance calculator tool – clause 7.3	Seth Treasure
December 2018	• Secondary supplies for EV charge points located at fuel filling stations have been accepted (clause 12). • Requirement for maximum number of EV charge points on high impedance circuits (clause 9).	Seth Treasure
September 2018	• ST:NC1AA/1 has been removed and replaced by this document	Seth Treasure

CONTENTS

1.0 INTRODUCTION

1.1 This Standard Technique describes WPD policy for processing notifications and applications from customers, or their nominated installer, for the installation and connection of individual or multiple Low Carbon Technologies (LCT's – Electric Vehicle Charge Points and Heat Pumps) - (installed beyond the same point of supply) each rated up to 32A per phase to WPD's distribution system LV & HV (Low and High voltage).

1.2 This policy will be read in conjunction with Standard Technique: SD5G Part 2 which relates to installations that contain Low Carbon Technologies with a rating > 32A per phase.

1.3 WPD will use the information provided by the customer or installer to assess the suitability of the existing network to supply the Low Carbon Technology. Suitability will be based upon the network's susceptibility to voltage fluctuations, flicker and harmonic voltage distortion, as well as ensuring it is kept within the designated thermal and voltage limits.

1.4 This Standard Technique should also be read in conjunction with ST:SD1E, ST:SD4A, ST:SD4OA, ST:SD5A, ST:SD5C, ST:SD5E, ST:SD5K, ST:SD5O, ST:SD5P, ST:SD5R, ST:SD6J, ST:TP21E, and ST:NC1P.

2.0 DEFINITIONS

2.1 **Mode 1 charging.** Connection of the EV to the AC supply network utilising standardised socket outlets not exceeding 16A and utilising the protective devices installed within the consumer unit.

2.2 **Mode 2 charging**. Connection of the EV to the AC supply network utilising standardised socket outlets not exceeding 32A and utilising a protective device installed within the charge point and which includes a control pilot function.

2.3 **Mode 3 charging**. Connection of the EV to the AC supply network utilising dedicated electric vehicle supply equipment where the control pilot function extends to the control equipment in the electric vehicle supply equipment. The charging point is permanently connected to the customer's installation (tethered lead).

2.4 **Mode 4 charging**. Connection of the EV to the AC supply network utilising an off board charger/converter which provides a DC supply to the EV. The equipment includes a control pilot function that extends to the control equipment in the EV. The charging point is permanently connected to the customer's installation (tethered lead).

2.5 Mode 1, 2 & 3 charging equipment (AC output devices) are within the scope of this document, additional power quality information relating to the installation is not required and the spreadsheet calculation tools detailed within this document shall be used to determine the connection requirements.

2.6 Mode 4 charging equipment (DC output devices) are outside of the scope of this document, see Standard Technique: SD5G Part 2.

3.0 APPLICATION AND NOTIFICATION PROCESS

3.1 The IET Code of Practice for Electric Vehicle Charging Equipment Installation has been created to assist the installer in ensuring the installation of electric vehicle charging equipment complies with the relevant requirements of BS 7671:2008 (as amended) and the Electricity Safety, Quality and Continuity Regulations 2002 (as amended).

3.2 The installer of any electric vehicle charging or heat pump infrastructure shall:

(a) Follow the Notification process for the installation of a single item(1) and where there are no identified adequacy or safety concerns with the property's existing service equipment and where the post installation maximum demand is less than 60 amps.

The notification shall be sent by the installer directly to WPD within one calendar month of installation, using the form found in Appendix D.

Or

(b) Follow the Application process for the installation of multiple items(1) or where there is identified adequacy or safety concerns with the property's existing service equipment or where the post installation maximum demand is greater than 60 amps.

The Application / Notification form is detailed within Appendix D and can also be found via the following link.

For installations of Low Carbon Technology at multiple locations, the ENA have provided an application spreadsheet available via the following link.

Note;

(1) The notification process is only acceptable for the installation of either one electric vehicle charge point or one heat pump with a rating ≤ 32A and where there are no adequacy concerns. The installation of more than one item at the same premises shall always follow the application process.

4.0 CONNECTIONS

4.1 Connections for Low Carbon Technology shall be designed in accordance with ST: SD4A or ST: SD5A for HV and LV supplies respectively.

4.2 Connections including Low Carbon Technology shall be designed with a network impedance that meets the requirements of this document at the point of common coupling (PCC).

4.3 Connections including Low Carbon Technology shall not be connected via a LV service loop. *See clause 13.6.*

4.4 Where a connection supplies more than one LCT, no diversity shall be allowed unless load control is provided and verified by the charge point installer to prevent the service and cut-out from being overloaded.

5.0 MINIMUM CUSTOMER INFORMATION

5.1 The installer shall submit a completed ENA LCT Application / Notification form (Appendix D)

5.2 For installations that include multiple items the installer shall apply to connect and shall submit the following:

- Make, Model and rating of EV Charge Point/s

And / Or

- The heat pump type register number (relating to the heat pump database), detailing the make and model number.

Or

- Provide technical data regarding Harmonics and Flicker *(not required for EV charging points with an AC output – including multiple AC outputs)*

5.3 For information regarding whether an Application or Notification is required, the ENA Process map can be found via the following Link.

5.4 Installers not meeting the minimum information requirements shall be contacted to provide the missing information.

6.0 ASSESSMENT PROCEDURE

6.1 The Records Team will complete an initial assessment of the information supplied within the notification and, where a LCT demand is less than or equal to 16A single phase and where the overall demand is less than or equal to 60A, will record the relevant information within CROWN.

6.2 For any other LCT notifications and for all LCT applications, the Records Team will attach the forms to an unclassified connection enquiry marked **EV/HP** and pass to the local teams.

6.3 The local Planner will assess the connection;

- When the total after diversity maximum demand of the connection exceeds 60 amps per phase or
- When the adequacy of the connection is in doubt or
- When the rating of the LCT is greater than 16 amps
- When the connection is HV metered

6.4 The installation will be accepted if;

- The service conductors, cutout and metering equipment have sufficient thermal capacity and;
- For the installation of LCT to the connection is not made via a looped service (either via the first cut-out or the subsequent looped cut-outs).
- The impedance at the point of common coupling satisfies the requirement detailed within Table 3 for an individual EV charge point installation or for multiple installations and for installations including heat pumps the impedance requirement as determined within the appropriate Impedance Calculator (see clause 8.2, 8.3 & 8.4).

- For the installation of heat pumps the impedance at the cutout satisfies the requirements of the heat pump flicker calculation as detailed within the heat pump impedance calculator or alternatively the noted requirement from the heat pump database.

6.5 Any LCT Notification or Application connecting to a network which fails to meet the design requirements detailed above will require a reinforcement scheme to be designed and a connection offer to be made to the applicant. This may or may not include chargeable costs, depending on the work required. The installer will be required to disconnect the charge point until the required reinforcement has been completed.

6.6 All Low Carbon Technology applications will include an assessment of the total number of LCT's connected to the WPD low voltage network using the CROWN reporting function as detailed within section 11.

6.7 A list of letters for the interaction with installers / customers is provided within N:\Connections\Guidance & Overview\Low Carbon Technology\EV Letter Templates

7.0 EARTHING ARRANGEMENTS

The following requirements relate to supplies for EV charge points and confirmation of the installation compliance to the requirements of BS EN 7671 (the Wiring Regulations) is the responsibility of the installer.

7.1 PME

A PME earthing facility shall not be used as the means of earthing of a charging point located outdoors or that might reasonably be expected to be used to charge a vehicle located outdoors unless the connection is compliant with one of the following requirements;

- The charging point includes a protective device that disconnects the supply (L,N & E) in the event of a potential difference in excess of 70V being measured between the WPD earth terminal and the general mass of earth.

  Care shall be taken to ensure that the measurement earth electrode is segregated from the installation and any PME earth electrodes or PILC cable by a minimum distance of 2m.

Or

For three phase supplies (including three phase supplies with single phase outputs)

- The charging point includes a protective device that disconnects the supply (L,N & E) in the event of a potential difference in excess of 70V being measured between the WPD neutral conductor and a 'virtual neutral' derived from the phase conductors of the supply.

Or

For single phase supplies only

- The charging point includes a protective device that disconnects the supply (L,N & E) in the event of the utilisation voltage at the charging point (measured between the neutral and phase) being > 253V or < 207V.

  At the time of writing, this device must not be used in conjunction with a Vehicle to Grid Connection (V2G) due to non-compliance with ENA EREC G98/G99.

Or

- The charging point forms part of a three phase installation where all of the demand including the charging point/s are evenly balanced over all of the available phases.

Or

- The maximum single phase load or overall unbalance of a split or three phase connection is $\leq$ 5kW and the car charging installation includes an independent earth electrode of sufficient resistance to ensure that the Earth Potential Rise (EPR) will be restricted during a broken neutral event. *See table 1 below.*

Earthing electrode requirement for customer's installation (Class I / metallic enclosure)

Connection	Maximum single phase load or overall unbalance on split or three phase connection	Maximum consumer earth electrode resistance bonded to main earth terminal
single phase, unbalanced split or three phase	500 W	100 Ω
	1kW	60 Ω
	2kW	20 Ω
	3kW	14 Ω
	4kW	11 Ω
	5kW	9 Ω

Table 1 - Customer installation earthing requirements

Notes;

If the earth electrode resistance as specified above cannot be satisfied, the installation should form part of a TT system by installing a separate earth electrode and fitting a suitable protection device in accordance with BS 7671 (e.g. an RCD).

The values given within Table 1 have been sourced from ENA EREC G12, BS 7671 details a similar table but with different impedance requirements due to a lower voltage limit.

See Appendix E for guidance on the design of PME earth electrodes

7.2 **SNE**

In view of the possible future conversion of SNE networks to PME, a SNE Earth Terminal shall not normally be offered for a supply solely for the Charging of Electric Vehicles. A SNE earth terminal may only be provided to a Charging Pillar when it can be guaranteed that there is complete separation of the neutral and earth conductors along the entire length of the circuit (except for at the substation).

7.3 Where a SNE earth terminal is provided on a guaranteed SNE main, the WPD mapping system shall be updated with the following note "Guaranteed SNE Main".

7.4 **TT**

TT earthing arrangements shall be utilised by electric vehicle charging pillars that do not meet the PME or SNE requirements specified within clause 7.1 or 7.2.

7.5 The customers buried TT earthing system shall be segregated from any WPD buried earthing systems (including buried LV metalwork and traditional Paper Insulated Lead Covered cables) by the required distance detailed within Table 2:

Connection:	Single Phase or Unbalanced 3 Phase Connection	Balanced Three Phase Connection
Minimum Segregation	3.6m	0.3m

Table 2 – Segregation requirement between Earthing Zones

7.6 **CLASS II CONSTRUCTION**

If the PME earth electrode resistance as specified above or the installation of an independent TT earthing is unachievable, the street furniture may have neither a mains derived earth terminal or residual current device (RCD) if the entire installation is categorised as 'Class II' (double insulated).

Definition of Class II equipment, equipment in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions such as supplementary insulation are provided, there being no provision for the connection of exposed metalwork of the equipment to a protective conductor, and no reliance upon.

7.7 Electric Vehicle charge points (class I) which are fully compliant with the above clauses do not require an above ground segregation requirement from metallic objects of a different earthing type as each item will individually limit the EPR presented on any extraneous metallic surface or disconnect the supply within 5 seconds during a fault scenario.

8.0 IMPEDANCE REQUIREMENTS FOR LOW CARBON TECHNOLOGY

8.1 Individual connections of LV connected electric vehicles shall comply with the requirements of Table 3 detailed below. The values represented are required at the Point of Common Coupling (LV PCC).

Equipment Rating (A)	Equipment rating (kVA)			Minimum short circuit power (kVA)			Minimum fault current (A)			Maximum source impedance at PCC (ohms)		
	1 phase	split phase	three phase	1 phase	split phase	three phase	1 phase	split phase	three phase	1 phase (1)	split phase (2)	three phase (3)
≤ 16	3.680	7.36	11.085	55.200	110.4	166.277	240	240	240	0.958	1.917	0.962
17	3.910	7.82	11.778	58.650	117.3	176.669	255	255	255	0.902	1.804	0.906
18	4.140	8.28	12.471	62.100	124.2	187.061	270	270	270	0.852	1.704	0.855
19	4.370	8.74	13.164	65.550	131.1	197.454	285	285	285	0.807	1.614	0.810
20	4.600	9.20	13.856	69.000	138	207.846	300	300	300	0.767	1.533	0.770
21	4.830	9.66	14.549	72.450	144.9	218.238	315	315	315	0.730	1.460	0.733
22	5.060	10.12	15.242	75.900	151.8	228.631	330	330	330	0.697	1.394	0.700
23	5.290	10.58	15.935	79.350	158.7	239.023	345	345	345	0.667	1.333	0.669
24	5.520	11.04	16.628	82.800	165.6	249.415	360	360	360	0.639	1.278	0.642
25	5.750	11.50	17.321	86.250	172.5	259.808	375	375	375	0.613	1.227	0.616
26	5.980	11.96	18.013	89.700	179.4	270.200	390	390	390	0.590	1.179	0.592
27	6.210	12.42	18.706	93.150	186.3	280.592	405	405	405	0.568	1.136	0.570
28	6.440	12.88	19.399	96.600	193.2	290.984	420	420	420	0.548	1.095	0.550
29	6.670	13.34	20.092	100.050	200.1	301.377	435	435	435	0.529	1.057	0.531
30	6.900	13.80	20.785	103.500	207	311.769	450	450	450	0.511	1.022	0.513
31	7.130	14.26	21.477	106.950	213.9	322.161	465	465	465	0.495	0.989	0.497
32	7.360	14.72	22.170	110.400	220.8	332.554	480	480	480	0.479	0.958	0.481

Table 3 – Minimum Fault level/Maximum Impedance at PCC for Rsce=15

Notes; (*1) Phase to Neutral impedance*
(2) Phase to Phase impedance
(3) Phase impedance (line impedance)
(4) The impedance requirements set out within Standard Technique: SD5R must also be satisfied

8.2 Connections for more than one installation of electric vehicle charger or where the connection is provided via a HV metered supply, shall comply with the impedance requirements detailed by using the 'Impedance Calculator – Rsce = 15' found via the following Link.

8.3 The power quality data regarding the majority of heat pumps can be found on the ENA Heat Pump Database which is located on the ENA Website or alternatively WPD have collated a similar table which details the connection requirements and can be found via the following link.

8.4 The connection requirements for installations that include multiple LCT items with a rating ≤ 32A shall comply with the impedance requirements detailed by using the 'Impedance calculator – EV & HP' found via the following Link.

Note:

Where the Electric Vehicle Charge Point has an A.C. output the conversion to D.C. is made within the Electric Vehicle itself, therefore the Harmonic Emissions are produced by the vehicle and are subject to the make and model.

It has been determined that where the capacity of the Electric Vehicle Charge point is rated ≤ 32A per phase (A.C.), the installation will be compliant with the technical requirements of BSEN 61000-3-2 and BSEN 61000-3-3 regarding Harmonics and Flicker respectively.

9.0 DEMAND REQUIREMENTS FOR LOW CARBON TECHNOLOGIES

9.1 When undertaking an assessment of the service and cut out (sole use equipment) for thermal capacity, no diversity factor shall be applied.

9.2 When undertaking an assessment of the network capacity (transformers and mains conductors) for thermal capacity, the diversity factor as detailed within Standard Technique: SD5A shall be applied. The diversity factor for EV charging is 50%.

9.3 Where connections have an installed capacity that matches the connection capacity (e.g. 3 x 22kW three phase chargers installed on a 69kVA supply), it is envisaged that the coincidence of the three chargers to all be operating at their maximum capacity at the same time, for a prolonged period of time to be low. Therefore, a cyclic load profile will be assumed.

9.4 Where connections have an installed capacity greater than the connection capacity, a load management scheme shall be installed to ensure that the maximum demand of the installation is not exceeded.

9.5 Where connections incorporate load management schemes which are designed to permit a current flow >80A and where a domestic style single or three phase cutout is utilised and where the equipment is positioned within a street mounted enclosure, the enclosure shall comply with the requirements detailed within clause 10.10.

9.6 Customer load management schemes for Low Carbon Technologies will be accepted if the principles of Standard Technique: SD1E (ENA EREC G100) are followed;

- Hard wired e.g. RS485 cable
- Fail safe – in the event of a component or signalling failure the system will revert to a pre-determine safe level of import capacity
- Output of component reaction time $\leq$ 5 seconds
- System compliance with ENA EREC P28 – e.g. $\leq$ 3% voltage change during operation

10.0 ARRANGEMENTS FOR LOW VOLTAGE STREET FURNITURE CONNECTIONS *(Electric vehicle charge points only)*

10.1 An unmetered connection is acceptable for on street electric vehicle charge points when a measured central management system (mCMS) is utilised.

- The exit point demand shall be ≤ 7.36kW
- An Elexon approved active measuring device shall be used

A list of approved active measurement devices can be found here.

10.2 For supplies rated up to 100A per phase, a DMC cutout arrangement shall be utilised as per Standard Technique: SD5A & SD5D. *See the requirements of Clause 9.*

10.3 For supplies between 100A and 400A and where the WPD equipment is positioned within a Street Furniture cubicle, a Schneider combined cutout and CT panel shall be utilised. ***See figure 1 below.***

10.4 For supplies between 100A and 400A and where the WPD equipment is not positioned within a Street Furniture cubicle, a Lucy combined cutout and CT panel shall be utilised.

10.5 For low voltage supplies greater than 400A, see Standard Technique: SD5E. For High Voltage metered supplies, see Standard Technique: SD4O (A or B as appropriate).

10.6 The combined cutout and CT panel shall be mounted on an 18mm thick backboard which has a minimum fire resistance of half an hour.

10.7 The positioning of the apparatus shall comply with the below requirements;

- Positioned free from risk of accidental or malicious damage.
- Positioned to minimise the likelihood of vehicle impact damage; however protective bollards are to be installed by the EV charge point installer to protect the equipment from vehicle damage as per the requirements of the Code of Practice for the Installation of Electric Vehicle Charging Equipment.
- The lowest part of the equipment is to be positioned at least 200mm above the outside ground level.
- For CT cabinets - positioned with at least 1300mm of safe working space in front of the equipment.
- Positioned to ensure the free movement of pedestrian or vehicle traffic and that the minimum footpath (1000mm) or road widths are maintained.
- Sufficient space shall be provided to ensure that the WPD equipment can be maintained or replaced without having to remove the customer's equipment.

10.8 The EV charge point installer shall purchase a street furniture cubicle with sufficient IP rating for the location in which the cubicle is intended to be positioned.

10.9 The street furniture cubicles / enclosures must include non forced ventilation (incorporating high and low vents to ensure that air is drawn across the equipment).

10.10 Where connections incorporate a load management scheme within the scope of Clause 9.5 above, the street mounted enclosure shall comply with the following criteria;

- A fire resistant panel (with at least ½ hour fire resistance) measuring the full height and depth of the enclosure shall be installed vertically between the customer's equipment and the WPD / Suppliers equipment.
- The dividing panel shall incorporate a single grommeted access hole for the metering 'tails' measuring 25mmØ and 35mmØ for single and three phase supplies respectively.
- The enclosure shall include a low and high level vent on each side of the divider to ensure sufficient air flow across the equipment.
- WPD and the supplier shall be provided with a minimum space requirement of 400mm (W) x 600mm (H).

10.11 For CT cabinets - the EV charge point installer shall provide a low level heater with thermostat within the street furniture cubicle to mitigate against condensation build up within the equipment.

10.12 Minimum bending radii of Wavecon cables.

Cable Type	**Cable Size**	
	95mm²	**185mm²**
3c Wavecon	**550mm**	**700mm**
4c Wavecon	**600mm**	**800mm**

The 300mm² Wavecon cables have been omitted due to the increased bending radii and subsequent increase in minimum height of the equipment positioning.

10.13 A slow bend duct entry is available for 95mm² Wavecon but an open draw pit with a depth of 600mm, length of 1200mm and width of 500mm is required for 185mm² Wavecon.

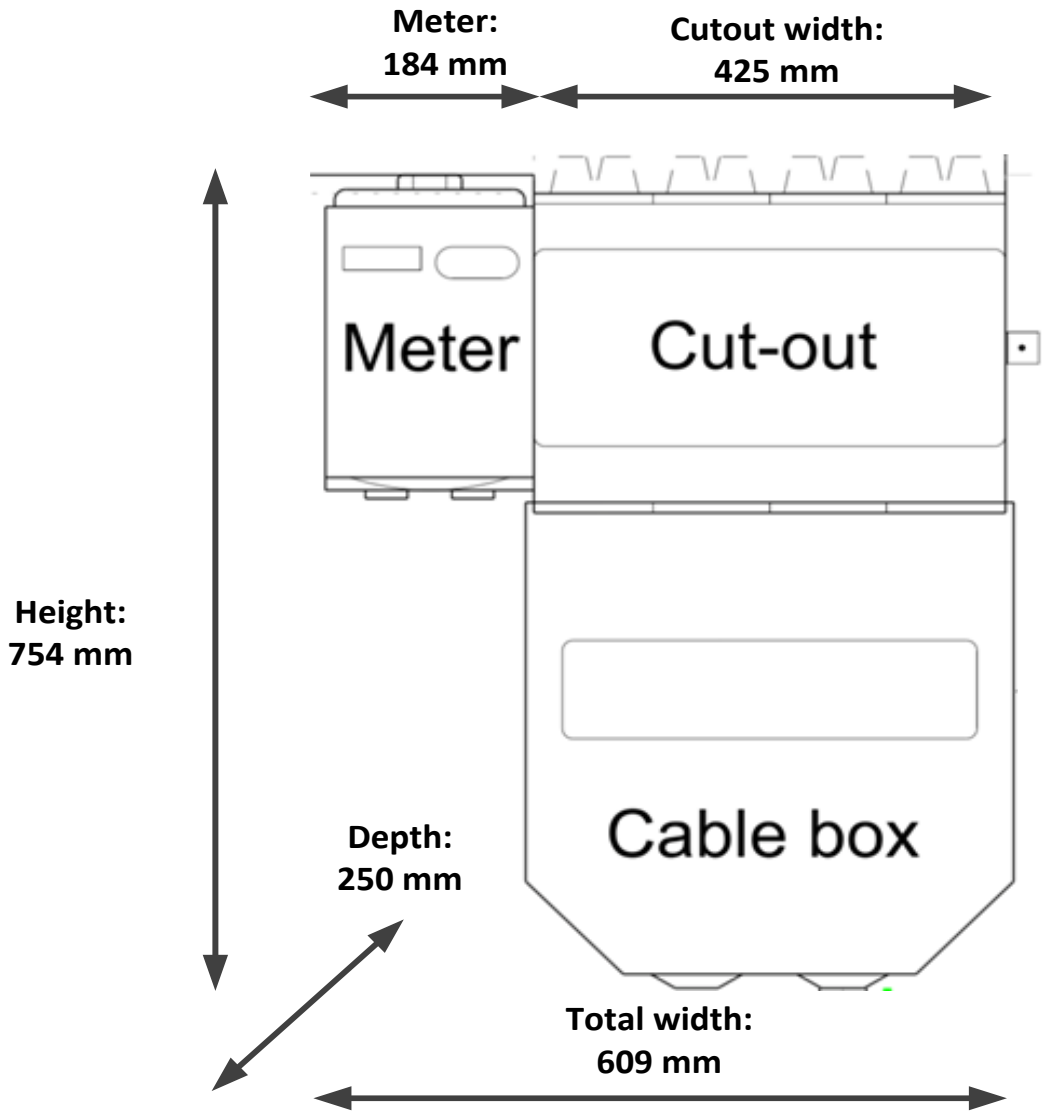

Figure 1 – Schneider Combined Cutout and CT Panel for use at EV Charge Point Street Furniture connections only

Note, *(1) The Schneider LV CT Metering panel has a maximum rating of 400A*

(2) Minimum meter tail size of 70mm² - stranded or solid (not tri-rated)

(3) Equipment to be positioned a minimum of 200mm above ground level

11.0 MAXIMUM NUMBER OF LOW CARBON TECHNOLOGIES PER CIRCUIT

11.1 Due to the summation of harmonic currents within the distribution network, there is a finite amount of LCT that can be connected to a low voltage circuit.

11.2 Where an existing circuit is found to be non-compliant with the requirements of Table 4, the circuit shall be redesigned to reduce the maximum source impedance of the main (excluding services).

Where reinforcement works are required, the impedance of the circuit shall if possible be reduced to 0.245Ω where the supplying transformer is rated ≤ 315kVA and 0.144Ω where the transformer is rated > 315kVA.

11.3 Reinforcement of existing shared use assets (conductors and transformers) due to the compliance of the network with Table 4 shall be at the cost of the company and **Budget Code 12** shall be used. Unless there are reasons to believe that harmonic current are at exceptionally high levels (significant risk of overheating equipment), the EV charge points can remain connected.

	Source Impedance of main (ph-n) (Z Max)				
Transformer rating (kVA)	less than 0.144 Ω	0.145 to 0.245 Ω	0.246 to 0.35 Ω	0.351 to 0.479 Ω	greater than 0.479 Ω
Up to 16	1	1	1	1	0
25 to 315	Limited by rating of circuit[3]	Limited by rating of circuit[3]	6	3	0

	less than 0.144 Ω	0.145 to 0.17 Ω	0.171 to 0.35 Ω	0.351 to 0.479Ω	greater than 0.479 Ω
500 and above	Limited by rating of circuit[3]	20	6	3	0

Table 4 – Maximum number of Low Carbon Technologies per phase [1] [2]

Notes; (*1) Equipment rated ≤ 32A per phase*
(2) Three phase equipment will count as 1 per phase
(3) The maximum number of LCT will be limited by the thermal capacity of the circuit
(4) The impedance requirements set out within Standard Technique: SD5R must also be satisfied

11.4 The number of Low Carbon Technologies connected to the WPD Distribution network can be found via the CROWN Reporting function for Low Carbon Technology (LCT) but due to notification enquiries being submitted via the Records Team. An automated report will be generated and forwarded to the relevant Distribution Manager to highlight circuits with high levels of LCT.

12.0 POWER QUALITY REQUIREMENTS FOR LOW CARBON TECHNOLOGY

12.1 The installation shall comply with the requirements of Energy Network Association Engineering Recommendation G5 regarding Harmonic emissions.

12.2 The installation shall comply with the requirements of Energy Network Association Engineering Recommendation P28 regarding Voltage Fluctuations (Flicker).

12.3 The installation shall comply with the requirements of Energy Network Association Engineering Recommendation P29 regarding Voltage Unbalance.

Note: By following the processes within this document, the installation will be deemed compliant with the above Engineering Recommendations.

13.0 REINFORCEMENT FOR LCT (ELECTRIC VEHICLE CHARGEPOINTS & HEAT PUMPS rated ≤ 32A per phase) (1)

13.1 Where it has been determined that the installation of low carbon technology will thermally overload sole use items – transformer, conductors, cut out, metering tails or meter(3) the item(s) of concern shall be upgraded to a sufficient capacity.

13.1.1 Reinforcement works required to upgrade sole use transformers and sole use main route conductors shall be fully charged to the customer.

13.1.2 Works and all associated costs incurred to replace an existing insufficient single phase service cable, cutout or fuse shall be attributed to WPD when the following conditions apply;

Replacement works are required to permit the installation of low carbon technology

&

Each technology type has an individual rating of ≤ 32A

&

Works are required for thermal capacity only

&

Existing domestic customer with a profile class of 1 or 2 or commercial customer with a profile class 3 or 4.

WPD's costs shall be allocated to Budget Code 49 and Engineering Class 77 – Service Replacement. Any reinforcement works required beyond the cutout / point of supply shall be implemented and funded by the supplier or customer as appropriate. However, WPD shall fund any wiring required between the cutout and consumer unit ("wire backs") due to the new cutout being positioned in a more appropriate location.

13.1.3 Where space and network configurations permit, the insufficient single phase service cable shall be overlaid with a three phase service cable / conductor. Where a customer wishes to utilise a multi-phase supply, 60A fuses shall be inserted within the three phase cutout. Where a customer requires a single phase supply, 100A fuses shall be inserted and one phase shall be chosen for the connection (subject to the requirements of ST:SD5D).

Overhead service spans of up to 30m can be achieved with 4c 35mm² ABC (see ST:OH6A for more guidance), the ABC shall be terminated within an ABC box as near as possible to the bracket and concentric or hybrid cables shall preferably be installed to the cutout position.

13.1.4 Where looped supplies are being overlaid, all associated supplies where possible shall be overlaid with a three phase cable. The third party customers will not incur any costs, WPD will fully fund all associated works.

WPD shall fund any wiring required between the cutouts and consumers unit ("wire backs") due to a cutout being positioned in a more appropriate location.

13.1.5 Where a three phase or split phase supply is not available, a single phase supply can be provided with a maximum capacity of 100A (subject to the requirements of ST:SD5D). Where excavation works are required, an additional sealed 38mm² alkathene duct shall be laid from the jointing position to the meter location for possible future upgrade works.

13.1.6 Where supplies are overlaid, the existing earthing arrangement shall be made available. The earthing arrangement can only be amended subject to a qualified electrician ensuring that the installation is compliant with the desired arrangement and the network being suitable to provide the requested arrangement.

13.2 If a sole use item (cut out, service conductor) requires reinforcement works and the shared use main also requires reinforcement works due to thermal constraints. The reinforcement cost of upgrading the shared use main shall be apportioned in accordance with ST: NC1P. The reinforcement costs shall be split across Budget Code 10 and 19.

13.3 If the sole use items (cut out or service conductors etc.) do not require reinforcement works but the shared use LV main does require upgrading. The cost to upgrade the shared use items shall be fully funded by WPD (Socialised cost recovered via DUOS charges).

13.4 WPD will fully fund any reinforcement works required to reduce the impedance of a point of connection and/or at the point of supply to connect one electric vehicle charge point and one heat pump where both items are rated $\leq$ 32A and where both items comply with the technical requirements of BSEN 61000-3-2 and BSEN 61000-3-3 for harmonics and flicker respectively. The required impedance at the Point of Common Coupling (PCC) is 0.336Ω and at the point of supply (POS) it is 0.47Ω.

13.5 The customer will fully fund any required reinforcement works where the equipment does not comply with the technical requirements of BSEN 61000-3-2 and BSEN 61000-3-3 and where the required impedance at the PCC is < 0.336Ω and at the POS it is < 0.47.

13.6 Services that have been looped via the incoming terminals of a cutout shall be removed for the installation of Low Carbon Technology. Where a service is looped and deemed inadequate the service and any associated services will be replaced at WPD's cost and shall be allocated to Budget Code 49 and Engineering Class 77 – Service Replacement. Where a service has been looped by an alternative method, the connection shall be analysed for compliance with thermal and voltage requirements (SD5A and SD5K etc.) and each customer connection shall be individually fused.

13.7 Where a customer and/or neighbour are opposed to the removal of a looped cutout or overlay of an insufficient cable, the below list is the hierarchy of works that should be proposed as a resolution;

1. Overlay of the service/s with individual three phase cable/s
2. Overlay of the services/s with individual single phase cable/s
3. Overlay of the looped supply only
4. Removal of the looped cutout with a service branch joint external to the property
5. Installation of a customer owned, funded and maintained import management scheme
6. Customer managing their load by manual means

If a customer is unable to manage the demand of the property and subsequently WPD are called to repeat failures of the cutout fuse. The customer's service shall be overlaid with a conductor of sufficient capacity.

13.8 Where existing services are to be retained, WPD shall ensure that any substandard cutout is replaced and that the fuse is of appropriate rating for the thermal capacity of the existing cable. See POL: CA12 for further guidance.

13.9 WPD will only contribute to required upstream reinforcement costs where the connection is to an existing domestic (profile class 1-2) or small business (profile class 3-4) property with whole current metering.

13.10 Where reinforcement works are required for new connections or for properties with a profile class 5-8 with CT metering or for HV metered supplies, any required reinforcement works shall be fully funded by the customer / installer.

Notes:

(1) Western Power Distribution's policy regarding the charging methodology for the reinforcement of the distribution system is detailed within Standard Technique: NC1P.

(2) Where the meter or meter tails of an installation are deemed to be thermally overloaded, the customer's supplier shall be informed. The EV installation will remain disconnected until the supplier has confirmed that reinforcement works have been completed.

(3) See figure 2 for guidance.

14.0 ARRANGEMENTS FOR FUEL FILLING STATIONS [1] *(Electric vehicle charge points only)*

14.1 WPD will not normally provide an earth terminal for a supply direct to a fuel filling station [2] or to a secondary [3] supply to an electric vehicle charge point [4]. The installer shall confirm that the existing fuel filling station connection does not utilise an earth connection from WPD (PME or SNE connection derived from a PME main).

WPD may provide a SNE earth terminal for a fuel filling station (that includes EV charging) subject to the supply being derived from a dedicated substation and circuit where it can be guaranteed that the neutral and earth conductors are continuously separate (except at the transformer).

Where a legacy earth connection has been provided (PME or SNE derived from a PME main), the WPD earth terminal shall be removed at WPD's cost prior to the energisation of the second supply or energisation of the electric vehicle charge point. Any changes to the customer's earthing system shall be completed by the customer at their expense.

14.2 The supplying cable shall not be routed through any noted temporary or permanent hazardous areas [5] (fuel pumps, fuel storage, fuel filling, fuel vents / manholes or tanker unloading areas).

14.3 A prominent warning label [6] shall be mounted on the supply cubicle of the EV charge point and cutout position of the fuel filling station to indicate that multiple supplies exist at the premises and the location of the alternate supply.

14.4 When a substation is established within 20m of a fuel filling station[2] (including the associated HV earthing system), a study using appropriate software shall be undertaken to ensure that the Earth Potential Rise (EPR) impressed onto the fuel filling station and associated earthing system is maintained to a value $\leq$ 250V. The EPR must also not exceed any touch / step limit as detailed within TS 41-24 for substations with single point earthing systems (SNE circuits).

14.5 The substation and associated earthing system shall be sited outside of any temporary or permanent hazardous area [5].

14.6 When a substation is established, adequate space shall be provided to enable the construction, maintenance and inspection of the site. Unhindered access must be available on a 24/7 basis (including times when a tanker is onsite and off-loading) and a single parking bay /area shall be available for WPD vehicles within close proximity.

Notes:

(1) The installer shall ensure that Electric Vehicle Charge points comply with the requirements of the IET Code of Practice for Electric Vehicle Charging Equipment Installation & the supplementary fuel filling station document (as revised).

(2) 'Fuel Filling Station' means the forecourt and associated shop at a fuel dispensing installation and any EV charge points within the original boundary of the filling station (e.g. petroleum, diesel, Hydrogen, or LPG and also includes areas where dangerous/explosive substances are stored (e.g. bulk storage installations). See ST: TP21E for further guidance.

(3) A supply positioned within a 10m radius of any extraneous metalwork bonded to the earthing system of a fuel filling station that has its own supply shall be deemed to be a secondary supply.

(4) Where a secondary supply is provided to an electric vehicle charge point, the Electric Vehicle Charge Point supply shall have a TT or guaranteed SNE earthing system and the earthing system shall be bonded to the Fuel filling station earthing system. The two supplies must utilise the same earthing type, mixed earthing types are not permitted e.g. SNE or TT systems must be used by both connections.

(5) The customer shall provide WPD with a plan of the site detailing the hazardous zones. A typical hazardous area plan can be found via the following link

(6) The WPD warning labels can be found via the following link and the E5 item codes are 62691 & 62692.

15.0 MULTIPLE CONNECTIONS

15.1 WPD normally provides a single point of connection to each site or premises but in some cases the customer may require more than one connection, for example, where:

- enhanced security is required
- the site is large and fragmented and there is no electrical interconnection between separate parts of the site
- the area for an electric vehicle charge point has been leased to a third party company

15.2 Where EV charge points are proposed, one or more additional points of connection may also be requested to supply the charge points, however multiple connections introduce a number of challenges including:

- a risk of paralleling WPD's connections through the customer's network
- complex earthing / bonding issues
- added complexity (e.g. means of electrically isolating the site under emergency conditions or when work is carried out)

(a) Risk of Paralleling:

It is essential that the multiple connections are not paralleled though the customer's network. If this were to occur this could adversely affect the protection performance and/or cause current to flow through the customer's network. This flow of current could overload cables, switchgear etc. or give rise to unexpected power flow through the metering.

In order to prevent the customer's network from being paralleled the customer shall either:

- Physically segregate the network supplied by each connection so that interconnection is impossible.
- Fit interlocking to prevent paralleling. This interlocking shall either consist of mechanical interlocking (without over-ride facilities) and/or fail-safe electrical (hard wired) interlocking. Where electrical interlocking is provided any mechanical closing facilities must be disabled to prevent it from being bypassed.

Software interlocking provided by programmable logic controllers (PLCs), programmable relays or equivalent are not acceptable.

(b) Complex Earthing / Bonding:

The earthing systems of each connection may be derived from different earth electrodes / earthing systems. This could cause differences in potential between items of equipment, including charge points, connected / bonded to different connections, if adequate precautions are not taken.

Precautions shall include either:

- Ensuring metalwork and items of equipment that are connected / bonded to the earth terminal of different connections are physically segregated from each other to prevent anyone touching both items of equipment at the same time. Where this approach is used any item of equipment that could possible transfer the potential from one earth zone to another must be removed / isolated (e.g. pipes, wiring, fences, communication cables etc.); or

- Ensure the earthing systems associated with each connection are common (i.e. physically bonded together). Where this approach is taken each connection must utilise the same type of earthing and it is not acceptable to bond different earthing types together. The only exception is that a PME connection may be bonded to a "SNE connection derived from a CNE network" since both options are considered to be a type of TN-C-S. Any such bonding must be rated for the current that is expected to flow through it. For LV installations the bonding shall satisfy the requirements for main equipotential bonding within the IET Wiring Regulations (BS7671).

All connections that are bonded together shall comply with the requirements of Section 6.

Multiple connections provided at different voltages (e.g. one connection provided at 11kV and one at LV) should be avoided, where possible. Where this cannot be avoided precautions shall be taken to prevent earth potential rise caused by faults on the high voltage network from causing danger in the low voltage system. The simplest way of achieving this is to physically segregate the buildings / metalwork / equipment supplied by each connection.

Further guidance on earthing is included in ST: TP21D.

(c) Isolation Requirements:

Where multiple connections are provided, the means of disconnecting and isolating the customer's network will be more complex than normal. Appropriate schematic drawings and labels / notices shall be provided at each connection point that clearly state i) that more than one connection point is provided and ii) describe where the other points of disconnection / isolation are. *See clause 14.3.*

16.0 IDNO NETWORKS

16.1 The responsibility for the connection of LCT within an IDNO network lies with the IDNO and not with WPD.

16.2 Under the requirements of ENA EREC G88 IDNOs are obliged to provide WPD with technical details of the disturbing load that is connected to, or proposed to be connected to, their network. In this context disturbing load is demand or generation that is outside of the scope of stage 1 of ENA EREC G5, P28 or P29 (i.e. typically equipment rated > 75A per phase).

17.0 RECORDING INSTALLATIONS OF LCT

17.1 The installation of the Low Carbon Technology shall be recorded within CROWN (Customer Responsive Organised Work Network) and associated with the relevant MPAN (Meter Point Administration Number). The following data shall be captured;

- Make
- Model
- Rating (kW)
- Number of phases

17.2 For the ease of future network assessments and the identification of installed LCT, the Mapping Centre form found via the below link shall be completed and sent to the relevant mapping centre contact. This will enable the insertion of the relevant symbol into the WPD mapping system at the point of supply.

LCT - Mapping centre form

17.3 Where a single phase supply has been upgraded to incorporate a three phase cable, the CT/VT data entry sheet within CROWN associated with the appropriate MPAN number shall be updated to note the available phases i.e. split phase or three phase.

CONNECTING LCT TO AN LV NETWORK

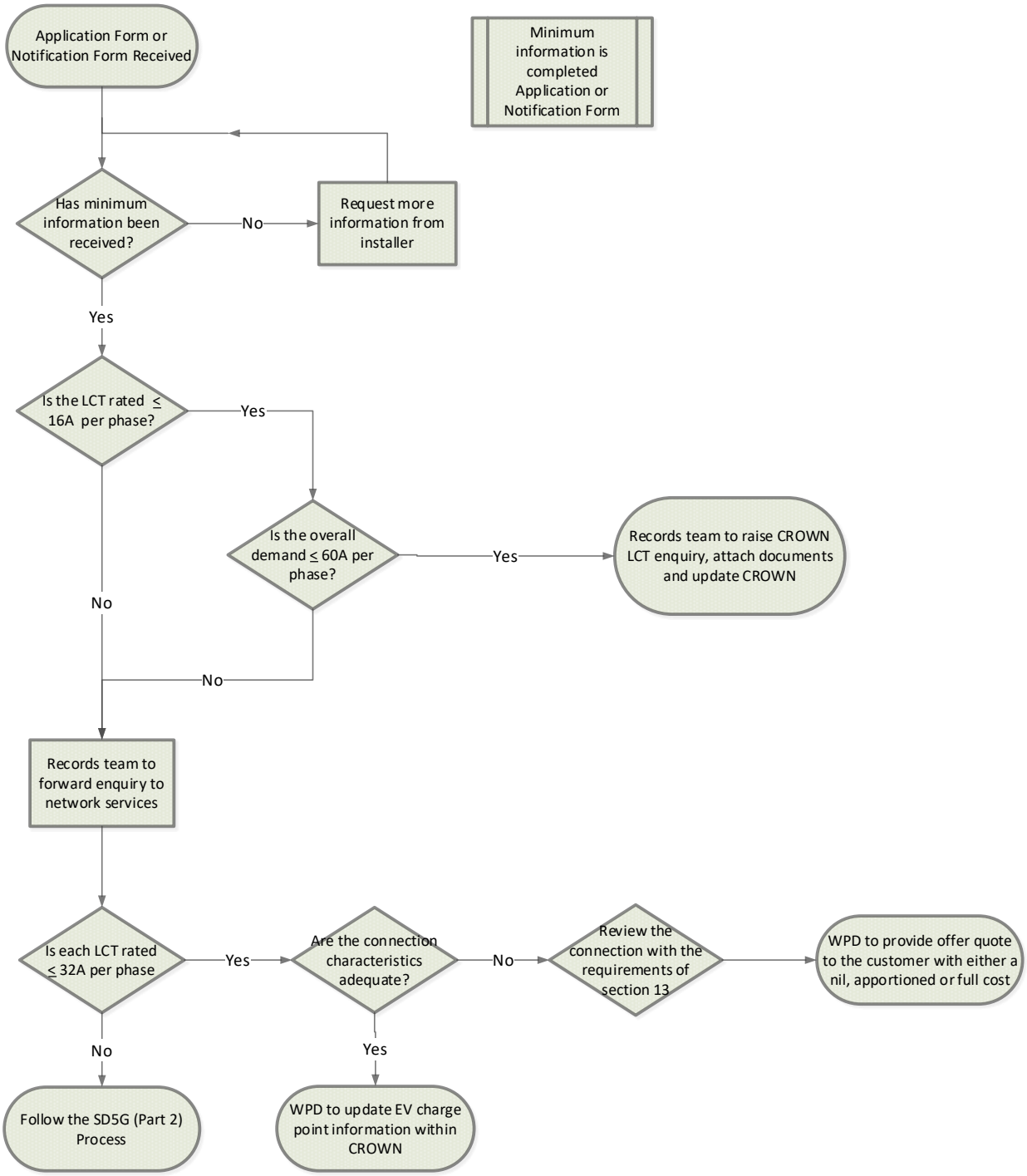

Figure 2 – LCT Connection Process

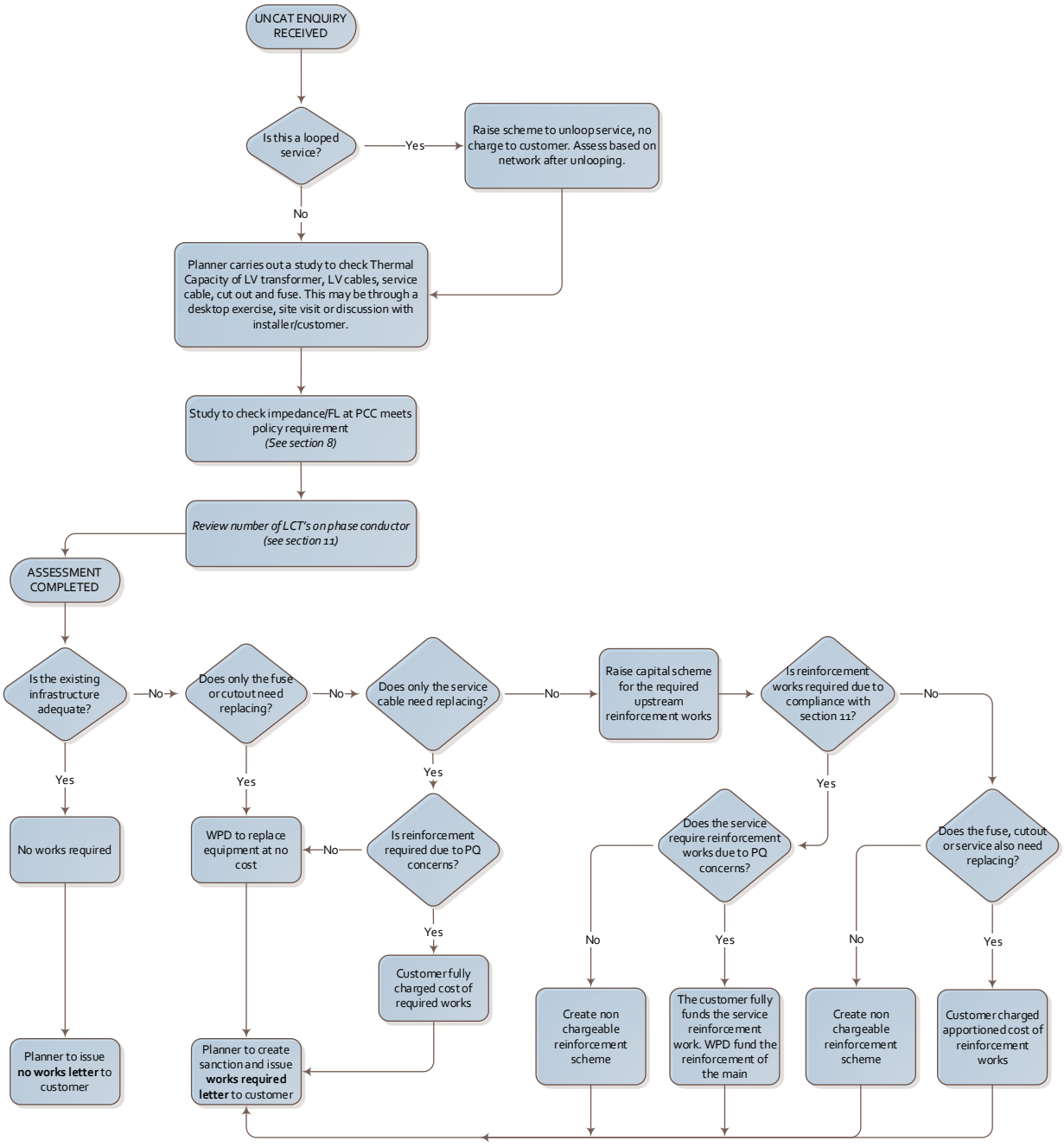

Figure 3 – WPD LCT Charging Methodology

A.1 RECORDING INFORMATION IN CROWN

A.1.1 When an LCT notification form is received by the WPD, NewSupplies, WPD,NewSuppliesMids, or WPD,NewSuppliesWales mailbox, the form shall be checked for minimum information.

A.1.2 The Records Team will raise a Low Carbon Technology Notification enquiry and attach all documentation to the enquiry.

A.1.3 For notifications with LCT equipment rated ≤ 16A per phase and where the overall demand is ≤ 60A, the Records team will record the presence of a charge point or heat pump and its maximum demand (in kW) under the relevant customer MPAN.

A.1.4 The conversion of demand from Amperes to Power on the LV network shall use 230V 1ph, 460V 2ph and 690V 3ph:

Equipment Rating (A)	Equipment rating (kW)		
	1 phase	split phase	three phase
1	0.230	0.46	0.693
2	0.460	0.92	1.386
3	0.690	1.38	2.078
4	0.920	1.84	2.771
5	1.150	2.30	3.464
6	1.380	2.76	4.157
7	1.610	3.22	4.850
8	1.840	3.68	5.543
9	2.070	4.14	6.235
10	2.300	4.60	6.928
11	2.530	5.06	7.621
12	2.760	5.52	8.314
13	2.990	5.98	9.007
14	3.220	6.44	9.699
15	3.450	6.90	10.392
16	3.680	7.36	11.085

A.1.5 For notifications of LCT rated over 16A per phase and for all applications or new connections, the Records Team will pass the enquiry on to the responsible Planning Team.

A.1.6 For notifications, the Planner will assess the network and if acceptable, the Planner will record the connected charge point/s in CROWN via a Low Carbon Technology Notification enquiry.

A.1.7 For cases where a supply upgrade is required, the Planner will raise a quotation and issue to the customer. This will also be required for non-chargeable schemes, where a nil-cost quote will be issued.

A.2 MONITORING LOW CARBON TECHNOLOGY LEVELS

A.2.1 The Policy Team shall monitor and review the levels of LCT connected on the LV network using the CROWN reporting function and will inform Network Services of Low Carbon Technology hot spots as per ST: SD1D.

APPENDIX D

EV & HP Application

Application Form for the Installation of Low Carbon Technologies

This application form must be completed and sent by the installer to the DNO directly when installing an **Electric Vehicle Charge Point or Heat Pump**. This form should be used for premises with an existing DNO connection. For new DNO connections, this form should be used in addition to a new electricity connection application. To ensure the safety and security of the Electricity Networks, depending on the size, type and location of the installation, you may need to apply for a connection with the DNO **prior to installation** of the device. To determine if you need to apply to the DNO for a connection prior to installation or not, please ensure you read and understand the connection processes for Electric Vehicles and Heat Pumps on the ENA website here: http://www.energynetworks.org/electricity/futures/electric-vehicles-and-heat-pumps.html

For help identifying the correct DNO and their contact details please visit:
http://www.energynetworks.org/assets/files/electricity/futures/Electric%20Vehicles%20and%20Heat%20Pumps/dno_info_for_ev&hp_310818.pdf

Please note that:

- One form must be submitted per device per premises. For multiple devices (including multiple devices under one controller) or multiple properties, please use the multiple installations spreadsheet, also available on the ENA website here: http://www.energynetworks.org/electricity/futures/electric-vehicles-and-heat-pumps.html
- An 'adequacy of the supply' assessment is required prior to any Electric Vehicle Charge Point or Heat Pump installation. This requires a load survey to calculate the new **Maximum Demand (MD),** including the device to be installed.
- The DNO must be contacted **in advance of installation** where there is an identified issue with adequacy or safety concern with the premises existing service equipment, where the new MD is greater than the cut-out rating, where the new MD is >60A (13.8kVA single phase) for residential properties or the devices do not meet the required standards.* Depending on the size and/or number of devices being connected, the DNO may ask for additional information to be supplied.
- In certain circumstances, for example if the total MD of the premises is ≤60A and adequacy of the connection is known*, the DNO shall be notified within 28 days of the installation.
- Any reinforcement costs associated with this installation may be recharged to the customer.

Providing that this form is fully and correctly completed, the following timeframes are applicable:

- Properties with new MD ≤60A and meeting all other relevant requirements* - installers can connect their device(s) and shall notify the DNO by filling in this form within 28 days of the installation
- Properties with new MD >60A and ≤100A (and not CT metered) - the installer must apply for a connection prior to installation by filling in this form and the DNO will assess the supply capacity within 10 working days
- Properties with new MD >100A (and not CT metered) - the installer must apply for a connection prior to installation by filling in this form. Timescales as per the Electricity Distribution Licence, Electricity (Guaranteed Standards of Performance) Regulations 2010: https://www.ofgem.gov.uk/ofgem-publications/47616/connections-gsop-guidance-sept0809.pdf. See local DNO connections Guaranteed Standards of Service for specific response timescales in your area.

* All devices must comply with the process described on the ENA website here: http://www.energynetworks.org/electricity/futures/electric-vehicles-and-heat-pumps.html

Installer Contact Details

Name	
Company	
Address line 1	
Address line 2	
Town	
Postcode	
Contact Number	
Email	

Customer Contact Details

Name	
Address line 1	
Address line 2	
Town	
Postcode	
Contact Number	

Installation Location Address (if different from Customer Address)

Name	
Address line 1	
Address line 2	
Town	
Postcode	
Contact Number	

Electrical Installation Details

Type of Installation Please note that one technology per form should be used	☐ Electric Vehicle Charge Point ☐ Heat Pump	
MPAN (11 digit MPRN if Northern Ireland) See http://www.energynetworks.org/electricity/futures/electric-vehicles-and-heat-pumps.html for details. If the supply is unmetered, the 'Apply to Connect' process is applicable and the local DNO must be contacted.	_ _ – _ _ _ – _ _ _ - _ _ – _ _ _ _ – _ _ _ _ – _ _ _	
Number of Phases	☐ Single Phase ☐ Split/two Phase ☐ Three Phase	
Declared Voltage at Connection Point	…….. Volts	
Maximum Demand (MD) of premises Including proposed installation, concluded from a Load Survey, as well as any import or load limiting devices.	…….. Amps (per phase – Whole Current Metered Only) …….. kVA (CT Metered Only)	
Does this premises include an import or load limiting device?	☐ Yes ☐ No	
Maximum Current Demand the proposed EV/HP can draw Include any associated additional components. The maximum simultaneous demand must be stated†. Additional equipment/reconfiguration not included in this application is not permitted after installation	…… Amps	☐ Single Phase ☐ Three Phase

Has the DNO been contacted about this installation and confirmed the Premises Supply Capacity? Essential if new MD >60A. Tick one as appropriate	☐Yes – Reference Number / Date, if applicable: …… Agreed Supply Capacity: ……A (Whole Current Metered Only) Agreed Maximum Import Capacity: ……kVA (CT Metered Only) ☐ No
Premises Cut-out Rating* If known. Whole Current Metered only. See ENA website for guidance.	…… Amps
Premises Existing Agreed Maximum Import capacity CT metered only	…… kVA
Final or Proposed Earthing Arrangements as per BS 7671 and the IET Code of Practice: https://www.theiet.org/resources/standards/cop-electric.cfm	☐ TN-C-S (PME) ☐ TN-S (SNE) ☐ TT (Direct) ☐ Customer Substation (HV CT metered)
Is the service looped? Tick one as appropriate	☐ Yes ☐ No ☐ Don't know
Type of installation Tick one as appropriate	☐ Domestic ☐ Non-domestic ☐ Other - Please detail: ……
Have you identified any issues with adequacy of the existing supply equipment? Tick one as appropriate	☐ Yes - Please detail: …… …… ☐ No
Date of Installation (if 'connect and notify' applicable)	DD/MM/YYYY

† The installer must ensure no other parallel devices can run simultaneously. If the installation is one controller but multiple devices, please use the multiple installations spreadsheet

* If the cut-out rating is unknown or uncertain, it can be established by raising an enquiry with the DNO. If the supply capacity still cannot be established, the 'Apply to Connect' process must be followed and the aforementioned timeframes are applicable. Please note that one should not open the cut out. Guidance on cut-out ratings is available on the ENA website. If the cut-out rating is unknown, a picture can be provided to the DNO.

Power Quality Declaration - Heat Pumps Only†

Heat Pump Manufacturer	
Heat Pump Model	
How will the Heat Pump be used? Please tick one of the following options	☐ The Heat Pump model stated will provide HEATING ONLY ☐ The Heat Pump model stated will provide HEATING & COOLING
Does the Heat Pump have additional components installed?	☐Back-up heater – on-board ☐Back-up heater – external ☐Boost heater – on-board ☐Boost heater – external ☐Immersion heater – on-board ☐Immersion heater – external
Is this model in the ENA Heat Pump Type Register Database and is the information in the Database correct? See register in database found in the second paragraph under "Processes & Forms" on the ENA website here. If yes, please proceed to 'Declaration' section.	☐Yes - Register No: …… ☐ No
If no, please fill in the following additional Power Quality details required for non-registered Heat Pump Models	
Datasheet and other Power Quality documentation for the Heat Pump attached to this application? **Must be provided.** It is the installer's responsibility to ensure all information required to populate the Heat Pump Type Register Database is provided.	☐Yes ☐ No
Does the installation meet the Microgeneration Certificate Scheme* Product Requirements?	☐Yes ☐ No

Harmonics Does the proposed installation comply with the technical requirements of BS EN/IEC **61000-3-2**?	☐Yes ☐ No
Harmonics Does the proposed installation comply with BS EN/IEC **61000-3-12**?	☐Yes ☐ No
Flicker Does the proposed installation comply with the technical requirements of BS EN/IEC **61000-3-3**?	☐Yes ☐ No
Flicker Does the proposed installation comply with BS EN/IEC **61000-3-11**?	☐Yes ☐ No

† Please refer to the Manufacturers Declaration of Conformity, device type test certificate and datasheet. If using the multiple installations spreadsheet, the confirmation of standards compliance should refer to the whole installation, i.e. at the point of common coupling.
* https://www.microgenerationcertification.org/mcs-standards/product-standards/heat-pumps/

Declaration

I confirm that the information I have given in this form is true to the best of my knowledge for the electrical installation noted above. The customer at the above address has been advised that commissioning of the installation may only take place when the Network Operator has completed any reinforcement works the supply network requires.					
Name		**Signed**		**Date**	

APPENDIX E

Expected resistance of PME earth electrodes

Table 4 and Table 5 list the expected earth resistance afforded by horizontal conductor and a single vertical earth rod. There is no minimum surface area requirement for individual PME earth electrodes.

The expected soil resistivity of a location can be queried within the WPD mapping system (EMU V8 for internal staff or Data Portal 2 for external users) and the value used to assist in the design of the required earthing system. However, on site measured values may differ from that of the calculated soil resistivities.

Electrode Length (m)	Resistance (ohms)		
	Soil Resistivity 100 ohm.m	Soil Resistivity 300 ohm.m	Soil Resistivity 1000 ohm.m
1	87	260	867
2.5	44	131	437
5	26	77	257
10	15	45	149
15	11	32	108
20	9	26	85

Table 4 Resistance of a horizontal 70mm² Cu electrode (Laid 500mm Below the surface in uniform Soil)

Rod Length (m)	Resistance (ohms)		
	Soil Resistivity 100 ohm.m	Soil Resistivity 300 ohm.m	Soil Resistivity 1000 ohm.m
1.5	58	174	579
3	33	100	332
4.5	24	71	238
6	19	56	187
7.5	16	47	155
9	13	40	133
10.5	12	35	116
12	10	31	104
13.5	9	28	94
15	9	26	86

Table 5 Resistance of a single vertical PME earth rod (in Uniform Soil)

APPENDIX F

SUPERSEDED DOCUMENTATION

This document supersedes ST: SD5G/4 (Part 1) dated May 2020 which has now been withdrawn.

APPENDIX G

ASSOCIATED DOCUMENTATION

Electricity Act 1989 (as amended by the Utilities Act 2000), ESQCR 2006, ST: SD5A, ST: SD5K, ST: SD5O, ST: SD6J, ST: TP21E and ST: NC1P.

The Code of Practice for Electric Vehicle Charging Equipment Installation
ENA EREC G5
ENA EREC P28
ENA EREC P29
Electric Vehicle Charging – RINA Report

APPENDIX H

KEY WORDS

EV, HP, LCT, Notification, Application, Electric Vehicle Charge Point, Heat Pump

APPENDIX I

RECORD OF COMMENT DURING CONSULTATION

ST: SD5G/5 (Part 1) - Comments