Electricity Distribution

nationalgrid

Company Directive

STANDARD TECHNIQUE: SD5G/7 (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 NGED's distribution system.

Author: **Seth Treasure**

Implementation Date: **September 2023**

Approved by

Carl Ketley-Lowe
Engineering Policy Manager

Date: **4th September 2023**

Target Staff Group	**Staff responsible for low voltage network design**
Impact of Change	**Amber – Significant change to the preferred solution when replacing a looped supply**
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 National Grid Electricity Distribution's (NGED's) distribution network (low and high voltage).

Main Changes

The document has been updated to provide a revised hierarchy of works when undertaking a service overlay for an insufficient or looped supply.

Impact of Changes

The revised hierarchy of works will provide a better balance between disruption, requirements and cost.

Target Staff Group	**Staff responsible for low voltage network design**
Impact of Change	**Amber – Significant change to the preferred solution when replacing a looped supply**

Implementation Actions

Within the month of May, dissemination events were held to discuss the standardisation of fusing to 80A with the linked document provided for guidance to internal and external stakeholders.

In addition, for improved clarity a pictorial guide has been created to detail the hierarchy of overlaying a looped supply, see clause 13.1.7.

Implementation Timetable

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

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
September 2023	• Clause 4.5 added – Domestic style cut-outs to typically be fused at 80A • Hierarchy or works for service renewals added within clause 13.1.7 • Revised hierarchy of works for schemes where customers are opposed to works – clause 13.5 • Inclusion of 80A fusing practice • Revised curtailment scheme requirements – clause 9.6 • Updated charging methodology to align with Access SCR • Revisions to incorporate centralised Secondary System Planning Team.	Seth Treasure
July 2021	• Notification procedure update to incorporate load management schemes and colour classification of heat pumps • Assessment procedure updated due to changes within SD5O – acceptance of LCT by Records • Charging methodology updated to reflect updated notification procedure • Clause 13.1.2 - Definition of insufficient service added • Links to revised ENA application form and process flowchart added	Seth Treasure
October 2020	• Service upgrade 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

Contents

1.0 INTRODUCTION

1.1 This Standard Technique describes NGED 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 NGED's LV & HV distribution system (Low and High voltage).

1.2 This policy details the connection process for mode 1-3 chargers with an AC output, mode 4 chargers with a DC output rated >32A per phase are detailed within Standard Technique: SD5G Part 2.

1.3 NGED 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 Power quality information relating to the installation of mode 1-3 chargers is not required and the spreadsheet calculation tools detailed within this document shall be used to determine the connection requirements.

1.5 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 **Point of Supply (POS) –** Point specified within the relevant Connection Agreement, at which the distribution network of the Distribution Network Operator connects to the distribution network of the user via the connection equipment – also known as 'Supply Terminals'.

2.6 **Point of Common Coupling (PCC) -** Point in the public supply system which is electrically closest to the installation concerned and to which other customers are or might be connected

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(2) or safety concerns with the property's existing service equipment and where the post installation maximum demand complies with one or more of the following requirements;

- The unrestricted demand of the property is ≤ 60 amps.
- The LCT is curtailed to zero when the properties demand exceeds 60A.
- The installation incorporates a load limiting device to maintain the properties entire demand to ≤ 60 amps.

For CT metered supplies,

The aggregate capacity of the EVCP is ≤ 30% of the Agreed supply capacity.

The notification shall be sent by the installer directly to NGED 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 one or more of the criteria set out in (a) above are not met.

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 AC output 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.

(2) A demand of up to 80A is only acceptable for a black phenolic resin or a grey dough moulded clay cut-outs. A demand of up to 60A is applicable to all other cut-outs.

3.3 Where a customer applies for the installation of equipment compliant with the following rules, the NGED Records teams shall accept the installation, provide a response to the customer and commission the equipment within CROWN.

- The maximum demand of the connection is $\leq$ 80A / 18.4kW per phase.

And,

- The EVCP is rated $\leq$ 32A / 7.36kW per phase

And / Or,

The HP is classified as 'Green' or 'Amber'.

- The connection may be looped and the cut-out may be rated at 60A.

For more information see Standard Technique: SD5O.

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 Technologies shall not be connected via a LV service loop. *See clause 13.5.*

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

4.5 Connection incorporating a domestic style cut-out will be fused at 80A per phase unless the connection is solely for vehicle chargers where the termination equipment is installed within a free standing pillar remote from a building and where the cubicle complies with the requirements detailed within section 10.

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 or application and where a LCT demand is compliant with the requirements of ST: SD5O (notes in clause 3.3 above), the team will accept the installation and record the relevant information within CROWN.

6.2 No further assessments are required for a heat pump classified as 'Green' and / or for EVCP rated ≤ 32A per phase.

And,

Where the cut-out is rated ≥ 80A and not looped

And,

Where the maximum demand is ≤ 80A (curtailment devices may be used to achieve this figure)

6.3 Where one or more of the below statements are true, the installation shall be accepted by the Records team but thereafter the enquiry will be passed to the network services teams for retrospective actions / checks.

- The Heat pump is classified as 'Amber'
- The supply is looped via the cut-out
- The cut-out is not rated ≥80A per phase
- The fuse requires upgrading from 60A to 80A

A 'Low Carbon Technology' enquiry shall be raised and forwarded to the relevant Network Services Teams. See the attached link for guidance.

6.4 For the application of a heat pump that is classified as 'Red' or for the installation of multiple items of equipment the Records team shall forward the enquiry to the relevant Network Services teams for review.

See Standard Technique: SD5O or Appendix A for more detail.

6.5 The local Planner will assess the connection where one or more of the following apply;

- The maximum demand of the connection exceeds 80 amps per phase
- The adequacy of the connection is in doubt
- The cut-out is not a black phenolic resin or grey dough moulded clay cut-out
- The heat pump is classified as 'Amber' or 'Red'
- The connection is HV metered

6.6 The installation will be accepted if all of the following conditions apply;

- The service conductors, cut-out and metering equipment have sufficient thermal capacity
- 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 cut-out 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.

6.7 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 LCT until the required reinforcement has been completed.

6.8 The centralised Secondary System Planning team shall be responsible for the assessment of the impact of the summation of existing LCT included within the secondary network. Network Services planners are only required to assess proposed new installations.

6.9 A list of letters for the interaction with installers / customers is provided within

https://sharepoint.westernpower.co.uk/sites/wpd/policy/connections/Low%20Carbon%20Technology/Letter%20Templates%20(LCT)

7.0 EARTHING ARRANGEMENTS

Excluding Fuel Filling Stations (FFS) – see section 14.

The following requirements relate to supplies for EV charge points and confirmation of the installation compliance to the requirements of BS 7671 (the IET 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 NGED 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 NGED 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 NGED 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 NGED 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 NGED 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 unless a curtailment scheme has been installed.

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 currently set at 50%, however, domestic EV charging profiles may be utilised for more in depth network analysis e.g. ConnectLV assessments.

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 multiple 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 cut-out is utilised and where the equipment is positioned within a street mounted enclosure, the enclosure shall comply with the requirements detailed within section 10.

9.6 Customer load management schemes for Low Carbon Technologies will be accepted if compliant with Standard Technique: SD1E (ENA EREC G100). The base requirements are detailed below;

- Suitable communication links
- Fail safe – in the event of a component or signalling failure the system will revert to a pre-determine safe level of import capacity
- Typical reaction time to curtail load $\leq$ 10 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 Street furniture connection may be used to incorporate vehicle charging subject to compliance with the following requirements;

- The supply does not form part of a loop of supplies
- The connection satisfies the earthing requirements of this documents
- The impedance requirements detailed within ST: SD5R are satisfied
- Suitable access to the cut-out is maintained
- The cable and cut-out are capable of a minimum of 25A

10.3 For commercial supplies with a **sustained** capacity greater than 80A, a DMC cut-out arrangement may be utilised as per Standard Technique: SD5A & SD5D. See clause 10.12 regarding the requirements of the equipment installation.

10.4 For supplies between 100A and 400A and where the NGED equipment is positioned within a Street Furniture cubicle, a Schneider combined cut-out and CT panel shall be utilised. ***See figure 1 below.***

10.5 For supplies between 100A and 400A and where the NGED equipment is not positioned within a Street Furniture cubicle, a Lucy combined Cut-out and CT panel shall be utilised.

10.6 For low voltage supplies greater than 400A, see Standard Technique: SD5E.

10.7 For High Voltage metered supplies, see Standard Technique: SD4O (A or B as appropriate).

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

10.9 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 NGED equipment can be maintained or replaced without having to remove the customer's equipment.

10.10 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.

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

It is recommended that the air vents incorporate a gauze to prevent access to insects.

10.12 Where connections incorporate a load management scheme within the scope of Clause 9.5 above, or where a customer requests a supply fused at 100A.

The installation shall be terminated within a street mounted enclosure that is positioned remote from any other structure and where the installations complies with all of 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 NGED / 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

- NGED and the supplier shall be provided with a minimum space requirement of 400mm (W) x 600mm (H)

10.13 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.

10.14 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.

10.15 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.

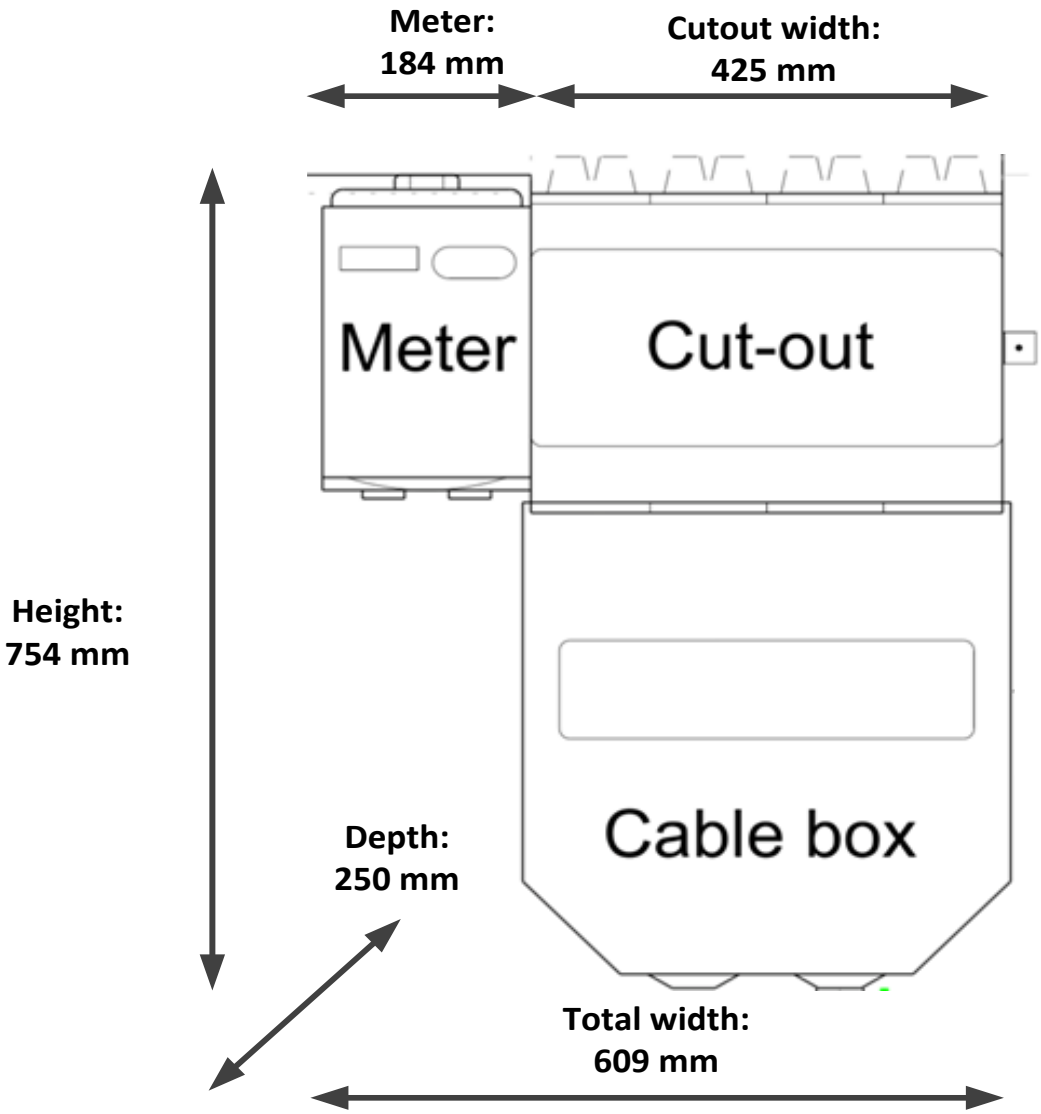


Figure 1 – Schneider Combined Cut-out and CT Panel for use at EV Charge Point Street Furniture connections only

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 [1] with the requirements of Table 4, the circuit shall be **redesigned by the Secondary System Planning team** 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.

	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 [2] [3]

Notes; (*1*) *Circuits may be determined to be overloaded with LCT via either an onsite, theoretical/planner or an automated CROWN assessment*

(*2*) *Equipment rated ≤ 32A per phase*

(*3*) *Three phase equipment will count as 1 per phase*

(*4*) *The maximum number of LCT will be limited by the thermal capacity of the circuit*

(*5*) *The impedance requirements set out within Standard Technique: SD5R must also be satisfied*

11.3 The number of Low Carbon Technologies connected to the NGED 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 **Secondary System Planning Manager** to highlight circuits with high penetration 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)

13.1.1 Where reinforcement works are identified following the notification of the following equipment, NGED shall fully fund the required reinforcement works subject to the service demand being ≤ 80A per phase;

- EVCP rated up to 32A per phase,

and / or

- Heat pump classified as 'Green' or 'Amber'

13.1.2 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 the item(s) of concern shall be upgraded to a sufficient capacity.

13.1.3 Reinforcement works required to upgrade sole use transformers and sole use main route conductors shall be fully charged to the customer subject to the customer being sufficiently capable of drawing an 80A supply.

13.1.4 Reinforcement works and all associated costs incurred to upgrade an existing **insufficient**(1) single phase service cable, cut-out or fuse shall be attributed to NGED when the following conditions apply;

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

&

EVCP rated ≤ 32A and / or HP classified as 'Green' or 'Amber'

&

Reinforcement 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.

Note;

(1) Definition of an insufficient supply: Where a supply of 80A is unachievable due to thermal or voltage limitations of the existing connection. Thermal restrictions may be due to mains or service assets and a voltage drop of up to 8% would be acceptable for a historic network.

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

13.1.5 Any ‘insufficient’ service cable that is being overlaid shall follow the hierarchy of renewal as detailed below.

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 cut-out position.

13.1.6 Services that have been looped via the incoming terminals of a cut-out 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 NGED’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 SD5H etc.) and each customer connection shall be individually fused.

Where looped supplies are being overlaid, the replacement service shall follow the hierarchy of renewal as detailed below.

NGED shall fund any wiring required between the cut-outs and consumers unit (“wire backs”) due to a cut-out being positioned in a more appropriate location.

13.1.7 Hierarchy of renewal.

Where a looped or ‘insufficient’ service is required to be overlaid, the chosen reinforcement scheme shall be determined with a balance of the following aspects;

- Future load growth (1) – The chosen solution should be sufficiently able to accommodate the expected future load growth of the connection during the expected lifespan of the installed asset.
- Wayleaves and Consents – The installed assets shall have sufficient consents to ensure that the appropriate maintenance and access is permitted.
- Cost – The chosen solution shall be cost proportionate.
- One visit – The chosen solution should ensure that any substandard, deteriorating, items of concern or high maintenance assets are modernised during the works to mitigate subsequent site visits.
- Space – Spatial availability for the cut-out, meter and customer equipment.

Note:

(1) Where a premises has space for more than two parking bays, a three phase service should be the preferred solution.

In order of preference, the following works should be chosen;

Overlay of a looped supply, in order of preference.

1. Installation of three phase service cable to connect onto existing single phase cables within the grounds of the property (excavations within one premises, shared cable).

2. Installation of new three phase cable and cut-out for customer of interest, new single phase cable for neighbour within same trench (subject to consents).

3. Installation of 2 x single phase cables, complete service renewal for customer of interest, joint onto existing cable for neighbour (subject to consents).

4. Installation of 1 x single phase service cable for one of the customers, retention of the existing cable for other customer.

5. Removal of the looped Cut-out with a service branch joint external to the property

   A guide for single phase loads is available via the following <link>

   A guide incorporating three phase loads is available via the following <link>

Overlay of an insufficient supply, in order of preference.

1. Installation of a new single phase service cable and new cut-out to provide a sustained capacity of 18.4kVA. (1)

2. Installation of a new three phase service cable and new cut-out to provide a sustained capacity of 41.4kVA

3. Installation of three phase service cable to external face of building, single phase cable to cut-out position. (1)

Note:

(1) Where a premises has space for more than two parking bays, a three phase service should be the preferred solution.

13.1.8 Whenever NGED are attending site for any form of works, as a minimum, the cut-out/s shall be changed to a DMC type cut-out and fused appropriately, the installation/s shall also be visually inspected for any deficiency.

13.1.9 Where a three phase or split phase supply is desired but not available, a single phase supply can be provided with a maximum cyclic capacity of 23kVA (where available). Where excavation works are required, an additional sealed 50mm alkathene duct shall be laid from the jointing position to the meter location for possible future upgrade works.

13.1.10 Where a customer has a supply of sufficient capacity (a demand of 18.4kVA can be achieved whilst maintaining a healthy voltage) but requires a supply cable upgrade to permit the cyclic capacity of up to 23kVA, the customer shall fully fund the required reinforcement work. The cut-out will incorporate an 80A fuse as per Standard Technique: SD5D.

13.1.11 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 internal installation is compliant with the desired arrangement and the network being suitable to provide the requested arrangement.

13.2 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 NGED (Socialised cost recovered via DUOS charges).

13.3 NGED 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.

13.4 The customer will fully fund any required reinforcement works where the heat pump is classified as 'Red' and where the existing service is of sufficient capacity (as per 13.1.4).

13.5 Where a customer and/or neighbour are opposed to the removal of a looped cut-out or overlay of an insufficient cable, as a minimum, the looped cut-out (loop feeding no more than two premises) shall be changed to a modern DMC type cut-out and both cut-outs to be fused at 60A.

Notes:

(1) – Where a lower rated fuse is inserted than that required, a customer shall install a load management scheme at their cost.

(2) If a customer is unable to manage the demand of the property and subsequently NGED are called to repeat failures of the cut-out fuse. The customer's service shall be overlaid with a conductor of sufficient capacity.

General notes:

National Grid Electricity Distribution's policy regarding the charging methodology for the reinforcement of the distribution system is detailed within Standard Technique: NC1P.

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.

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

14.1 NGED 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 NGED (PME or SNE connection derived from a PME main).

NGED 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 NGED earth terminal shall be removed at NGED'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 Cut-out position of the fuel filling station to indicate that multiple supplies exist at the premises and the precise 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 NGED 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 NGED with a plan of the site detailing the hazardous zones. A typical hazardous area plan can be found via the following link*

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

15.0 MULTIPLE CONNECTIONS

15.1 NGED 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 NGED'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).

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 NGED.

16.2 Where a second supply is provided to an EVCP within the curtilage of a premises that already has a NGED supply, the following requirements shall be met;

- The supply shall be distinct from the NGED supply. This may be achieved with product signing different to that of the main building
- The installation (including earthing system) shall be a minimum of 2.5m from any asset electrically connected to the NGED supply e.g. street lighting
- The supplies must not be electrically interconnected via cabling or earthing systems / electrodes

16.3 Under the requirements of ENA EREC G88 IDNOs are obliged to provide NGED 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

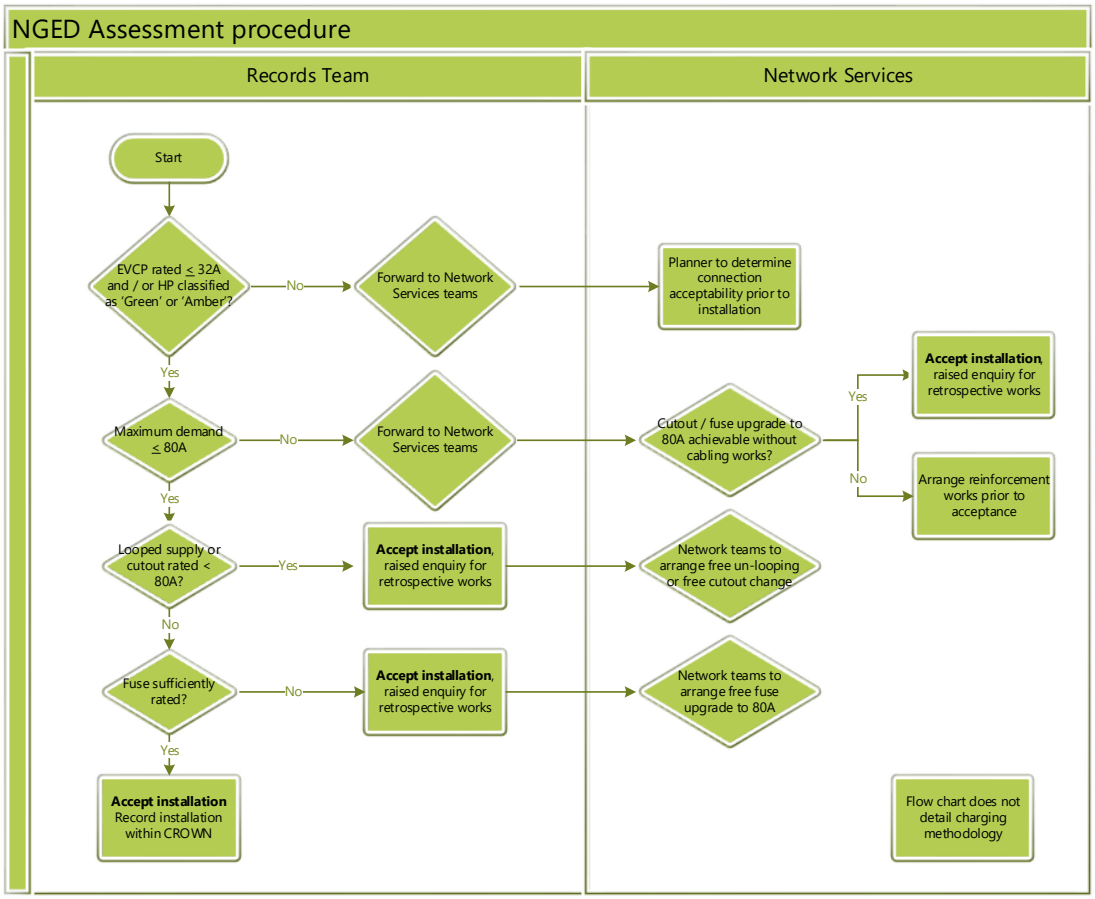
17.1 The installation of the Low Carbon Technology shall be recorded within CROWN (Customer Responsive Organised Work Network) and associated with the relevant MPAN (Meter Point Administration Number). The following data shall be captured;

- 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 will automatically apply identification symbols to the NGED mapping system from data provided from CROWN.

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



Cutout / fuse upgrade achievable without cabling works?

Figure 2 – LCT Connection Process

APPENDIX B

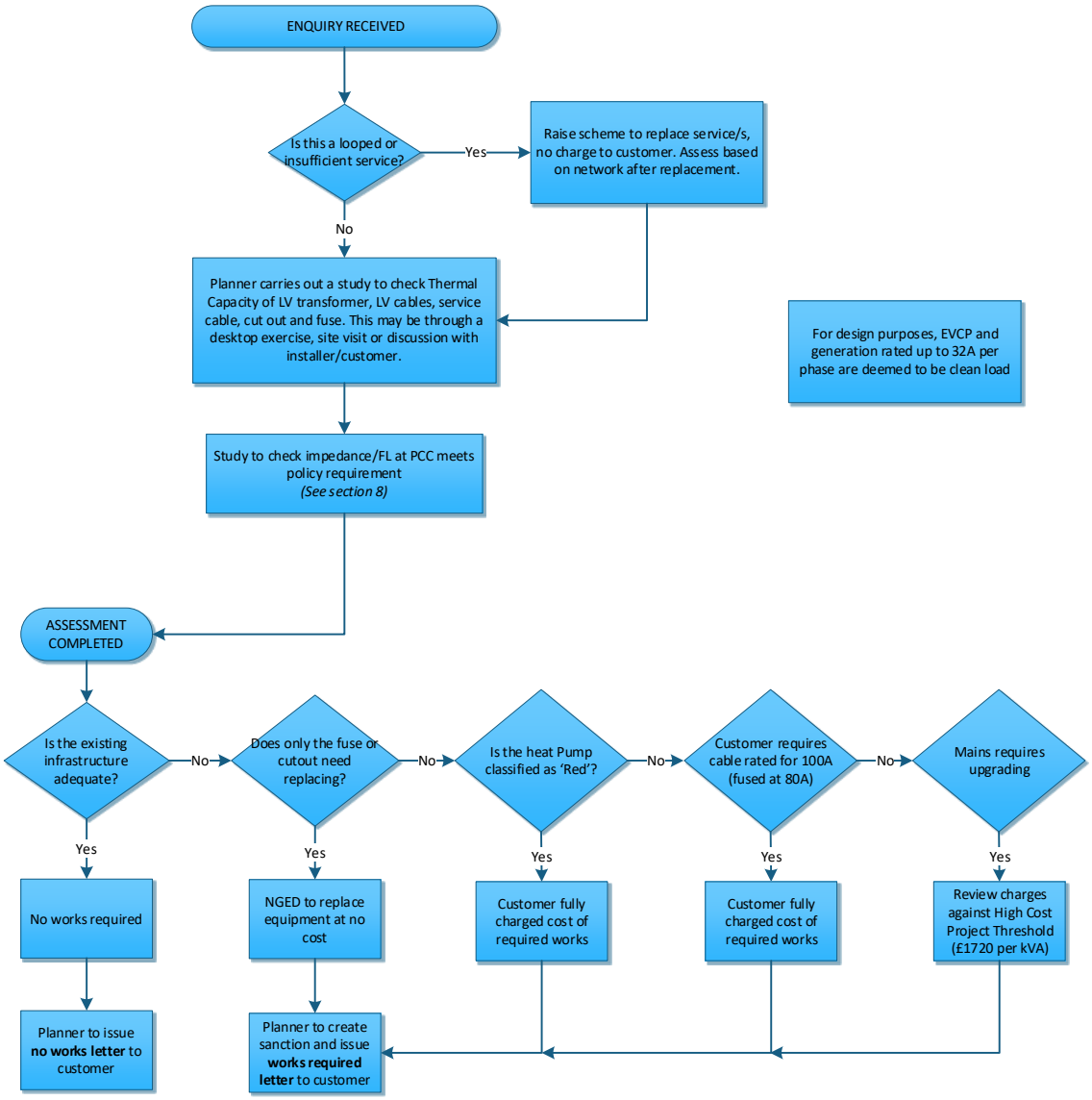


Figure 3 – NGED LCT Charging Methodology

APPENDIX C

A.1 RECORDING INFORMATION IN CROWN

A.1.1 When an LCT notification form is received by the NGED, NewSupplies, NGED,NewSuppliesMids, or NGED,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 $\leq$ 32A per phase and where the overall demand is $\leq$ 80A, 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 32A per phase and for all applications or new connections, the Records Team will pass the enquiry on to the responsible Network Services Team.

A.1.6 As per Section 6 of this document, the Planner will assess the network and if acceptable, will record the connected LCT 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 secondary System Planning Team shall monitor and review the levels of LCT connected on the LV network and will design reinforcement schemes when required.

Cover Page

Completing this form accurately will help DNOs process your application as quickly as possible. Please read the following information thoroughly before starting to ensure you have all information required to complete the relevant sections.

What is eligible	This form is for **Electric Vehicle Charge Points (EVCP)** or **Heat Pumps (HP)** being installed in a premises with an existing Distribution Network Operator (DNO) electricity connection. This form may also be used for the installation of **Vehicle-to-Grid Electric Vehicle Charge Points (V2G EVCP)** where the total aggregated capacity of generation/battery storage equipment in a premises is 17kW (single phase) or 50kW (3-phase) or less. To apply for a new connection to the network, please contact your relevant DNO.
When to complete	This form should always be reviewed prior to installing any new EVCP or HP to determine whether the installation requires an application or whether it is eligible for the notification process.
When to submit	If the installation meets all the notification criteria (Section B) the DNO must be notified within 28 days of installing the new equipment. If all the criteria in Section B cannot be met, you should submit an application to the DNO using this form before connecting the new equipment to ensure that the DNO can maintain safe and effective operation of the electricity network.
What to submit	Depending on the nature of the new equipment, the DNO may require additional information. For multiple pieces of equipment (including multiple pieces of equipment under one controller) or multiple premises, please use the multiple installations spreadsheet, also available on the ENA website[1].
Finding your DNO	For help identifying your DNO and their contact details please visit the ENA website[2].
Cost	Any reinforcement costs associated with this installation may be charged to the customer.

Required Information

To populate this form, you will need information about the following.

Device to be installed	Details of EVCPs or HPs to be installed are required. Where equipment is not registered in the relevant ENA database, additional information will be required (Section E). A link to the **Heat Pump Database** can be found on the Databases page on the ENA website[1]. Type tested V2G EVCPs can be found in the ENA Type Test Verification Report Register.
Existing devices at the premises	Details of any existing EVCPs, electric heating, battery storage, generation (e.g. solar PV), storage or other large load drawing devices.
Maximum demand (MD)	A load survey is required to calculate the Maximum Demand. This should comprise the existing Maximum Demand of the whole premises and the new equipment to be installed as well as any import or load limiting devices. Further Guidance on such devices is available in the FAQ section of the Connecting to the networks page on the ENA website[1].
Supply Capacity / cut-out rating	If the cut-out rating is unknown or uncertain, it can be established by asking the DNO. The supply capacity MUST be confirmed with the DNO where the MD is greater than the cut-out rating or where the new MD is >60A per phase (13.8kVA single phase) for residential / non-CT metered premises. If the cut-out rating is unknown, a photograph can be provided to the DNO together with the application. Please note that you **MUST NOT** open the cut-out unless authorised to do so. Further Guidance on cut-out ratings is available on the ENA website[1].
Adequacy of supply	An 'adequacy of supply' assessment is required prior to installing a EVCP or HP. The DNO must be contacted in advance of installation where there is an identified issue with adequacy or a safety concern with the premises existing DNO service equipment.

[1] https://www.energynetworks.org/operating-the-networks/connecting-to-the-networks
[2] https://www.energynetworks.org/info/faqs/who-is-my-network-operator.html

Timelines

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

Notifications	Provided the installation meets **all** the relevant notification criteria (i.e. all the applicable checkboxes in Section B that are relevant to the installation can be ticked) installers can connect the new EVCP of HP and notify the DNO using this form within 28 days of their installation.
Application (60A < MD ≤ 100A)	The DNO should assess the supply capacity and confirm if the new equipment can be connected within 10 working days of receiving the completed form.
Application (MD > 100A)	The DNO will respond within the timescales as per the Electricity Distribution Licence, Electricity Guaranteed Standards of Performance (GSoP) Regulations 2010[3].

Declaration

Once populated, please remove the cover page, sign below and submit to the relevant DNO with any attachments.

I confirm that the information I have given in this form is true to the best of my knowledge. If this is for an application for connection, the customer has been advised that the installation may only take place following approval from the DNO.	Name: ……
	Signature: ……
	Date: ……

Section A – Contact Details

Installer Contact Details	
Name	
Company	
Address line 1	
Address line 2	
Town	
Postcode	
Contact Number	
Email	
If necessary, are we able to contact the customer directly e.g. to arrange a fuse upgrade	☐ Yes ☐ No
Customer Contact Details	
Name	
Contact Number	
Email	
Installation Location Address	
Address line 1	
Address line 2	
Town	
Postcode	

Section B – Notification Criteria

All Equipment	☐ Only connecting one additional piece of equipment (EV Charge Point or Heat Pump)

[3] https://www.ofgem.gov.uk/ofgem-publications/47616/connections-gsop-guidance-sept0809.pdf. See local DNO connections GSoP for specific response timescales in your area.

Types	☐	DNO cut-out rating known
	☐	No safety concerns over integrity of DNO service equipment
	☐	No other issues identified with adequacy or integrity of the DNO service equipment
	☐	Not a Looped Service
	☐	Metered supply
	☐	Maximum Demand less than the known cut-out rating
	☐	Maximum Demand less than 13.8kVA per phase OR the premises is CT metered OR the premises load is limited to below the known cut-out fuse rating
HP only	☐	Heat pump system under single controller only
	☐	Total heat pump system Maximum Demand ≤32A
	☐	Model marked at 'Connect and Notify' in the ENA's HP Database
EVCP only	☐	AC Output
	☐	Premises MD ≤13.8 kVA per phase OR where CT metered: Maximum AC output of EV charge points ≤30% of the Maximum Import Capacity
V2G only	☐	Total installed generating capacity (including any PV, storage and V2G storage) ≤3.68kW (16A) per phase and excluding any export limiting device
	☐	V2G EVCP charge point Fully Type Tested and registered in the ENA Type Test Verification Report Register
Does the installation meet all applicable notification criteria? If yes (i.e., all applicable checkboxes in Section B above are ticked), you can connect the equipment and notify the DNO within 28 days. If no, please apply to the DNO before connecting the equipment.	☐	No – **Apply to the DNO before installation**
	☐	Yes – Notify the DNO of the installation Date installed: ……
V2G notify requirements	☐	Confirmation that the V2G EVCP was installed and commissioned in accordance with EREC G98[4] – this is V2G only
	☐	Electrical schematic of the installation and site layout showing location of the EVCP attached

Section C – Electricity Supply Details		
Type of premises	☐ Residential house ☐ Commercial ☐ Other – Please detail:	☐ Residential flat ☐ Public ……..
MPAN[5] 11-digit MPRN if Northern Ireland	_ _ _ _ _ _ _ _ _ _ _	
Smart Meter installed on site	☐ Yes	☐ No
Declared Voltage at Connection Point		…… Volts
Number of Phases	☐ Single Phase ☐ Split/two Phase	☐ Three Phase
Maximum Demand (MD) of premises See page 1 for guidance	☐ Whole Current Metered ☐ CT Metered	…… Amps …… kVA
Supply Capacity Agreed Supply/Maximum Import Capacity	☐ Whole Current Metered ☐ CT Metered	…… Amps per phase …… kVA

[4] G98 and G99 forms are not required in addition to this form – this form replaces the need to fill in G98 and G99 forms for the V2G if "connect and notify" process.
[5] See https://www.energynetworks.org/operating-the-networks/connecting-to-the-networks for details. If the supply is unmetered, the 'Apply to Connect' process is applicable and the local DNO must be contacted.

Supply capacity confirmed by the DNO? Must be confirmed with DNO if MD>60A	☐ Yes ☐ No	Reference No/Date:	……
Premises Cut-out Rating If known. See the cover page for guidance	Whole Current Metered only	…… ..	Amps
Import or load limiting device on premises	☐ Yes ☐ No	If yes, please confirm MD of the premises with load limiting device installed:	…… Amps
G100 export limiting scheme on premises	☐ Yes ☐ No	Please detail:	……
Any issues identified with the DNO existing supply equipment?	☐ Yes ☐ No	Please detail:	……
Final or Proposed Earthing Arrangements[6]	☐ TN-C-S (PME) ☐ Customer Substation (HV CT metered)	☐ TT (Direct) ☐ TN-S (SNE)	
Is the service looped[7]?	☐ Yes, multiple service cables present	☐ No	

Section D – Existing equipment at premises if applicable (this section is for V2G applications only)								
Technology Type	**Approximate date of installation**	**Manufacturer**	**Manufacturer's Ref No. where available**	**Registered Capacity (kW)**		**Phase (if known)**	**Power Factor**	**Device to be removed**
				Import	***Export***			
Example	*DD/MM/YYYY*	*CompanyX*	*1234*	*3.68*	*6.2*			*No*
Heat Pump								
EVCP								
V2G EVCP								
Solar PV								
Battery Storage								
Other *(please specify here):* ……..								

Section E – Equipment to be installed			
Type of equipment Tick all that apply (if selecting multiple this must be an application)	☐ Heat Pump ☐ Electric Vehicle Charge Point **(EVCP)** ☐ Vehicle-to-Grid Electric Vehicle Charge Point **(V2G EVCP)**		
Maximum Current Demand of proposed equipment[8]	☐ Single phase ☐ Three phase	…… ……	Amps Amps

[6] As per BS 7671 and the IET Code of Practice: https://www.theiet.org/resources/standards/cop-electric.cfm

[7] Some DNO cut-outs have more than one DNO service cable terminated in the DNO cut-out. Such a situation indicates a 'Looped Service' where there are one or more services connected via the cut-out. Note this may impact on the adequacy of the DNO service equipment. Looped services can be found anywhere but are often found in housing estates from the 1970s & 1980s, rural areas and terraced housing.

[8] Connection of additional equipment or reconfiguration not included in this application is not permitted without submitting another application

Include any associated additional components. The aggregate maximum simultaneous current of all pieces of equipment must be stated.			
Electric Vehicle Charge Points			
Manufacturer			
Model			
Model in the ENA EVCP Database (DC Only)	☐ Yes ☐ No	Product ID: …… If no, fill in Section F	
V2G Electric Vehicle Charge Points			
Manufacturer			
Model			
Export Capacity (kW)			
Model Fully Type Tested and registered in the ENA Type Test Verification Report Register	☐ Yes ☐ No	Product ID: …… If no, fill in Section F	
Heat Pumps			
Manufacturer			
Model			
How will the Heat Pump system be used? Please tick one	The Heat Pump model stated will provide:	☐ Heating only ☐ Heating and cooling	
Does the Heat Pump system have additional components installed?	Back-up heater: ☐ On-board ☐ External	Boost Heater: ☐ On-board ☐ External	Immersion heater: ☐ On-board ☐ External
Model in the ENA Heat Pump Database	☐ Yes ☐ No	Register No: …… If no, fill in Section F	

Section F – Equipment not currently in ENA Databases

EVCP (DC Only)	
You must provide the required data for DC-coupled EVCP models not currently in the ENA EVCP Database. It is the installer's responsibility to ensure all information required to populate the EVCP Database is provided.	
Datasheet and Power Quality documentation for the EVCP **(Rated power, harmonic emission data & test standard applied for harmonic emission data)**	**Must attach with application**
V2G EVCP Only	
If only part of the V2G ECVP is not Fully Type Tested and registered with the ENA Type Test Verification Report Register, Form A2-1 or A2-2 or A2-3 (as appropriate) should be submitted to the DNO with this form. These forms can be downloaded from the ENA website Resource Library: https://www.energynetworks.org/industry-hub/resource-library/	
EREC G98 or G99 Forms A1-3 (where applicable)	**Must attach with application**
Heat Pumps Only	
You must fill in the following Power Quality details required for non-registered Heat Pump Models. It is the installer's responsibility to ensure all information required to populate the Heat Pump Database is provided.	
Datasheet and Power Quality documentation for the Heat Pump.	**Must attach with application**
Microgeneration Certificate Scheme[9] Product Requirements met	☐ Yes ☐ No

[9] https://www.microgenerationcertification.org/mcs-standards/product-standards/heat-pumps/

Proposed installation complies with:	Technical requirements of BS EN/IEC **61000-3-2 (harmonics)**	☐ Yes ☐ No
	BS EN/IEC **61000-3-12 (harmonics)**	☐ Yes (R_{sce} = 33)
		☐ Yes, subject to minimum short-circuity power (S_{sc})
		☐ No
	Technical requirements of BS EN/IEC **61000-3-3 (flicker)**	☐ Yes ☐ No
	BS EN/IEC **61000-3-11 (flicker)**	☐ Yes (meets 61000-3-3 tech. requirements)
		☐ Yes, subject to a service current capacity ≥100A per phase
		☐ Yes, subject to a Zmax value at point of supply
		☐ No
Microgeneration Certificate Scheme[10] Product Requirements met		☐ Yes ☐ No
Proposed installation complies with:	Technical requirements of BS EN/IEC **61000-3-2 (harmonics)**	☐ Yes ☐ No
	BS EN/IEC **61000-3-12 (harmonics)**	☐ Yes ☐ No
	Technical requirements of BS EN/IEC **61000-3-3 (flicker)**	☐ Yes ☐ No
	BS EN/IEC **61000-3-11 (flicker)**	☐ Yes ☐ No

[10] https://www.microgenerationcertification.org/mcs-standards/product-standards/heat-pumps/

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 NGED 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/6 (Part 1) dated July 2021 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

No formal responses received.