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Generic industry risk assessment and asset management approach for Low Voltage service termination equipment
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1 Purpose of this document

The purpose of this document is to describe in generic terms the risks arising from Low Voltage (LV) service termination equipment that is present in customer’s premises including the approach taken by electricity distribution network operators (DNO) in Great Britain to manage this asset class. In doing so it describes the potential risk posed by the equipment, the existing mitigations and controls that the industry has in place and further mitigations that are being developed to enhance the efficacy and efficiency of these regimes in order to ensure that risk is mitigated to a level that is as low as reasonably practicable.

This document is not intended to be prescriptive or to supersede or supplant in any way the detailed individual asset management and risk mitigation strategies that DNOs have in place for this class of asset. However, the details in this document describe the consolidated view of the GB DNOs and represent the basic framework practice that all DNOs intend to adopt, as a minimum.

2 Scope of this document

The scope of this document is limited to LV Whole Current Meter installations including the DNO service termination equipment within them.

3 Introduction and background

In order to provide safe and reliable supplies of electricity to customers, DNOs install at customers’ premises service termination equipment (i.e. a cut-out or service fuse and service cable), the purpose of which is to:

- Protect the network from faults on the downstream side of the service termination;
- Provide a means of connecting the Supplier’s, Customer’s or Building Network Operator’s (BNO) installation to the distribution network;
- Provide a means of de-energising or isolating the supply; and
- Make available, if appropriate, a terminal for the connection of the Customer’s or BNO’s earth conductor.

Service termination equipment is normally electrically and mechanically very simple comprising a fuse carrier with fuse positioned at the boundary between the DNO’s network and the Supplier’s or BNO’s equipment.

The design of service termination equipment is such as to prevent risk of fire or explosion, shock and electrocution in all normal environmental conditions and for the equipment to remain operational for several tens of years.

4 Description of the service position

The diagram below describes a typical domestic non half hourly (NHH) metered service position. The DNO service termination equipment and the extent of their responsibility is captured within the green area of the diagram.
### 5 Compliance with legislation

Under Regulations 3 and 5 of The Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) DNOs have a duty to ensure, so far as is reasonably practicable, that their equipment is:

- a) Sufficient for the purposes for and the circumstances in which it is used;
- b) So constructed, installed, protected (both electrically and mechanically), used and maintained as to prevent danger, interference with or interruption of supply; and

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<table>
<thead>
<tr>
<th>DNO equipment</th>
<th>Supplier equipment</th>
<th>Customer equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Service cable</td>
<td>4 - Meter tails (cut-out to meter and meter to timeswitch)</td>
<td>8 - Meter tails (between the meter / timeswitch and the Customer equipment)</td>
</tr>
<tr>
<td>2 - Cut-out (or main fuse or DNO fuse)</td>
<td>5 - Communications hub if fitted (may be within the meter)</td>
<td>9 - Customer isolating switch (if fitted / requested)</td>
</tr>
<tr>
<td>3 - DNO earth terminal</td>
<td>6 - Meter</td>
<td>10 - Customer consumer unit</td>
</tr>
<tr>
<td></td>
<td>7 - Timeswitch (if fitted)</td>
<td>11 - Customer earthing conductor (and earth block if fitted)</td>
</tr>
</tbody>
</table>

Source: MOCOPA Guidance on Service Termination Issues Reporting
c) Inspected with sufficient frequency so that the DNO is aware of what action they need to take so as to comply with (a) and (b).

An electricity user has a duty to:
- Comply with the National Terms of Connection and/ or any other connection agreements they have entered into with the DNO from which their electrical supply is taken.

A Supplier and a Meter Operator has a duty to:
- Comply with the requirements of:
  - Distribution Connection and Use of System Agreement (DCUSA);
  - Meter Operation Code of Practice Agreement (MOCOPA); and
  - The Electricity Safety, Quality and Continuity Regulations 2002.

Under Regulation 4 of ESQCR the DNOs, Suppliers and Meter Operators have a duty of cooperation and shall:
- disclose such information to each other as might reasonably be required in order to ensure compliance with these Regulations; and
- otherwise co-operate amongst themselves so far as is necessary in order to ensure compliance with these Regulations.

See Appendix A for further detail.

6 Hazards

The principle hazards which can arise from service termination equipment are two-fold; namely:
- Fire or short circuit flashover; and/or
- Shock or electrocution.

The types of actions, activities or scenarios that can give rise to the above hazards are:
- An overload situation affecting the service cable or service fuse;
- Deterioration of the condition of the material from which the service termination equipment is constructed due to aging effects or excessive loading;
- Resistive-type failures (which can be caused by numerous actions, including mal-operation of or damage caused to the service termination equipment or loose connections);
- Inadvertent interference with or damage to the service termination equipment (e.g. by third parties carrying out work at or near the service position and disturbing the equipment);
- Abusive/ malicious operation of the service termination equipment (e.g. tampering, theft etc.);
- Effects on equipment as a result of the service position environment being outside of its operating specification.(e.g. temperature, moisture, dust, corrosive substances, atmosphere, flammable or explosive dusts, vapours or gases etc.);
- Poor initial installation of the service termination equipment;
- ‘Shrink back’ of the service cable insulation as it enters into the service termination equipment with the potential result of exposing inadequately insulated conductors;
- Type/design or form of the service termination equipment (e.g. cut-outs with fused neutrals),
- Inadequate space around the service termination equipment and/or close proximity of combustible materials;
- Area around service termination equipment used as storage space resulting in restricted access if work is required to be carried out on or in the vicinity of exposed live conductors; and
- Inappropriate operation of or work on the service termination equipment by persons with insufficient competency, knowledge or authorisation.

7 Potential mitigation activities

Across the GB electricity industry the following activities (in no particular order) are currently in place and could be employed to mitigate the above hazards that may be posed by service termination equipment:

i) **Design & installation:**

- Using service cables and terminations designed in accordance with relevant British Standards (BS);
- Preference for installation in locations outside of premises i.e. outdoor meter cabinets:
  - General company policy restriction on locations unsuitable for indoor meter positions;
  - General company policy on working space & access requirements.
- ENA EREC G87 process for multi occupancy buildings;
- ENA EREC G81 process where DNOs adopt equipment designed & installed by Independent Connection Providers (ICPs);
- The input and engagement DNOs have into the drafting of BS 7671 (the IET Wiring Regulations) to ensure the engineering practices adopted in and around their service termination equipment is appropriate (e.g. reporting by NAPIT members);
- The input and engagement DNOs have into the drafting of BS 7657 (the British Standard for service termination design) to ensure the engineering standards for service termination equipment are relevant and appropriate for the environment in which they are expected to operate.

ii) **Operation & use:**
Defined safe systems of work and authorisation procedures to ensure only appropriately trained and authorised personnel work on service terminations;

MOCOPA registration of sealing equipment for DNO and MOP staff for traceability;

Security sealing equipment to indicate responsibility / right to operate, to prevent tampering / unwarranted operation, and to ensure basic safety;

MOCOPA registration and ongoing auditing to ensure competence of MOP staff;

The input and engagement DNOs have into the form and delivery of accreditation programmes related to the operation of their service termination equipment (e.g. National Skills Academy for Power (NSAP); and

The Service Termination Issues Group (STIG), a collective forum, operated by ENA on behalf of DNOs to enable them to discuss, share and agree best practice in the management of service termination equipment.

iii) Condition monitoring:

Health and safety legislation obligations on Suppliers to undertake risk based inspections of their NHH meters and associated electrical equipment. This body of legislation includes the Electricity at Work Regulations 1989, and the general provisions of the primary Health and Safety at Work etc. Act 1974; and

The operational check of termination equipment as a benefit of works to install Smart Meters.

iv) Reactive maintenance and management of reported equipment defects:

DNO’s reactive response to service termination equipment related issues that are reported to them by:

- Customers;
- DNO personnel carrying out other works;
- Meter Operators or Meter Readers/ Data Collectors; and
- Others (e.g. electricians or BNOs etc.).

The sending of the D0135 dataflow by a Meter Operator, via Data Transfer Network, notifying the DNO of the discovery of a Category B or C ‘defect’ in accordance with MOCOPA Guidance for Service Termination Issue Reporting;

The EATL STP 3174 project looking at the failure modes of service termination equipment, and
• ENA Engineering Recommendation G93, Guidance on the Management of Fused Neutral Cut-outs, that describes a consistent approach by DNOs to the management of fused neutral cut outs when these are reported to them.

v) Planned maintenance and replacement

• Planned asset replacement or modernisation programmes that some DNOs have in place currently. These replacement programmes are developed based upon information gathered of condition and performance.

vi) Equipment records

• The sending of the D0150 dataflow by a Meter Operator, via Data Transfer Network, notifying the DNO of the exchange or installation of an electricity meter;
• The notification to the DNO upon or prior to installation of certain types of low carbon technologies, such as:
  o Electric vehicle charging points;
  o Heat pumps; and
  o Distributed generation (e.g. photovoltaic panels).
• The asset information gathering and recording that DNOs undertake currently.

8 Justification of existing approach

Service termination equipment is positioned at the boundary between the DNO’s network and the Supplier’s equipment or the BNO’s equipment. This equipment generally comprises a service cable, fuse carrier and fuse which is electrically and mechanically simple in design.

The historic rate of failure for service termination equipment that give rise to the hazards described in section 6 above is extremely low and therefore the industry believes that the mitigations outlined in section 7 are proportionate to the risk posed.

This is borne out by the long-standing nature of the majority of these mitigations and the concurrently stable rate of failure of service termination equipment. This demonstrates that the industry’s current and long-standing approach to the management of its service termination equipment has maintained a very low level of risk of failure of these assets and will continue to do so.

9 Continual improvement

Whilst DNOs are comfortable that the mitigations and controls currently in place are suitable and sufficient to maintain the existing low level of risk posed by hazards arising from their service termination equipment they also recognise that they cannot be complacent and should identify opportunities for continual improvement.
In particular the findings of the judge in the recent ‘RIMISSE’ court case, the views of key policy makers within the Health & Safety Executive and those of the industry’s financial regulator, Ofgem, have caused DNOs to consider what further mitigations and controls might be put in place to enhance the effectiveness of their existing regimes for managing service termination equipment.

With this in mind the DNOs have identified a number of potential additional measures (as described in the section 10 below). These will need to be carefully evaluated in order to verify their potential benefit and to establish that any additional cost is proportionate to the reduction in risk. The cumulative effect of these additional measures coming to fruition will be to ensure that any future intervention DNOs may make to manage their service termination equipment will be as targeted and therefore as efficient as possible.

10 Possible future mitigations

In addition to the above mitigations that are already in place across the industry, DNOs are pursuing a number of avenues for additional measures to mitigate hazards posed by their service termination equipment, such as:

- Instituting sample auditing / inspections of surrounding properties when a defective service termination position is encountered;
- Gathering certain key pieces of service termination asset information by DNO staff when attending Category A or B defects or any other situation giving rise to a visit to a customer premise;
- Data available to DNOs from the electricity Smart Meters that will be installed in the vast majority of customer premises by 2020;
- Instituting a regime whereby D0150 (NHH meter technical details) informs the DNO strategy;
- The forensic examination of actual service termination equipment failures to better understand failure modes of this equipment. Undertake sample inspection regime of service termination equipment informed by these investigations.
- Projects being pursued via DNO innovation work to develop tools and techniques to manage service termination equipment and the hazards it gives rise to; and
- Influencing future design and engineering standards for service termination equipment in order to minimize hazards.

1 MOCOPA Guidance for Service Termination Issues Reporting
Appendix A

Relevant Regulations within

The Electricity, Safety, Quality and Continuity Regulations

General adequacy of electrical equipment

3.—(1) Generators, distributors and meter operators shall ensure that their equipment is—
   (a) sufficient for the purposes for and the circumstances in which it is used; and
   (b) so constructed, installed, protected (both electrically and mechanically), used and maintained as to prevent danger, interference with or interruption of supply, so far as is reasonably practicable.

11 Duty of co-operation

4. Generators, distributors, suppliers and meter operators shall—
   (a) disclose such information to each other as might reasonably be required in order to ensure compliance with these Regulations; and
   (b) otherwise co-operate amongst themselves so far as is necessary in order to ensure compliance with these Regulations.

Inspection of networks

5. A generator or distributor shall, so far as is reasonably practicable, inspect his network with sufficient frequency so that he is aware of what action he needs to take so as to ensure compliance with these Regulations and, in the case of his substations and overhead lines, shall maintain for a period of not less than 10 years a record of such an inspection including any recommendations arising therefrom.

12 Equipment on a consumer’s premises

24.—(1) A distributor or meter operator shall ensure that each item of his equipment which is on a consumer’s premises but which is not under the control of the consumer (whether forming part of the consumer’s installation or not) is—
   (a) suitable for its purpose;
   (b) installed and, so far as is reasonably practicable, maintained so as to prevent danger; and
   (c) protected by a suitable fusible cut-out or circuit breaker which is situated as close as is reasonably practicable to the supply terminals.