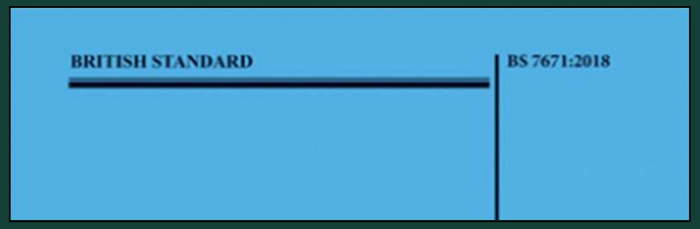
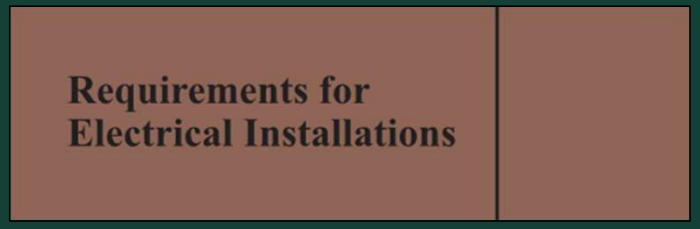


BS 7671: 2018



+ A2 2022

Hello

Paul Meenan CEng FIET, FCMI, MIAM, MILP

Trenitalia c2c – Asset Manager (M&E)

Chairman – ESR Workplace Safety

IET Volunteer

e5 group (Instagram YouTube)

In the beginning…

FIRST WIRING RULES

Society of Telegraph Engineers and of Electricians

RULES and REGULATIONS for the prevention of Fire Risks arising from Electric Lighting, recommended by the Council in accordance with the Report of the Committee appointed by them on **May 11, 1882,** to consider the subject.

MEMBERS OF THE COMMITTEE

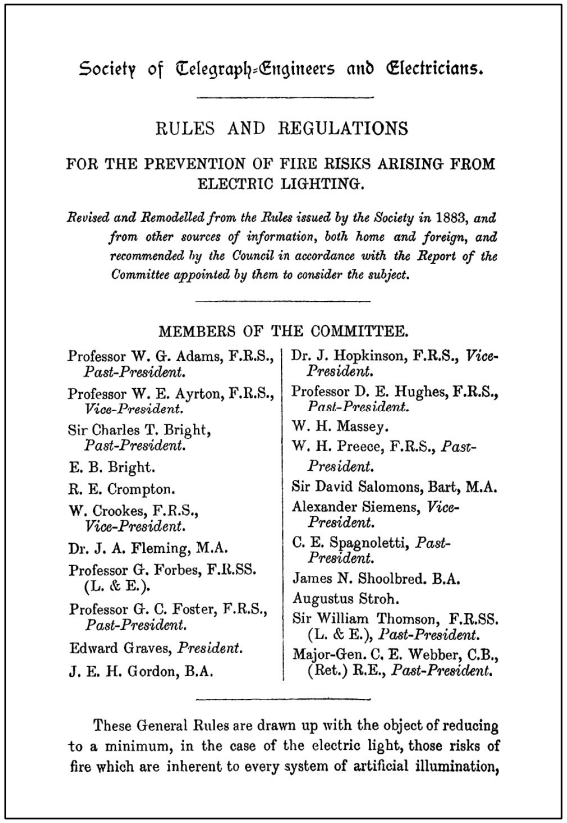
Professor W. G. Adams, F.R.S., Vice-President.
Sir Charles T. Bright.
T. Russell Crampton.
R. E. Crompton.
W. Crookes, F.R.S.
Warren De la Rue, D.C.L., F.R.S.
Professor G. C. Foster, F.R.S., Past President.
Edward Graves.
J. E. H. Gordon.
Dr. J. Hopkinson, F.R.S.
Professor D. E. Hughes, F.R.S., Vice-President.
W. H. Preece, F.R.S., Past President.
Alexander Siemens.
C. E. Spagnoletti, Vice-President.
James N. Shoolbred.
Augustus Stroh.
Sir William Thomson, F.R.S., Past President.
Lieut.-Colonel C. E. Webber, R.E., President.

These rules and regulations are drawn up not only for the guidance and instruction of those who have Electric Lighting Apparatus installed on their premises, but for the reduction to a minimum of those risks of fire which are inherent to every system of artificial illumination.

Over time, rules and regulations…

The road began with rules and regulations…

1st Edition
1882
4 Parts
4 Pages



Society of Telegraph-Engineers and Electricians.

RULES AND REGULATIONS

FOR THE PREVENTION OF FIRE RISKS ARISING FROM ELECTRIC LIGHTING.

Revised and Remodelled from the Rules issued by the Society in 1883, and from other sources of information, both home and foreign, and recommended by the Council in accordance with the Report of the Committee appointed by them to consider the subject.

MEMBERS OF THE COMMITTEE.

Professor W. G. Adams, F.R.S., *Past-President.*
Professor W. E. Ayrton, F.R.S., *Vice-President.*
Sir Charles T. Bright, *Past-President.*
E. B. Bright.
R. E. Crompton.
W. Crookes, F.R.S., *Vice-President.*
Dr. J. A. Fleming, M.A.
Professor G. Forbes, F.R.SS. (L. & E.).
Professor G. C. Foster, F.R.S., *Past-President.*
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Sir David Salomons, Bart, M.A.
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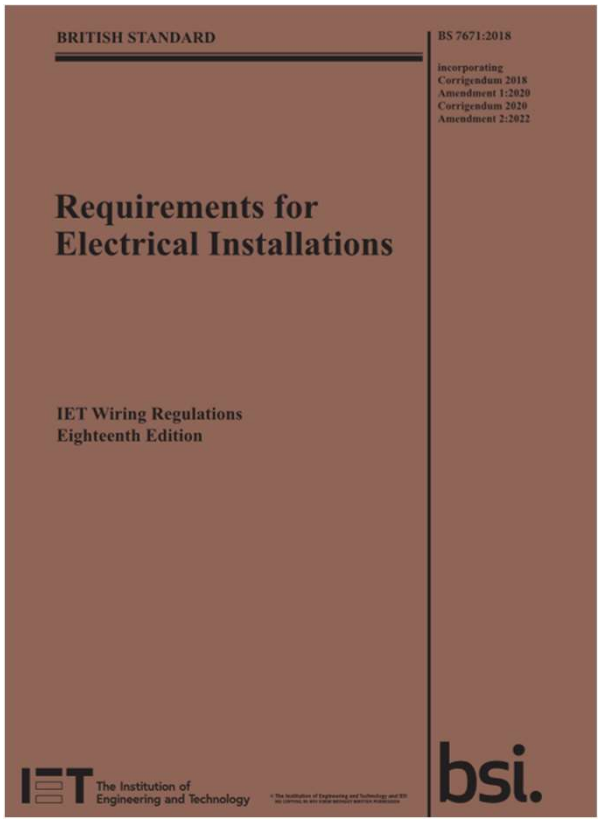
James N. Shoolbred. B.A.
Augustus Stroh.
Sir William Thomson, F.R.SS. (L. & E.), *Past-President.*
Major-Gen. C. E. Webber, C.B., (Ret.) R.E., *Past-President.*

These General Rules are drawn up with the object of reducing to a minimum, in the case of the electric light, those risks of fire which are inherent to every system of artificial illumination,

BS 7671:2018+A2
2022
8 Parts
608 Pages



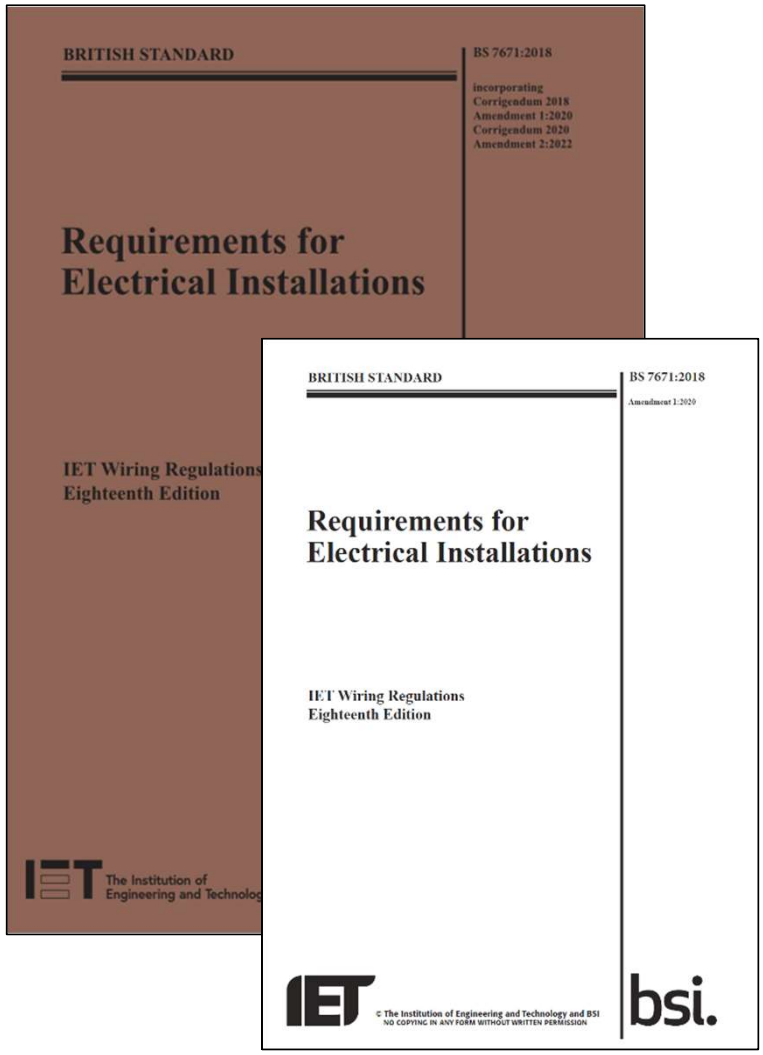
Released 28th March 2022

Can implement immediately.

but post 28th March 2023 installations expected to comply

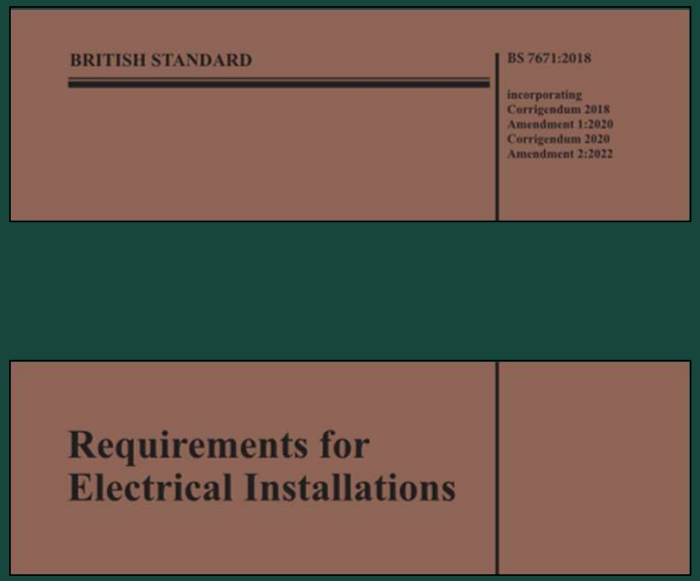
Support for BS 7671 +A1: 2020

Withdrawn 27th Sept 2022



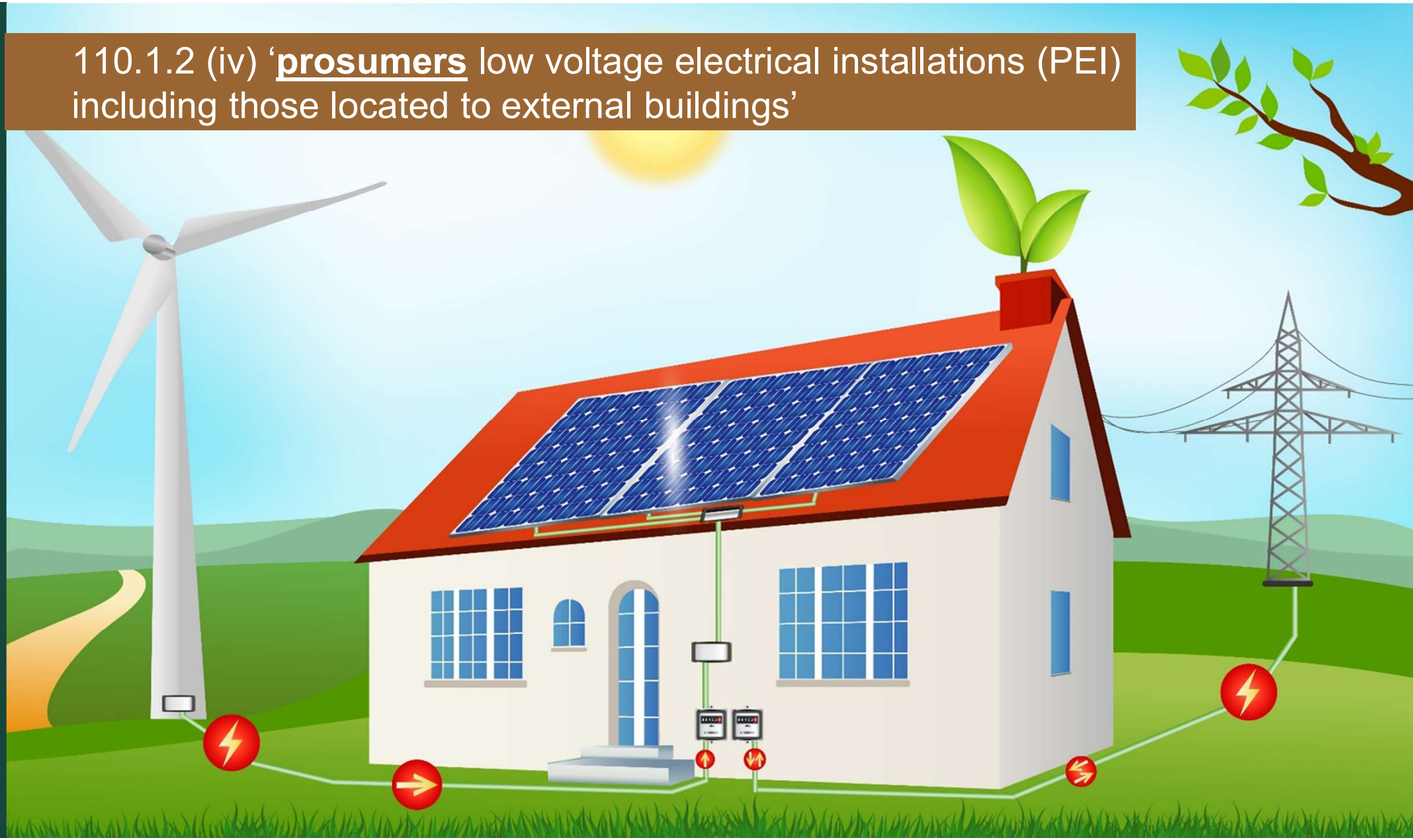
Some important changes…

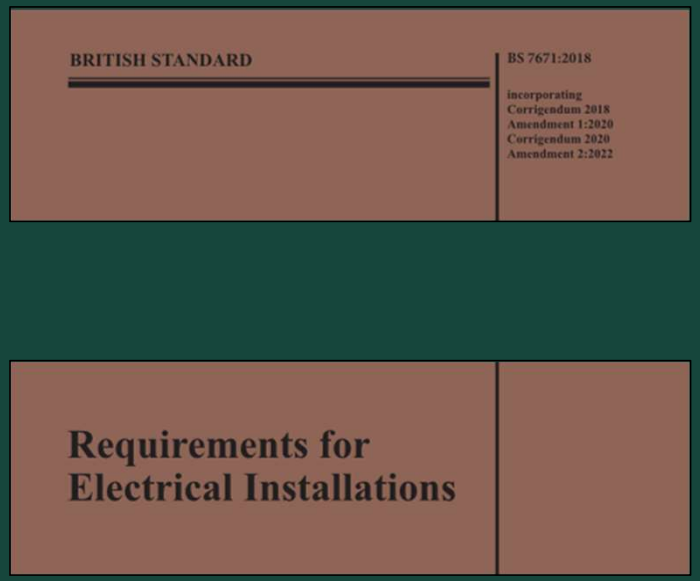
Verbal forms used in BS 7671		
Implication	**Requirement**	**Typical Context**
Requirement	Shall	Normative element
Recommendation	Should	Informative element
Permission	May	Informative element
Possibility and Capability	Can	Informative element
Possibility	Might	Informative element
Description	Is	Informative element
The content of this table is based on Rules for the structure and drafting of UK standards, second edition published April 2017, published by BSI Standards Ltd.		


BRITISH STANDARD
BS 7671:2018
incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 1

110.1.2 (iv) '**prosumers** low voltage electrical installations (PEI) including those located to external buildings'




BRITISH STANDARD
BS 7671:2018
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Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 2

Part 2: New Terms and Definitions

- Arc fault detection device (AFDD)
- Connected mode
- Direct feeding mode
- Direct lightning strike
- Indirect lightning stroke
- Efficiency measures (EM)
- Emergency switching off
- Electrical Energy Management System (EEMS)
- Generating set
- Island mode
- Load shedding
- Metering
- Open-circuit maximum voltage
- Operating mode
- Producer (of electricity)
- **Prosumers** Electrical Installations (PEI)
- Protected escape route
- Reverse feeding mode
- Rural Environment
- Suburban Environment
- Zdb (first time on certificates)

Prosumer

Island Mode

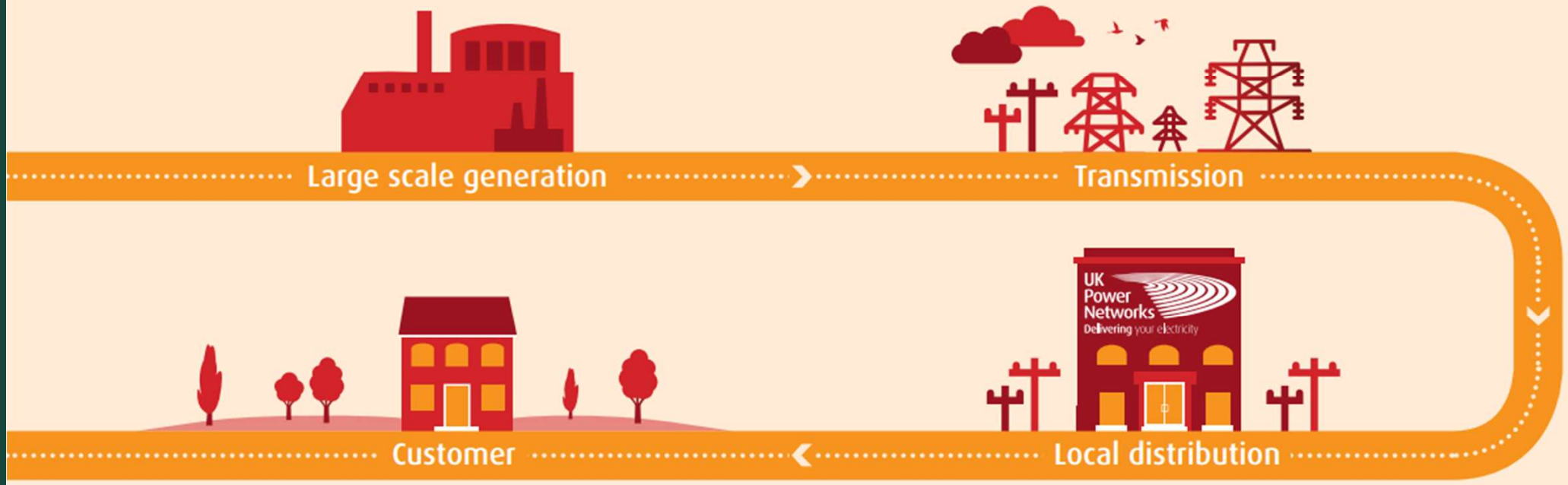
DSO

DNO / DSO

Distribution Network Operator / Distribution System Operator

DNO

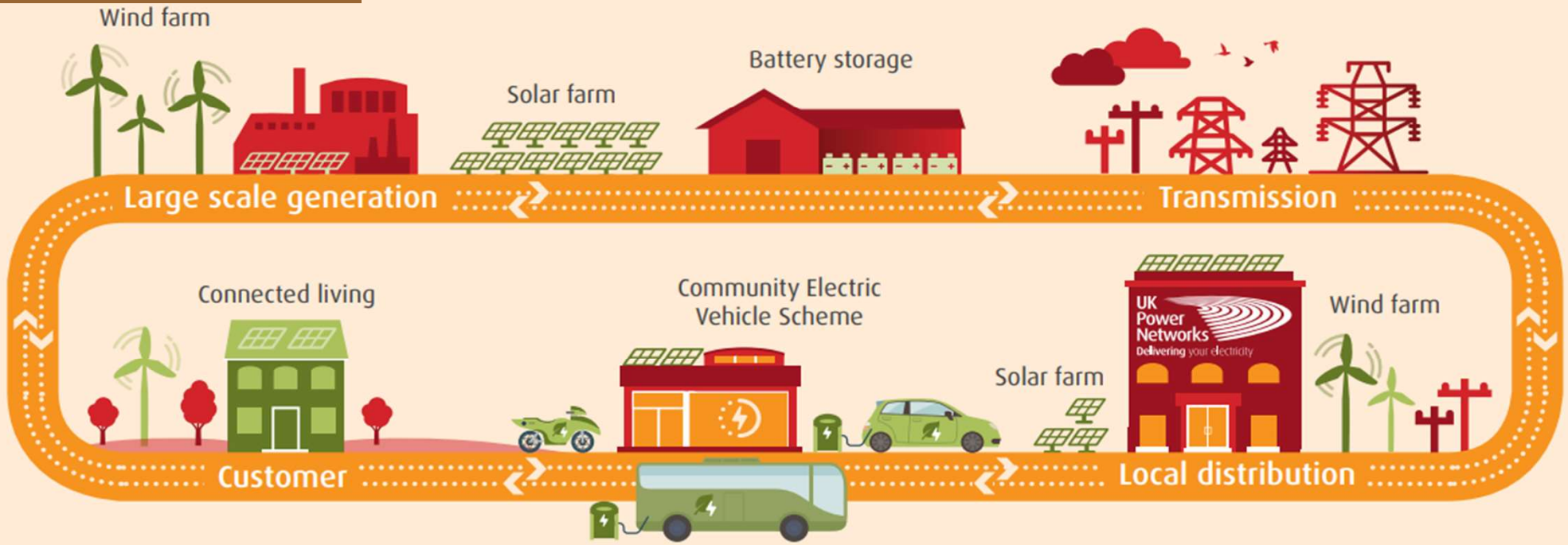
Old World



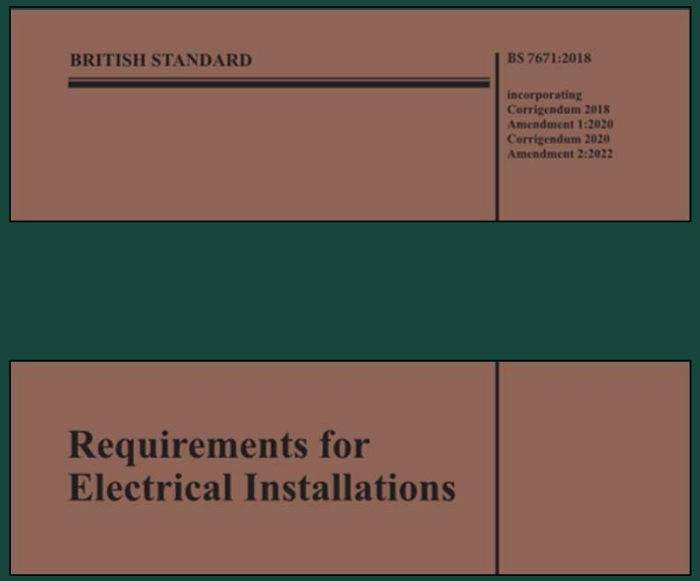
- Small number of large generators connected on the transmission network
- Coal-fired and gas power stations
- One-way power flows
- Limited customer engagement

DSO

New World



- Large number of generators connected on the distribution network, including behind-the-meter
- Two-way power flows
- Inclusion of renewables (such as, solar PV, wind turbines and biomass) and grid scale battery storage
- Proactive and active customer engagement


BRITISH STANDARD
BS 7671:2018
incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 4

411.1.2 Protective equipotential Bonding

411.1.2 Protective equipotential Bonding

In each consumer's installation within a building, extraneous-conductive-parts liable to introduce a dangerous potential difference shall be connected to the main earthing terminal by protective bonding conductors complying with Chapter 54. Examples of extraneous-conductive-parts may include:

i. metallic water installation pipes
ii. metallic gas installation pipes
iii. other metallic installation pipework and ducting
iv. central heating and air conditioning systems
v. exposed metallic structural parts of the building.

411.1.2 Protective equipotential Bonding

NOTE: Where non-metallic pipes (e.g. plastic) enter a building and are then connected to metallic pipes within the building, the metallic pipes within the building do not normally require protective bonding as they are unlikely to be extraneous-conductive-parts.

Where an incoming telecommunication cable has a metallic sheath, equipotential bonding shall be applied. However, the consent of the owner or operator of the cable shall be obtained. **Where consent is not granted, and as a consequence this requirement is not met, details shall be recorded in the description section of the appropriate electrical certification specified in Part 6.**

Careful consideration

411.3.3 Additional Requirements

In AC systems, additional protection by means of an RCD with a rated residual operating current not exceeding 30 mA shall be provided for:

(i) socket-outlets with a rated current not exceeding 32A in locations where they are liable to be used by persons of capability BA1, BA3 or children (BA2, BA3),
(ii) socket-outlets with a rated current not exceeding 32 A in other locations, and
(iii) mobile equipment with a rated current not exceeding 32 A for use outdoors.

B	BA	*Capability*
	BA1	Ordinary
	BA2	Children
	BA3	Disabled
	BA4	Instructed
	BA5	Skilled

411.3.3 Additional Requirements

An exception to (ii) but not (i) or (iii) is permitted where a suitably documented risk assessment undertaken with the involvement of a skilled person (electrically) determines that RCD protection is not necessary.

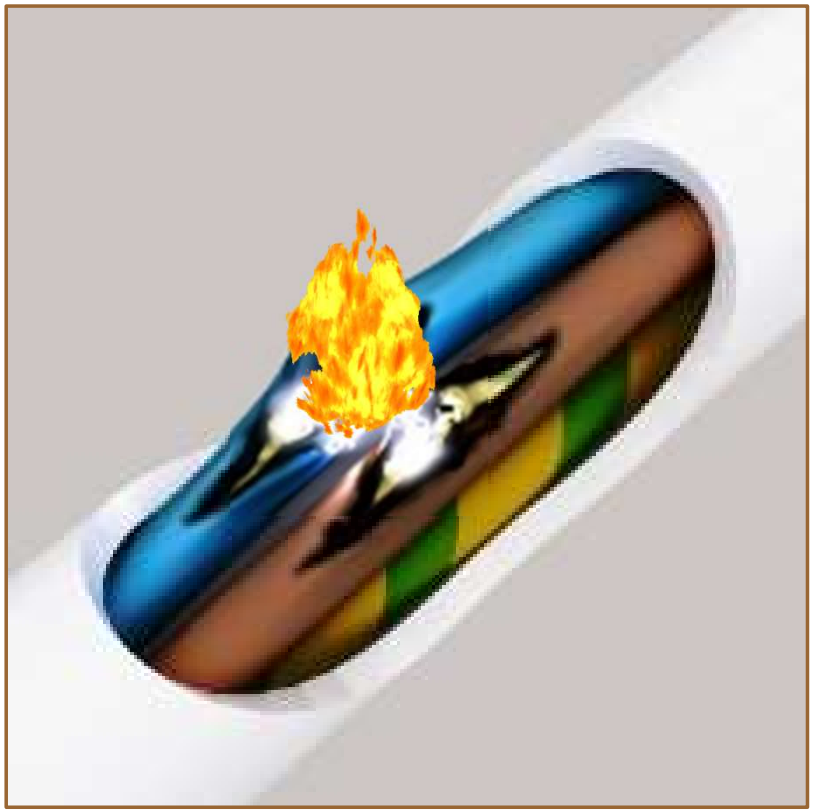
NOTE 1: For the purpose of this exception, an ordinary person (BA1) instructed in the use of the installation does not become an instructed person (electrically) or cease to be an ordinary person.

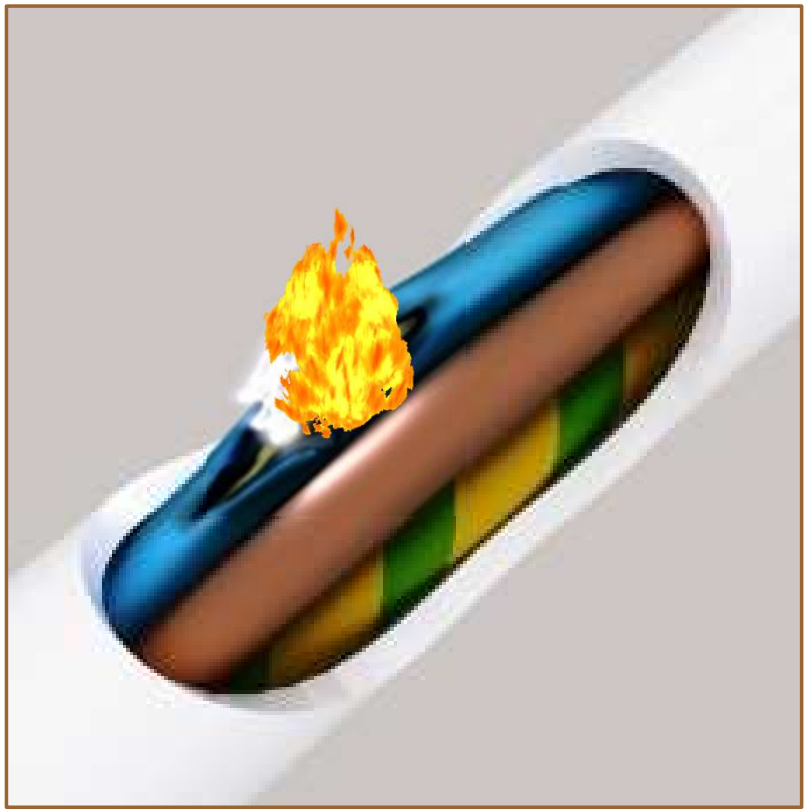
The documented risk assessment shall be provided with the appropriate electrical installation certificate

411.4.2 TN System

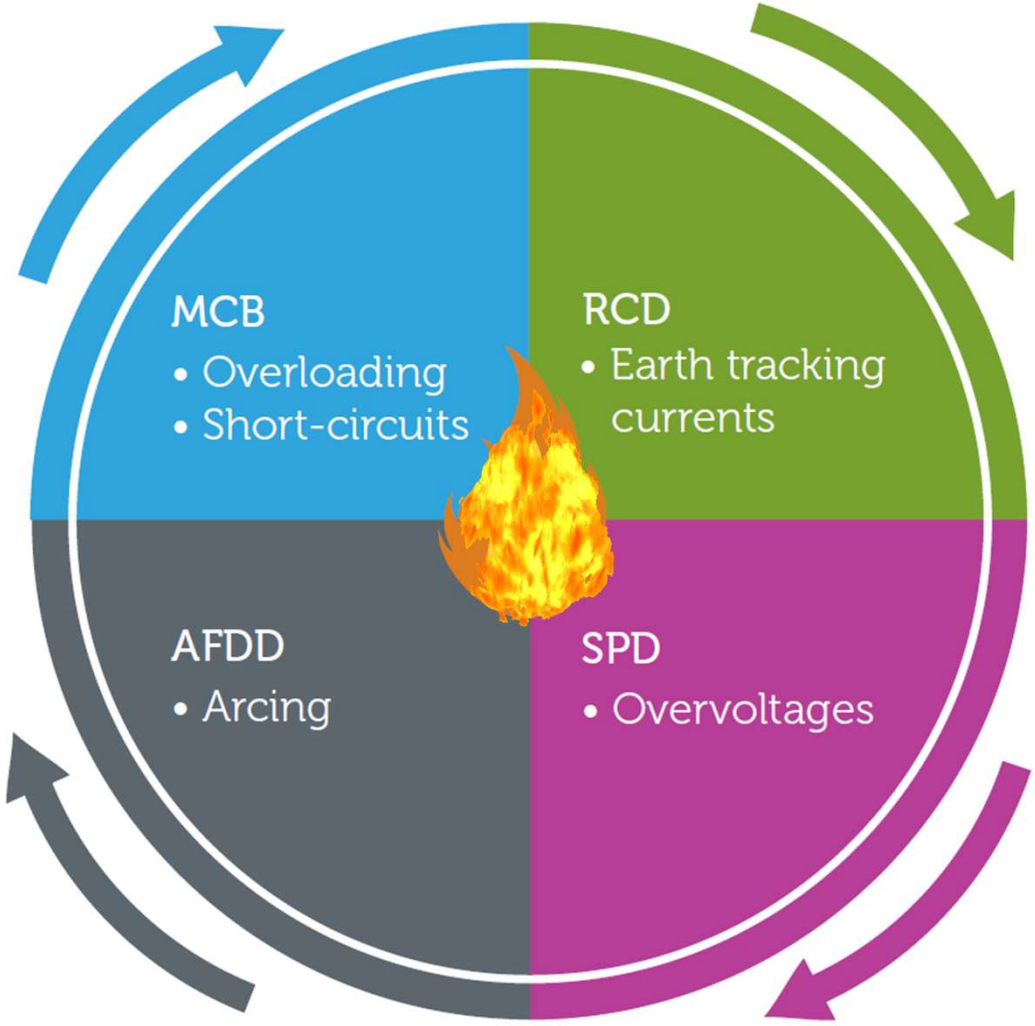
It is **recommended** that an additional connection to Earth, by means of an earth electrode in accordance with Chapter 54, is made to the main earthing terminal. This recommendation does not apply to outbuildings of dwellings served by the installation.

421.1.7 Protection against fire - AFDD





421.1.7 Protection against fire - AFDD



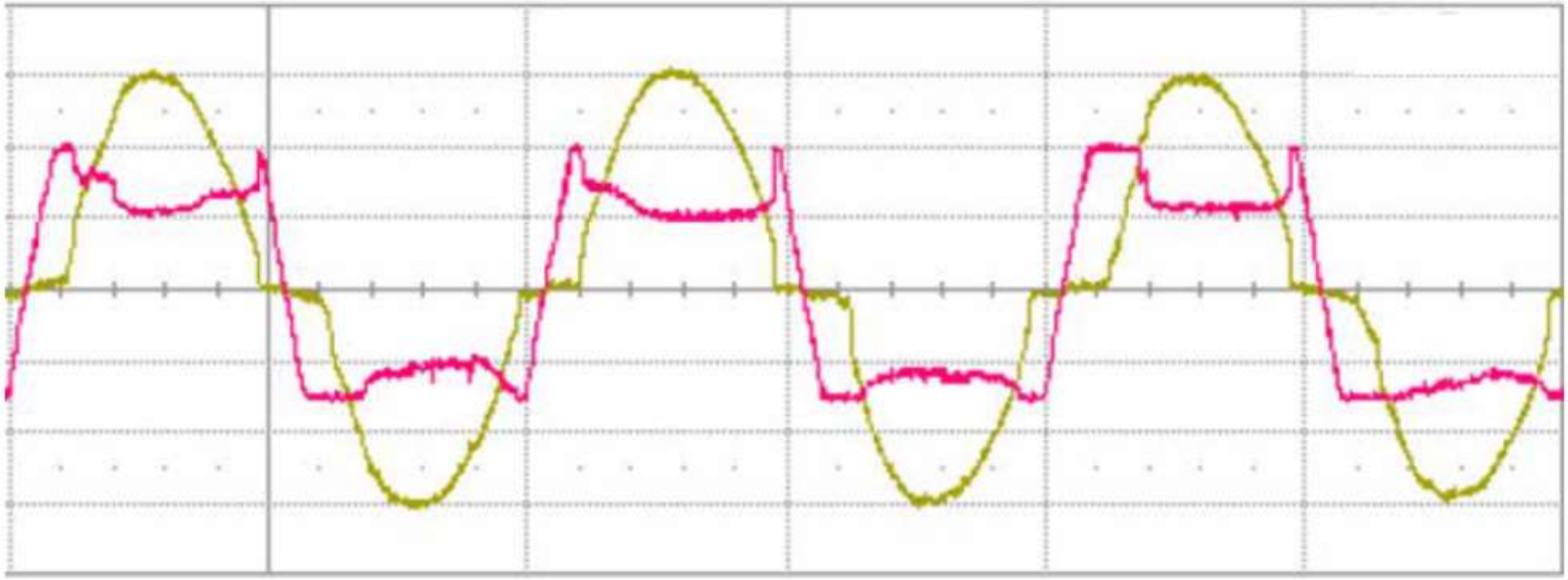


Figure 37 – Example of arc voltage and current waveform obtained with cable specimen

421.1.7 Protection against Fire - AFDD

421.1.7 Protection against Fire - AFDD

Arc fault detection devices (AFDD) conforming to BS EN 62606 shall be provided for single-phase AC final circuits supplying socket-outlets with a rated current not exceeding 32A in:

- Higher Risk Residential Buildings (HRRB)
- Houses in Multiple Occupation (HMO)
- Purpose-built student accommodation
- Care homes

NOTE 1: Higher Risk Residential Buildings are assumed to be residential buildings **over 18 m** in height or in excess of six storeys, whichever is met first. It is anticipated that in many areas higher risk residential buildings will be defined in legislation which can be subject to change over time, as well as in risk management procedures adopted by fire and rescue services. Current legislation should be applied.

421.1.7 Protection against ire - AFDD

For all other premises, the use of AFDDs conforming to BS EN 62606 is recommended for single-phase AC final circuits supplying socket-outlets not exceeding 32 A.

Where used, AFDDs shall be placed at the origin of the circuit to be protected. The use of AFDDs does not obviate the need to apply one or more measures provided in other clauses in BS 7671.

NOTE 2: For busbar systems conforming to BS EN 61439-6 and Powertrack systems to BS EN 61534, the AFDD may be placed at a location other than the origin of the circuit.

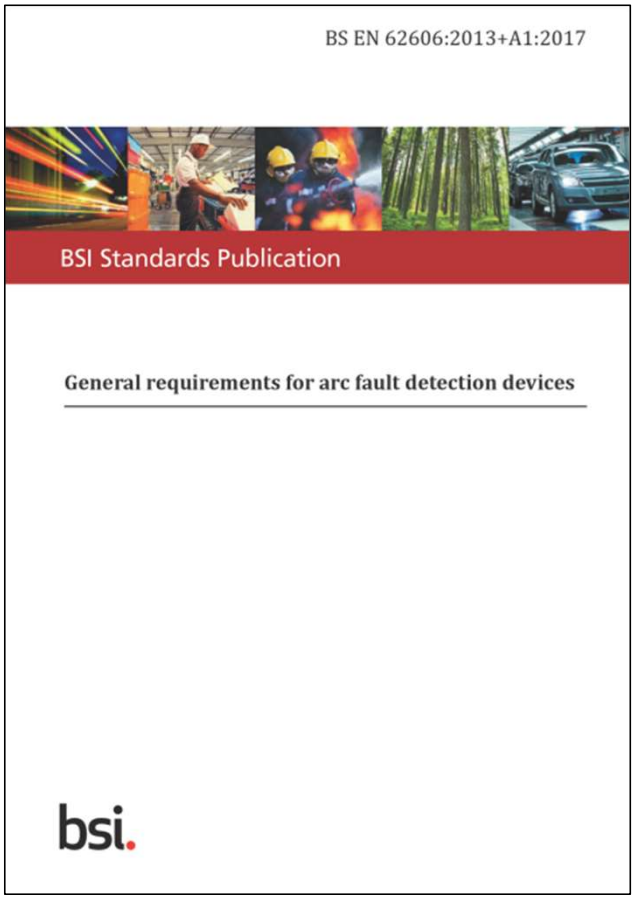
421.1.7 Protection against Fire - AFDD

5.3.7.1 Limit values of operating criteria for AFDDs at low arc currents up to 63 A

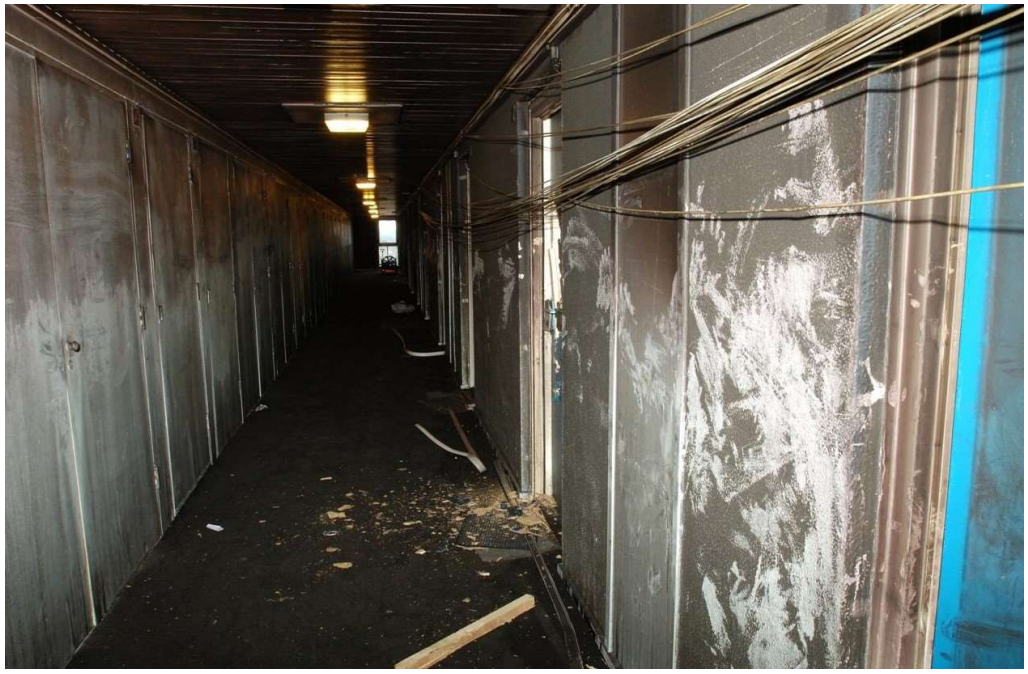
Table 1 – Limit values of break time for U_n = 230 V AFDDs

Test arc current (r.m.s. values)	2,5 A	5 A	10 A	16 A	32 A	63 A
Maximum break time	1 s	0,5 s	0,25 s	0,15 s	0,12s	0,12 s

Minimum Level of arc energy tested under product standard



422 Precautions where particular risk of fire exist



422 Precautions where particular risk of fire exist

422.1 General

For such locations the fire safety design of the building(s) should be documented. This information should be included in a fire safety manual produced by or for the person responsible for the building (the 'responsible person') as detailed in local and/or national fire safety legislation or guidance, including, for example BS 9999

422.1 General

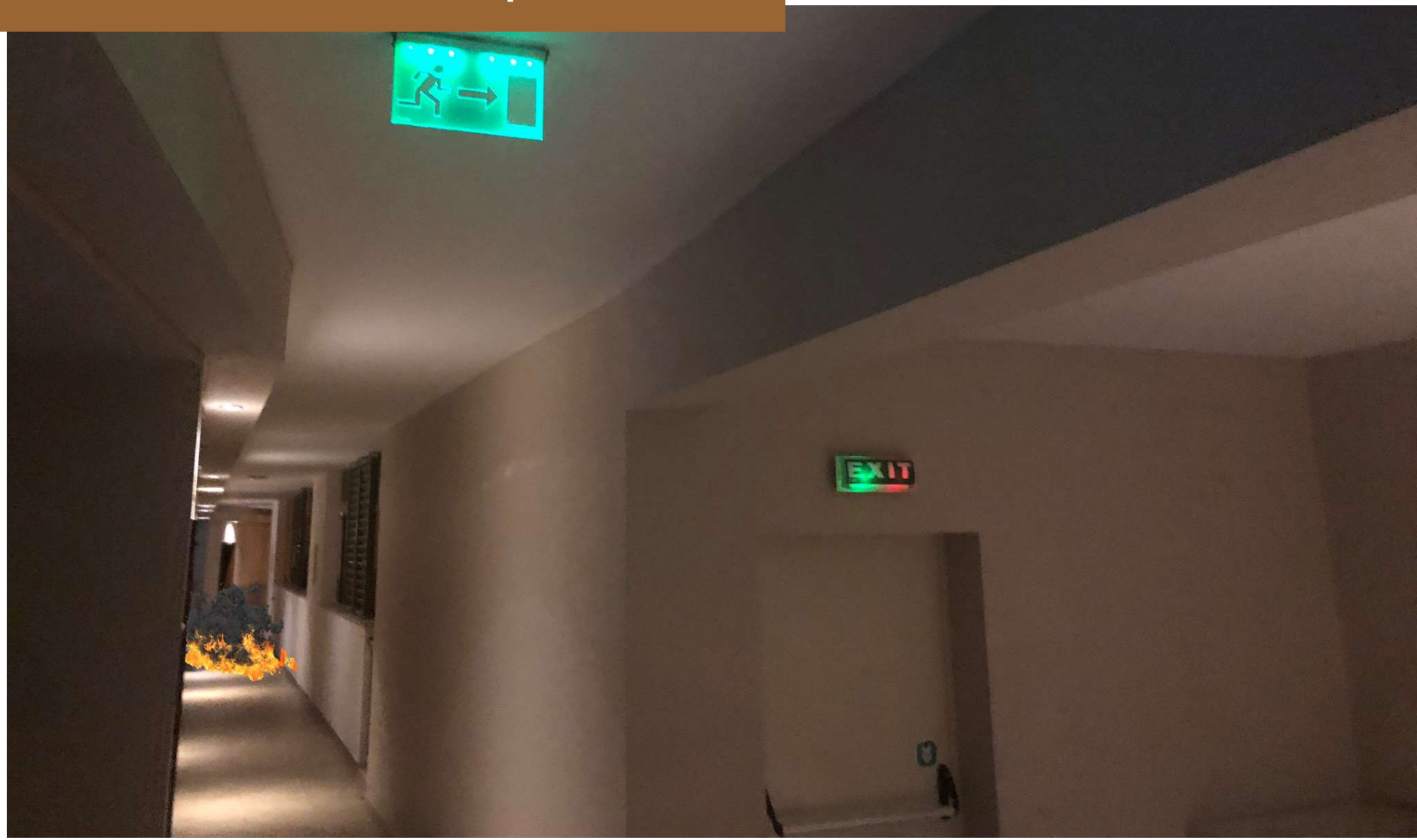
It is recommended that the electrical system designer/installer provides the person responsible for the building with details of the electrical system, setting out the basis of the design with respect to fire safety including routine maintenance requirements.

422.1 General

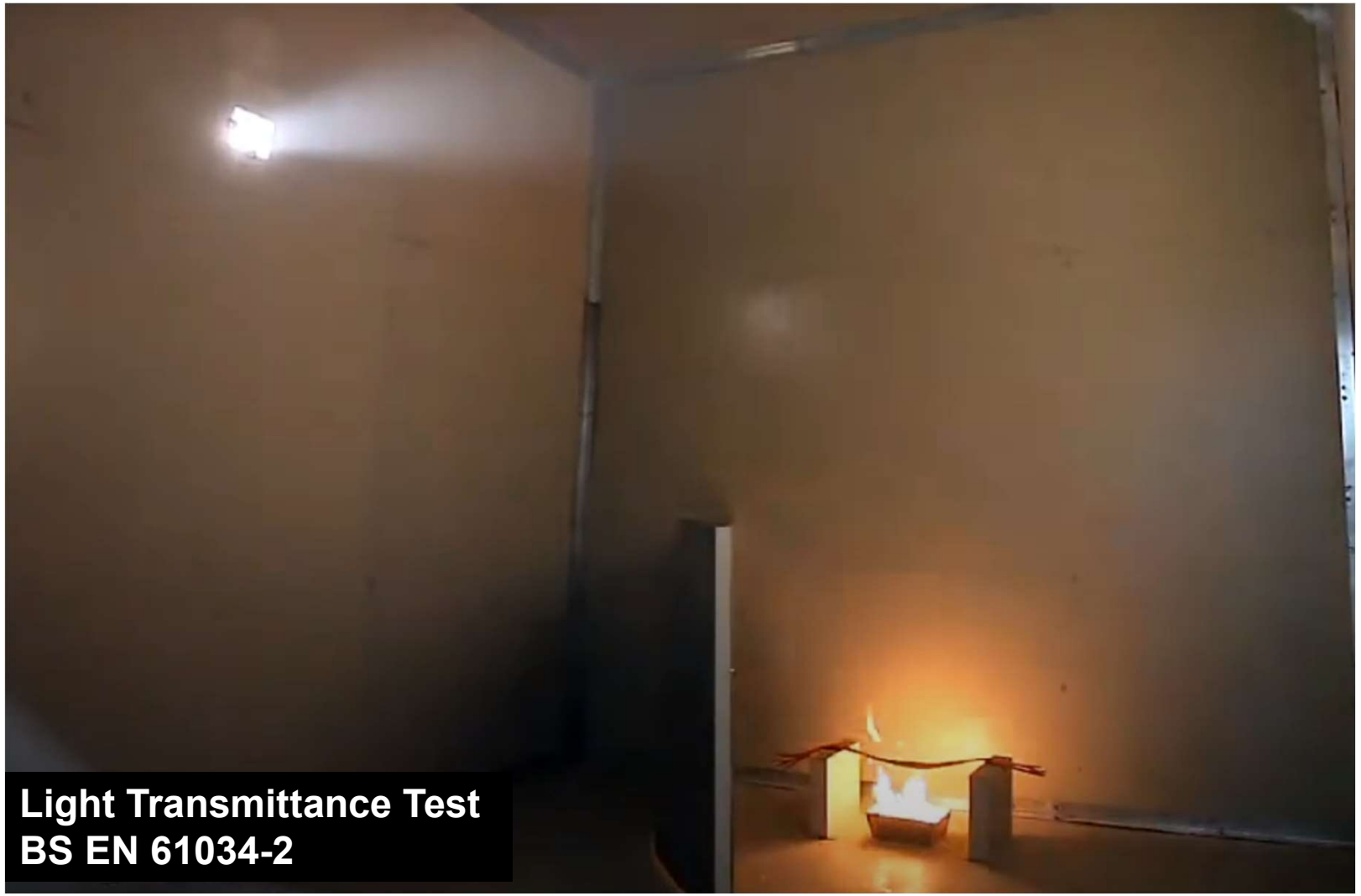
Where it is determined that cables should have an improved fire performance but are not covered by Regulations 422.2 to 422.6, this may be achieved by using cables with a minimum light transmittance of 60% when tested in accordance with BS EN 61034-2 and,

(i) limited flame propagation according to the minimum requirements of the relevant part of BS EN 60332-3 series or
(ii) where cable management systems according to 422.2.1 (iii) or (iv) are used, cables shall conform to the minimum requirements of BS EN 60332-1-2.

422.2 Protected escape routes



422.2.1 Protected escape routes

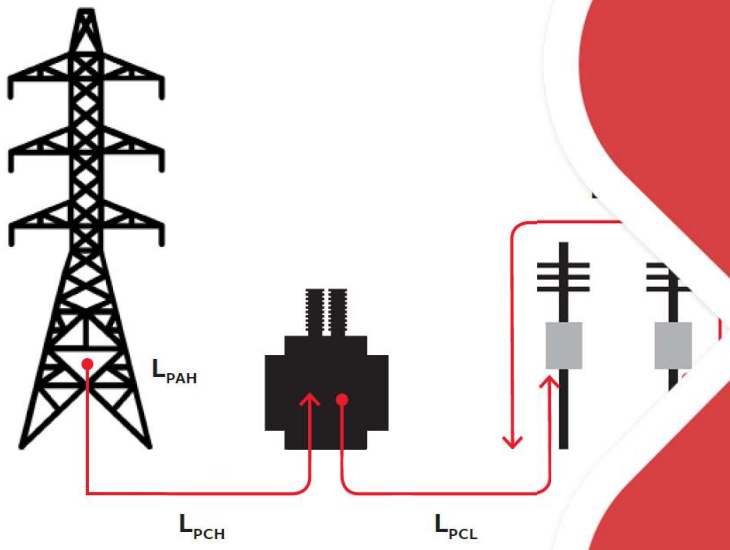


Light Transmittance Test
BS EN 61034-2

422.2.1 Protected escape routes

Light Transmittance Test
BS EN 61034-2

443.4.1 Overvoltage Control



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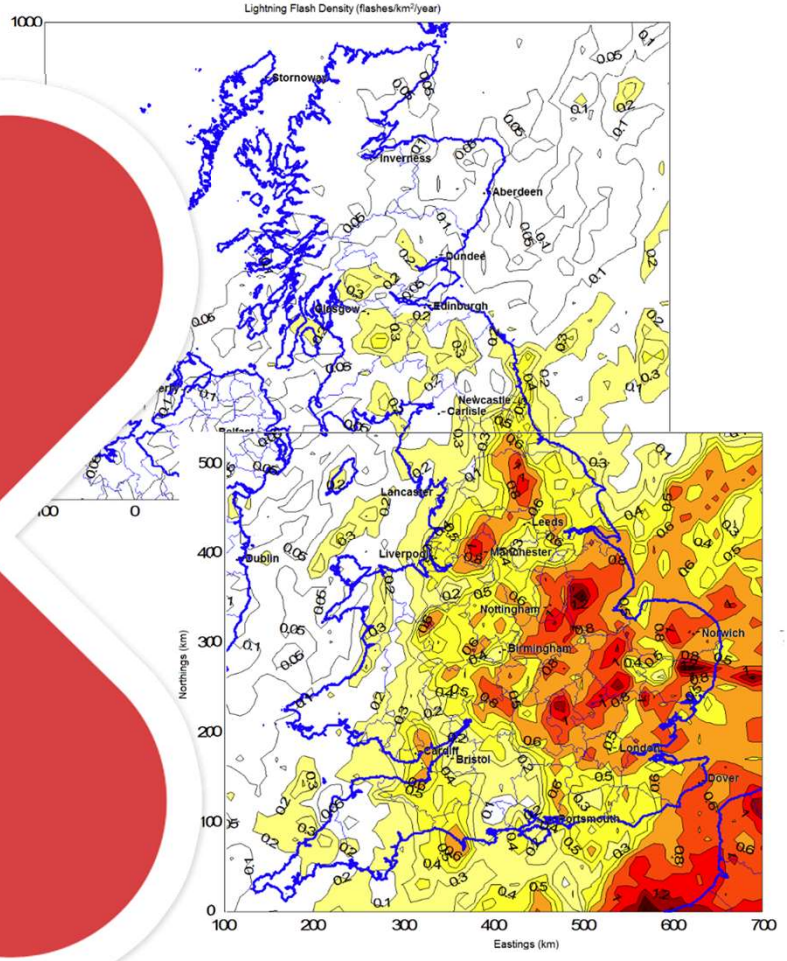


443.4.1 Overvoltage Control

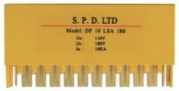
Protection against transient overvoltages shall be provided where the consequence caused by the overvoltage could result in:

(i) serious injury to, or loss of, human life
(ii) failure of a safety service, as defined in Part 2
(iii) significant financial or data loss.

For all other cases, protection against transient overvoltages shall be provided unless the owner of the installation declares it is not required due to any loss or damage being tolerable and they accept the risk of damage to equipment and any consequential loss.

Type 3
Overvoltage SPD

Terminal equipment

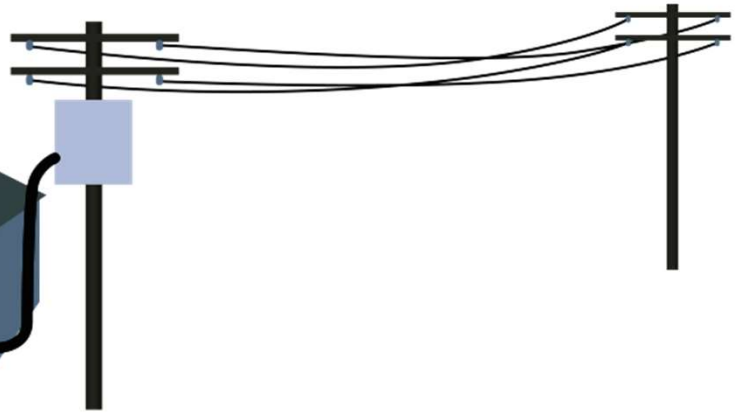


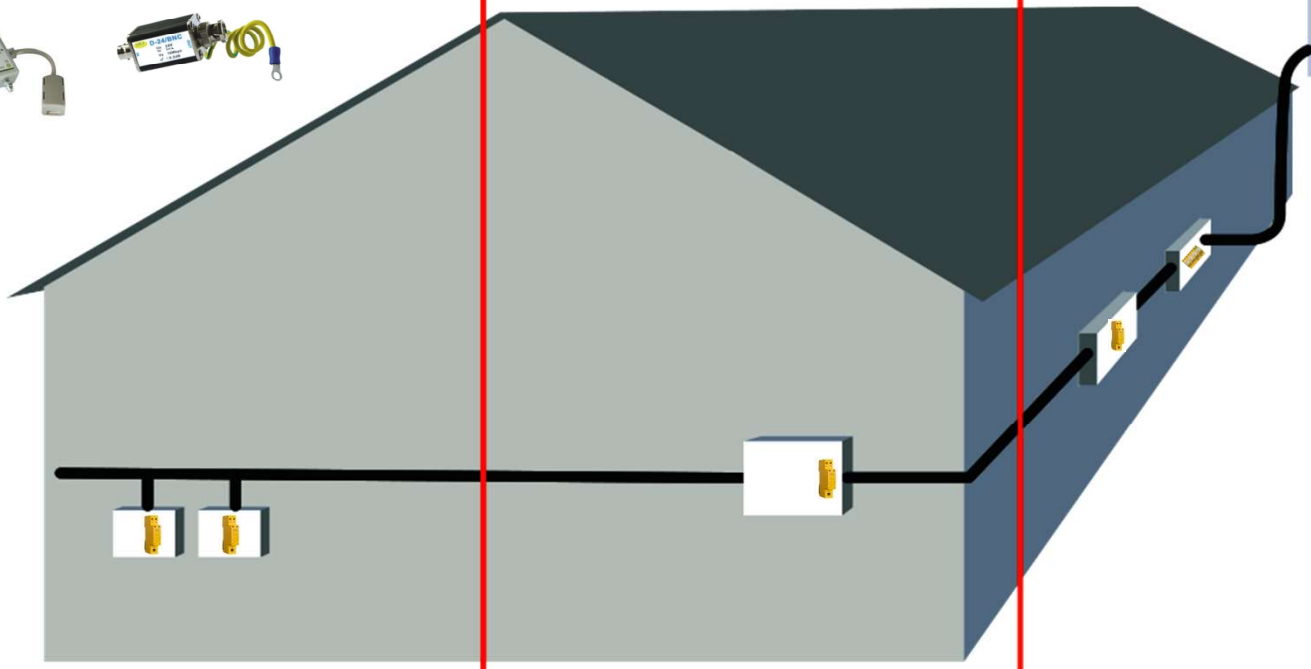
Type 2
Overvoltage SPD

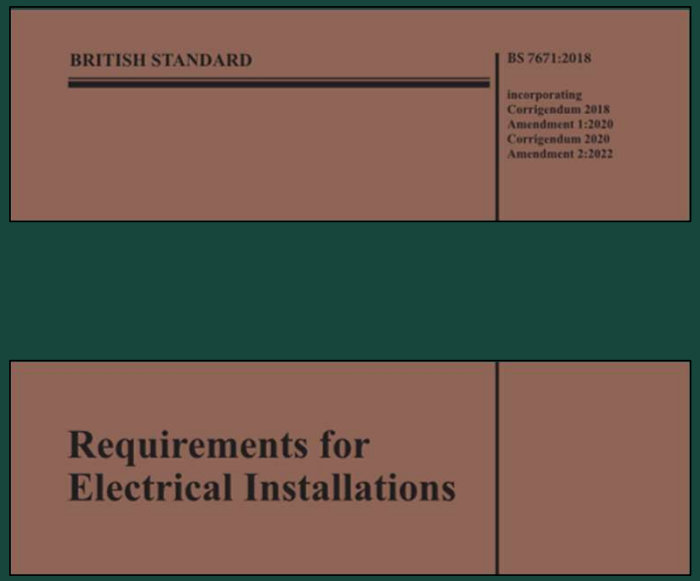
Distribution board or consumer unit

Type 1
Equipotential bonding or lightning protection/current SPD

Origin



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Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 5

514.14 Diagrams and documentation

531.3.2 Unwanted tripping

Residual current protective devices shall be selected and erected such as to limit the risk of unwanted tripping. The following shall be considered:

(i) subdivision of circuits with individual associated RCDs. RCDs shall be selected and the circuits subdivided in such a way that any earth leakage current likely to occur during normal operation of the connected load will not cause unwanted tripping of the device. See also *Section 314*

531.3.2 Unwanted tripping

Residual current protective devices shall be selected and erected such as to limit the risk of unwanted tripping. The following shall be considered:

(ii) the use of RCBOs for individual final circuits in domestic installations. See also Section 314.

531.3.3 Types of RCD

Different ‘types’ of protective RCD devices.

- Type AC – General AC circuits

- Type A – up to 6mA DC protection

- Type F – up to 10mA DC protection

- Type B – up to 10mA DC protection

531.3.3 Types of RCD

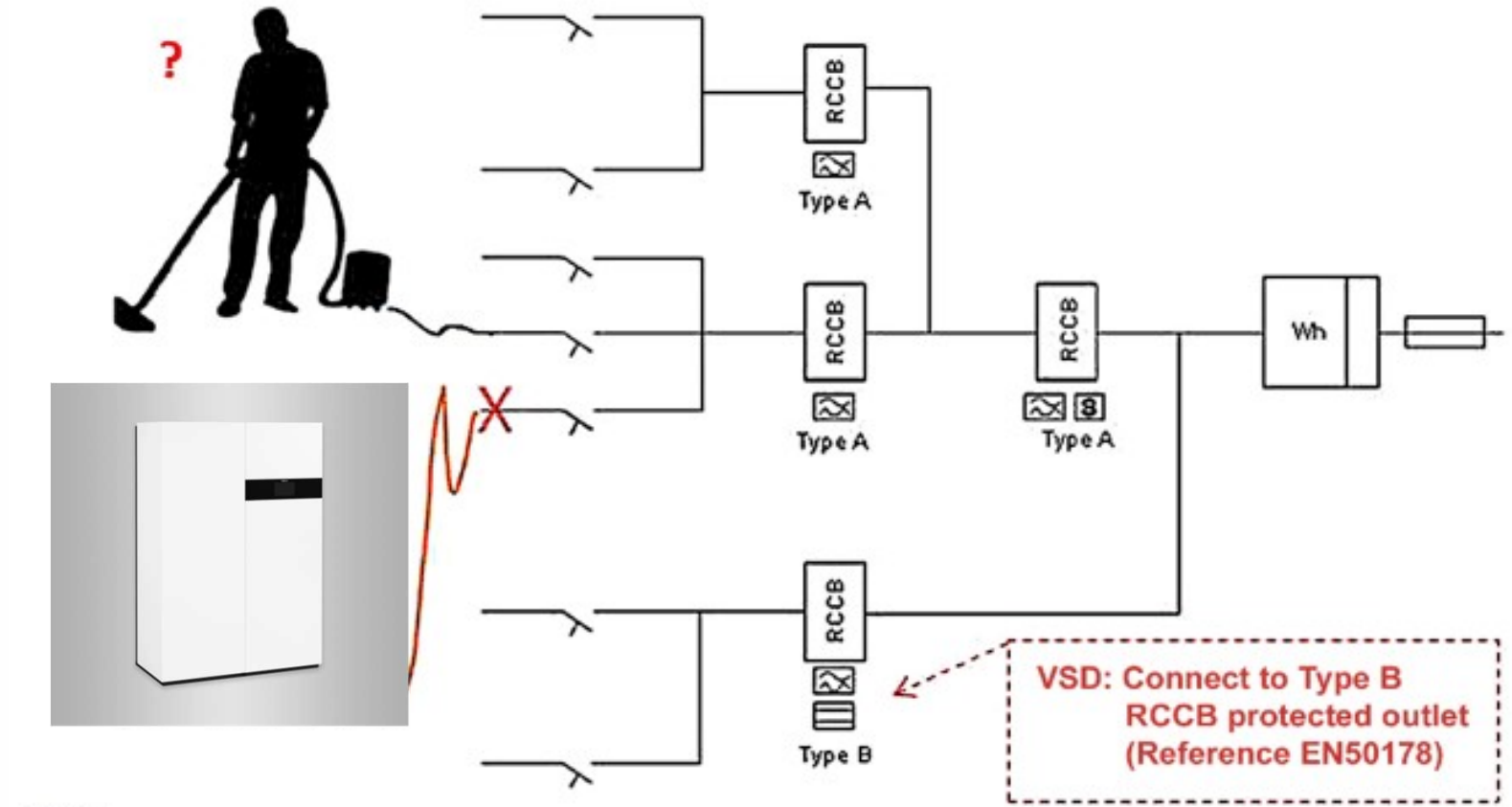


Fig 2

Type AC Banned

Austria
Belgium
Denmark
Germany
Switzerland

531.3.3 Types of RCD

RCD Type AC shall only be used to serve fixed equipment, where it is known that the load current contains **no** DC components.

NOTE 1: Examples of fixed equipment with a load current containing no DC components can include but not be limited to electric heating appliances and/or simple filament lighting, neither containing electronic components.

NOTE 2: For guidance on the correct use of RCDs for household and similar use, see PD IEC/TR 62350.

531.3.3 Types of RCD

Table 1
Approximate Leakage current calculation for domestic installations: (Source IEC/TR 62350)
Leakage current per circuit = Sum of the connected appliances x 0.75

Appliance (Connection 3 pin plug)	Leakage current (mA)
PC / Laptop	1 < 2
Printer	0.5 < 1
Mobile devices	0.5 < 0.75
Other appliances	< 3.5

How to design efficient earth fault protection www.se.com

How to select and install residual current devices

For continuity of service, RCD must withstand the leakage currents in the installation (continued)

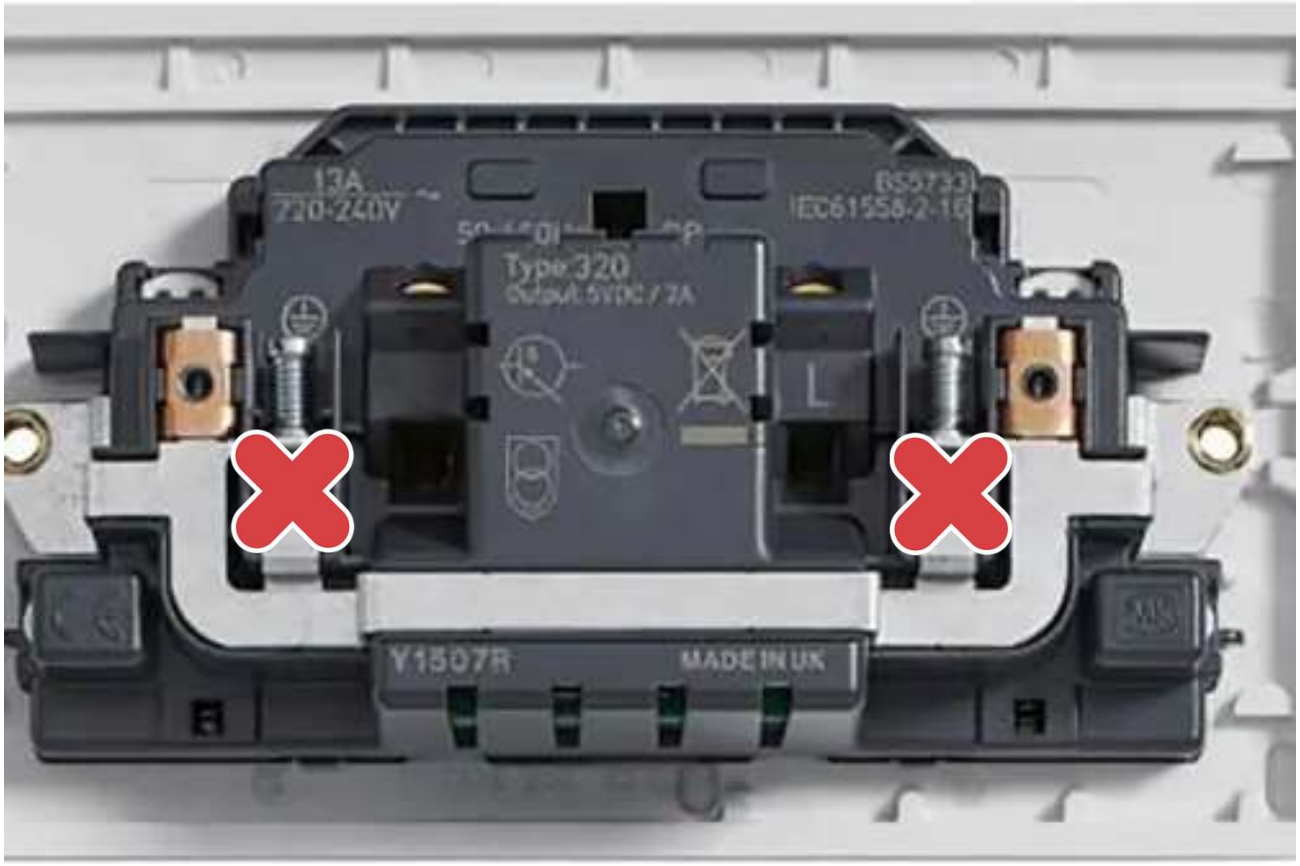
Type of load	Standard	Allowed leakage current	Maximum leakage current
Fixed PC, workstation	Estimated (230 V/50 Hz)		2 mA
Portable computer	IEC 60335-1		0.5 mA (with EMC filter)
Printer	Estimated (230 V/50 Hz)		1 mA
Photocopier	Estimated (230 V/50 Hz)		1.5 mA
Heating floor	IEC 60335-1	0.75 mA or 0.75 mA/kW of rated power, whichever is the higher	5 mA
Dishwasher (fixed class 1)	IEC 60335-2-5	3.5 mA or 1 mA/kW of rated power, whichever is the higher	5 mA
Cooking ranges hobs, ovens and equivalent fixed appliances	IEC 60335-2-6	1 mA or 1 mA/kW of rated power, whichever is the higher	10 mA
Washing machines (fixed class 1)	IEC 60335-2-7	3.5 mA or 1 mA/kW of rated power, whichever is the higher	5 mA
Drum tumble-dryer (fixed class 1)	IEC 60335-2-11	3.5 mA or 1 mA/kW of rated power, whichever is the higher	5 mA
Grills toasters and similar portable cooking appliances	IEC 60335-2-9		■ 0.75 mA (earthed metal) ■ 0.25 mA (no earthed metal)
Pads	IEC 60335-2-17		0.5 mA
Blankets and mattresses		1 mA/m² of the heated area	2.5 mA
Refrigerating appliances, ice cream appliances and ice makers	IEC 60335-2-24		■ 0.75 mA (class 0I appliances) ■ 1.5 mA (class I appliances)
Massage fixed class 1 appliances	IEC 60335-2-32		0.75 mA
Instantaneous class I water heaters	IEC 60335-2-35		0.25 mA
Class 1 electric cookers, ovens, hobs and hot plates for collective use	IEC 60335-2-36	1 mA/kW of rated power	■ 10 mA (with a power supply cord and power socket-outlet) ■ No maximum (for other)
Class 1 electric griddles for collective use	IEC 60335-2-38		
Class 1 electric fryer for collective	IEC 60335-2-39		

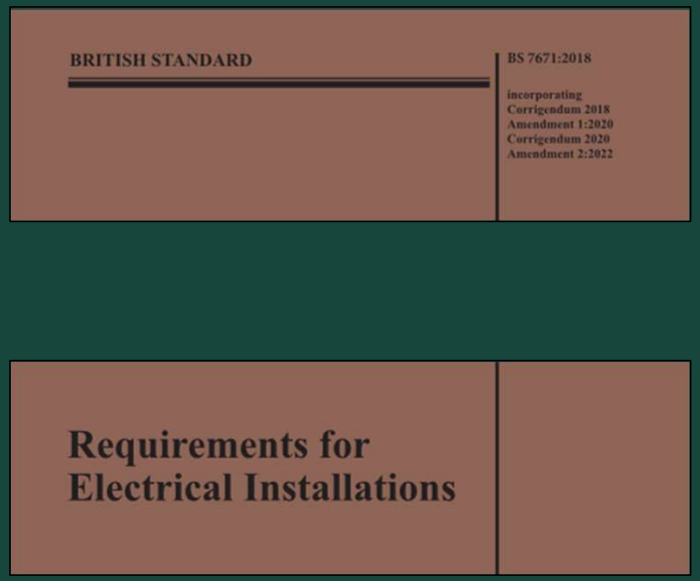
PUBLISHED DOCUMENT

PD IEC/TR 62350:2006

Guidance for the correct use of residual current-operated protective devices (RCDs) for household and similar use

53[illegible].204 Earthing arrangements




BRITISH STANDARD
BS 7671:2018
incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 6

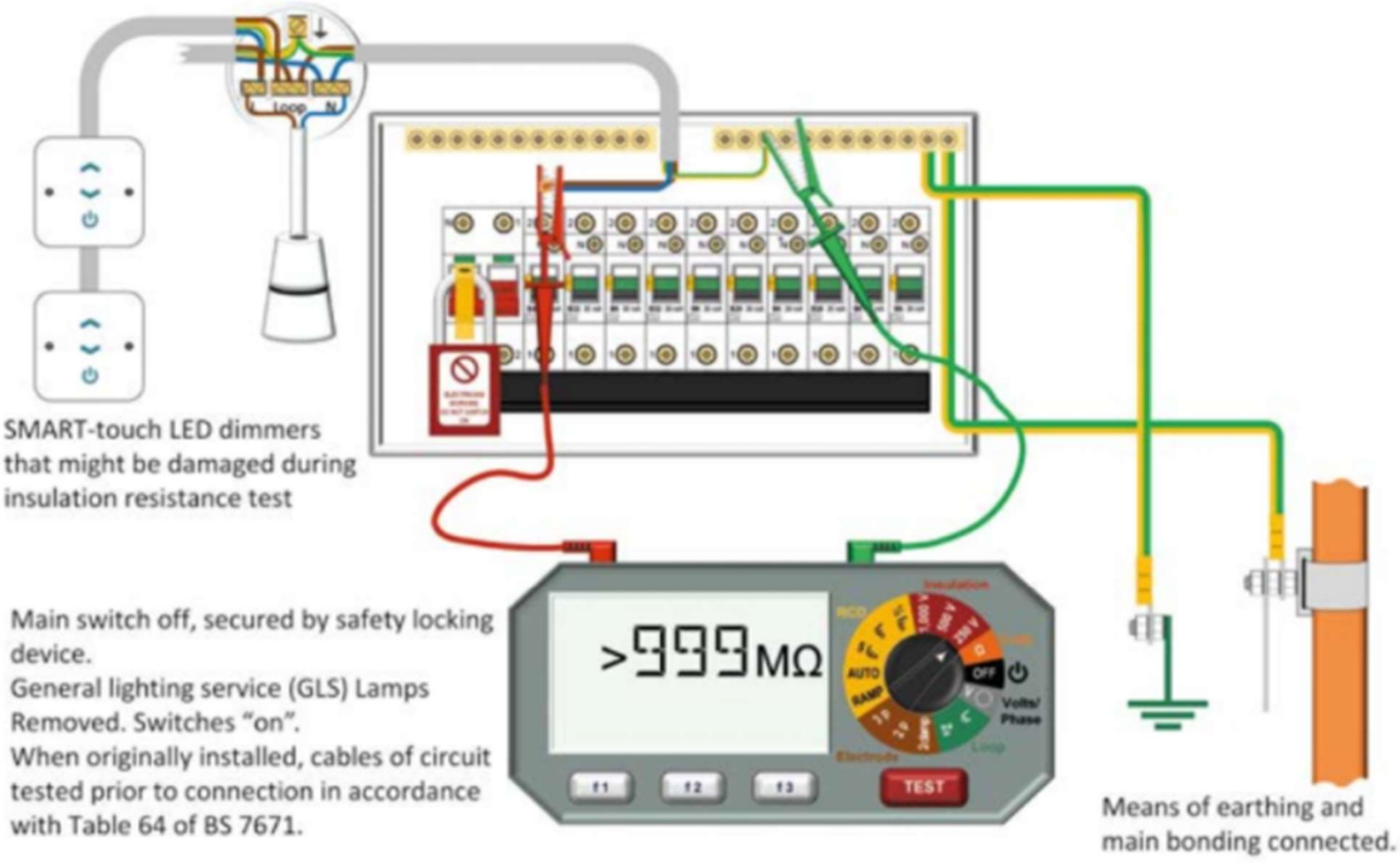
643.1.1 Insulation resistance testing

The insulation resistance shall be measured between:

(i) live conductors, and

(ii) live conductors and the protective conductor connected to the earthing arrangement. During this measurement, line and neutral conductors may be connected together.

643.3.3 Insulation resistance testing



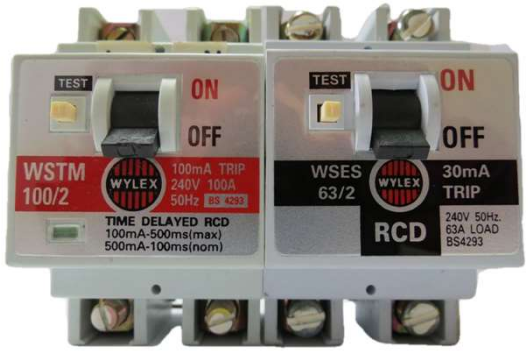
643.3.3 Insulation resistance testing

Where connected equipment is likely to influence the measurement or result of the test, or be damaged, the test shall be applied prior to the connection of such equipment, in accordance with Table 64.

Following connection of the equipment, a test at 250V DC shall be applied between live conductors and the protective conductor connected to the earthing arrangement. The insulation resistance shall have a value of at least 1 MΩ.

NOTE: Manufacturer's instructions may recommend some equipment to be disconnected during 250 V DC insulation resistance tests as it may influence the results of the test.

643.8 Additional protection (RCD)



643.8 Additional protection (RCD)

FIRST WIRING RULES

Society of Telegraph Engineers and of Electricians

RULES and REGULATIONS for the prevention of Fire Risks arising from Electric Lighting, recommended by the Council in accordance with the Report of the Committee appointed by them on **May 11, 1882,** to consider the subject.

MEMBERS OF THE COMMITTEE

Professor W. G. Adams, F.R.S., Vice-President.	Professor D. E. Hughes, F.R.S., Vice-President.
Sir Charles T. Bright.	W. H. Preece, F.R.S., Past President.
T. Russell Crampton.	Alexander Siemens.
R. E. Crompton.	C. E. Spagnoletti, Vice-President.
W. Crookes, F.R.S.	James N. Shoolbred.
Warren De la Rue, D.C.L., F.R.S.	Augustus Stroh.
Professor G. C. Foster, F.R.S., Past President.	Sir William Thomson, F.R.S., Past President.
Edward Graves.	Lieut.-Colonel C. E. Webber, R.E., President.
J. E. H. Gordon.	
Dr. J. Hopkinson, F.R.S.	

These rules and regulations are drawn up not only for the guidance and instruction of those who have Electric Lighting Apparatus installed on their premises, but for the reduction to a minimum of those risks of fire which are inherent to every system of artificial illumination.

The chief dangers of every new application of electricity arise mainly from ignorance and inexperience on the part of those who supply and fit up the requisite plant.

The difficulties that beset the electrical engineer are chiefly internal and invisible, and they can only be effectually guarded against by "testing" or probing with electric currents. They depend chiefly on leakage, undue resistance in the conductor, and bad joints, which lead to waste of energy and the production of heat. These defects can only be detected by measuring, by means of special apparatus, the currents that are either ordinarily or for the purpose of testing, passed through the circuit. Bare or exposed conductors should always be within visual inspection, since the accidental falling on to, or the thoughtless placing of other conducting bodies upon such conductors might lead to "short circuiting" or the sudden generation of heat due to a powerful current of electricity in conductors too small to carry it.

It cannot be too strongly urged that amongst the chief enemies to be guarded against are the presence of moisture and the use of "earth" as part of the circuit. Moisture leads to loss of current and to the destruction of the conductor by electrolytic corrosion, and the injudicious use of "earth" as a part of the circuit tends to magnify every other source of difficulty and danger.

The chief element of safety is the employment of skilled and experienced electricians to supervise the work.

N.B.—The value of frequently testing the wires cannot be too strongly urged. It is an operation, skill in which is easily acquired and applied. The escape of electricity cannot be detected by the sense of smell as can gas, but it can be detected by apparatus far more certain and delicate. Leakage not only means waste, but in the presence of moisture it means destruction of the conductor and its insulating covering, by electric action.

No. 842—1939.

British Standards Institution

Incorporated by Royal Charter.

FORMED IN 1901 AS THE ENGINEERING STANDARDS COMMITTEE.
INCORPORATED IN 1918 AS THE BRITISH ENGINEERING STANDARDS ASSOCIATION.

BRITISH STANDARD

SPECIFICATION

FOR

VOLTAGE-OPERATED EARTH-LEAKAGE CIRCUIT-BREAKERS

FOR USE ON CONSUMERS' PREMISES.

This Specification, having been approved by the Electrical Industry Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council as a British Standard on 19th June, 1939.

LONDON:
PUBLISHED BY THE BRITISH STANDARDS INSTITUTION,
PUBLICATIONS DEPARTMENT,
28, VICTORIA STREET, LONDON, S.W.1.
Telegrams: Standards, Sowest, London. *Telephone:* Abbey 3333.

June, 1939.

BS EN 61008-1:2012+A12:2017

Incorporating corrigenda January 2014 and May 2016

BSI Standards Publication

Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)

Part 1: General rules (IEC 61008-1:2010, modified)

bsi.

BS IEC 62955:2018

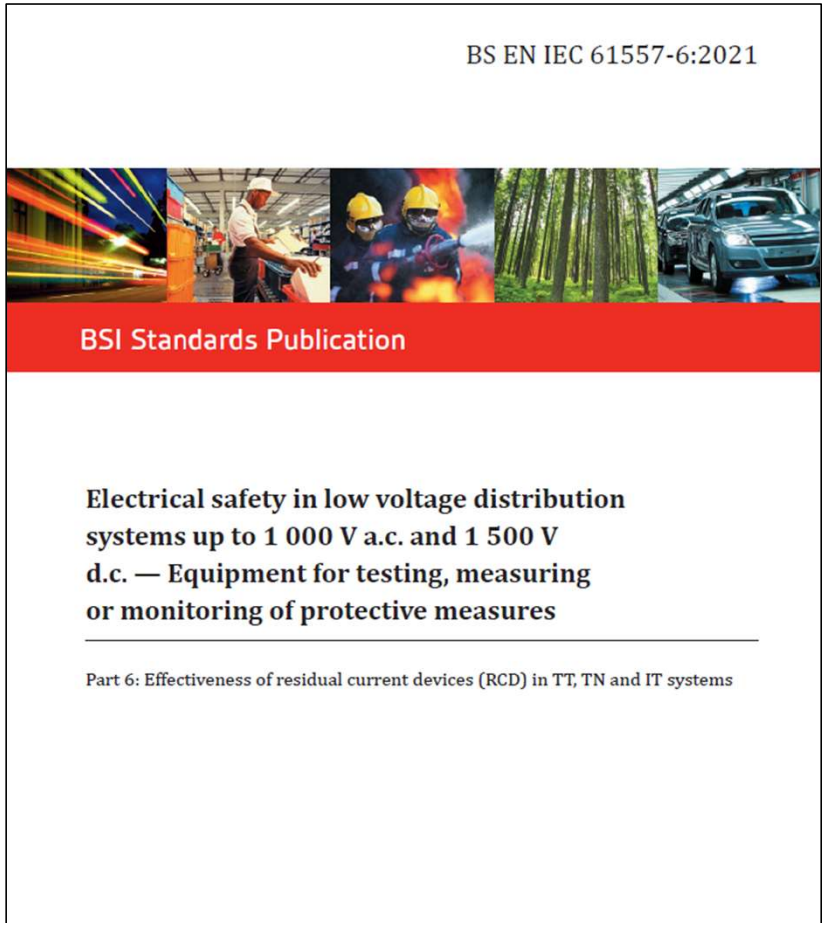
BSI Standards Publication

Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles

bsi.

643.8 Additional protection (RCD)

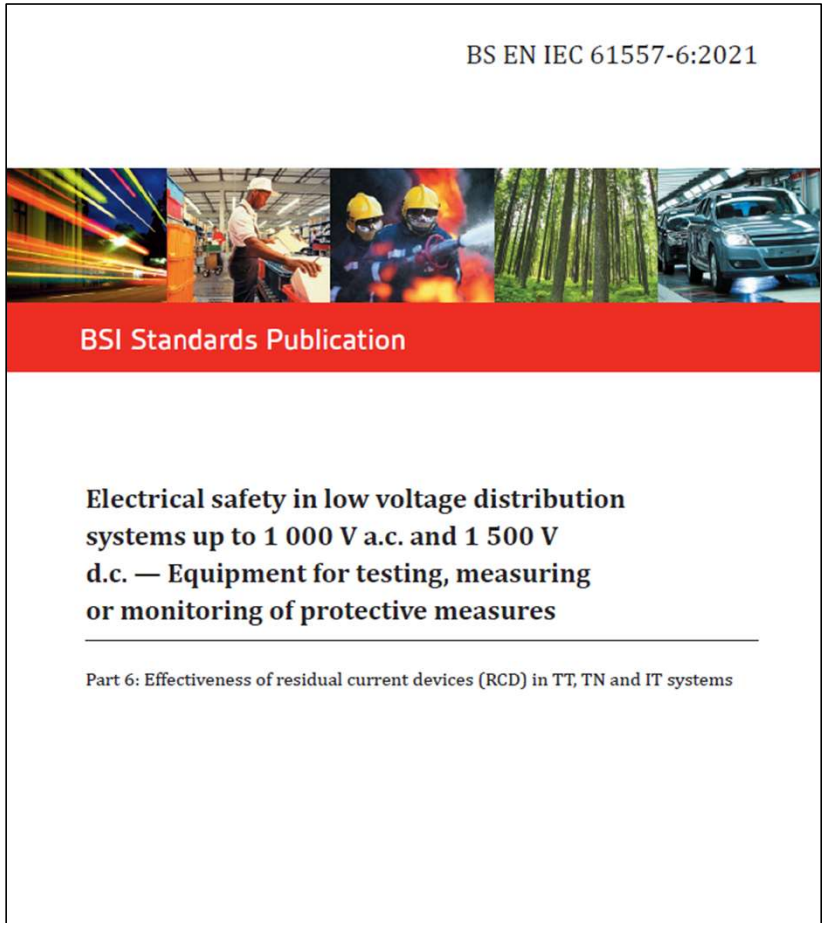
The effectiveness of automatic disconnection of supply by RCDs shall be verified using suitable test equipment according to BS EN 61557-6 to confirm the relevant requirements of Chapter 41 are met, taking into account the operating characteristic of the device.



643.8 Additional protection (RCD)

NOTE: Regardless of RCD Type, effectiveness is deemed to have been verified where an RCD disconnects within the time stated below with an alternating current test at rated residual operating current (IΔn):

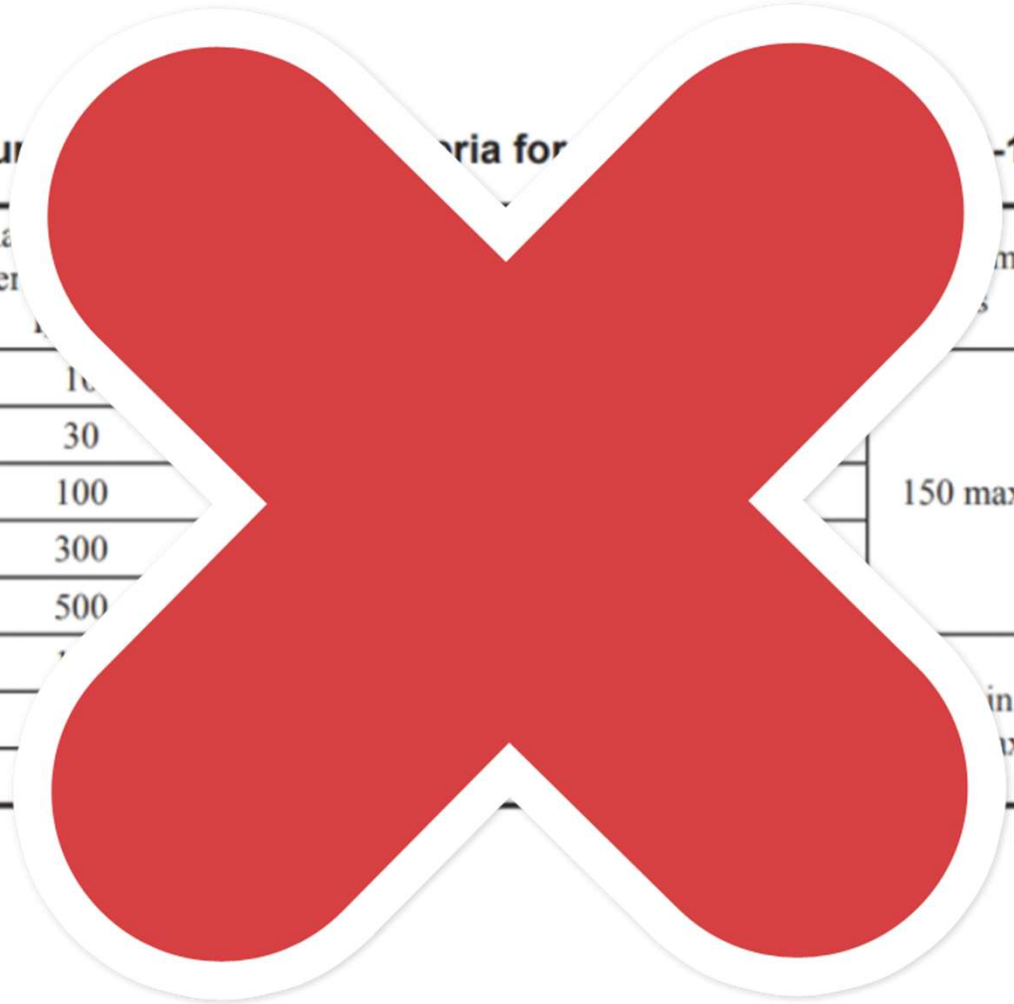
- For general non-delay type, 300ms maximum.
- *For delay 'S' type RCD, between 130 ms minimum and 500 ms maximum.*



RCD Trip times from Appendix 3

TABLE 3A – Time/cu ria for -1 and BS EN 61009-1

RCD type	Ra oper	me	Residual current mA	Trip time ms
General Non-delay	1	150 max.	50	40 max.
	30		150	
	100		500	
	300		1500	
	500		2500	
Delay 'S'		in. ax.	500	40 min. 150 max.
			1500	
			2500	



Type A testing issue

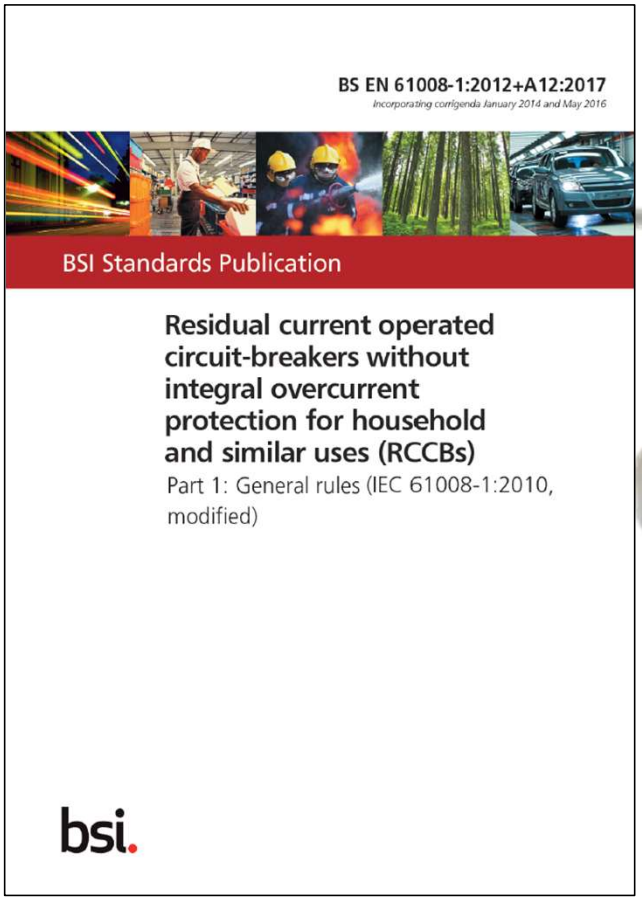
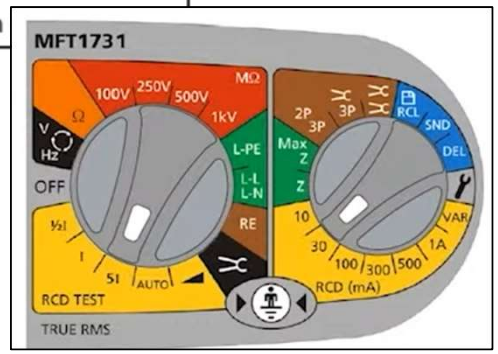


Table 1 – Limit values of break time and non-actuating time for alternating residual currents (r.m.s. values) for type AC and A RCCB

Type	I_n A	$I_{\Delta n}$ A	Limit values of break time and non-actuating time (s) for type AC and A RCCB in event of alternating residual currents (r.m.s. values) equal to: $I_{\Delta n}$	2 $I_{\Delta n}$	5 $I_{\Delta n}$	5 $I_{\Delta n}$ or 0,25 A[a]	5 A - 200 A[b]	500 A	
General	Any	< 0,03	0,3	0,15		0,04	0,04	0,04	Maximum break times
		0,03	0,3	0,15		0,04	0,04	0,04	
		> 0,03	0,3	0,15	0,04		0,04	0,04	
S	≥ 25	> 0,03	0,5	0,2	0,15		0,15	0,15	
		> 0,03	0,13	0,06	0,05		0,04	0,04	Ⓒ Minimum non-actuating times Ⓒ

a Value to be decided by the manufacturer for this test.

b The tests are only made during the verification of the correct operation as mentioned in

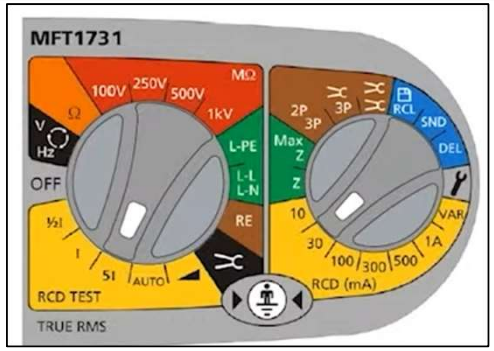


1 x 30 = 30 mA within 150ms

5 x 30 = 150 mA within 40ms

Table 2 – Maximum values of break time for half-wave pulsating residual currents (r.m.s. values) for type A RCCB

			Maximum values of break time(s) for type A RCCB in event of half-wave pulsating residual currents (rms values) equal to							
Type	I_n A	$I_{\Delta n}$ A	1,4 $I_{\Delta n}$	2 $I_{\Delta n}$	2,8 $I_{\Delta n}$	4 $I_{\Delta n}$	7 $I_{\Delta n}$	0,35 A	0,5 A	350 A
General	Any	< 0,03		0,3		0,15			0,04	0,04
		0,03	0,3		0,15			0,04		0,04
		> 0,03	0,3		0,15		0,04			0,04
S	≥ 25	> 0,03	0,5		0,2		0,15			0,15



1 x 30 x 1.4$I_{\Delta n}$ = 42 mA within 300ms

5 x 30 x 1.4$I_{\Delta n}$ = 210 mA within ??

IMO
Follow GN 3
And
Manufacturer Data

ELECTRICAL INSTALLATION CERTIFICATE

(REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671)

Certificate No.: .....

DETAILS OF THE CLIENT

.....

INSTALLATION ADDRESS

.....

.....

DESCRIPTION AND EXTENT OF THE INSTALLATION

Description of installation:

New installation ☐

Extent of installation covered by this Certificate:

Addition to an existing installation ☐

(Use continuation sheet if necessary) See continuation sheet No: .....

Alteration to an existing installation ☐

FOR DESIGN

I/We, being the person(s) responsible for the design of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design, hereby CERTIFY that the design work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671:2018, amended to ..... (date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3, 133.1.3 and 133.5):

Details of permitted exceptions (Regulation 411.3.3). Where applicable, a suitable risk assessment(s) must be attached to this Certificate.

Risk assessment attached ☐

The extent of liability of the signatory or signatories is limited to the work described above as the subject of this Certificate.

For the DESIGN of the installation: ..... **(Where there is mutual responsibility for the design)

Signature: ..... Date: ..... Name (IN BLOCK CAPITALS): ..... Designer No 1

Signature: ..... Date: ..... Name (IN BLOCK CAPITALS): ..... Designer No 2**

FOR CONSTRUCTION

I, being the person responsible for the construction of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the construction hereby CERTIFY that the construction work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to ..... (date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5):

The extent of liability of the signatory or signatories is limited to the work described above as the subject of this Certificate.

For CONSTRUCTION of the installation: .....

Signature: ..... Date: ..... Name (IN BLOCK CAPITALS): ..... Constructor

FOR INSPECTION AND TESTING

I, being the person responsible for the inspection & testing of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection & testing hereby CERTIFY that the work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to ..... (date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5):

The extent of liability of the signatory or signatories is limited to the work described above as the subject of this Certificate.

For INSPECTION AND TESTING of the installation: .....

Signature: ..... Date: ..... Name (IN BLOCK CAPITALS): ..... Inspector

NEXT INSPECTION

I/We, the designer(s), recommend that this installation is further inspected and tested after an interval of not more than ..... years/months.

Certificate No.: .....

PARTICULARS OF SIGNATORIES TO THE ELECTRICAL INSTALLATION CERTIFICATE

Designer (No 1) Name: ..... Company: .....
Address: .....
..... Postcode: ..... Tel No: .....

Designer (No 2) (if applicable) Name: ..... Company: .....
Address: .....
..... Postcode: ..... Tel No: .....

Constructor Name: ..... Company: .....
Address: .....
..... Postcode: ..... Tel No: .....

Inspector Name: ..... Company: .....
Address: .....
..... Postcode: ..... Tel No: .....

SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements	Number and Type of Live Conductors		Nature of Supply Parameters	Supply Protective Device
TN-C ☐	AC ☐	DC ☐	Nominal voltage, U / U_0 (1) V	BS (EN) .....
TN-S ☐	1-phase, 2-wire ☐	2-wire ☐	Nominal frequency, f (1) ..... Hz	Type .....
TN-C-S ☐	2-phase, 3-wire ☐	3-wire ☐	Prospective fault current, I_{pf} (2) ..... kA	Rated current ..... A
TT ☐	3-phase, 3-wire ☐	Other ☐	External earth fault loop impedance, Z_e (2) ..... Ω	
IT ☐	3-phase, 4-wire ☐			
	Confirmation of supply polarity ☐		(Note: (1) by enquiry (2) by enquiry or by measurement)	

Other sources of supply (as detailed on attached schedule) ☐

PARTICULARS OF INSTALLATION REFERRED TO IN THE CERTIFICATE

Means of Earthing

Distributor's facility ☐
Installation earth electrode ☐

Maximum Demand

Maximum demand (load) ..... kVA / Amps (Delete as appropriate)

Details of Installation Earth Electrode (where applicable)

Type (e.g. rod(s), tape etc) .....
Location .....
Electrode resistance to Earth .....

Main Protective Conductors

Earthing conductor	Material	csa ..... mm²	Connection / continuity verified ☐
Main protective bonding conductors	Material	csa ..... mm²	Connection / continuity verified ☐

To water installation pipes ☐ To gas installation pipes ☐ To oil installation pipes ☐ To structural steel ☐ To lightning protection ☐
To other ☐ Specify .....

Main switch / Switch-fuse / Circuit-breaker / RCD

Location	Current rating ..... A	**If RCD main switch**
.....	Fuse / device rating or setting ..... A	RCD Type .....
BS (EN)	Voltage rating V	Rated residual operating current ($I_{\Delta n}$) ..... mA
No of poles		Rated time delay ..... ms
		Measured operating time ..... ms

Schedule of Inspections

Item No.	Description	Outcome ✓ / N/A	Item No.	Description	Outcome ✓ / N/A
1.0	Condition of consumer's intake equipment (Visual inspection only)		8.0	Circuits (Distribution and Final)	
			9.0	Isolation and switching	
2.0	Parallel or switched alternative sources of supply		10.0	Current-using equipment (permanently connected)	
3.0	Protective measure: Automatic Disconnection of Supply (ADS)				
			11.0	Identification and notices	
4.0	Basic protection		12.0	Location(s) containing a bath or shower	
5.0	Protective measures other than ADS		13.0	Other special installations or locations	
6.0	Additional protection		14.0	Prosumer's low voltage electrical installation(s)	
7.0	Distribution equipment				

COMMENTS ON EXISTING INSTALLATION (in the case of an addition or alteration see Regulation 644.1.2):

.....
.....
.....
.....
.....

SCHEDULES

This Certificate is valid only when ..... Schedules of Circuit Details and Test Results are attached. (Enter quantities of schedules attached).

Schedule of Inspections

Item No.	Description	Outcome ✓ / N/A	Item No.	Description	Outcome ✓ / N/A
1.0	Condition of consumer's intake equipment (Visual inspection only)		8.0	Circuits (Distribution and Final)	
			9.0	Isolation and switching	
2.0	Parallel or switched alternative sources of supply		10.0	Current-using equipment (permanently connected)	
3.0	Protective measure: Automatic Disconnection of Supply (ADS)				
			11.0	Identification and notices	
4.0	Basic protection		12.0	Location(s) containing a bath or shower	
5.0	Protective measures other than ADS		13.0	Other special installations or locations	
6.0	Additional protection		14.0	Prosumer's low voltage electrical installation(s)	
7.0	Distribution equipment				

GENERIC SCHEDULE OF CIRCUIT DETAILS

Certificate/Report No.: .....

Distribution board details

DB reference: ..... Location: ..... Supplied from: .....

Distribution circuit OCPD: BS (EN): ..... Type: ..... Rating/Setting: ..... A

SPD Details: Type(s)*: T1 ☐ T2 ☐ T3† ☐ N/A ☐

Your Logo Here

CIRCUIT DETAILS

		Conductor details					Overcurrent protective device					RCD			
					Number & size										
1 Circuit number	2 Circuit description	3 Type of wiring	4 Reference method‡	5 Number of points served	6 Live (mm^2)	7 cpc (mm^2)	8 BS (EN)	9 Type	10 Rating (A)	11 Breaking capacity (kA)	12 Maximum permitted Z_s (Ω)§	13 BS (EN)	14 Type	15 $I_{\Delta n}$ (mA)	16 Rating (A)

CODES FOR TYPES OF WIRING

A	B	C	D	E	F	G	H	O
Thermoplastic insulated/ sheathed cables	Thermoplastic cables in metallic conduit	Thermoplastic cables in non-metallic conduit	Thermoplastic cables in metallic trunking	Thermoplastic cables in non-metallic trunking	Thermoplastic SWA cables	Thermosetting SWA cables	Mineral insulated cables	Other - please state .....

* SPD Type. Where a combined T1 + T2 or T2 + T3 device is installed, indicate by ticking both Type boxes.
† Where a T3 SPD is installed to protect sensitive equipment, enter details in 'Remarks', column 31, of the Schedule of Test Results. (See Section 534 of BS 7671:2018+A2:2022.)
‡ See Table 4A2 of Appendix 4 of BS 7671:2018+A2:2022.
§ Where the maximum permitted earth fault loop impedance value stated in column 12 is taken from a source other than the tabulated values given in Chapter 41 of BS 7671:2018+A2:2022, state the source of the data in the appropriate cell for the circuit in the 'Remarks', column 31, of the Schedule of Test Results.

MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATE

(REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671)

Certificate No.: .....

To be used only for minor electrical work which does not include the provision of a new circuit

PART 1: Description of the minor works

1. Details of the Client ..... Date minor works completed .....
2. Installation location/address .....
3. Description of the minor works .....
4. Details of any departures from BS 7671:2018 as amended to ..... (date) for the circuit altered or extended (Regulation 120.3, 133.1.3 and 133.5). **Details of permitted exceptions (Regulation 411.3.3).** Where applicable, a suitable risk assessment(s) must be attached to this Certificate. ..... Risk assessment attached ☐
5. **Comments on (including any defects observed in) the existing installation (Regulation 644.1.2):** .....

PART 2: Presence and adequacy of installation earthing and bonding arrangements (Regulation 132.16)

1. System earthing arrangement: TN-S ☐ TN-C-S ☐ TT ☐
2. Earth fault loop impedance at distribution board (Z_{db}) supplying the final circuit ..... Ω
3. Presence of adequate main protective conductors:
   Earthing conductor ☐
   Main protective bonding conductor(s) to: Water ☐ Gas ☐ Oil ☐ Structural steel ☐ Other (Specify)..... ☐

PART 3: Circuit details

DB Reference No.: ..... DB Location and type: .....
Circuit No.: ..... Circuit description: ..... Installation reference method .....
Number & size of conductors: Live ..... mm² cpc ..... mm²
Circuit overcurrent protective device: BS (EN) ..... Type ..... Rating ..... A
RCD: BS (EN) ..... Type ..... Rating ..... A Rated residual operating current ($I_{\Delta n}$) ..... mA
AFDD: BS (EN) ..... Rating ..... A
SPD: BS (EN) ..... Type .....

PART 4: Test results for the altered or extended circuit (where relevant and practicable)

Protective conductor continuity: ($R_1 + R_2$) ..... Ω or R_2 ..... Ω
Continuity of ring final circuit conductors: L/L ..... Ω N/N ..... Ω cpc/cpc ..... Ω
Insulation resistance: Test voltage ..... V Live - Live ..... MΩ Live - Earth ..... MΩ
Polarity satisfactory: ☐ Maximum measured earth fault loop impedance: Z_s ..... Ω
RCD disconnection time at rated residual operating current ($I_{\Delta n}$) ..... ms Satisfactory test button operation: ☐
AFDD satisfactory test button operation: ☐ NOTE: Not all AFDDs have a test button
SPD functionality confirmed: ☐ NOTE: Not all SPDs have visible functionality indication

PART 5: Declaration

I certify that the work covered by this certificate does not impair the safety of the existing installation and the work has been designed, constructed, inspected and tested in accordance with BS 7671:2018 amended to ..... (date) and that to the best of my knowledge and belief, at the time of my inspection, complied with BS 7671 except as detailed in Part 1 above.

Name: .....
For and on behalf of: .....
Address: .....
.....
.....
.....
.....

Signature: .....
Position: .....
Date: .....

MINOR ELECTRICAL INSTALLATION WORKS CERTIFICATE

Notes for the person producing the Certificate:

The Minor Electrical Installation Works Certificate is intended to be used for additions and alterations to an installation that do not extend to the provision of a new circuit. Examples include the addition of socket-outlets or lighting points to an existing circuit, the relocation of a light switch etc. This Certificate may also be used for the replacement of equipment such as accessories or luminaires, but not for the replacement of distribution boards or similar items. Appropriate inspection and testing, however, should always be carried out irrespective of the extent of the work undertaken.

GUIDANCE FOR RECIPIENTS (to be appended to the Certificate)

This Certificate has been issued to confirm that the electrical installation work to which it relates has been designed, constructed, inspected and tested in accordance with BS 7671.

You should have received an 'original' Certificate and the person that issued the Certificate should have retained a duplicate. If you were the person ordering the work, but not the owner of the installation, you should pass this Certificate, or a copy of it, to the owner. A separate Certificate should have been received for each existing circuit on which minor works have been carried out. This Certificate is not appropriate if you requested the person that issued the Certificate to undertake more extensive installation work, for which you should have received an Electrical Installation Certificate.

The Certificate should be retained in a safe place and be shown to any person inspecting or undertaking further work on the electrical installation in the future. If you later vacate the property, this Certificate will demonstrate to the new owner that the minor electrical installation work carried out complied with the requirements of BS 7671 at the time the Certificate was issued.

For safety reasons, the electrical installation will need to be inspected at appropriate intervals by a skilled person or persons, competent in such work.

Where the installation includes a residual current device (RCD) it should be tested six-monthly by pressing the button marked 'T' or 'Test'. The device should switch off the supply and should then be switched on to restore the supply. If the device does not switch off the supply when the button is pressed, seek expert advice. **For safety reasons it is important that this instruction is followed.**

Where the installation includes an arc fault detection device (AFDD) having a manual test facility it should be tested six-monthly by pressing the test button. Where an AFDD has both a test button and automatic test function, manufacturer's instructions shall be followed with respect to test button operation.

Where the installation includes a surge protective device (SPD) the status indicator should be checked to confirm it is in operational condition in accordance with manufacturer's information. If the indication shows that the device is not operational, seek expert advice. **For safety reasons it is important that this instruction is followed.**

Where the installation includes alternative or additional sources of supply, warning notices should be found at the origin or meter position or, if remote from the origin, at the consumer unit or distribution board and at all points of isolation of all sources of supply.

ELECTRICAL INSTALLATION CONDITION REPORT

Report No.: .....

SECTION A. DETAILS OF THE PERSON ORDERING THE REPORT

Name .....

Address .....

.....

SECTION B. REASON FOR PRODUCING THIS REPORT

.....

Date(s) on which inspection and testing was carried out .....

SECTION C. DETAILS OF THE INSTALLATION WHICH IS THE SUBJECT OF THIS REPORT

Occupier .....

Address .....

.....

Description of premises

Residential ☐ Commercial ☐ Industrial ☐ Other (include brief description) ☐ .....

Estimated age of wiring system ..... years

Evidence of additions / alterations? Yes ☐ No ☐ Not apparent ☐ If yes, estimate age ..... years

Installation records available? (Regulation 651.1) Yes ☐ No ☐ Date of last inspection ..... (date)

SECTION D. EXTENT AND LIMITATIONS OF INSPECTION AND TESTING

Extent of the electrical installation covered by this report .....

.....

Agreed limitations including the reasons (see Regulation 653.2) .....

.....

Agreed with: .....

Operational limitations including the reasons (see page no.....) .....

.....

The inspection and testing detailed in this report and accompanying schedules have been carried out in accordance with BS 7671:2018 as amended to .....

It should be noted that cables concealed within trunking and conduits, under floors, in roof spaces, and generally within the fabric of the building or underground, have not been inspected unless specifically agreed between the client and inspector prior to the inspection. An inspection should be made within an accessible roof space housing other electrical equipment.

SECTION E. SUMMARY OF THE CONDITION OF THE INSTALLATION

General condition of the installation (in terms of electrical safety) .....

.....

.....

Overall assessment of the installation in terms of its suitability for continued use SATISFACTORY / UNSATISFACTORY* (Delete as appropriate)
*An unsatisfactory assessment indicates that dangerous (code C1) and/or potentially dangerous (code C2) conditions have been identified.

SECTION F. RECOMMENDATIONS

Where the overall assessment of the suitability of the installation for continued use above is stated as UNSATISFACTORY, I / we recommend that any observations classified as *'Danger present'* (code C1) or *'Potentially dangerous'* (code C2) are acted upon as a matter of urgency. Investigation without delay is recommended for observations identified as *'Further investigation required'* (code FI). Observations classified as *'Improvement recommended'* (code C3) should be given due consideration.

Subject to the necessary remedial action being taken, I / We recommend that the installation is further inspected and tested by ..... (date) for the following reasons.....

SECTION G. DECLARATION

I/We, being the person(s) responsible for the inspection and testing of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection and testing, hereby declare that the information in this report, including the observations and the attached schedules, provides an accurate assessment of the condition of the electrical installation taking into account the stated extent and limitations in section D of this report.

Inspected and tested by:	Report authorised for issue by:
Name (Capitals)	Name (Capitals) .....
Signature	Signature .....
For/on behalf of	For/on behalf of .....
Position	Position .....
Address	Address .....
Date	Date .....

SECTION H. SCHEDULE(S)

.....Inspection Schedule(s) and ..... Schedule(s) of Circuit Details and Test Results are attached.
The attached schedule(s) are part of this document and this report is valid only when they are attached to it.

SECTION I. SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements	Number and Type of Live Conductors		Nature of Supply Parameters	Supply Protective Device
TN-C ☐ TN-S ☐ TN-C-S ☐ TT ☐ IT ☐	AC ☐ 1-phase, 2-wire ☐ 2-phase, 3-wire ☐ 3-phase, 3-wire ☐ 3-phase, 4-wire ☐	DC ☐ 2-wire ☐ 3-wire ☐ Other ☐	Nominal voltage, U / U_0 (1) ..... V Nominal frequency, f (1) ..... Hz Prospective fault current, I_{pf} (2) ..... kA External earth fault loop impedance, Z_e (2) ..... Ω	BS (EN) ..... Type ..... Rated current ..... A
	Confirmation of supply polarity ☐		*(Note: (1) by enquiry (2) by enquiry or by measurement)*	

Other sources of supply (as detailed on attached schedule) ☐

SECTION J. PARTICULARS OF INSTALLATION REFERRED TO IN THE REPORT

Means of Earthing	Details of Installation Earth Electrode (where applicable)
Distributor's facility ☐ Installation earth electrode ☐	Type (e.g. rod(s), tape etc) ..... Location ..... Electrode resistance to Earth .....

Main Protective Conductors

Earthing conductor	Material	csa ..... mm²	Connection / continuity verified ☐
Main protective bonding conductors	Material	csa ..... mm²	Connection / continuity verified ☐

To water installation pipes ☐ To gas installation pipes ☐ To oil installation pipes ☐ To structural steel ☐ To lightning protection ☐
To other ☐ Specify .....

Main switch / Switch-fuse / Circuit-breaker / RCD

Location .... BS (EN) ..... No of poles	Current rating ..... A Fuse / device rating or setting ..... A Voltage rating V	**If RCD main switch** RCD Type ..... Rated residual operating current ($I_{\Delta n}$) ..... mA Rated time delay ..... ms Measured operating time ..... ms

SECTION K. OBSERVATIONS

Referring to the attached inspection schedule(s) and schedule(s) of circuit details and test results, and subject to the limitations specified at the *Extent and limitations of inspection and testing* section .....

No remedial action is required ☐ The following observations are made ☐ (see below):

OBSERVATION(S) Include schedule reference, as appropriate	Classification code

One of the following codes, as appropriate, has been allocated to each of the observations made above to indicate to the person(s) responsible for the installation the degree of urgency for remedial action.

C1 – Danger present. Risk of injury. Immediate remedial action required

C2 – Potentially dangerous - urgent remedial action required

C3 – Improvement recommended

FI – Further investigation required without delay

CONDITION REPORT INSPECTION SCHEDULE FOR RESIDENTIAL AND SIMILAR PREMISES WITH UP TO 100 A SUPPLY

Report No.: .....

NOTE: This form is suitable for many types of smaller installation, not exclusively residential.

The persons responsible for the periodic inspection of the installation should include the relevant items in relation to the electrical installation, the inspection schedule can be reduced or expanded depending on the requirements for the installation.

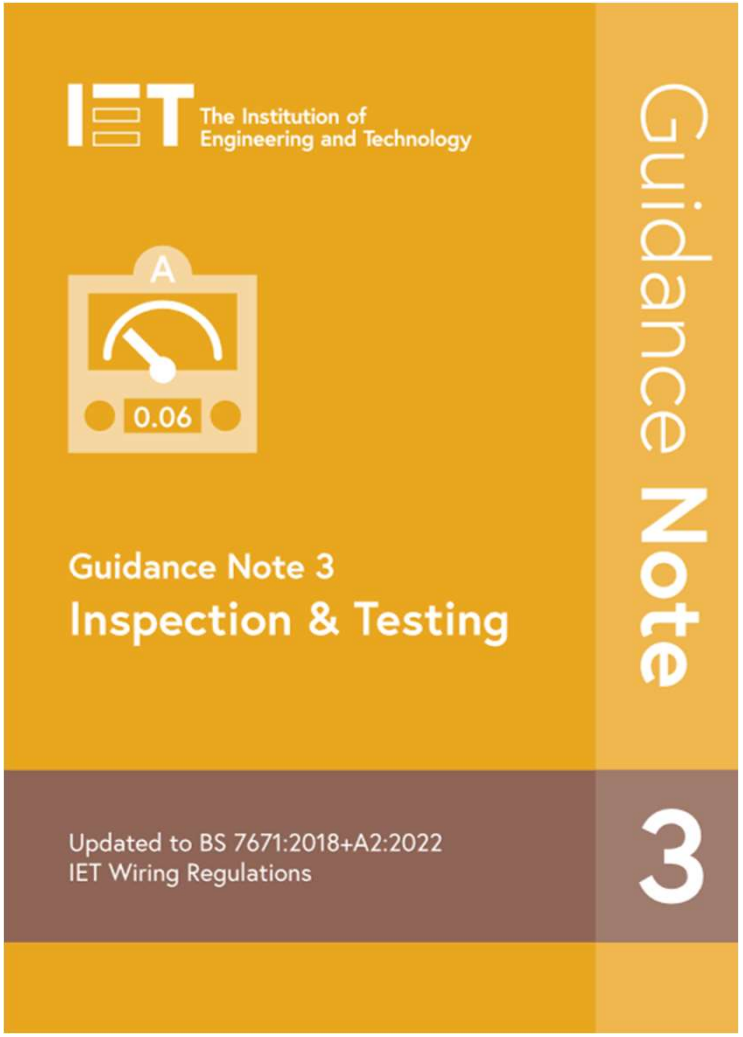
Outcomes	Acceptable condition	✓	Unacceptable condition	**C1 or C2**	Improvement recommended	**C3**	Further investigation	**FI**	Not verified	**N/V**	Limitation	**LIM**	Not applicable	**N/A**

Item No	**Description** 	**Outcome** (Use codes above. Provide additional comment where appropriate. C1, C2, C3 and FI coded items to be recorded in Section K of the Condition Report)
1.0	**INTAKE EQUIPMENT (VISUAL INSPECTION ONLY)** An outcome against an item in this section, other than access to live parts, should not be used to determine the overall outcome.	
1.1	– Service cable – Service head – Earthing arrangement – Meter tails – Metering equipment – Isolator (where present) **NOTE 1:** Where inadequacies in the intake equipment are encountered, which may result in a dangerous or potentially dangerous situation, the person ordering the work and/or dutyholder must be informed. It is strongly recommended that the person ordering the work informs the appropriate authority. **NOTE 2:** For this section only, where inadequacies are found, an 'X' should be put against the appropriate item and a comment made in Section K.	
	Person ordering work/dutyholder notified (Delete as appropriate)	Y / N/A
1.2	Consumer's isolator (where present)	
1.3	Consumer's meter tails	

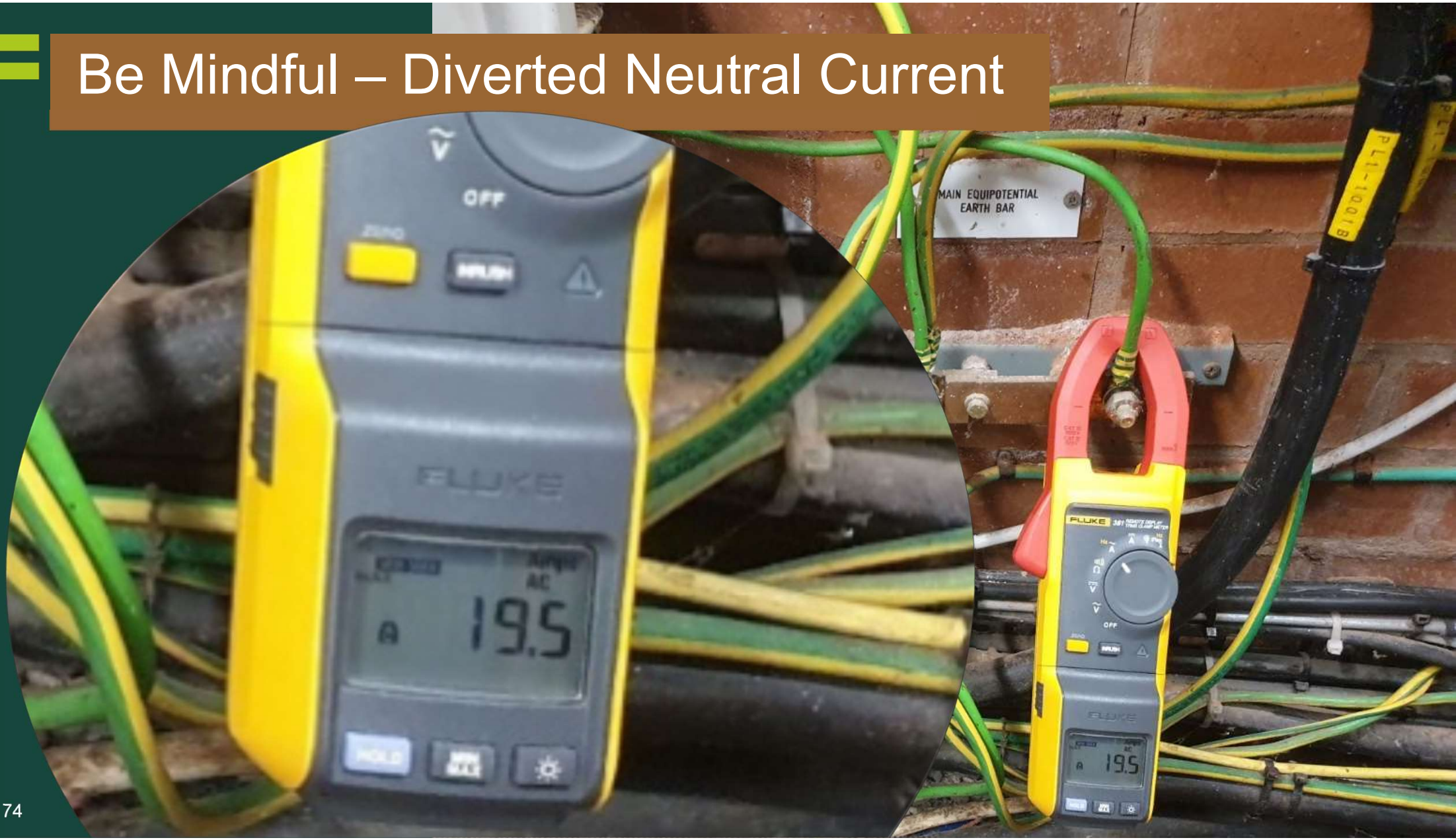
Guidance Note 3

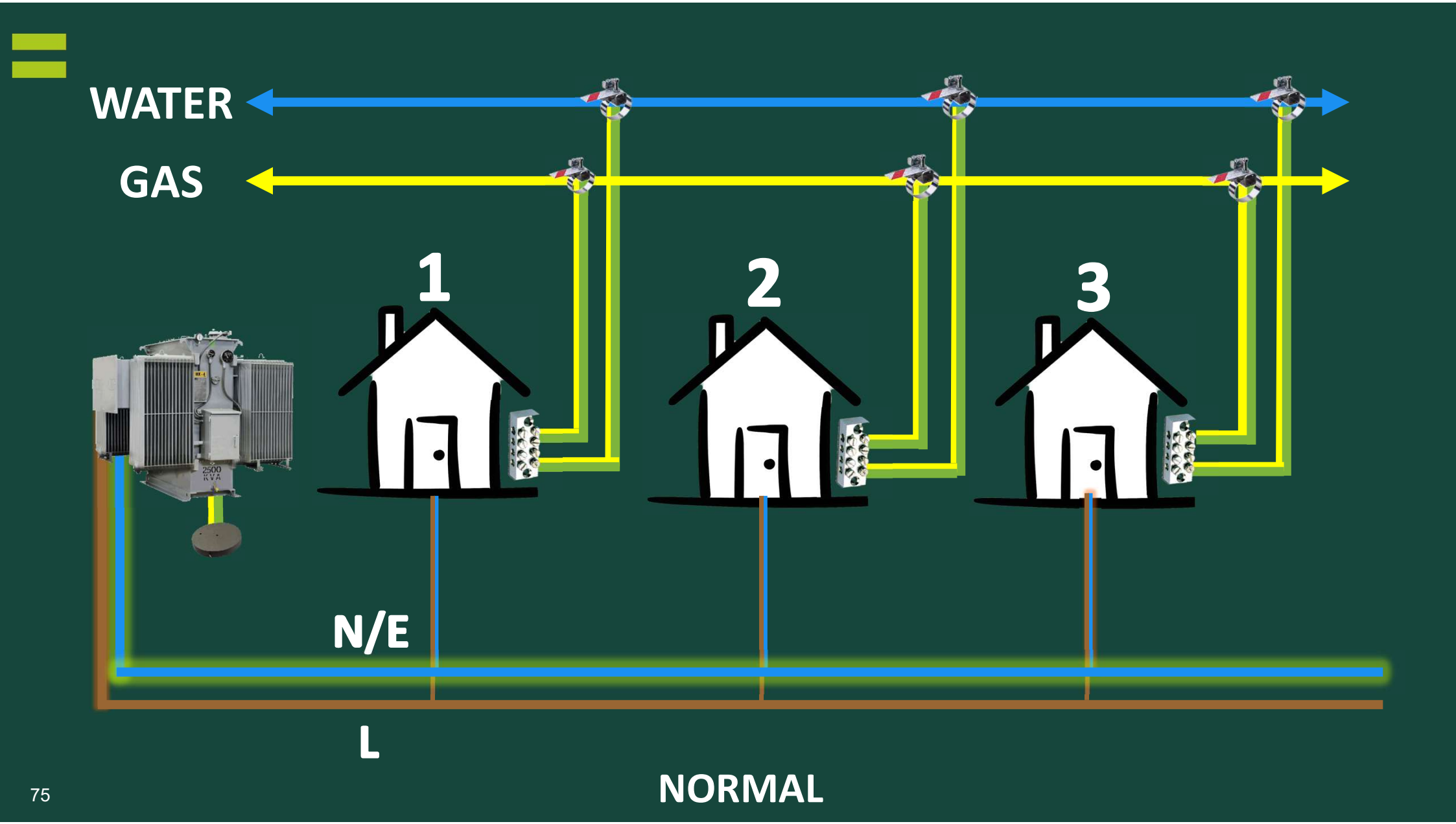
Section 3.3.3

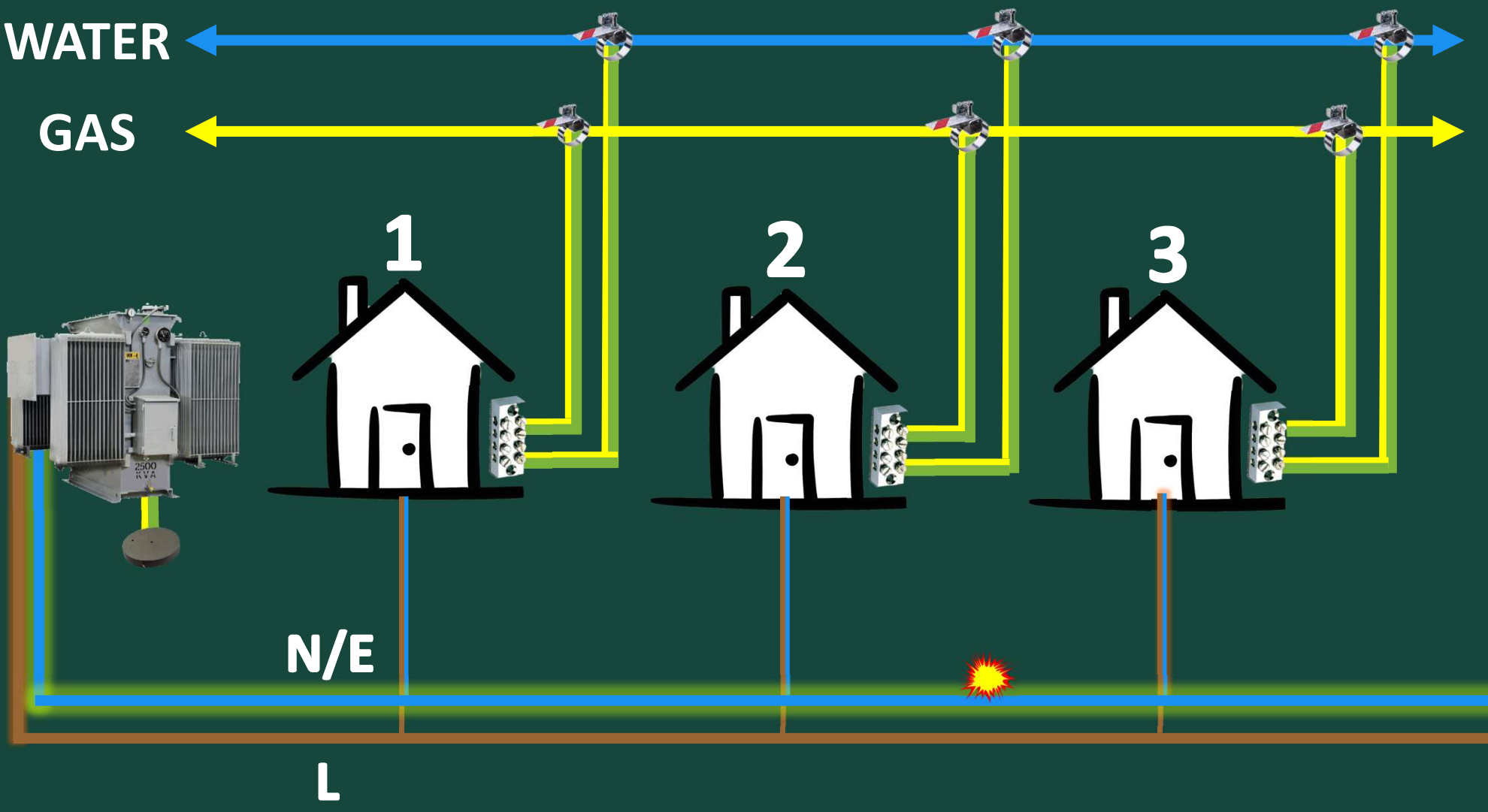
Appendix D

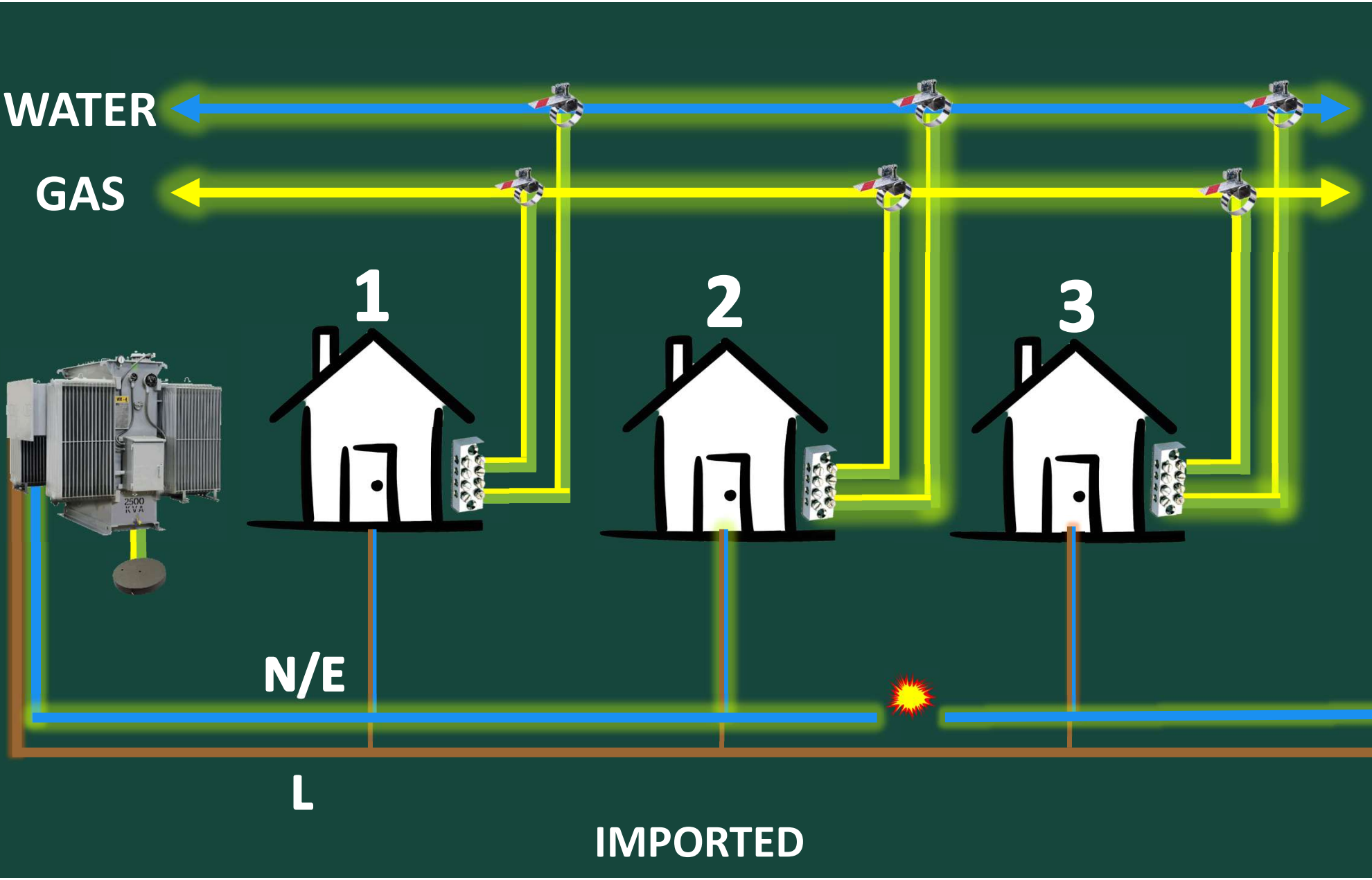


Be Mindful – Diverted Neutral Current




WATER
GAS
1
2
3
N/E
L
NORMAL


WATER
GAS
1
2
3
N/E
L
THEN OVER TIME


WATER
GAS
1
2
3
N/E
L
IMPORTED

WATER

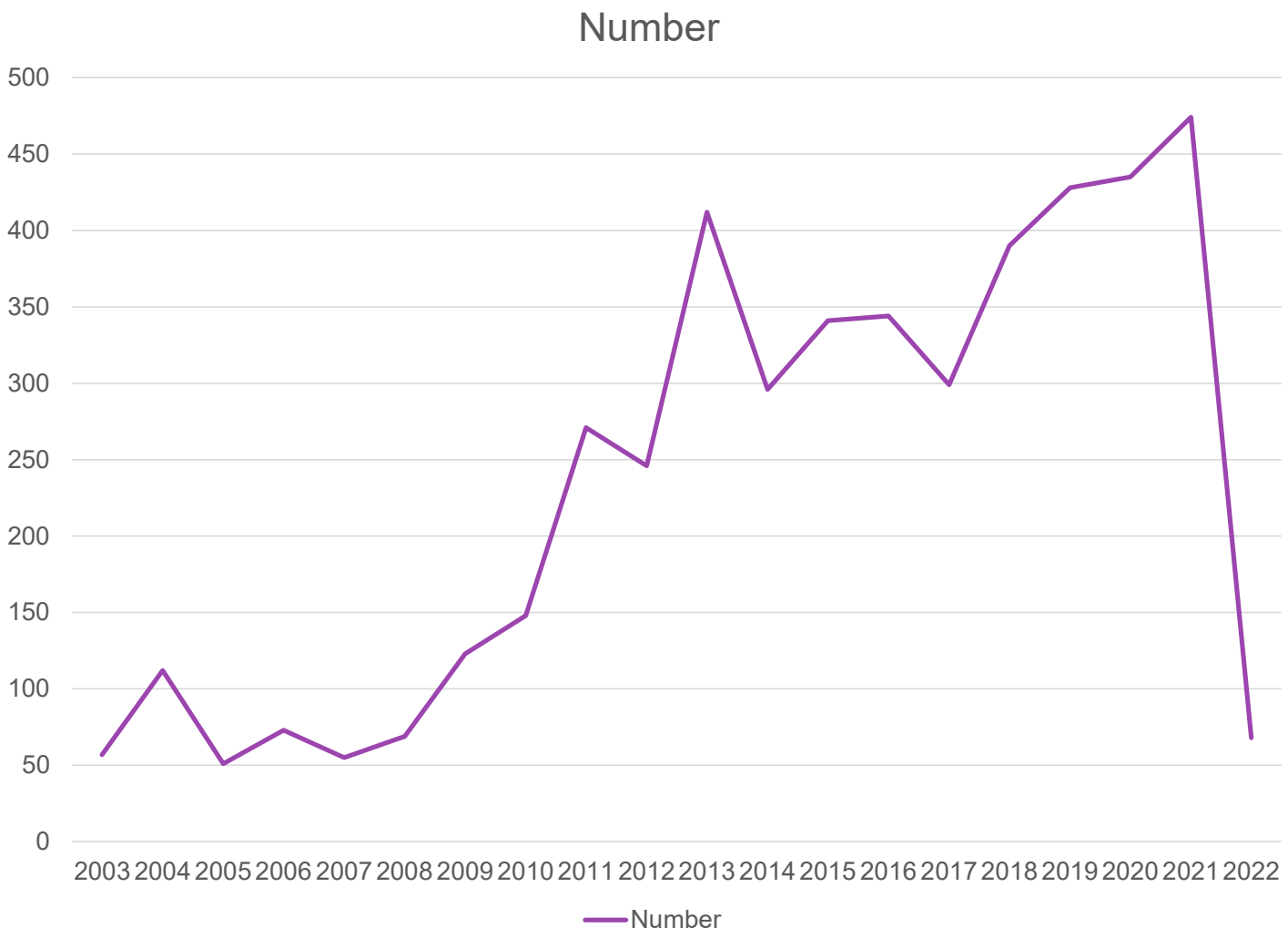
GAS

N/E

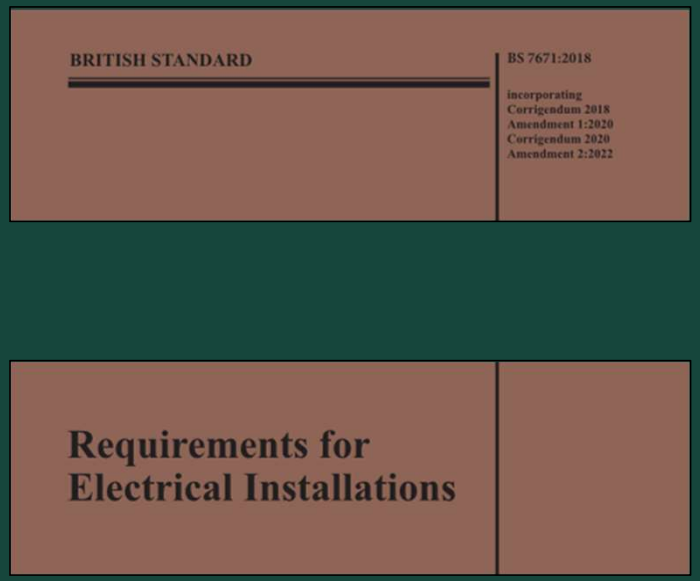
L

EXPORTED

HSE broken neutral reports 1/1/2003 to 1/3/2022

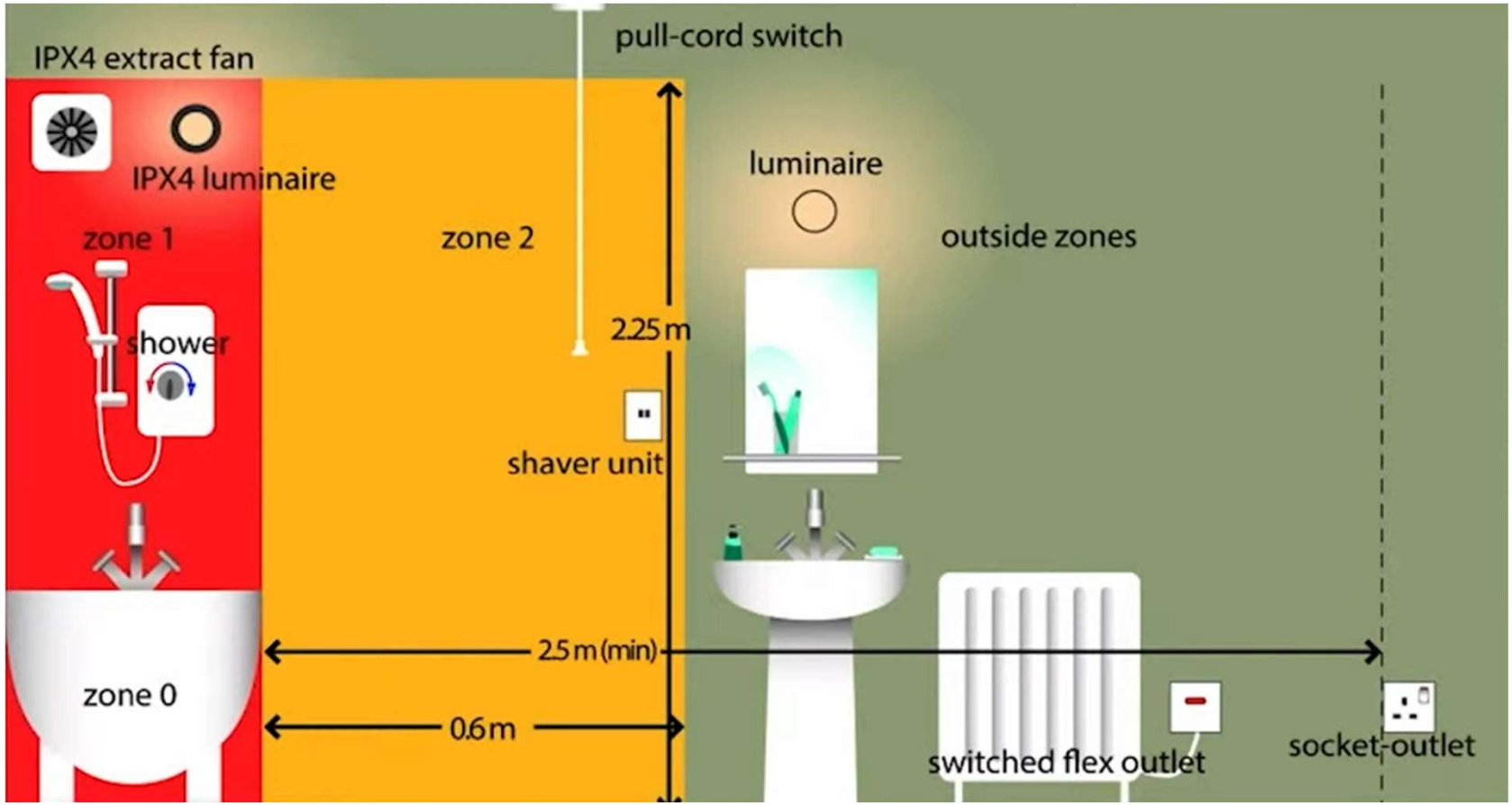


Year	Number Reported
2003	57
2004	112
2005	51
2006	73
2007	55
2008	69
2009	123
2010	148
2011	271
2012	246
2013	412
2014	296
2015	341
2016	344
2017	299
2018	390
2019	428
2020	435
2021	474
2022	68


BRITISH STANDARD
BS 7671:2018
incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Part 7

701 Locations containing a bath or shower



701.512.3

712 Solar PV

712 Solar PV

712 Solar PV

714 Outdoor lighting installations

714.411.3.4 Additional protection

Lighting that is accessible to the public shall have additional protection by an RCD having the characteristics specified in Regulation 415.1.1.

Examples Includes;

(i) gardens, spaces to the public

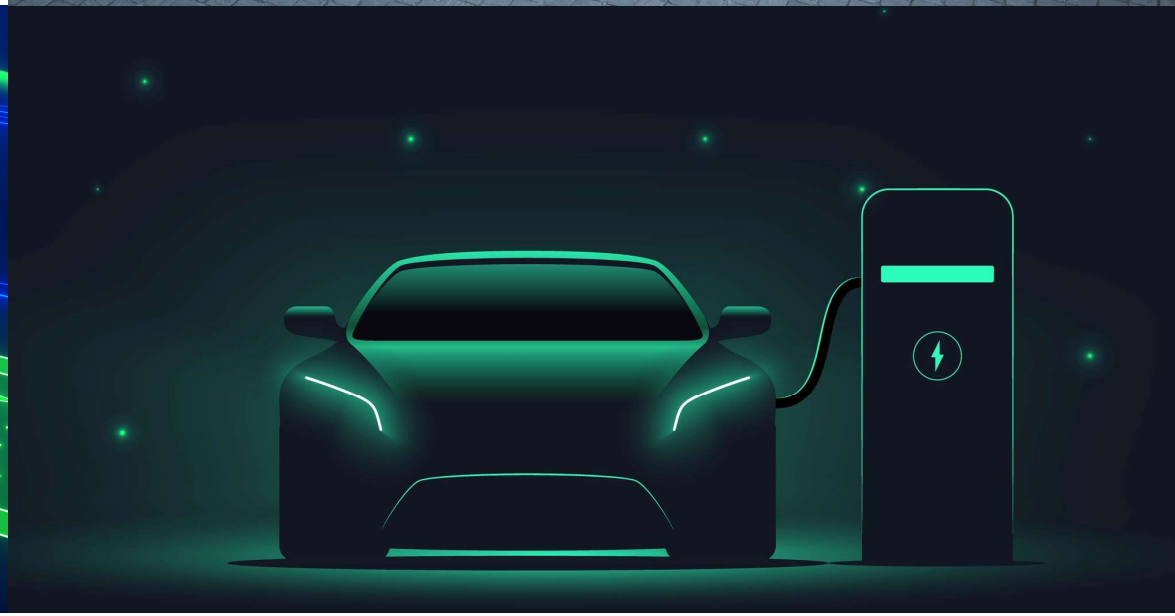
(ii) telephone kiosks

(iii) bus shelters

(iv) advertising panels and town plans

Harvey Tyrrell
7 years old

722 Electric Vehicles



722 Electric Vehicles

722.411.4.1

Where equipment to be used is not covered by a British or Harmonized Standard, or where there is no British or Harmonized Standard for the functionality of a piece of equipment used, it is the responsibility of the electrical installation designer or other person responsible for specifying the installation to establish that:

(i) the equipment meets the requirements of the Electrical Equipment (Safety) Regulations 2016 (as amended), the Electromagnetic Compatibility Regulations 2016 (as amended) and other relevant legislation, and

(ii) the equipment has either a CE, UKCA or UKNI mark and a Declaration of Conformity; where third-party approval is required, the equipment is marked appropriately.

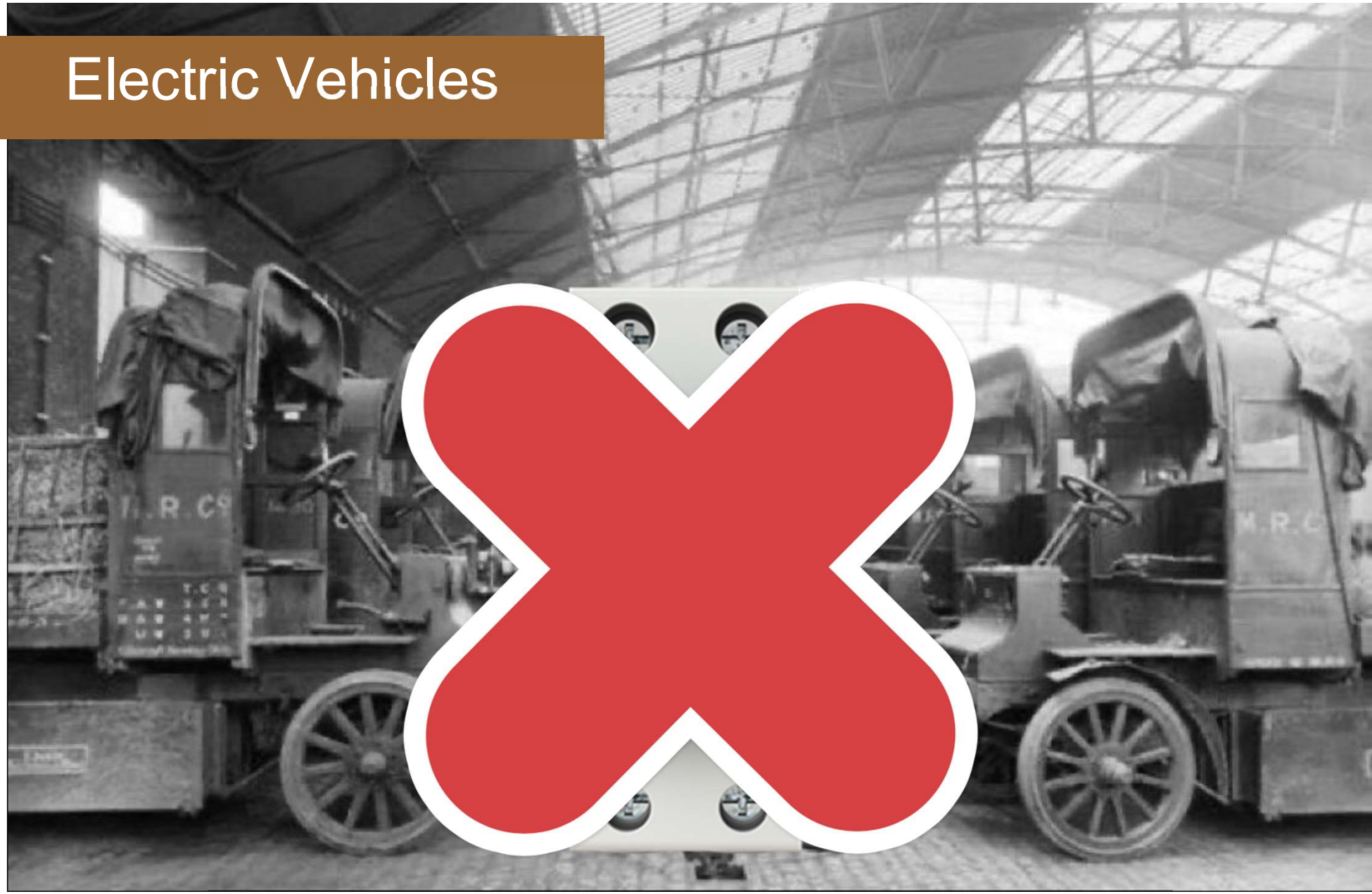
The Declaration of Conformity is to be appended to the certification for initial verification.
Where the above is satisfied, it is not considered to be a departure from BS 7671:2018+A2:2022.

722 Electric Vehicles

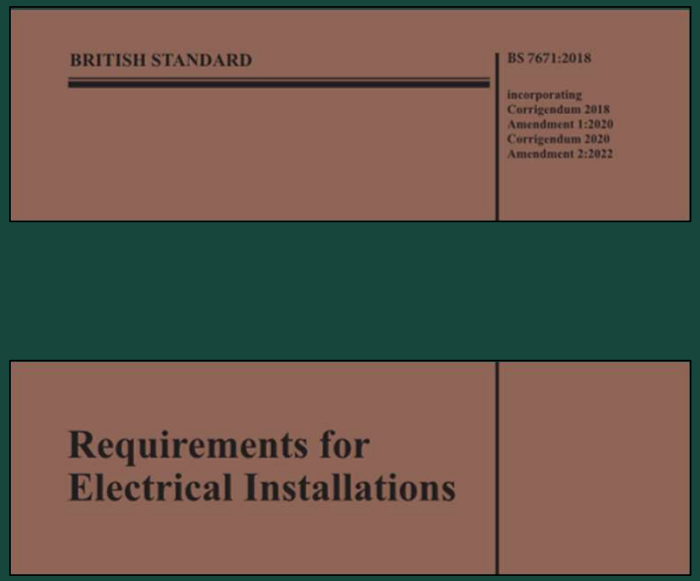
722.531.3.101

Unless supplied by a circuit using the protective measure of electrical separation, each charging point incorporating a socket-outlet or vehicle connector complying with the BS EN 62196 series shall be protected individually by an RCD of Type A, Type F or Type B and having a rated residual operating current not exceeding 30 mA.

722 Electric Vehicles



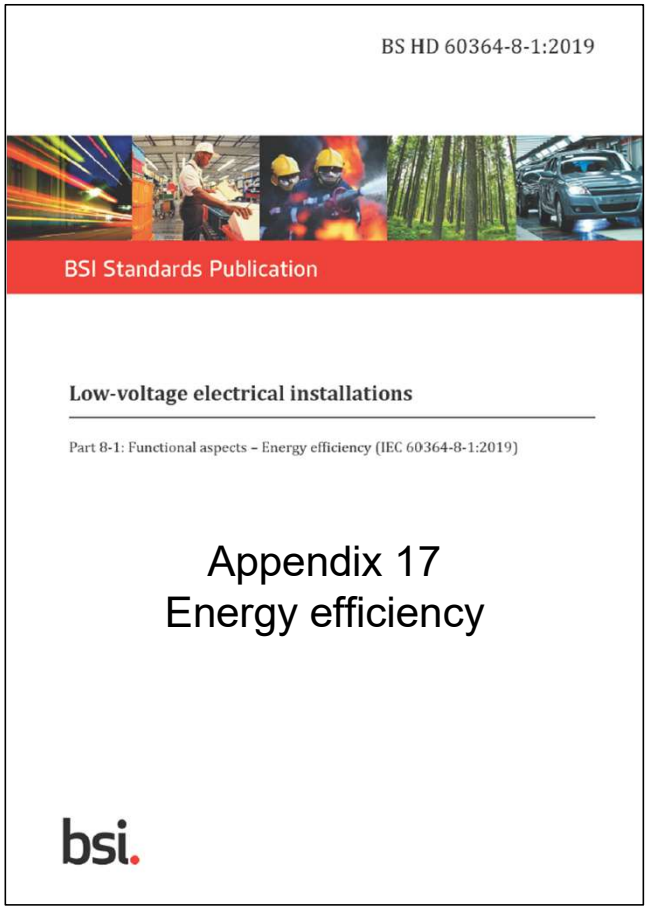

PVINVERTER
ENERGY STORAGE
Lithium ion battery system
ENERGY STORAGE
Lithium ion battery system
ENERGY STORAGE
Lithium ion battery system



Part 8

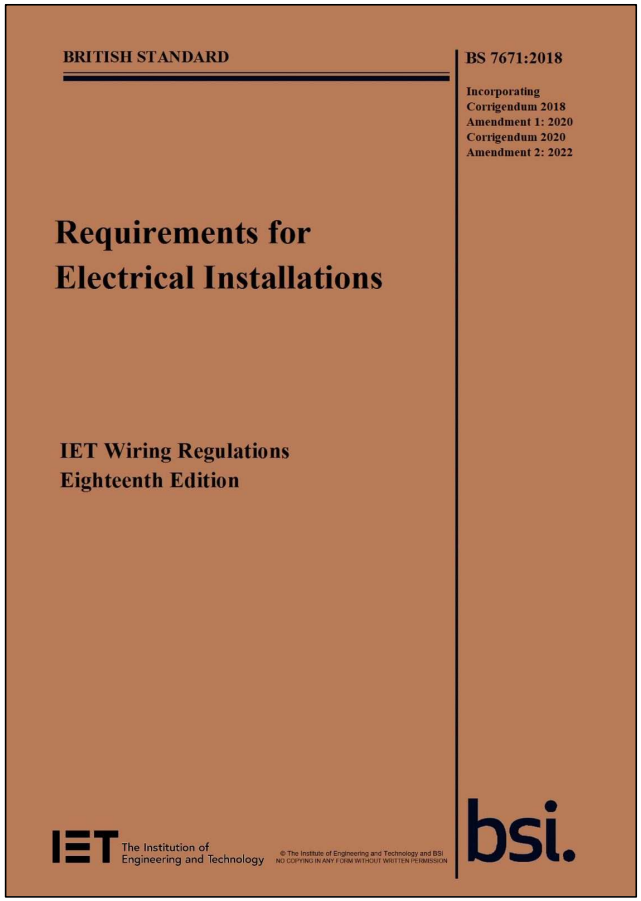
Functional Requirements

Chapter 81



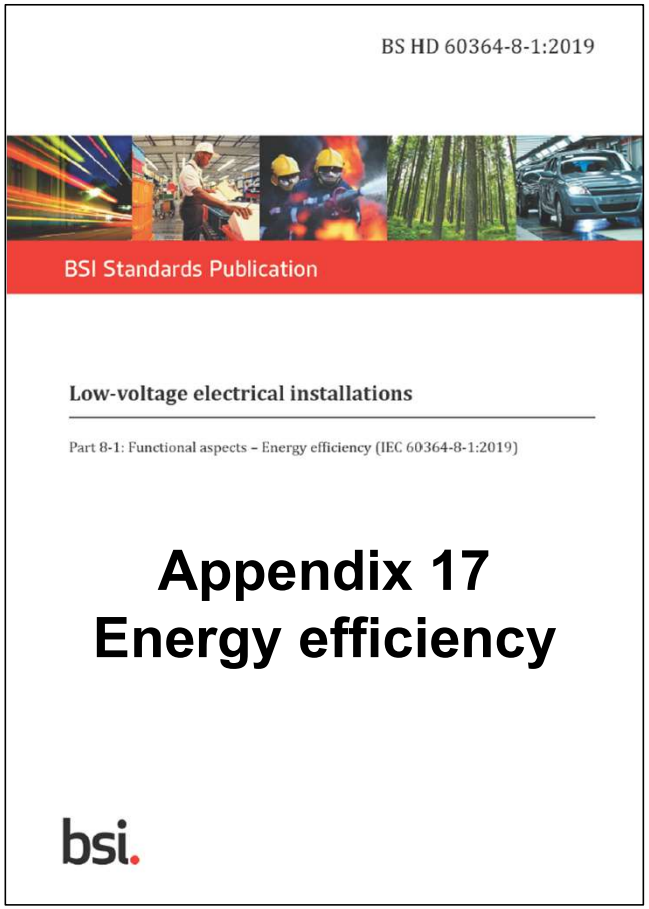
Appendix 17
Energy efficiency

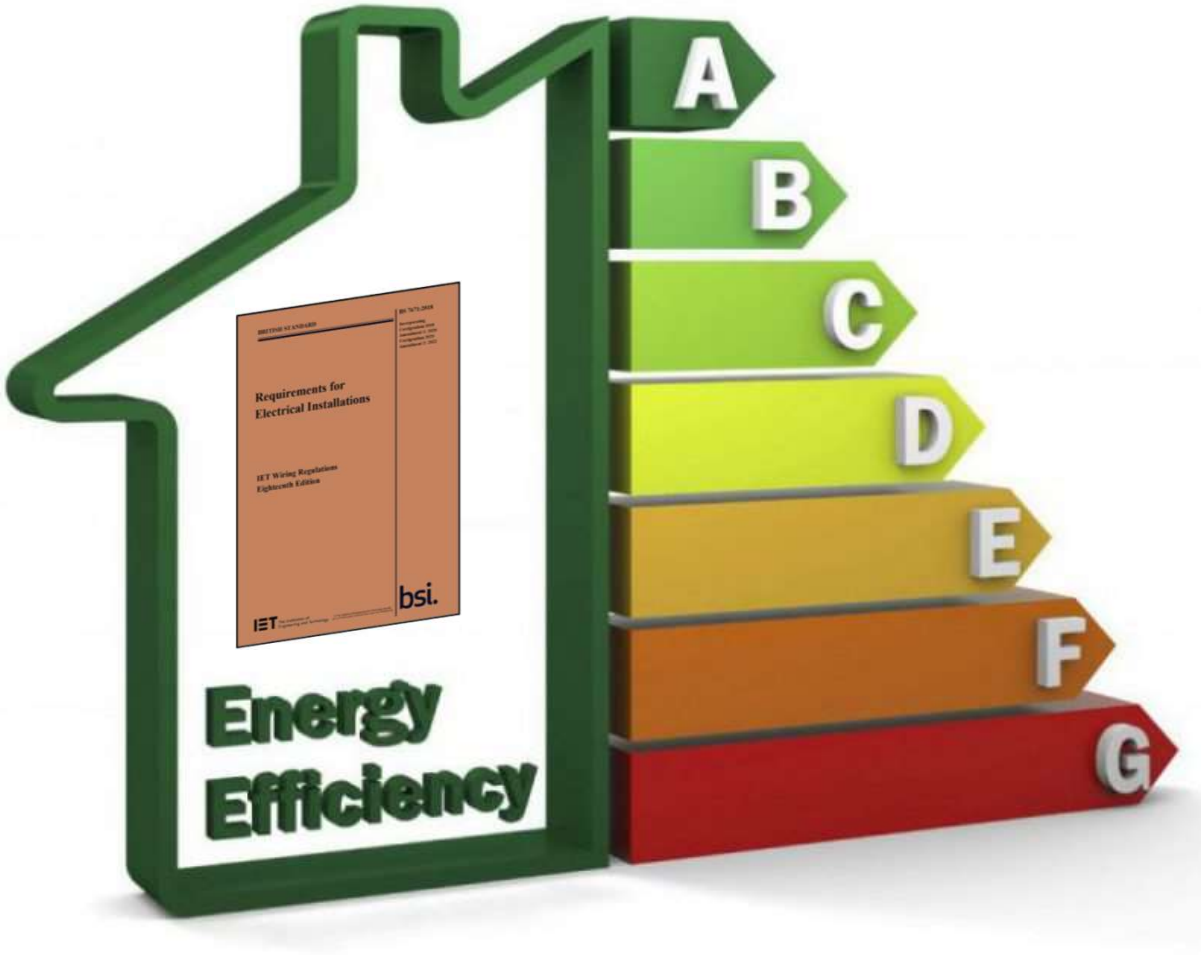
Chapter 82



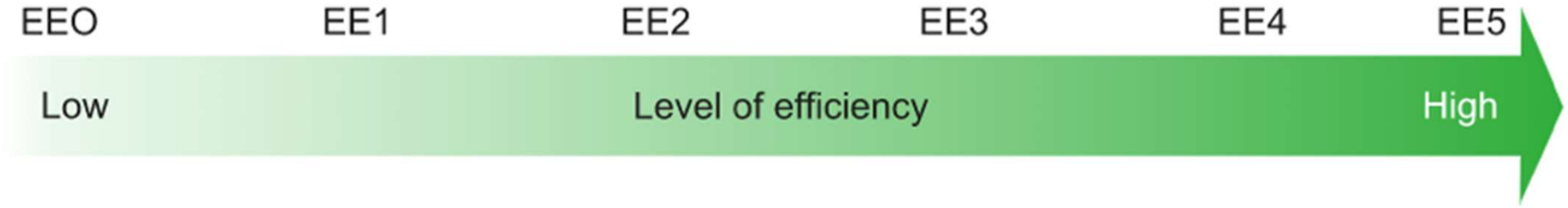
Chapter 83

Appendix 17



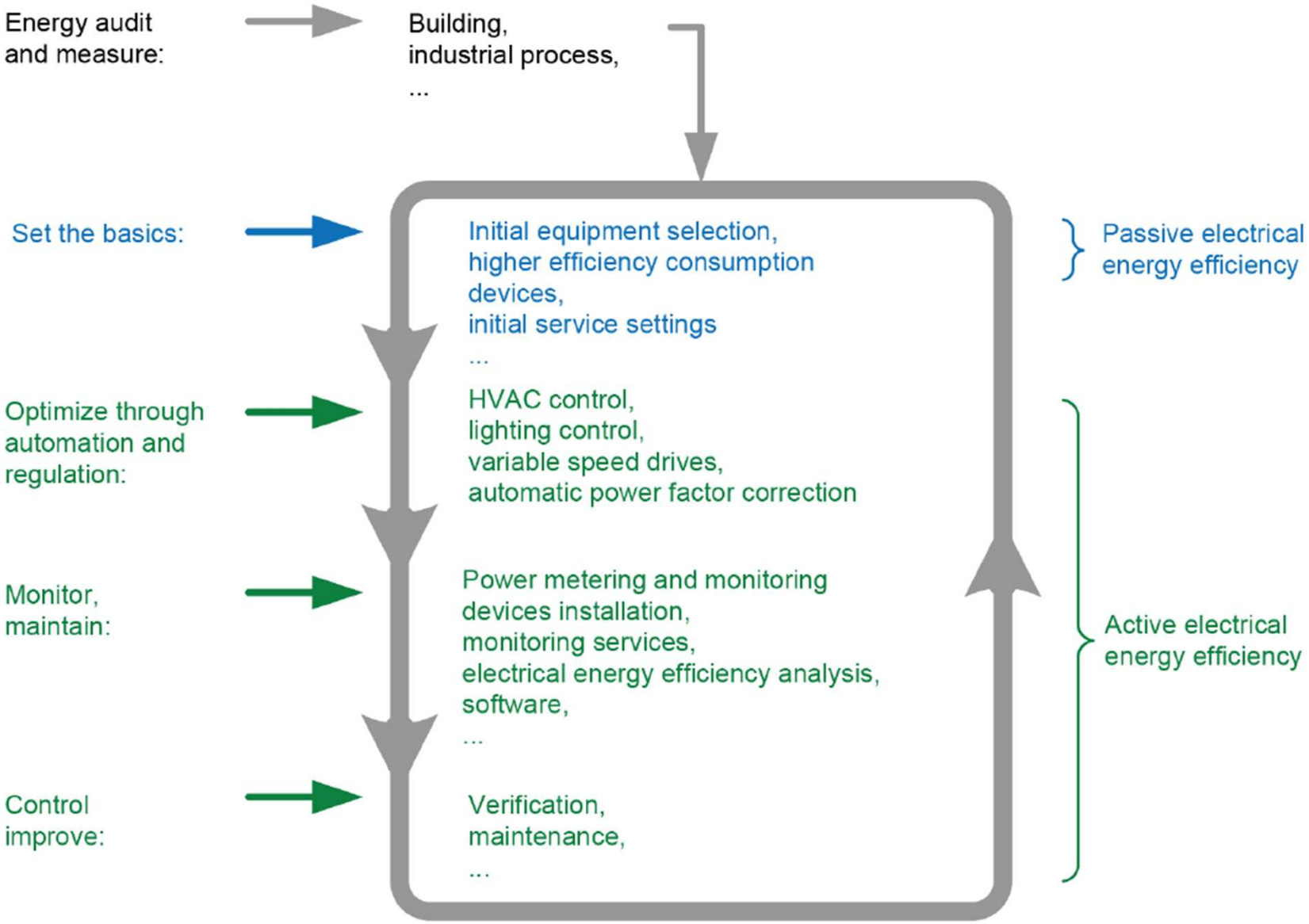


78 pages into 6



Electrical Installation Efficiency Classes	Total Number of Points			
	For Residential	For Industrial	For Commercial	For Infrastructure
Class EE0	from 0 to 14	from 0 to 19	from 0 to 18	from 0 to 18
Class EE1	from 15 to 30	from 20 to 38	from 19 to 36	from 19 to 36
Class EE2	from 31 to 49	from 39 to 63	from 37 to 60	from 37 to 59
Class EE3	from 50 to 69	from 64 to 88	from 61 to 84	from 60 to 83
Class EE4	from 70 to 89	from 89 to 113	from 85 to 108	from 84 to 106
Class EE5	90 or more	114 or more	109 or more	107 or more

The Energy Manager


Energy audit
and measure:
Building,
industrial process,
...
Set the basics:
Initial equipment selection,
higher efficiency consumption
devices,
initial service settings
...
Passive electrical
energy efficiency
Optimize through
automation and
regulation:
HVAC control,
lighting control,
variable speed drives,
automatic power factor correction
Monitor,
maintain:
Power metering and monitoring
devices installation,
monitoring services,
electrical energy efficiency analysis,
software,
...
Control
improve:
Verification,
maintenance,
...
Active electrical
energy efficiency

Barycentre Method

Procedure to optimize the position of energy source(s) and loads in consideration of energy efficiency

$$(x_b, y_b, z_b) = \frac{\sum_{i=1}^{i=n} (x_i, y_i, z_i) \times EAC_i}{\sum_{i=1}^{i=n} EAC_i}$$

$$(x_b, y_b) = \frac{\sum_{i=1}^{i=n} (x_i, y_i) \times EAC_i}{\sum_{i=1}^{i=n} EAC_i}$$

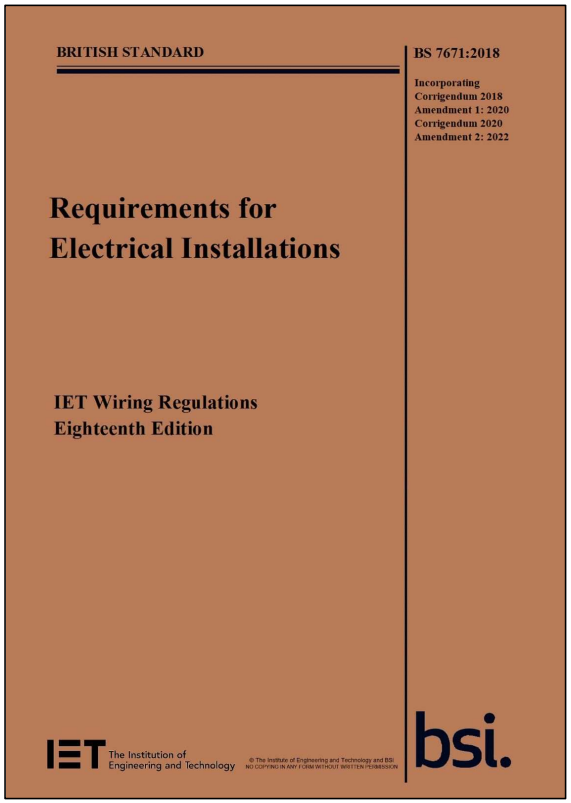
Initial Installation	Industry	Commercial	Infrastructure
Determination of energy consumption	7	6	7
Consumption and local of main sub station	12	8	12
Voltage drop	6	6	6
Efficiency of Tx	3	3	3
Efficiency of current using equipment	4	4	4

Power monitoring	Industry	Commercial	Infrastructure
Power Factor	6	4	6
Harmonics	8	6	8

Bonus	Industry	Commercial	Infrastructure
Renewable Energy source	5	5	5
Electrical Energy storage	3	3	3

Chapter 82

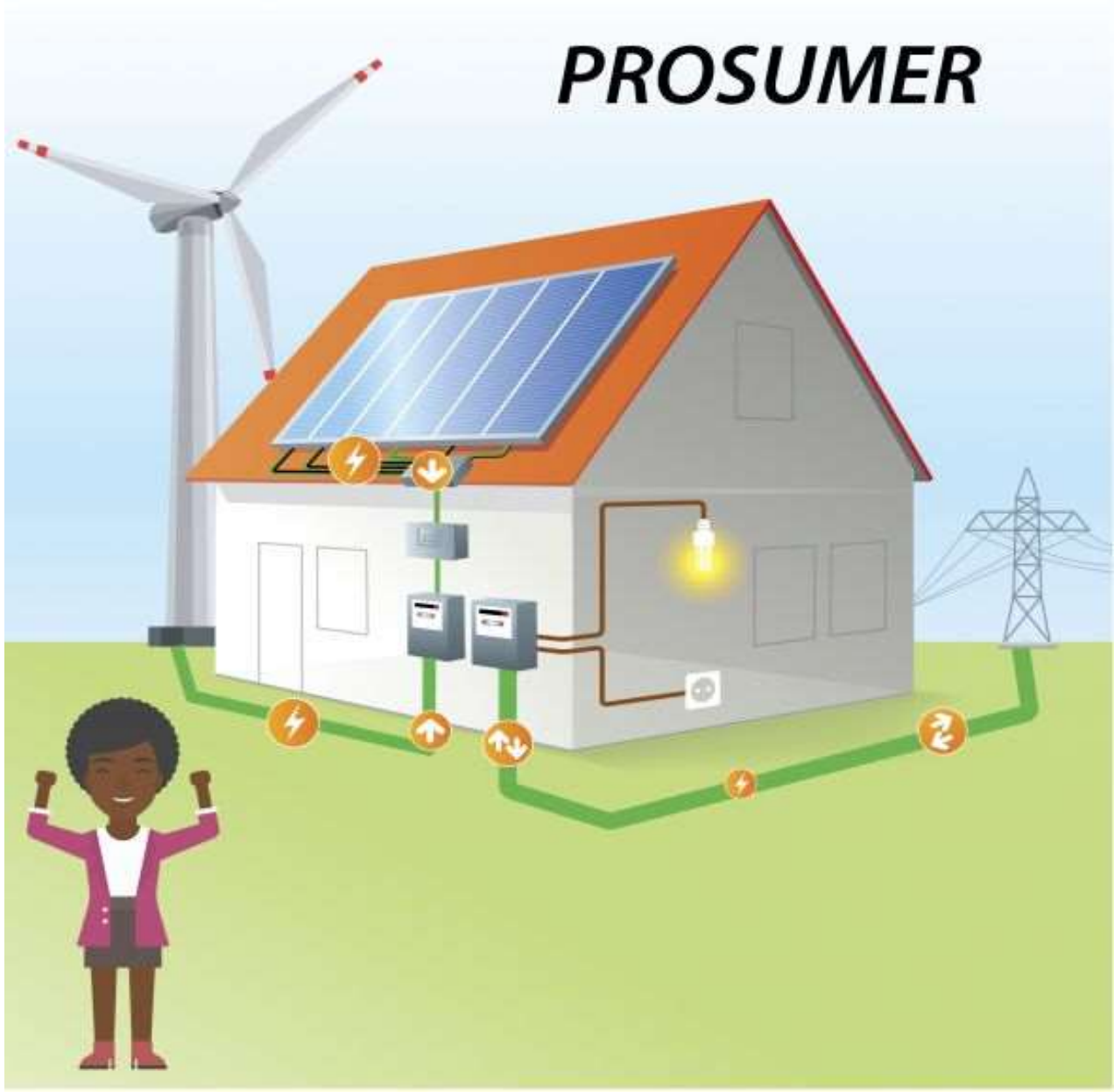
Prosumers Low Voltage Electrical Installations



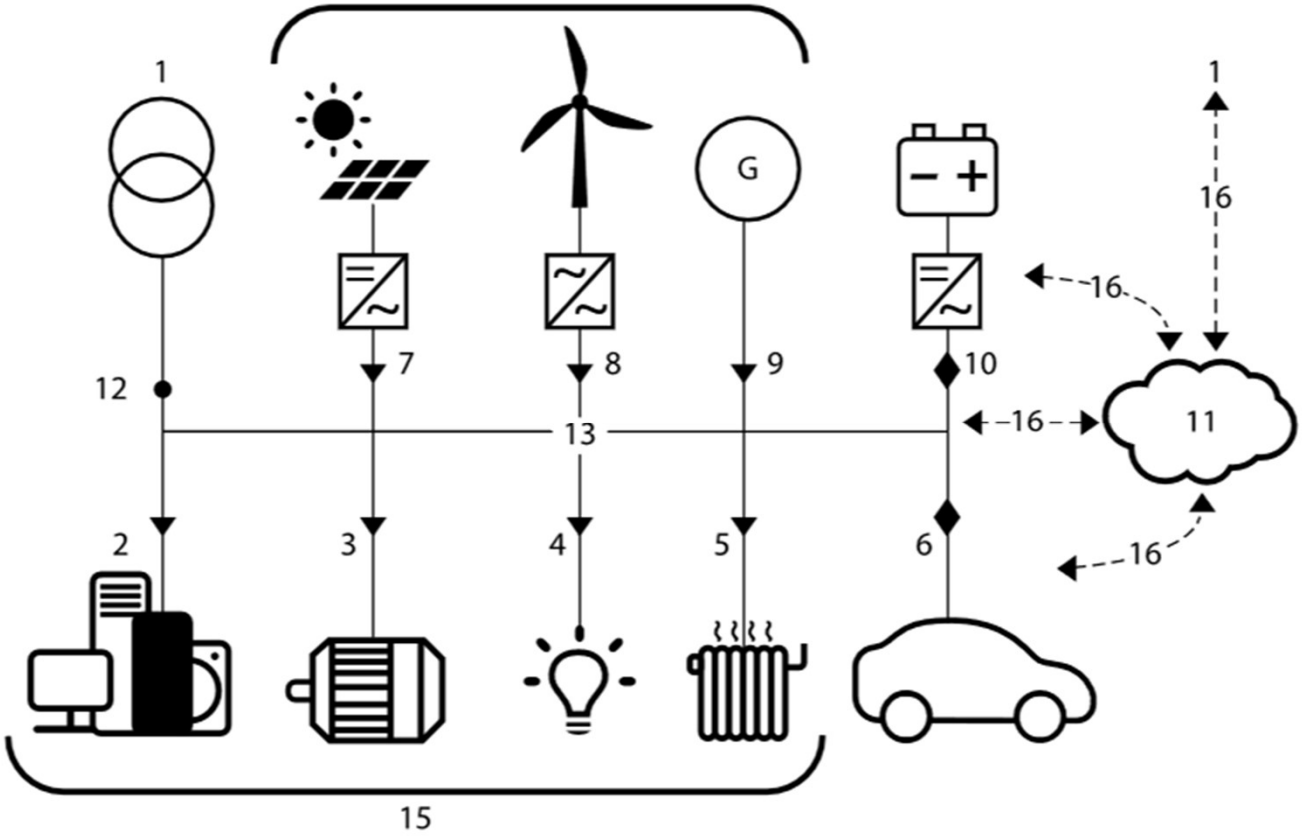
Producer
and
Con**sumer**
of energy

Prosumers
Electrical
Installation

PEI



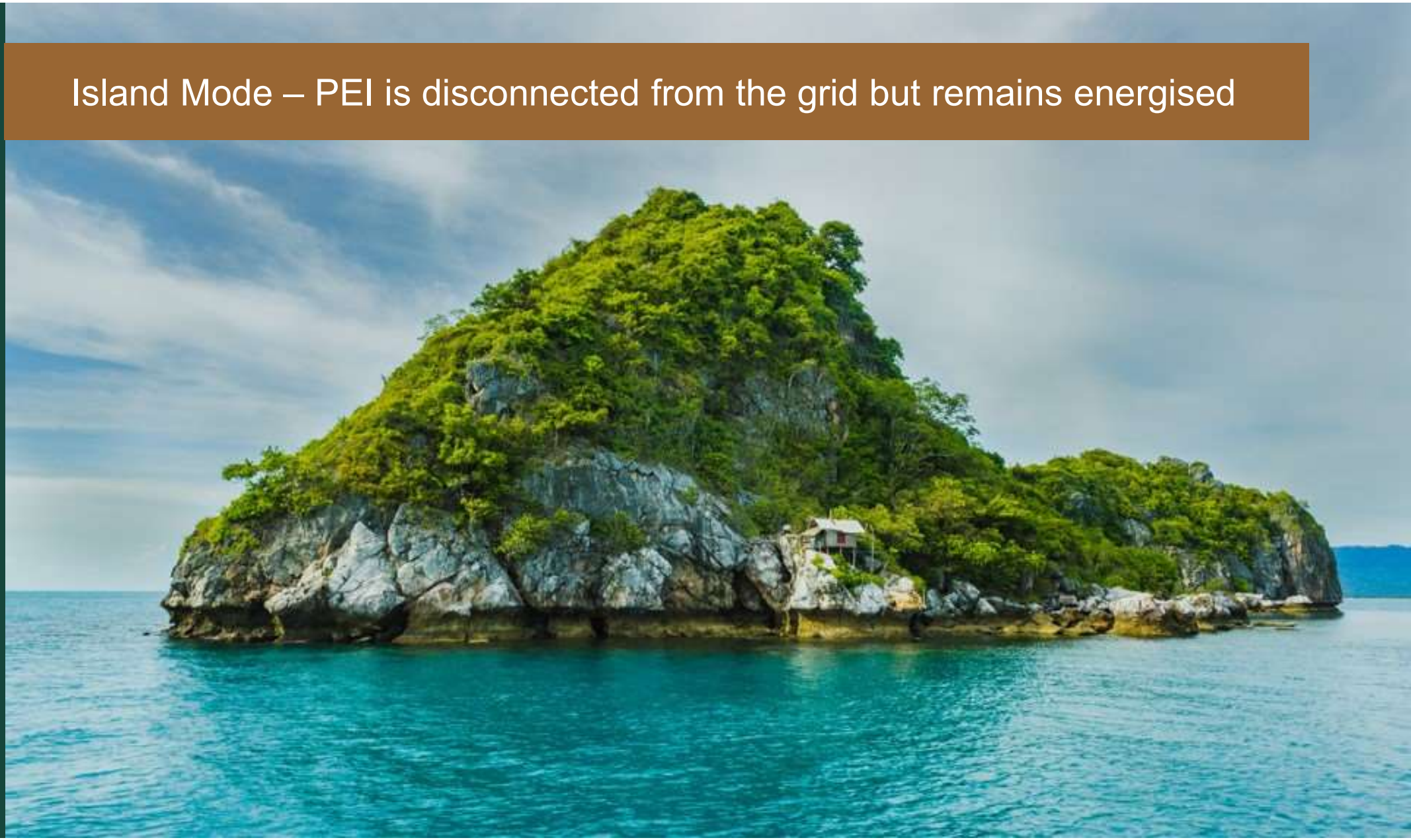
PEI Example



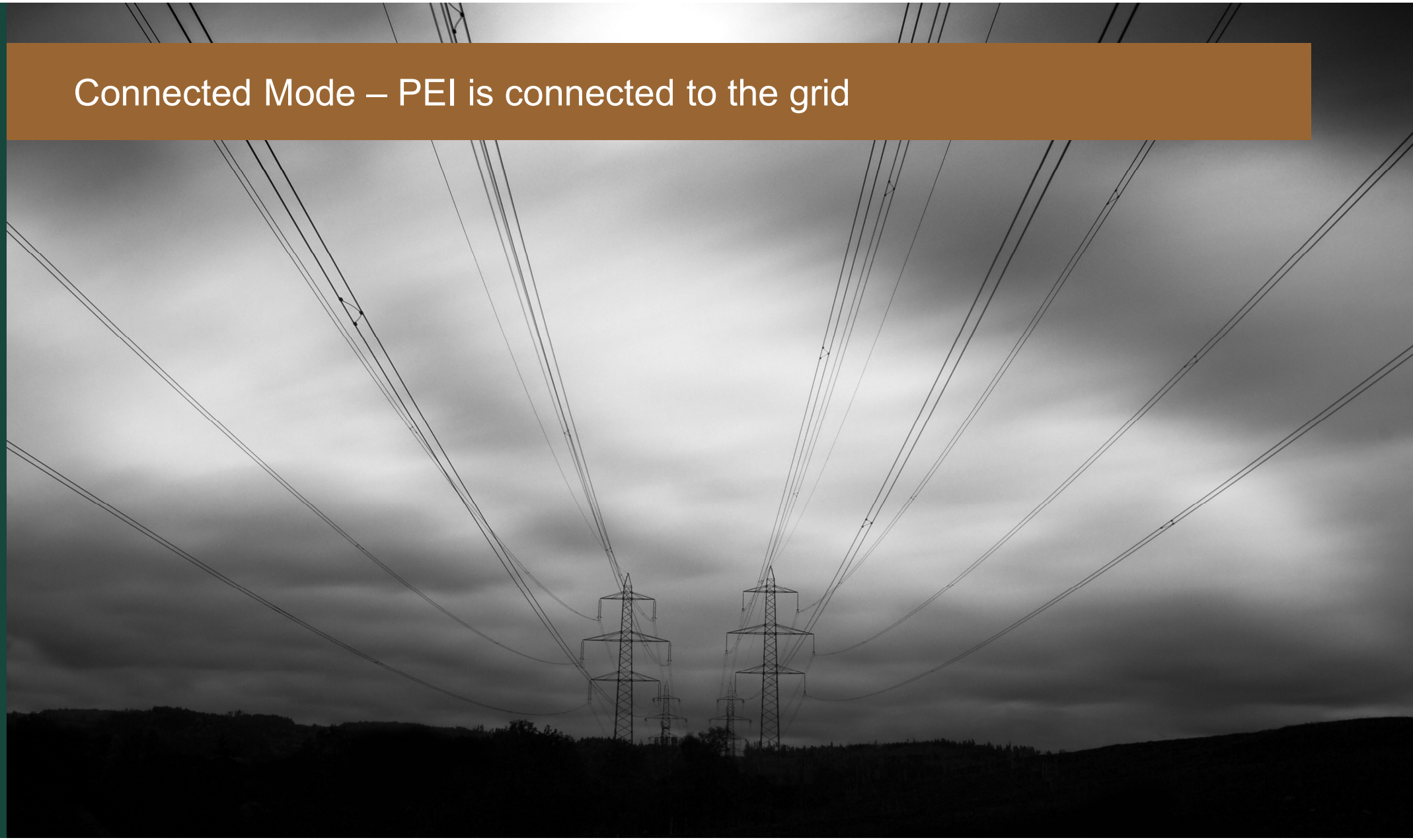
Key

1	Public network
2	Home appliances and electronic devices
3	Motors
4	Lighting
5	Heaters
6	Electric vehicles
7	Solar inverter
8	Wind inverter
9	Other generators
10	Electric storage
11	EEMS
12	Origin of installation
13	Local distribution
14	Local generation
15	Local consumption
16	Management signals

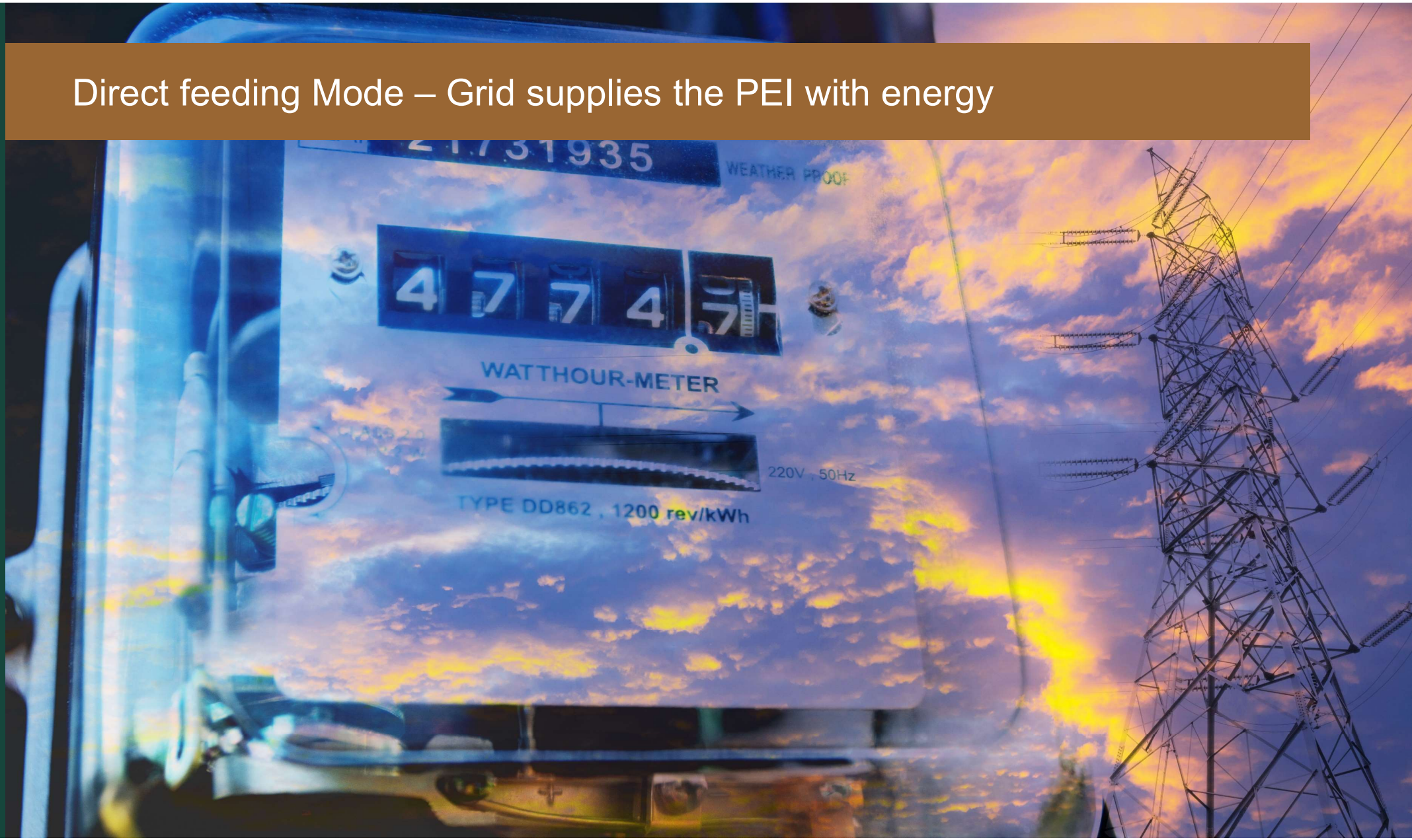
Island Mode – PEI is disconnected from the grid but remains energised



Connected Mode – PEI is connected to the grid



Direct feeding Mode – Grid supplies the PEI with energy



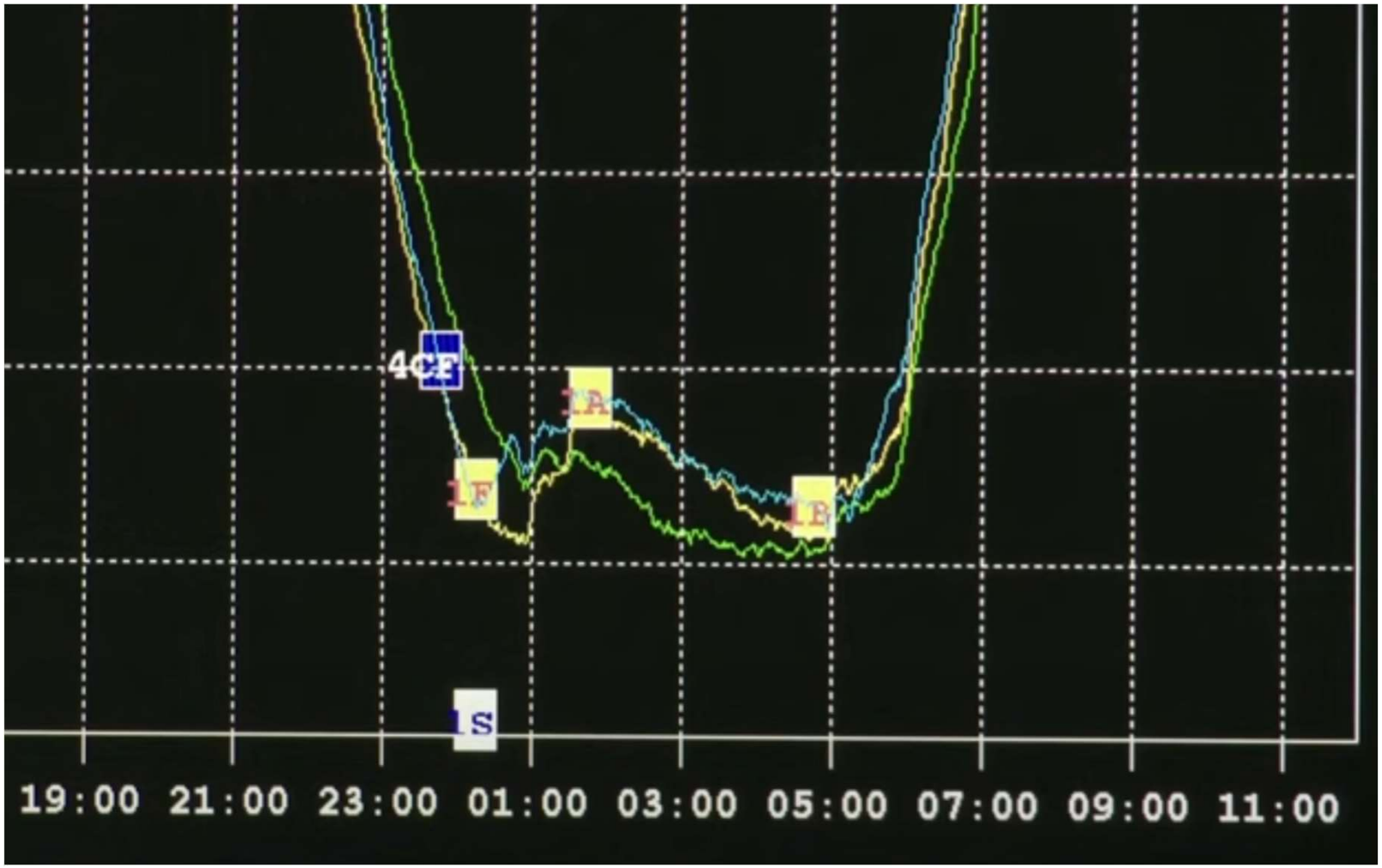
Reverse feeding Mode – PEI supplies the grid, and you get paid

825 Electrical Energy Management Systems (EEMS)

- Connection of PEI to the smart grid
- Manage local energy production
- Manage local energy consumption
- Manage energy procurement

See Annex D82
or BS HD 60364-8-1
or BS HD 60364-8-3

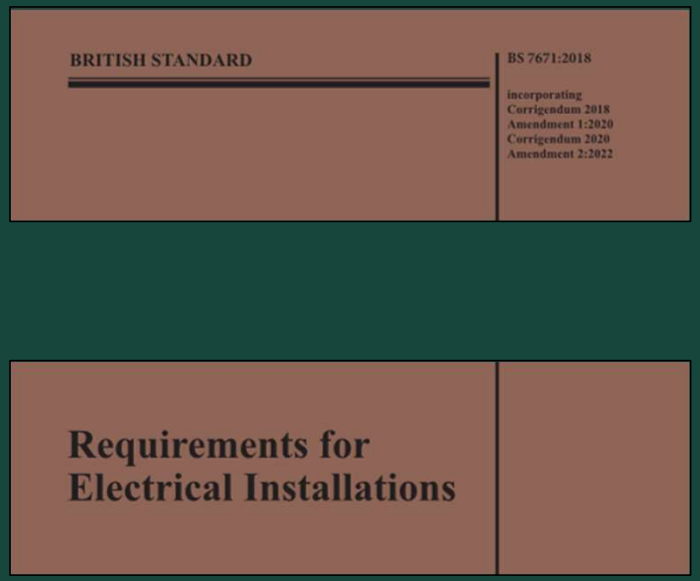
825 Electrical Energy Management Systems (EEMS)



825 Electrical Energy Management Systems (EEMS)

826.5 EV

- Both a load and storage device
- Not permanently connected
- Should be managed by the EEMS


BRITISH STANDARD
BS 7671:2018
incorporating
Corrigendum 2018
Amendment 1:2020
Corrigendum 2020
Amendment 2:2022
Requirements for
Electrical Installations

Net Zero


COP26
ZERO EMISSION
CO2
2050

VIRAL

NET ZERO by 2050

Eliminate Emissions

Marketing?

Decades of Inaction

Green Colonialism

Deflection

Confusing

More harm than good

Green Washing

Money from Pollution

Money from Planting

Economic Stimulator

False Targets

Next Generations Problem

Office for National Statistics

‘Net zero means that the UK’s **total greenhouse gas** (GHG) **emissions** would be **equal to or less** than the **emissions** the UK **removed** from the environment. This can be achieved by a combination of emission reduction and **emission removal**.’

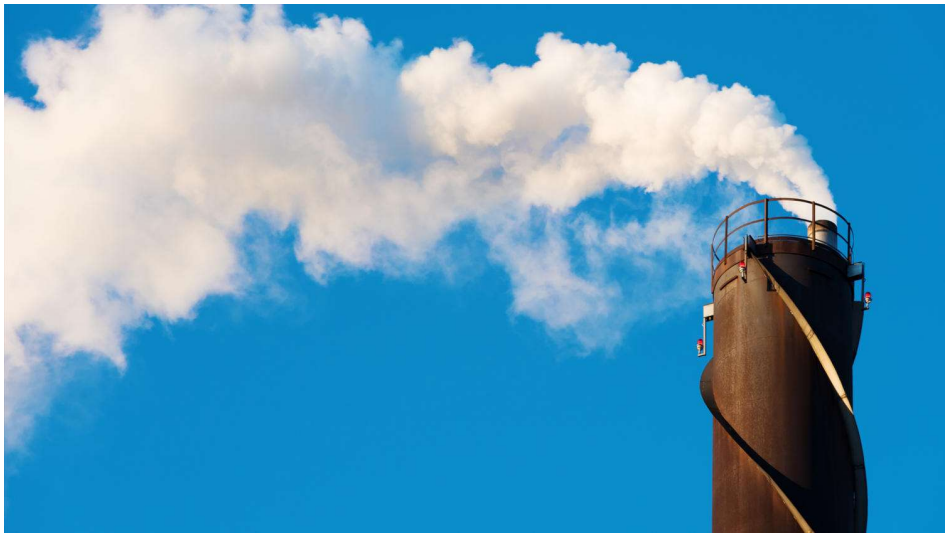
https://researchbriefings.files.parliament.uk/documents/CBP-8590/CBP-8590.pdf

Includes Green house Gas emissions or removals from:

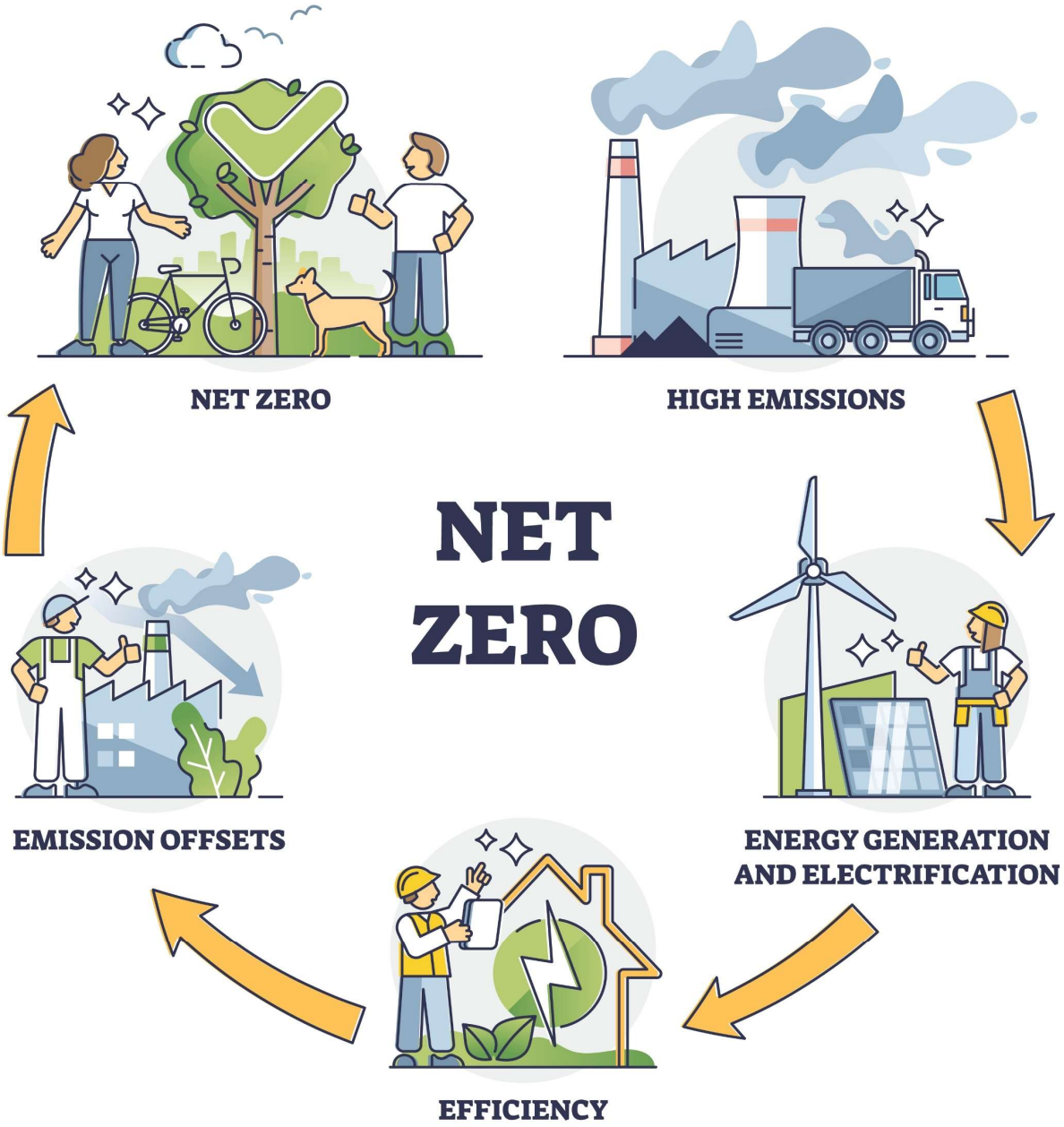
- Businesses based in the UK regardless of where in the world they are registered
- The activities of people that live in the UK as well as non-UK visitors
- Land such as forest, crop or grazing land

Excludes Green house Gas emissions or removals from:

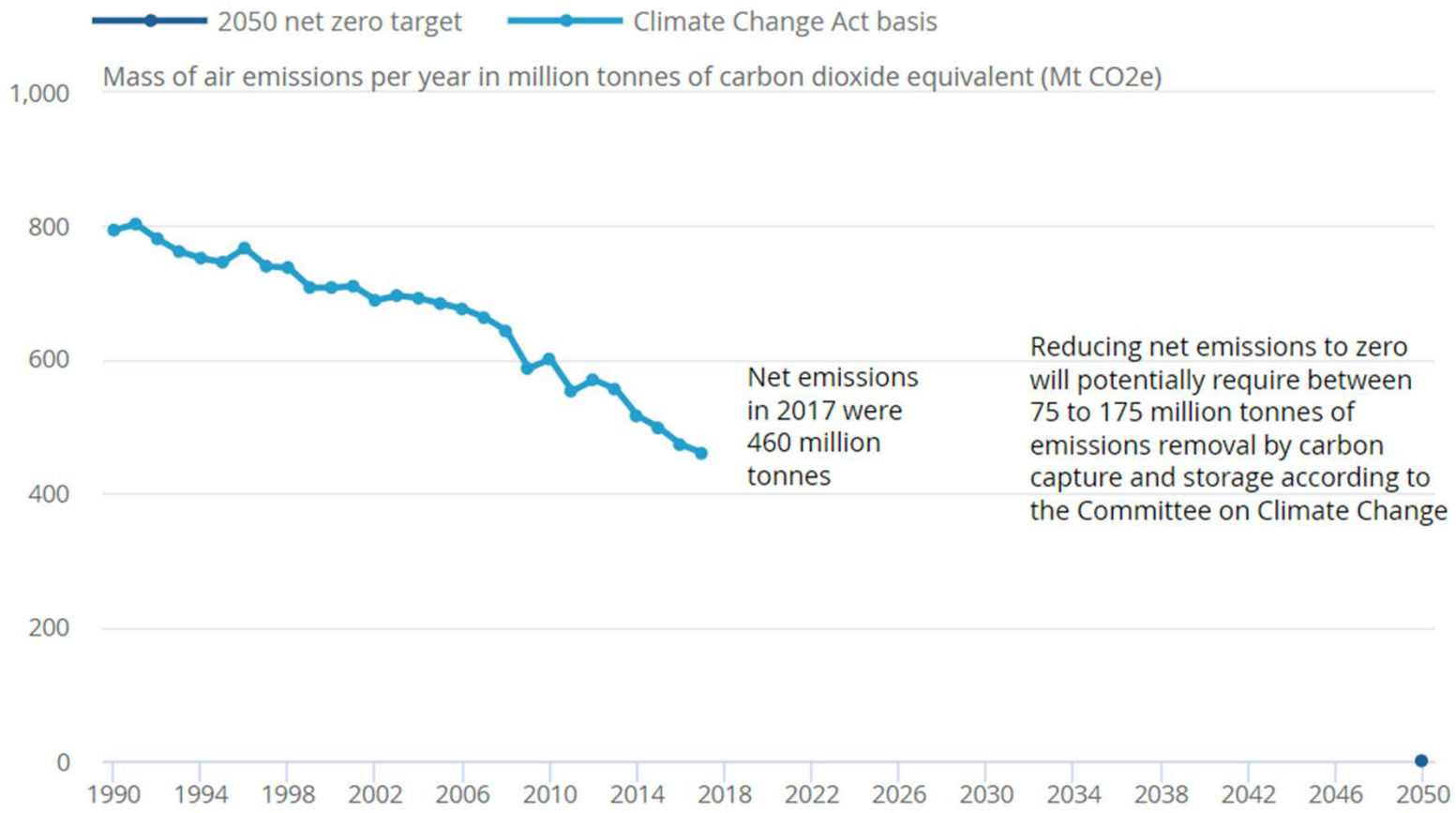
- International air travel
- International shipping
- UK residents abroad
- UK Crown dependencies and overseas territories
- The burning of biomass such as wood, straw, biogases and poultry litter for energy production
- Land such as peatland
- The production of goods and services that the UK imports from other countries



Emissions Vs Removal

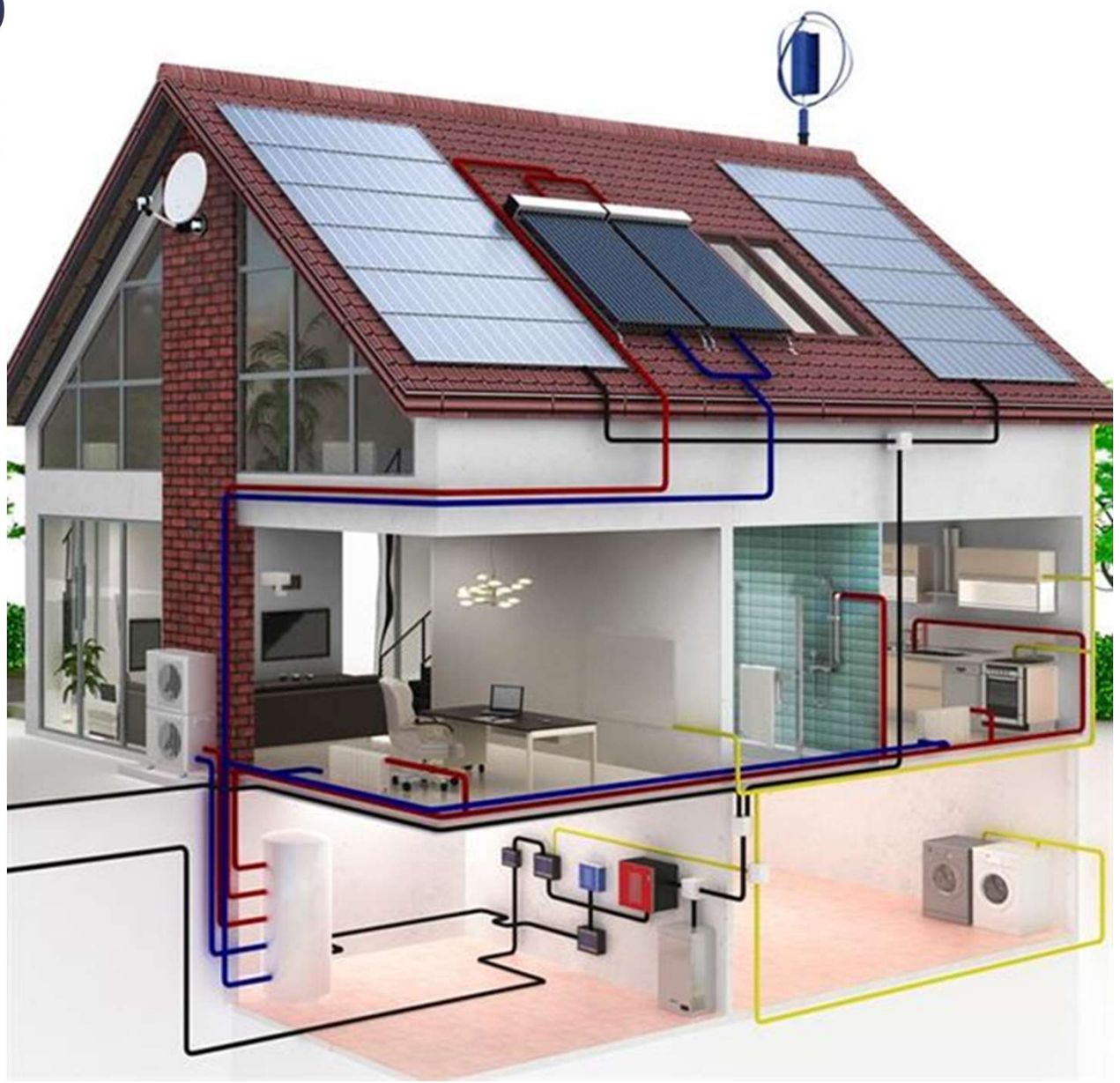

NET ZERO
HIGH EMISSIONS
NET ZERO
EMISSION OFFSETS
ENERGY GENERATION AND ELECTRIFICATION
EFFICIENCY

Office for National Statistics

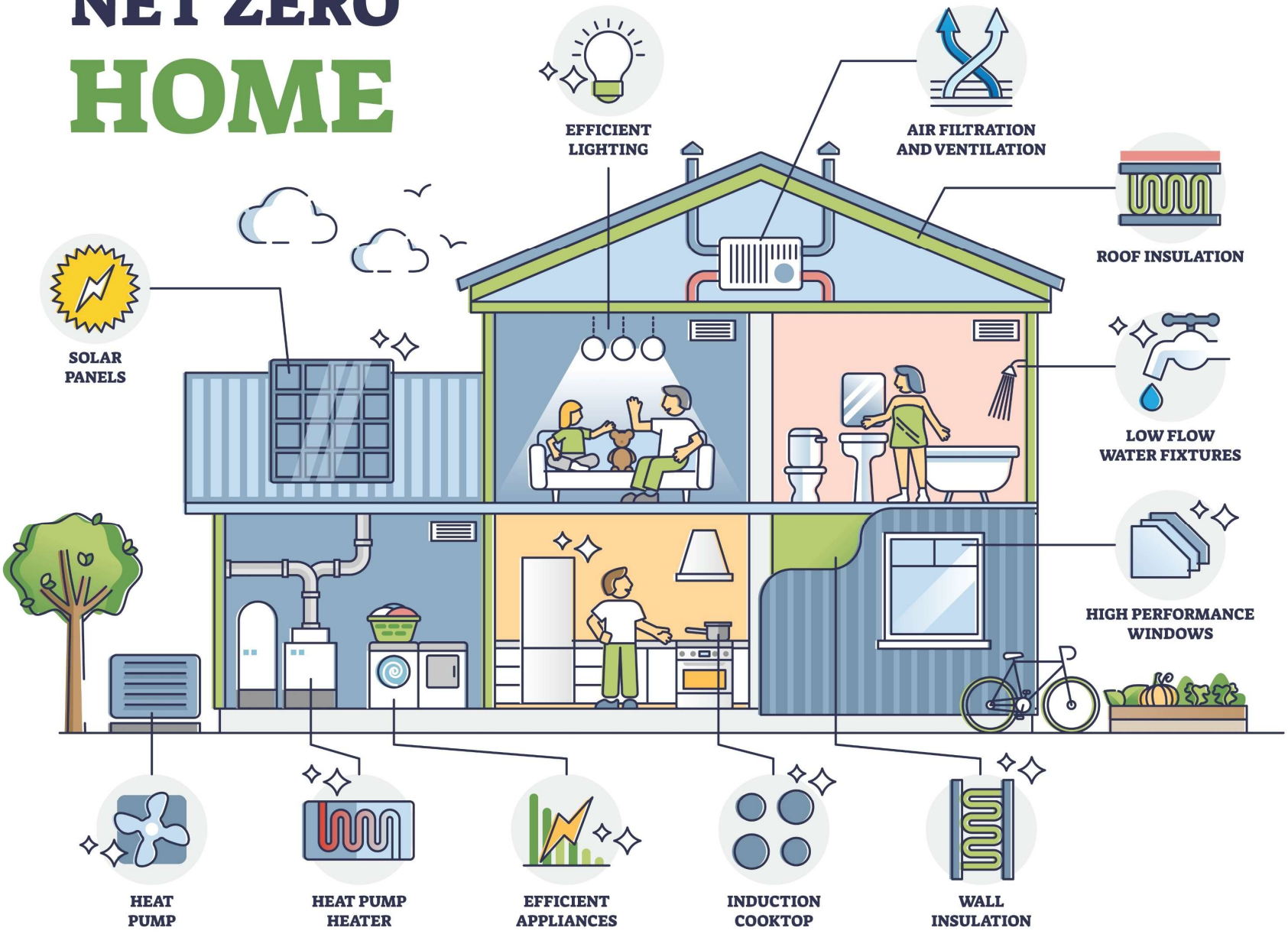


https://www.ons.gov.uk/economy/environmentalaccounts/articles/netzeroandthedifferentofficialmeasuresoftheuksgreenhousegasemissions/2019-07-24#:~:text=Net%20zero%20means%20that%20the,emission%20reduction%20and%20emission%20removal.

NET ZERO HOME



NET ZERO HOME




A
B
C
D
E
F
G


69
HEAT SET TO
63
Main Floor
69
HEAT SET TO
63
Inside Humidity
39%
Outside Temp.
52°

Office for National Statistics

The UK's carbon footprint is classed as an **Experimental Statistic** due to inherent uncertainties in the estimates produced. The methodology used to produce them is subject to ongoing review and refinement.

https://www.ons.gov.uk/methodology/methodologytopicsandstatisticalconcepts/guidetoexperimentalstatistics

Ongoing CPD

HOUSE OF COMMONS LIBRARY

BRIEFING PAPER

Number CBP 8394, 19 June 2020

Brexit: Energy and Climate Change

By Suzanna Hinson and Sara Priestley

Contents:

Draft Order laid before Parliament under sections 2(6) and 91(1) of the Climate Change Act 2008, for approval by resolution of each House of Parliament.

DRAFT STATUTORY INSTRUMENTS

2019 No.

CLIMATE CHANGE

The Climate Change Act 2008 (2050 Target Amendment) Order 2019

Made - - - - ***

Coming into force in accordance with article 1

A draft of this instrument was laid before and approved by a resolution of each House of Parliament, in accordance with sections 2(6) and 91(1) of the Climate Change Act 2008 ("the Act")(a).

Before the draft was laid, the Secretary of State—

(a) obtained and took into account the advice of the Committee on Climate Change, in accordance with section 3(1)(a) of the Act; and

(b) took into account representations made by the Scottish Ministers, the Welsh Ministers and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland in accordance with section 3(1)(b) of the Act(b),

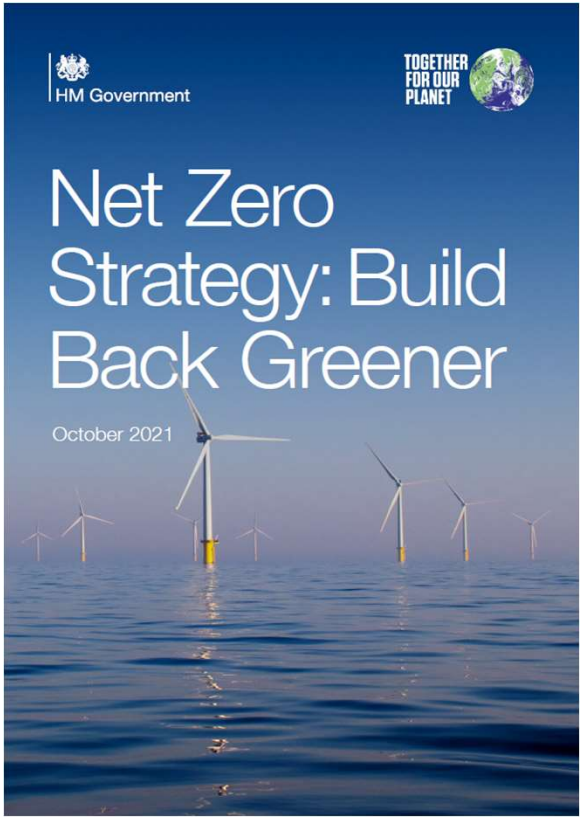
The Secretary of State considers that since the Act was passed, there have been significant developments in scientific knowledge about climate change that make it appropriate to amend the percentage specified in section 1(1) of the Act.

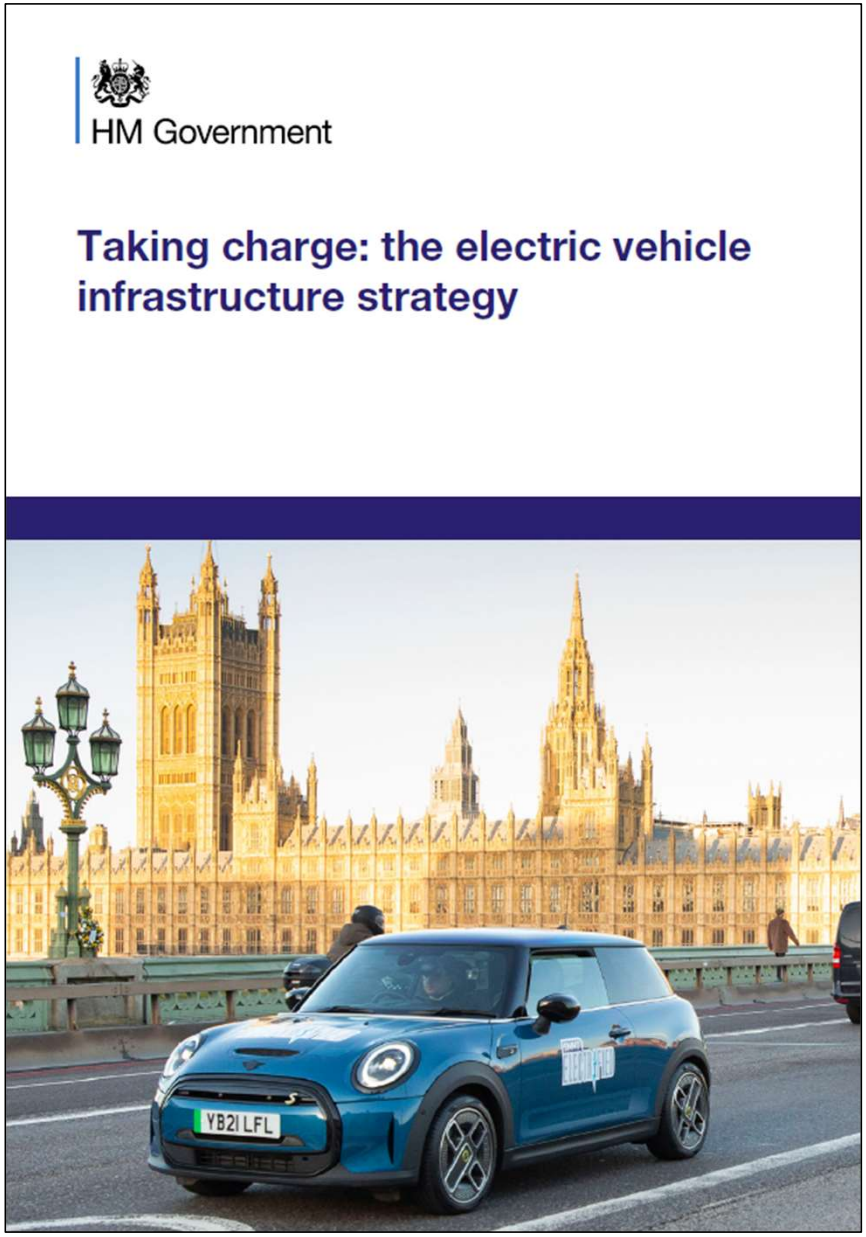
Accordingly, the Secretary of State, in exercise of the power conferred by section 2(1)(a) of the Act, makes the following Order:

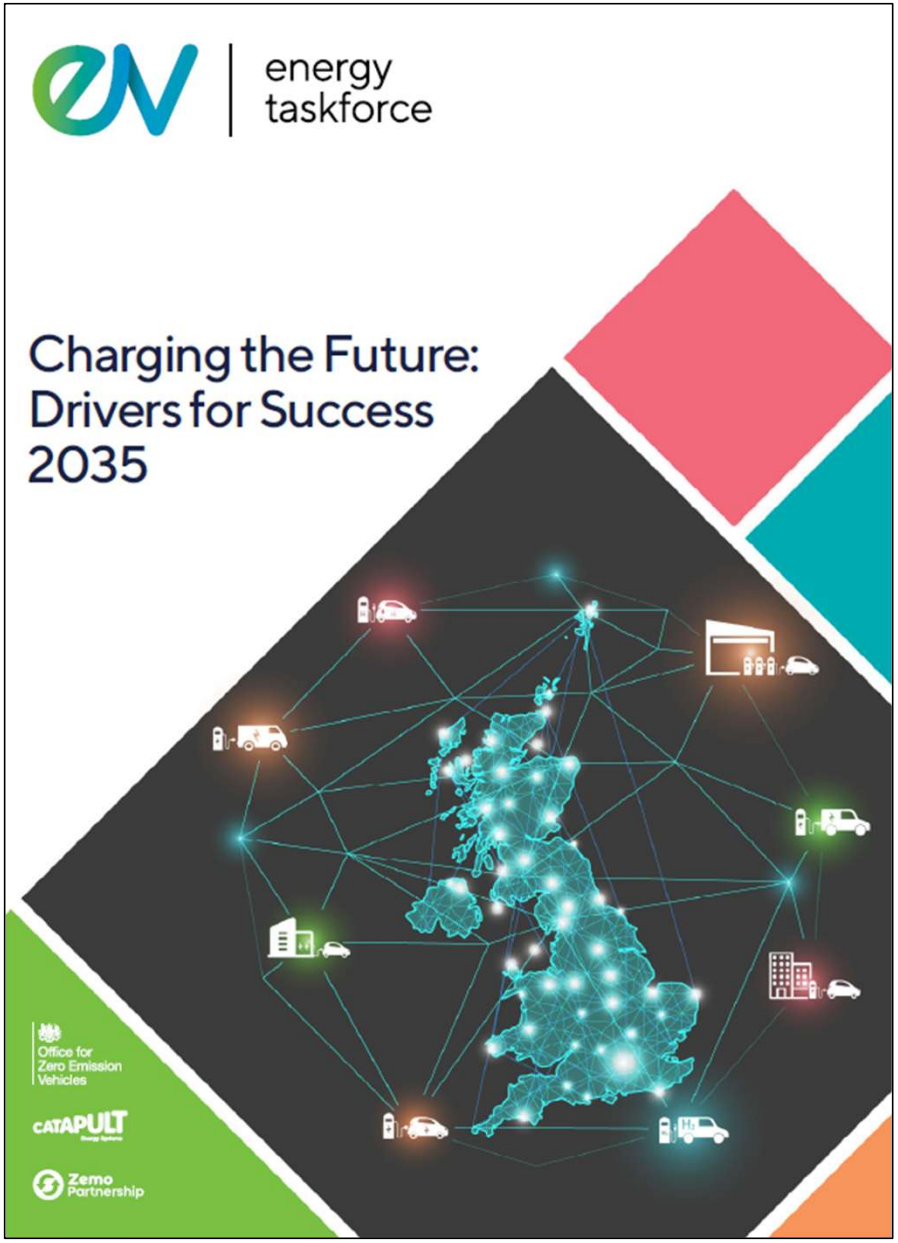
Citation and commencement

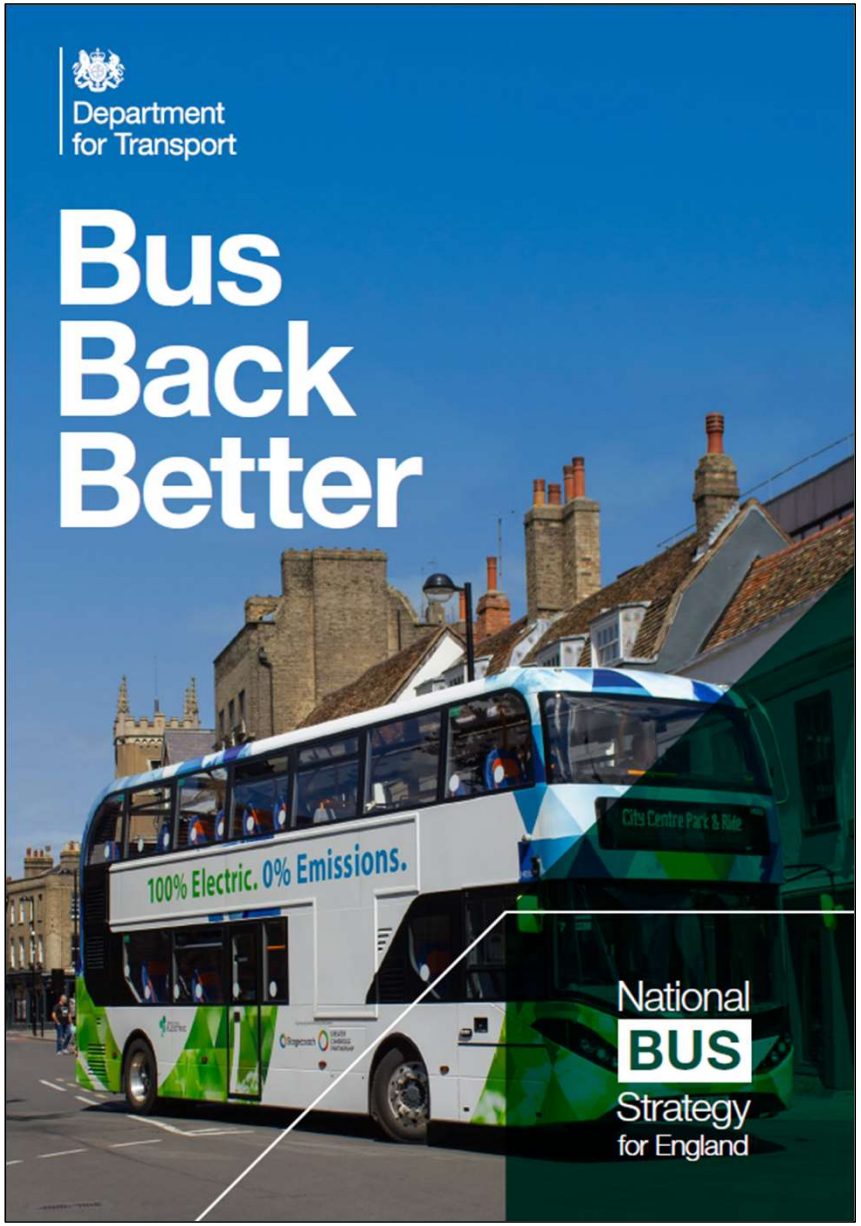
1. This Order may be cited as the Climate Change Act 2008 (2050 Target Amendment) Order 2019 and comes into force on the day after the day on which it is made.

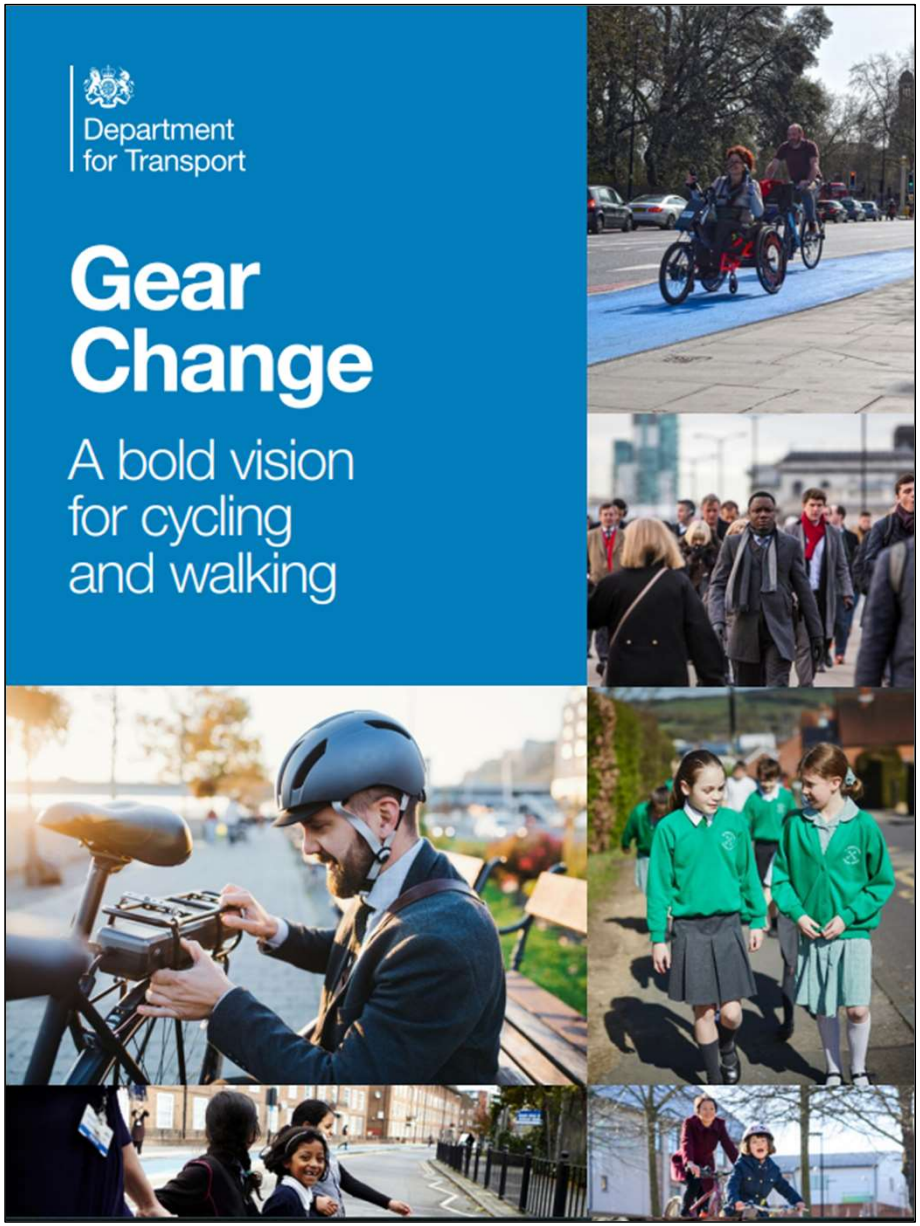
(a) 2008 c.27
(b) see sections 95 and 96 of the Act for definitions of "national authority" and "relevant Northern Ireland Department".

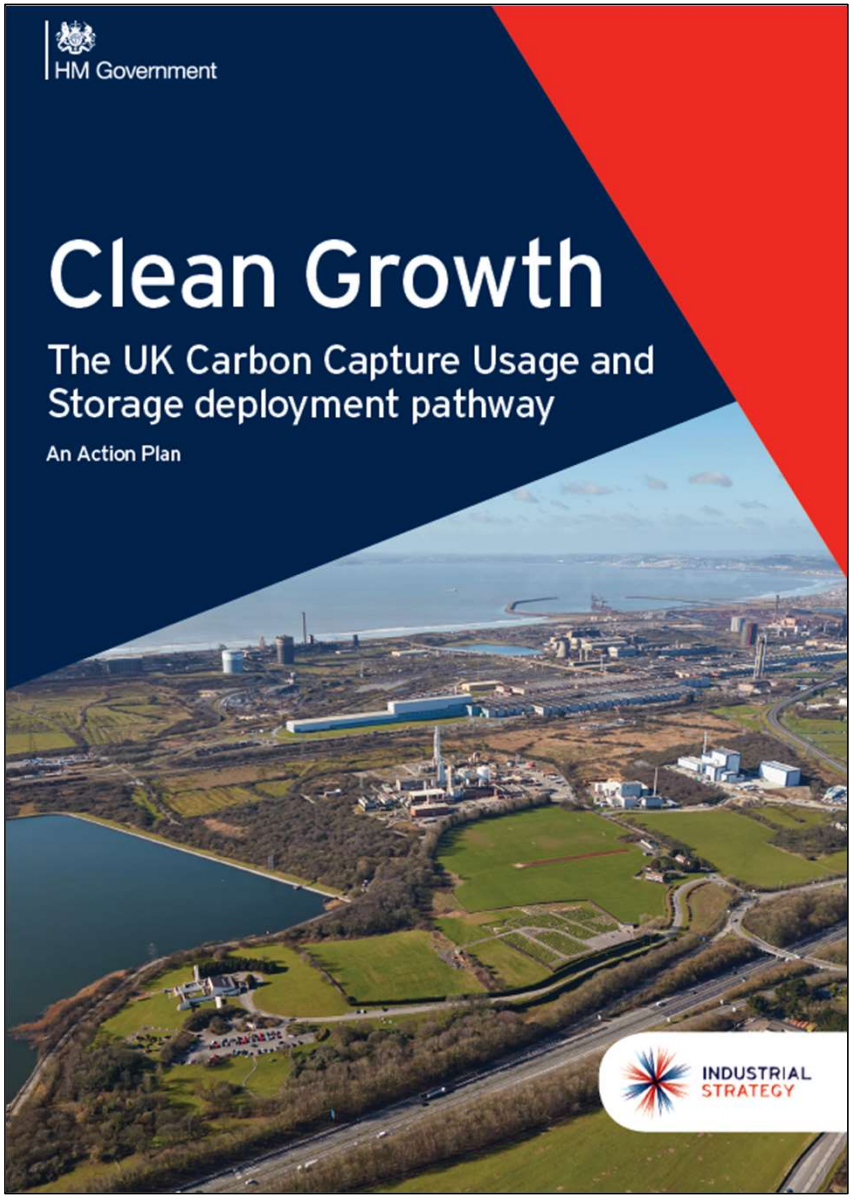



HM Government
Taking charge: the electric vehicle infrastructure strategy
YB21 LFL


energy taskforce
Charging the Future: Drivers for Success 2035
Office for Zero Emission Vehicles
CATAPULT
Zemo Partnership

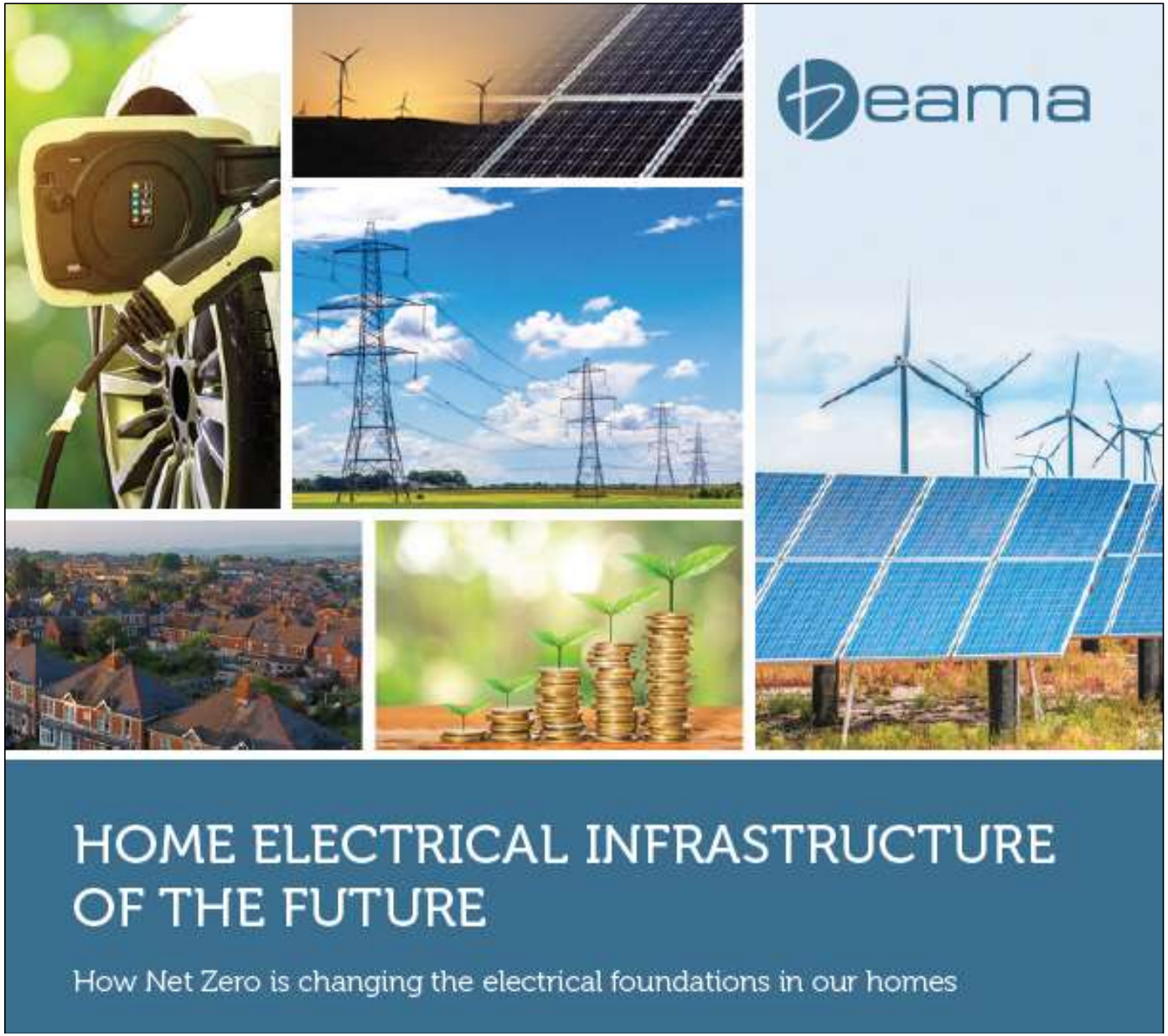

Department for Transport
Bus Back Better
100% Electric. 0% Emissions.
National BUS Strategy for England

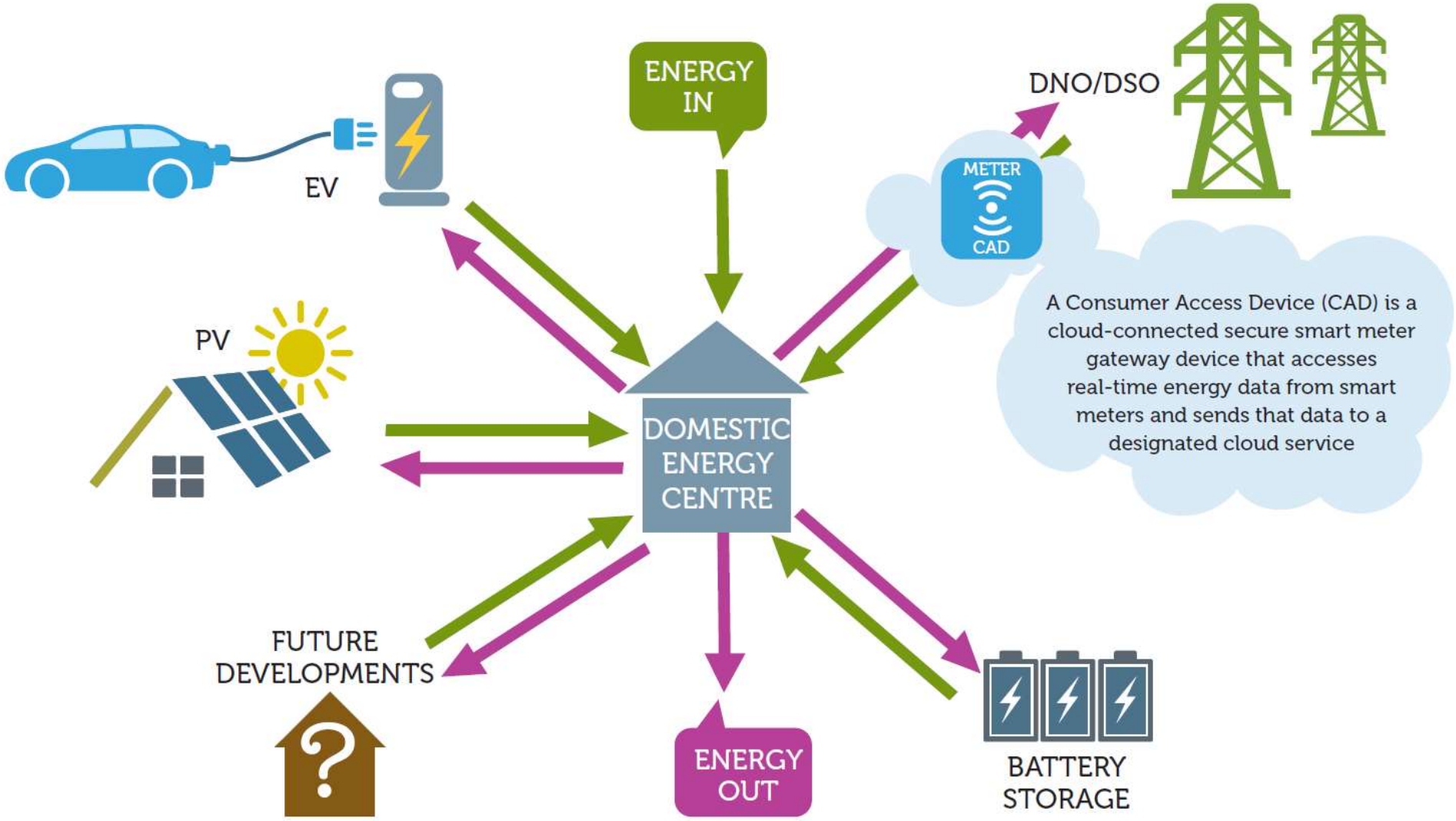

Department for Transport
Gear Change
A bold vision for cycling and walking



Kemper, Mississippi, USA $7.5bn

Gorgon, Australia $3bn


beama
HOME ELECTRICAL INFRASTRUCTURE OF THE FUTURE
How Net Zero is changing the electrical foundations in our homes


ENERGY IN
DNO/DSO
METER
CAD
EV
PV
A Consumer Access Device (CAD) is a cloud-connected secure smart meter gateway device that accesses real-time energy data from smart meters and sends that data to a designated cloud service
DOMESTIC ENERGY CENTRE
FUTURE DEVELOPMENTS
ENERGY OUT
BATTERY STORAGE

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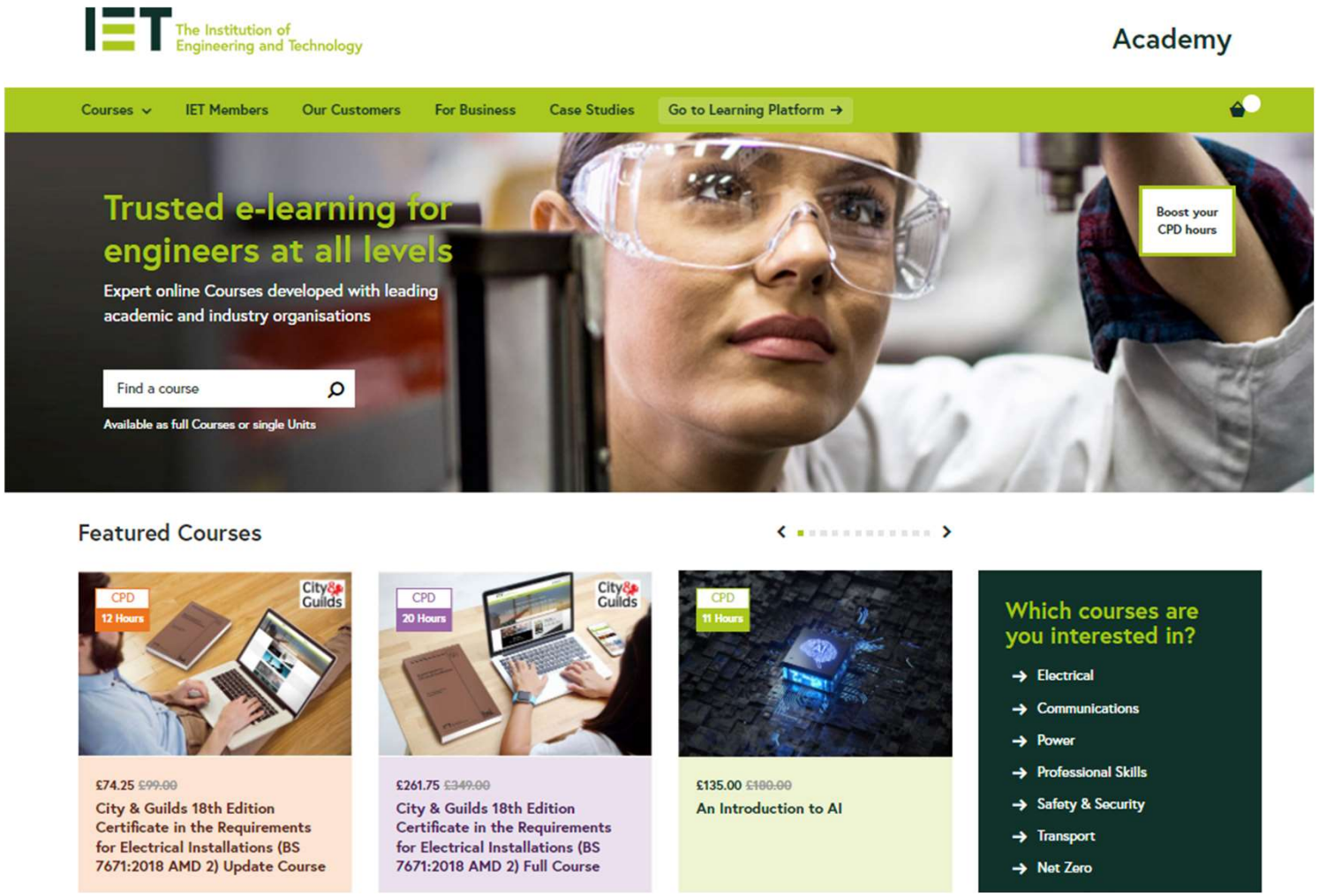
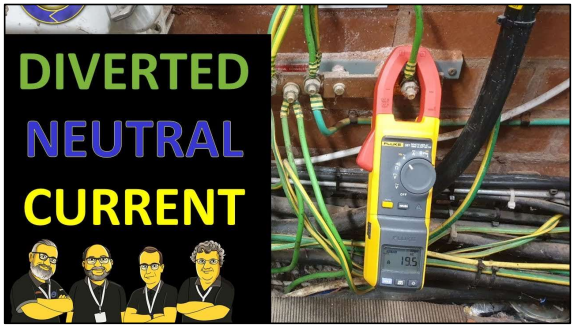
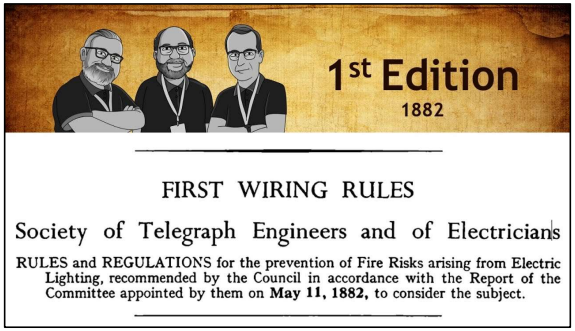




YouTube

e5



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