

Title	Demonstrate knowledge of electricity supply networks		
Level	3	Credits	8

Purpose	People credited with this unit standard are able to demonstrate knowledge of: the principles of electricity transmission, distribution and reticulation; and switching stations, substations and associated equipment.
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Classification	Electricity Supply > Electricity Supply - Core Skills
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Available grade	Achieved
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Guidance Information

- 1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with applicable industry and legislative requirements.
- 2 Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to the current version of the Health and Safety at Work Act 2015; and any subsequent amendments and replacements; Electricity Act 1992; Electricity (Safety) Regulations 2010; Electricity supply industry codes of practice and documented enterprise procedures, including *Safety Manual – Electricity Industry* (SM-EI) (2015) Wellington: Electricity Engineers' Association, available from www.eea.co.nz.
- 3 Definitions
Asset owner refers to a participant who owns or operates assets used for generating or conveying electricity.
Industry requirements include all asset owner requirements; manufacturers' specifications; and enterprise requirements which cover the documented workplace policies, procedures, specifications, business, and quality management requirements relevant to the workplace in which assessment is carried out.
- 4 Candidates are expected to recognise the location of particular items of plant and equipment in the overall supply system.
- 5 This unit standard excludes the detailed knowledge of plant and equipment in electricity networks.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the principles of electricity transmission, distribution and

reticulation.

Performance criteria

- 1.1 The concept of conductor current carrying capacity is explained.
- Range conductor cross-sectional area, current density, conductor resistance, heating, and heat flow balance.
- 1.2 The construction of cables used in electricity industry is described.
- Range may include but is not limited to – Neutral Screen (NS), Mineral Insulated Metal Sheath (MIMS), Steel Wire Armoured (SWA), Paper Insulated (PI), Polymeric, Cross-Linked Polyethylene (XPLE);
evidence of three is required.
- 1.3 The Multiple Earth Neutral (MEN) system of supply in New Zealand is explained.
- 1.4 The concept of referencing in a MEN system to the general mass of earth is explained in terms of safety, insulation levels, and protection.
- 1.5 The requirement for insulation of conductors in electrical systems is explained in terms of safety, segregation of conductors of differing phases, and insulation coordination.
- 1.6 The relationship of line voltage to phase voltage to earth is defined in terms of delta, star phasors, and $\sqrt{3}$ factor.
- 1.7 Common transmission line voltages used in New Zealand are defined in terms of 220 kV, 110 kV, 66 kV, and 33 kV.
- 1.8 Common sub-transmission, distribution and reticulation line voltages used in New Zealand are defined in terms of 66 kV, 33 kV, 22 kV, 11 kV, 400 V and 230 V.
- 1.9 The basic principles of high voltage direct current (HVDC) transmission is explained with reference to the inter-island link.
- 1.10 Common overhead power line and power cable configurations are described.
- Range single phase and three phase conductors, bundle conductors, insulators, towers, poles, cross-arms, and earthing conductors.

Outcome 2

Demonstrate knowledge of switching stations, substations and associated equipment.

Performance criteria

- 2.1 The detection of fault currents and principles of overcurrent and earth fault

protective relays are described.

Range current transformers, protective relays, definite time, and inverse time.

2.2 The use of disconnectors and earth switches are explained in terms of the isolation and earthing of conductors and plant.

2.3 Common switching station and circuit layouts are described in terms of single and double busbar, duplicate feeders, and ring feeders.

2.4 Standard sub-transmission and distribution substation configurations are described.

Range high voltage switchgear, transformer(s), low voltage switchgear, protection equipment, and local transformer.

2.5 Standard means of remote control of switching stations and substations are described in terms of supervisory control and data acquisition and use of telecommunications.

Planned review date	31 December 2024
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 April 2001	31 December 2016
Review	2	22 October 2003	31 December 2016
Rollover and Revision	3	16 July 2010	31 December 2016
Review	4	20 March 2014	31 December 2021
Review	5	28 November 2019	N/A

Consent and Moderation Requirements (CMR) reference	0120
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Comments on this unit standard

Please contact Connexis - Infrastructure Industry Training Organisation at qualifications@connexis.org.nz if you wish to suggest changes to the content of this unit standard.