Title	**Demonstrate knowledge of the electricity generation sector in New Zealand**		
Level	**3**	**Credits**	**5**

Purpose	People credited with this unit standard are able to demonstrate knowledge of: the electricity supply industry in New Zealand; the principles of electricity generation; the types of large scale electricity generation in New Zealand: and switchyards and associated equipment.

Classification	Electricity Supply > Electricity Supply - Core Skills

Available grade	Achieved

Guidance Information

1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with applicable legislative and industry requirements.

2 Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to:
- Health and Safety at Work Act 2015;
- Electricity Act 1992;
- Electricity (Safety) Regulations 2010;
- Electricity supply industry codes of practice and documented enterprise procedures, including *Safety Manual – Electricity Industry* (SM-EI) and relevant EEA guides available from www.eea.co.nz;
  and any subsequent amendments and replacements.

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 and standards; 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.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the electricity supply industry in New Zealand.

Performance criteria

1.1 The electricity supply industry is described in terms of generation, transmission, distribution and retail.

1.2 An overview of the electricity transmission network is described.

Range national grid, and high voltage direct current (HVDC) link.

1.3 An overview of the electricity distribution network is described.

Range distribution networks, substations.

1.4 Electricity retailing is described in terms of purpose.

1.5 The New Zealand electricity market is described in terms of its operation.

Outcome 2

Demonstrate knowledge of the principles of electricity generation.

Performance criteria

2.1 The effect on conductor forced through magnetic field is explained in terms of current induced in conductor.

2.2 The concept of electromagnetic fields is explained in terms of magnetic field in a conductor coil.

2.3 Concepts of alternating current generation are explained.

Range rotating magnetic field, induced voltage in stator winding.

2.4 Concepts of direct current generation are explained.

2.5 The effect on the generated output voltage of varying the current in the electromagnetic rotating field coils and the rotational speed of a generator is explained.

2.6 The effects of balance and imbalance between generator power output and load power consumption are explained.

Range frequency, output voltage.

2.7 The concept of system frequency is explained.

2.8 The effects of varying the magnetic field strength of the rotor on generator output under load when connected to the transmission or distribution system are explained.

Range reactive power, active power.

2.9 The concepts of single-phase and three-phase generation are explained.

2.10 The relationship of line voltage to phase voltage to earth is defined.

Range delta, star, √3 factor.

Outcome 3

Demonstrate knowledge of the types of large scale electricity generation in New Zealand.

Range renewable, non-renewable;
evidence of three different types is required.

Performance criteria

3.1 Renewable generation is explained in terms of type, characteristics, plant and equipment.

Range may include but is not limited to – hydro, wind.

3.2 Thermal generation is explained in terms of type, characteristics, plant and equipment.

3.3 The concept of combined cycle and co-generation electricity generation is explained in terms of fuel source and characteristics, generation system, plant and equipment.

Outcome 4

Demonstrate knowledge of switchyards and associated equipment.

Range may include but is not limited to – transformers, switchgear, protective equipment, voltage and current transformers, capacitors, communications.

Performance criteria

4.1 Common switchyard layouts are described.

Range may include but is not limited to – single and double busbar, duplicate feeders, ring feeders, power, local and instrument transformer, circuit breakers, disconnectors, earth switches, protection equipment;
evidence for two layouts is required.

4.2 Common transmission line voltages used in New Zealand are defined.

Range 220 kV, 110 kV, 66 kV, 50 kV.

4.3 Methods of fault current detection and principles of operation of protective relays are described.

Range voltage and overcurrent relays, definite time and inverse time relays.

4.4 The cause of system fault currents is explained.

Range phase to phase faults, phase to earth faults, and typical magnitude of fault currents in transmission and distribution networks.

4.5 The use, location and normal operating sequence of power transformers, circuit breakers, disconnectors and earth switches are explained.

4.6 Common sub-transmission, distribution and reticulation line voltages used in New Zealand are defined.

Range 66 kV, 50 kV, 33 kV, 22 kV, 11 kV, 400 V, 230 V.

Replacement information	This unit standard replaced unit standard 28572.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	16 March 2017	31 December 2023
Review	2	30 September 2021	N/A

Consent and Moderation Requirements (CMR) reference	0120

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 qualifications@connexis.org.nz if you wish to suggest changes to the content of this unit standard.