Title	**Operate electrical switchgear in the electricity generation industry**		
Level	**4**	**Credits**	**10**

Purpose	People credited with this unit standard are able to: describe electrical switchgear in common use in electricity generation switchyards; describe the operating principles of switchgear in common use in generation switchyards; identify and communicate switchgear status; operate electrical switchgear; and report electrical switchgear operation.

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.
Status refers to the operational condition or state of any or all of the components of an electrical power system, relative to its expected or required performance level.

Outcomes and performance criteria

Outcome 1

Describe electrical switchgear in common use in electricity generation switchyards.

Range circuit breakers (CBs), disconnectors, air break switches, earth switches, metal clad switchgear.

Performance criteria

1.1 The functions of electrical switchgear are described with reference to the ability to switch under fault, load, and no load conditions.

1.2 The principle of operation and the construction of electrical switchgear are described.

Range bulk oil, minimum oil, SF6 (sulphur hexafluoride), vacuum, air blast, air break.

1.3 The component parts of electrical switchgear are described.

Range contacts, arc chutes or splitters, arc extinguishing medium, operating rods, insulators, closing mechanisms, release mechanisms, racking mechanism, lock out relay, closing and trip coils, direct current control fuses, alternating current drive fuses, trip circuit supervision, slow closing mechanism, electrical and mechanical interlocks.

1.4 The types and functions of stored energy systems used on circuit breakers are described.

Range hydraulic, pneumatic, motor or hand charged springs, capacitors, batteries.

1.5 The switchgear numbering system is described for high voltage (HV) switchgear.

Outcome 2

Describe the operating principles of switchgear in common use in electricity generation switchyards.

Performance criteria

2.1 The ratings of switchgear are described.

Range rated voltage, rated current, fault making ratings, fault breaking ratings, fault carrying ratings, operation duty (number of operations able to be completed and dead time in between operations).

2.2 The factors that may affect the rating of switchgear are described.

Range power factor, capacitive current, magnetising current, duty cycles, circuit loop current, point on wave switching.

2.3 The function of reclosers and line sectionalisers is described.

2.4 The impacts of the Resource Management Act 1991 on the operation of switchgear are described.

Outcome 3

Identify and communicate switchgear status.

Range type of switchgear, switching capability, load currents, indications, alarms, healthy trip, open, closed, isolated, isolated and earthed, protective relay flaggings, operations counter, loggings, service requirements;
may include – insulant levels, SF6 pressure, air pressure, hydraulic pressure, pump and/or compressor starts or running times, springs charging status.

Performance criteria

3.1 Switchgear is correctly identified.

3.2 Switchgear status is determined.

Range locally, equipment status flags, operator control screens and/or panels.

3.3 At shift change, handover procedures are completed, ensuring that all relevant information is transferred to new shift operator in a manner and time frame which meets established operating requirements.

Outcome 4

Operate electrical switchgear.

Range open, close, isolate, manual, local and remote operation.

Performance criteria

4.1 Electrical switchgear operation is carried out in accordance with industry safety rules, company procedures, and ensuring that security of supply is maintained.

4.2 The equipment is safely and correctly operated.

Range includes but is not limited to – switchyard or substation layout, correct switchgear identification, appropriate personal protection equipment (PPE) utilised, correct procedures and documentation utilised, interlocking systems, switching methods are suitable for switchgear type and characteristics and in accordance with manufacturer's operating manual and specifications.

4.3 Switching sequences to operate equipment are carried out in accordance with organisational requirements.

Range checked, actioned, recorded, reported.

4.4 The response to abnormal conditions during switching is described.

Range may include but is not limited to – switchgear fault, switchgear in distress, failure to open all phases, failure to close all phases, busbar protection operation, trip fail alarm, loss of air or gas pressure, disconnector or earth switch welded contacts; evidence of three conditions is required.

Outcome 5

Report electrical switchgear operation.

Range includes but is not limited to – log book, entry approval, switching instruction, plant outage requests.

Performance criteria

5.1 Reported information, including responses to abnormal events, is recorded concisely in the required format and filed within the scheduled time frame.

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.