

Title	Demonstrate knowledge of transmission and distribution network engineering		
Level	5	Credits	15

Purpose	<p>People credited with this unit standard are able to demonstrate knowledge of:</p> <ul style="list-style-type: none"> • electricity transmission and distribution systems, • power quality control of a transmission or distribution network, and • electricity transmission or distribution system faults.
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Classification	Electricity Supply > Electricity Supply - Power System Maintenance
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Available grade	Achieved
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Guidance Information

Definitions

HVDC – High voltage direct current.

SVC – Static VAR compensator.

TCR – Thyristor controlled reactor.

TSC – Thyristor switched capacitor.

TSR – Thyristor switched reactor.

VSC – Voltage source converter.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of electricity transmission and distribution systems.

Range may include – radial, mesh, looped, dc links, smart grid, super grid.

Performance criteria

1.1 The key system components in an electricity supply system are described.

1.2 The systems available for a transmission and distribution are compared.

1.3 Line diagrams of a simplified New Zealand electricity supply system are drawn.

1.4 The constraints of the current New Zealand grid configuration are described.

Range may include – loss of generation, effect of renewable generation, power flows limits, grid layout, parallel networks, types of spinning reserve, local generation.

1.5 The need, benefits and limitations of using a HVDC link are explained.

Outcome 2

Demonstrate knowledge of power quality control of a transmission or distribution network.

Performance criteria

2.1 The circuit parameters of a transmission line or distribution network are explained.

2.2 The need for grid and distribution system voltage control is explained.

Range may include – sending voltage, receiving voltage, true power, reactive power.

2.3 The function and operation of static and active voltage and power factor compensators in networks is explained.

Range may include – SVC, VSC, TCR, TSR, TSC, synchronous machine, tap changers.

Outcome 3

Demonstrate knowledge of electricity transmission or distribution system faults.

Performance criteria

3.1 The causes and effects of transmission or distribution three phase system faults are explained.

Range may include – symmetrical (balanced), asymmetrical (unbalanced), short circuit, open circuit, simultaneous faults (cross country), positive sequence, negative sequence, zero sequence, vector groups, high resistance to earth, arcing impedance.

3.2 Simplified equivalent circuits of transmission or distribution networks are drawn showing possible location of faults.

3.3 Fault current calculation using the per unit system is explained.

Range may include – source impedance, power transformer balanced, sequenced.

- 3.4 Fault analysis using short circuit steady state and transient line voltage and current waveforms is explained.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	20 July 2017	31 December 2024
Review	2	2 March 2023	31 December 2024

Consent and Moderation Requirements (CMR) reference

0120

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.