Title	Describe, operate, and monitor a generator and associated systems in an energy and chemical plant		
Level	4	Credits	10

Purpose	This unit standard is intended for people working as energy and chemical process operators in an energy and chemical plant.
	People credited with this standard are able to describe in relation to an energy and chemical plant generator: electrical power; magnets and magnetism; how the production of electromagnetic force (EMF) is induced and managed; alternating current (AC) generation; direct current (DC) generation; and generator operation and associated controls. They are also able to operate and monitor a generator and associated systems in an energy and chemical plant

Classification	Energy and Chemical Plant > Operation of Energy and Chemical Plant

Available grade	Achieved	

## **Guidance Information**

- 1 Legislation and regulations relevant to this unit standard include but are not limited to:
  - Health and Safety at Work Act 2015;
  - Health and Safety at Work (Hazardous Substances) Regulations 2017;
  - Hazardous Substances and New Organisms Act 1996; and any subsequent amendments.

#### 2 Definitions

*Energy and chemical plant* may be in – petrochemical, agri-nutrient, power generation, dairy processing, meat processing, and wood fibre manufacturing, or other plants that operate with a combination of high temperatures, pressures, steam and/or chemicals in gas, liquid or solid form.

*Generator* – main system generators and coupled to a prime mover. Generators exclude standby and emergency generators.

*Organisational requirements* – documented policies and procedures. These may include: equipment manufacturers' procedures; plant procedures; suppliers' instructions; site signage; codes of practice; company health and safety plans; on site briefings; and supervisor's instructions. This includes all regulatory and legislative obligations that apply to the plant.

Operate – manual operation and testing.

*Plant* – the operational unit, equipment and/or workplace at which the person is working.

- 3 For the purposes of assessment:
  - evidence for the practical components of this unit standard must be supplied from the workplace.

# Outcomes and performance criteria

## Outcome 1

Describe electrical power in relation to an energy and chemical plant generator.

#### Performance criteria

- 1.1 Describe electrical power in terms of voltage, current, and resistance, including its units.
- 1.2 Describe electrical energy in terms of power and time, and its units and symbols.
- 1.3 Describe efficiency in terms of the relationship between input and output powers of electrical machines.

## Outcome 2

Describe magnets and magnetism in relation to an energy and chemical plant generator.

#### Performance criteria

- 2.1 Describe magnetic terms.
  - Range permanent magnet, magnetic field, magnetic poles, magnetic flux, flux density.
- 2.2 Describe the construction of an electromagnet indicating current direction and magnet polarity.

# Outcome 3

Describe how the production of electromagnetic force (EMF) is induced and managed in relation to an energy and chemical plant generator.

#### Performance criteria

- 3.1 Describe how an EMF is induced by a conductor being moved in a magnetic field.
- 3.2 Describe how the magnitude of an EMF may be managed.

Range resistance, voltage, current, magnitude.

## Outcome 4

Describe alternating current (AC) generation in relation to an energy and chemical plant generator.

#### Performance criteria

- 4.1 Describe the operation of a simple single-loop, two-pole alternator with slip-rings and brushes.
- 4.2 Describe the wave form produced through one revolution of an AC generator.
- 4.3 Describe alternator output for each quarter-cycle through one revolution.
- 4.4 Describe AC terms.

Range cycle, frequency, peak, average.

#### Outcome 5

Describe direct current (DC) generation in relation to an energy and chemical plant generator.

#### Performance criteria

- 5.1 Describe the components of a simple DC generator.
  - Range simple generator permanent magnet, single loop of wire, twosegment commutator, carbon brush.
- 5.2 Describe the wave form produced through one revolution of a DC generator.

#### Outcome 6

Describe generator operation and associated controls in an energy and chemical plant.

#### Performance criteria

- 6.1 Describe the general principles of generators in terms of their construction and operation.
  - Range includes but is not limited to generator capabilities, cooling.
- 6.2 Describe generator excitation and electrical protection.
- 6.3 Describe generator controls in terms of their functions.
  - Range includes but is not limited to synchronising, load control, voltage control, temperature control.

## Outcome 7

Operate and monitor a generator and associated systems in an energy and chemical plant.

#### Performance criteria

7.1 Synchronise a generator in accordance with organisational requirements.

Range includes but is not limited to – voltage, frequency, phase displacement, phase sequence, waveform.

- 7.2 Log operating and monitoring actions in accordance with organisational requirements.
- 7.3 Determine operating decisions in accordance with plant status in accordance with organisational requirements.

Range includes but is not limited to – plant availability and service condition, loading limitation, impact on operations, business and/or market conditions.

- 7.4 Monitor a generator and associated systems in accordance with organisational requirements.
- 7.5 Identify, log, and act on deviations from normal operating conditions in relation to an energy and chemical plant generator in accordance with organisational requirements.
  - Range may include but is not limited to lube oil leak to stator, cooling water leak to stator, excessive temperature, loss of cooling or lubricating fluid, H<sub>2</sub>S (hydrogen sulphide) ingression.

Replacement information	This unit standard was replaced by skill standard 40456.
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# 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	27 February 2020	31 December 2026
Review	2	24 April 2025	31 December 2026

0079

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