

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

<b>Purpose</b>	<p>This unit standard is intended for people working as energy and chemical process operators in an energy and chemical plant.</p> <p>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</p>
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<b>Classification</b>	Energy and Chemical Plant > Operation of Energy and Chemical Plant
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<b>Available grade</b>	Achieved
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### 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.

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## 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, two-segment 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) ingress.

<b>Planned review date</b>	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 February 2020	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0079
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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 the Primary Industry Training Organisation [standards@primaryito.ac.nz](mailto:standards@primaryito.ac.nz) if you wish to suggest changes to the content of this unit standard.