40456 Operate and monitor a generator and associated systems in an energy and chemical plant

Kaupae | Level	4
Whiwhinga | Credit	10
Whāinga | Purpose	This skill 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 electrical power in relation to an energy and chemical plant generator; explain the principles of magnetism and electromagnetic force (EMF) generation in an energy and chemical plant generator; and describe current generation in relation to an energy and chemical plant generator. They are also able to describe generator operation and associated controls; and operate and monitor a generator and associated systems, in an energy and chemical plant. This skill standard can be used in the New Zealand Energy and Chemical qualifications at Level 4 and above.

Hua o te ako me Paearu aromatawai \| Learning outcomes and assessment criteria

Hua o te ako | Learning outcomes	**Paearu aromatawai** | Assessment criteria
1. Describe electrical power in relation to an energy and chemical plant generator.	a. Describe electrical power in terms of voltage, current, and resistance, including its units.
	b. Describe electrical energy in terms of power and time, and its units and symbols.
	c. Describe efficiency in terms of the relationship between input and output powers of electrical machines.
2. Explain the principles of magnetism and electromagnetic force (EMF) generation in an energy and chemical plant generator.	a. Identify key magnetic terms.
	b. Describe the construction of an electromagnet indicating current direction and magnet polarity.
	c. Explain how an EMF is induced by a conductor being moved in a magnetic field.
	d. Explain how the magnitude of an EMF may be managed.

Hua o te ako | Learning outcomes	**Paearu aromatawai** | Assessment criteria
3. Describe current generation in relation to an energy and chemical plant generator.	a. Describe the operation of a simple single-loop, two-pole alternator with slip-rings and brushes.
	b. Explain how alternating current varies as the wave form rotates through key points in a cycle.
	c. Define AC terms related to AC generation.
	d. Describe the components of a simple DC generator.
	e. Describe the wave form produced through one revolution of a DC generator.
4. Describe generator operation and associated controls in an energy and chemical plant.	a. Describe the general principles of generators in terms of their construction and operation.
	b. Describe generator excitation and electrical protection.
	c. Describe generator controls in terms of their functions.
5. Operate and monitor a generator and associated systems in an energy and chemical plant.	a. Synchronise a generator in accordance with organisational requirements.
	b. Log operating and monitoring actions in accordance with organisational requirements.
	c. Determine operating decisions based on plant status in accordance with organisational requirements.
	d. Monitor a generator and associated systems in accordance with organisational requirements.
	e. Identify, log, and act on deviations from normal operating conditions in relation to an energy and chemical plant generator in accordance with organisational requirements.

Pārongo aromatawai me te taumata paearu | Assessment information and grade criteria

Assessment specifications:

- evidence for the practical components of this skill standard must be supplied from the workplace.
- 2a: permanent magnet, magnetic field, magnetic poles, magnetic flux, flux density.
- 2d: resistance, voltage, current, magnitude.
- 3c cycle, frequency, peak, average.
- 3d: simple generator – permanent magnet, single loop of wire, two-segment commutator, carbon brush.
- 4a: includes but is not limited to – generator capabilities, cooling.
- 4c: includes but is not limited to – synchronising, load control, voltage control, temperature control.
- 5a: includes but is not limited to – voltage, frequency, phase displacement, phase sequence, waveform.
- 5c: includes but is not limited to – plant availability and service condition, loading limitation, impact on operations, business and/or market conditions.

Definitions:

Associated systems – interconnected components and subsystems that support the safe and efficient operation of a generator in an energy and chemical plant. These may include excitation systems, voltage regulation, cooling and lubrication systems, control and monitoring systems, and protective devices.

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.

Operate – manual operation and testing.

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.

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

Ngā momo whiwhinga | Grades available

Achieved

Ihirangi waitohu | Indicative content

Deviations from normal generator operating conditions such as – lube oil leak to stator, cooling water leak to stator, excessive temperature, loss of cooling or lubricating fluid, H2S (hydrogen sulphide) ingression.

Rauemi | Resources

Legislation and regulations relevant to this skill 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.

Pārongo Whakaū Kounga | Quality assurance information

Ngā rōpū whakatau-paerewa | Standard Setting Body	Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council
Whakaritenga Rārangi Paetae Aromatawai | DASS classification	Manufacturing > Energy and Chemical Plant > Operation of Energy and Chemical Plant
Ko te tohutoro ki ngā Whakaritenga i te Whakamanatanga me te Whakaōritenga | CMR	0079

Hātepe | Process	**Putanga** | Version	**Rā whakaputa** | Review Date	**Rā whakamutunga mō te aromatawai** | Last date for assessment
Rēhitatanga | Registration	1	24 April 2025	N/A
Kōrero whakakapinga | Replacement information	This skill standard replaced unit standard 32032.		
Rā arotake | Planned review date	31 December 2029		

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council at qualifications@hangaarorau.nz to suggest changes to the content of this skill standard.