Title	**Describe and operate geothermal binary plant in the energy and chemical industry**		
Level	**4**	**Credits**	**20**

Purpose	This unit standard is intended for people working as boiler operators and energy and chemical process operators in an energy and chemical plant. People credited with this unit standard are able to describe: geothermal binary plant processes and equipment used in the energy and chemical industry; and the operation of geothermal binary plant and identify deviations from normal operating parameters. They are also able to operate a geothermal binary plant in the energy and chemical industry.

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

Available grade	Achieved

Guidance Information

1 Legislation relevant to this unit standard includes but is not limited to:
- Health and Safety at Work Act 2015;
- Hazardous Substances and New Organisms Act 1996;
- Resource Management Act 1991;
  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.
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.

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

4 This unit standard covers the operation of a binary plant but not the generation of electricity.

Outcomes and performance criteria

Outcome 1

Describe geothermal binary plant processes and equipment used in the energy and chemical industry.

Performance criteria

1.1 Describe a geothermal binary plant in terms of layout and operational principles.

Range layout includes but is not limited to – equipment, flows, Rankin cycle, motive fluid system, heating medium system.

1.2 Describe the physical properties of motive fluid in terms of their relationship to its use.

Range physical properties include but are not limited to – vaporising temperature, lower explosive limit, upper explosive limit, specific gravity, odour.

1.3 Describe the accidental release of the fluid in terms of response.

1.4 Describe geothermal binary plant equipment in terms of design and operating concepts.

Range equipment includes but is not limited to – heating medium system, pre-heaters, vaporiser, separator, recuperator, condenser.

1.5 Describe binary turbine components in terms of design and operating concepts.

Range components include but are not limited to – rotor, nozzles, governor, governor valves, emergency stop valves, glands, seal systems, bearings, motive fluid inlet and outlet.

1.6 Describe geothermal binary plant auxiliary equipment and systems in terms of design and operating concepts.

Range auxiliary equipment includes but is not limited to – lube oil, seal oil, seal cooling, seals, fans, purging systems, feed pumps, condensate pumps.

Outcome 2

Describe the operation of a geothermal binary plant and identify deviations from normal operating parameters.

Performance criteria

2.1 Describe the geothermal binary plant in terms of control systems used.

Range control systems include but are not limited to – pressure control, level control, power output control, heat medium control; evidence is required of one control loop for each of the above.

2.2 Describe the geothermal binary turbine in terms of protection systems.

Range protection systems include but are not limited to – overspeed, vibration, oil pressure, seal and lube oil pressure, control air pressure;
evidence is required of one control loop for each of the above.

2.3 Identify deviations from normal operating parameters that can occur in the geothermal binary plant in terms of the operational steps and techniques used to respond to each deviation.

Range operating parameters may include but are not limited to – volumes, temperatures, flow rates, contaminants, time; evidence of two deviations from normal operating parameters is required.

2.4 Describe the binary plant in terms of manual emergency trip methods.

Outcome 3

Operate a geothermal binary plant in the energy and chemical industry.

Performance criteria

3.1 Identify the location of binary plant equipment in accordance with the site-specific identification coding system and organisational requirements.

3.2 Operate geothermal binary plant equipment using safe work practices in accordance with organisational requirements.

3.3 Demonstrate safe handling techniques when working with the motive fluid in accordance with organisational requirements.

3.4 Start up and shut down the geothermal binary plant in accordance with organisational requirements.

3.5 Identify plant operational problems and take corrective actions in accordance with organisational requirements.

3.6 Carry out plant checks on geothermal binary plant in accordance with organisational requirements.

3.7 Complete all plant documentation related to the process and equipment operation in accordance with organisational requirements.

Replacement information	This unit standard was replaced by skill standard 40436.

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	25 November 2000	31 December 2014
Revision	2	24 July 2002	31 December 2014
Review	3	27 June 2005	31 December 2014
Rollover and Revision	4	25 July 2006	31 December 2014
Review	5	22 May 2009	31 December 2016
Review	6	24 October 2014	31 December 2022
Review	7	27 February 2020	31 December 2026
Review	8	24 April 2025	31 December 2026

Consent and Moderation Requirements (CMR) reference	0079

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