Title	**Demonstrate knowledge of water turbines for hydro-electric power plant**		
Level	**4**	**Credits**	**12**

Purpose	People credited with this unit standard are able to: demonstrate knowledge of the fundamental principles of water turbines; demonstrate knowledge of the different types of water turbines; and describe the function and operation of water delivery and discharge systems for water turbines.

Classification	Electricity Supply > Electricity Supply - Power System Management

Available grade	Achieved

Guidance Information

1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with applicable legislative and industry requirements.

2 Legislation, regulations and/or industry standards relevant to this unit standard include but are not limited to:
- Health and Safety at Work Act 2015;
- Electricity Act 1992;
- Electricity (Safety) Regulations 2010;
- Electricity supply industry codes of practice and documented enterprise procedures, including *Safety Manual – Electricity Industry* (SM-EI) and relevant EEA guides available from www.eea.co.nz;
  and any subsequent amendments and replacements.

3 Definitions
Asset owner refers to a participant who owns or operates assets used for generating or conveying electricity.
Industry requirements include all asset owner requirements and standards; manufacturers' specifications; and enterprise requirements which cover the documented workplace policies, procedures, specifications, business, and quality management requirements relevant to the workplace in which assessment is carried out.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the fundamental principles of water turbines.

Range includes but is not limited to – potential and kinetic energy, energy conservation, Newton's laws of motion.

Performance criteria

1.1 Fundamental principles of water turbines are described using diagrams and simple equations.

Outcome 2

Demonstrate knowledge of the different types of water turbines.

Range includes but is not limited to – Francis, Kaplan, Pelton, propellor, pump, bulb.

Performance criteria

2.1 The principles of water turbine operation are described and defined for each type in accordance with manufacturers' specifications.

2.2 The types and characteristics of water turbines are described.

Range hydraulic head, impulse, reaction, horizontal or vertical shaft, efficiency of energy transformation, specific speed, runaway speed.

2.3 Components of each type and function are described.

Range may include but is not limited to – wicket gates, wicket gate locking mechanism, shear pins, runners, guide vanes, head cover, draught tube, bearings, cooling, lubrication, shaft seal, pumps, valves, diffusers or deflectors, control of power output, rough running zones, air admission, cavitation, tail water depression, runner band cooling;
evidence of six different types and their function is required.

Outcome 3

Describe the function and operation of water delivery and discharge systems for water turbines.

Performance criteria

3.1 Components of intakes used in a hydro-electric power plant are identified and described.

Range forebay, trash racks and debris removal, stoplogs, air inlets.

3.2 Components of intake gates used in a hydro-electric power plant are identified and described.

Range may include but is not limited to – sliding gates, wheeled or tractor gates, stoney roller gates, caterpillar gates, taintor gates, butterfly valves, cylinder gates;
evidence of three different intake gates is required.

3.3 The function and operation of conduits in the water delivery system are described.

Range includes but is not limited to – penstock construction, methods of priming, air valves in pipelines, surge tank.

3.4 The function and operation of the spiral case in the water delivery system are described.

Range shape of spiral casing, stay ring and vanes, relief valve, bypass valve.

3.5 The function and operation of conduits in the water discharge system are described.

Range draught tube, tunnels, tail race, environmental issues.

Planned review date	31 December 2026

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	19 May 2008	31 December 2019
Review	2	16 March 2017	31 December 2023
Review	3	30 September 2021	N/A

Consent and Moderation Requirements (CMR) reference	0120

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

Comments on this unit standard

Please contact Connexis - Infrastructure Industry Training Organisation qualifications@connexis.org.nz if you wish to suggest changes to the content of this unit standard.