Title	**Demonstrate knowledge of water turbine governors for hydro-electric power plant**		
Level	**4**	**Credits**	**10**

Purpose	People credited with this unit standard are able, for hydro-electric power plant, to: describe the purpose of a water turbine governor; describe different types of water turbine governors; describe the operation of a water turbine governor; and identify and describe the components, and describe the function, of a pressure oil supply system for a water turbine governor.

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 *Electricity Industry Participation Code* available from https://www.ea.govt.nz/code-and-compliance/the-code/ 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.

4 Range
Assessment against this unit standard includes the whole water turbine governor/hydro-electric turbine governor system, from the speed sensing device out to, and including the main servo motor/s.

Outcomes and performance criteria

Outcome 1

Describe the purpose of a water turbine governor for hydro-electric power plant.

Range output power, permanent speed droop, stability, frequency, load change.

Performance criteria

1.1 The purpose of a water turbine governor is described with reference to automatic control systems.

Range start up, synchronising, power regulation, shut down, supplying isolated network.

1.2 Reference is made to accuracy and reliability of supply.

Range Electricity Industry Participation Code: part 8 – Common quality.

1.3 The relationship between turbine and load characteristics is described.

Outcome 2

Describe different types of water turbine governors for hydro-electric power plant.

Range may include but is not limited to – mechanical, electronic, analog or digital governors;
evidence of two different types of water turbine governors is required.

Performance criteria

2.1 Water turbine governor components are described with labelled block diagrams.

Outcome 3

Describe the operation of a water turbine governor for hydro-electric power plant.

Performance criteria

3.1 The function of components is described.

Range includes but is not limited to – pilot valve, main distributing valve, dither, speed sensing, servomotors, return motion or feedback, gate limiter, protection shut down device, penstock pressure rise limiting devices, control power amplification.

3.2 Governor operation in response to changes in load and required power output is explained with the aid of diagrams.

Range includes but is not limited to – permanent speed droop, temporary speed droop and dashpot time, Proportional Integral Derivative regulation, protection shutdown;
evidence of three different turbine governor responses is required.

Outcome 4

Identify and describe the components, and describe the function, of a pressure oil supply system for a water turbine governor for hydro-electric power plant.

Range accumulator tank and oil and air level regulation, pressure relief valve, sump tank, oil pump/s, unloader valve/s, non-return valve/s, oil level indication, oil pressure indication, oil filtration, oil coolers.

Performance criteria

4.1 Components of a pressure oil supply system are identified and described by means of diagrams.

4.2 The function of the pressure oil supply system is described by means of diagrams.

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 2018
Revision	2	15 September 2011	31 December 2019
Review	3	16 March 2017	31 December 2023
Review	4	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.