



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UEPOPS445A Shut Down a Hydro Turbine**

**Release: 1**

## UEPOPS445A Shut Down a Hydro Turbine

### Modification History

Not applicable.

### Unit Descriptor

#### Unit Descriptor

#### 1) Scope:

##### 1.1) Descriptor

This unit deals with the skills and knowledge required to conduct a shut-down of a hydro turbine to where it can be placed at rest safely.

### Application of the Unit

#### Application of the Unit 2)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

### Licensing/Regulatory Information

#### License to practice 3)

The skills and knowledge described in this unit may require a licence to practise in the workplace in some States or Territories. There may also be additional assessment activities required by regulatory authorities for the issue of the licence to practise.

Practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships and the like.

## Pre-Requisites

**Prerequisite Unit(s)** 4)

**Competencies** 4.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

There are no prerequisite units.

**Literacy and numeracy skills** 4.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading 4      Writing 4      Numeracy 4

## Employability Skills Information

**Employability Skills** 5)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

## Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element.  
Assessment of performance is to be consistent with the Evidence Guide.

## Elements and Performance Criteria

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
1 Plan and prepare work	1.1 Safety issues are identified to comply with enterprise/site requirements
	1.2 Work requirements are identified from relevant personnel and documentation
	1.3 Pre-operational checks are carried out on plant according to manufacturer's recommendations and site requirements
	1.4 The turbine running up and loading schedule are ascertained from relevant documentation and in accordance with enterprise/site requirements
	1.5 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training.
2 Shut down a hydro turbine	2.1 Hydro turbine load is reduced in accordance with enterprise and manufacturer operating procedures
	2.2 Hydro turbine and alternator are removed from the system in accordance with enterprise and manufacturer operating procedures
3 Test plant operation	3.1 Tests are performed in accordance with defined procedures applicable to the operational test
	3.2 System and plant are observed for correct operational response
	3.3 Corrective action is taken when response is not in accordance with documentation, plant integrity or personnel safety requirements
	3.4 Plant is returned to required operational status upon completion of test

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
4 Analyse system faults	4.1 Causes of abnormal plant operating conditions are identified by analysing the technical and operational information in a logical and sequential manner
	4.2 Corrective action taken is in accordance with enterprise/site procedures
	4.3 Plant integrity and personnel safety is maintained through consultation with appropriate personnel, and reference to plant, technical and operational documentation
	4.4 Appropriate personnel are notified when defects are detected
5 Complete documentation	5.1 Documentation is updated and plant problems, movements, abnormalities and status are reported and logged in accordance with enterprise/site procedures

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired shutting down a hydro turbine. The extent of the Essential Knowledge and Associated Skills required follows:

KS01-PO445A Shut Down a Hydro Turbine

T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant Environmental, Occupational Health and Safety legislation and regulations
- Enterprise procedures
- Plant drawings and manufacturers manuals
- Introduction to and typical arrangements of hydro power production plant
- Relevant plant and equipment, its location and operating parameters
- Electric motor types and characteristics
- Pump and compressor types and characteristics
- Valve, damper and actuator types and characteristics
- Switchgear types and characteristics
- Electrical protection types and characteristics
- Relevant state and territory regulations
- Plant status
- Hydro machines operational modes
- Hydro machines online condition monitoring equipment and trends
- Automatic governor control types and characteristics
- Control and data acquisition systems
- Hydro turbine, types and characteristics
- Hydro turbine governor, types and characteristics
- Headgate, tailgate, intake, penstock, tunnels and tail races, types and characteristics
- Hydro alternator types and characteristics
- Alternator performance characteristics
- Speed control systems
- Electrical fundamentals
- Electrical supply and distribution systems
- heat exchanger types and characteristics
- lubrication systems and oil conditioning systems
- Equipment behaviours under the influence of high water pressure and/or flows

T2 Specific skills needed to achieve the Performance Criteria:

- Apply enterprise recording procedures
- Identify plant status

## REQUIRED SKILLS AND KNOWLEDGE

- Prepare plant/equipment for operation
- Organise resources
- Shut down turbine plant and equipment
- Apply diagnostic and testing techniques
- Identify and respond to abnormal plant operating conditions
- Plan and prioritise work
- Use relevant hand tools
- Communicate effectively
- Apply data analysis techniques and tools

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

### Overview of Assessment 9.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, high pressure water or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included in the Assessment Guidelines of this Training Package.

**Critical aspects  
of evidence  
required to  
demonstrate  
competency in  
this unit** 9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement OHS workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in 6) Essential Knowledge and Associated Skills of this unit
  - Conduct work observing the relevant Anti-Discrimination legislation, regulations, policies and workplace procedure
- Demonstrated performance across a representative range of contexts from the prescribed items below:



- The knowledge and application of relevant sections of: Occupational Health and Safety legislation; Statutory legislation; Enterprise/site safety procedures; Enterprise/site emergency procedures
- The preparation and planning of work
- The (add) safe and controlled shut down of turbine plant and equipment
- Operationally testing plant
- Analysing plant faults
- The knowledge of the system components and their interaction
- The knowledge of turbine operational processes
- The knowledge of turbine supervision and control systems including on-line condition monitoring equipment and trends
- The knowledge of heat transfer principles
- Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

**Context of and specific resources for assessment** 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in 'Context of assessment', evidence should show competency working in limited spaces with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

**Method of  
assessment****9.4)**

This unit shall be assessed by methods given in Section 1.3.00 Assessment Guidelines.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent  
assessment and  
relationship with  
other units****9.5)**

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

Nil

## Range Statement

### RANGE STATEMENT

**10)** This relates to the competency standard unit as a whole, providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Plant and equipment may include turbines including Kaplan, Pelton and Francis type turbines; auxiliary plant and equipment; governor and associated hydraulic circuits; computer with equipment control functions; supervisory, alarm and control equipment; electrical motors, fans and pumps; electrical supply and distribution systems; valves and dampers (electric, hydraulic, pneumatic and manual); lubrication and oil conditioning systems; condition monitoring equipment, fire protection and detection equipment; heat exchangers, filters and strainers; transformers; water drainage systems; and environmental protective systems.

Safety standards may include relevant sections of Occupational Health and Safety legislation, enterprise safety rules, Australian standards, national standards for plant and relevant State, and federal legislation and enterprise safety procedures and practices.

Information and documentation sources may include verbal or written communications; enterprise safety rules documentation; enterprise operating instructions; manufacturer's operational and maintenance manuals; equipment and alarm manuals, enterprise log books, dedicated computer equipment, enterprise standing instructions and plant notes; enterprise standing instructions and plant notes. Technical and operational indicators may include stimuli (audio, smell, touch, visual), remote or local indicators and recorders, computers and alarms (visible and or audible).

Communications may be by means of telephone, two way radio, pager, computer (electronic mail) and operating log (written or verbal).

Tests may include loss of a major auxiliary controls response checks, trip test; stand-by plant "cut-in" tests, valves operating checks, turbine valve and emergency governor operation test, pre-start tests, performance tests, and alarm and protection tests.

Appropriate personnel to consult, give or receive direction may include supervisor/team leader or equivalent; other coordinators of energy production or equivalent; technical and engineering officers or equivalent; maintenance staff; other operating staff and contractor staff.

Operating environment may be remote from plant and equipment being operated; where operation is assisted by remote indicators of plant status and other parameters monitored; in wet/noisy/dusty/hot areas, during night periods; and during inclement or otherwise harsh weather conditions.

Faults and abnormal operating conditions may include loss of a major auxiliary; loss of electrical supply to auxiliaries (a.c. or d.c.); high turbine bearing temperatures/vibration; high/low bearing oil temperature; loss of turbine bearing oil flow/pressure; low/high pressure heaters malfunctions; actuator/valve mechanical/electrical faults/failure; failed field devices; and turbine protection.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The

**RANGE STATEMENT**

definition of these and other terms are given in Section 2.1 Preliminary Information and Glossaries.

**Unit Sector(s)**

Not applicable.

**Competency Field**

<b>Competency Field</b>	<b>11)</b>
	Operations