



**Australian Government**

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

# **UEPOPS408B Shut down a gas turbine**

**Release: 1**

## UEPOPS408B Shut down a gas turbine

### Modification History

Not applicable.

### Unit Descriptor

#### Unit Descriptor

#### 1) Scope:

##### 1.1) Descriptor

This unit deals with the skills and knowledge required to shut down a gas turbine unit to a standby state. The Gas Turbine may be operated as an individual unit on open cycle or as a component of a combined cycle plant consisting of a gas turbine, heat recovery steam generator and steam turbine.

### Application of the Unit

#### Application of the Unit 2)

This unit is intended to augment formally acquired competencies.

### 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.

However, practice in this unit is subject to regulations directly related to Occupational Health and Safety.

## 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 pre-requisite 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

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare work	<p>1.1 Safety issues are identified to comply with enterprise/site requirements</p> <p>1.2 Work requirements are identified from relevant personnel and documentation</p> <p>1.3 Operational checks are carried out on plant according to manufacturer's recommendations and site requirements</p> <p>1.4 Where appropriate, the teams and individuals roles and responsibilities within the team are identified</p> <p>1.5 Where required, assistance is given in the provision of the on-the-job training.</p>
2 Shut down a gas turbine	<p>2.1 Gas turbine is unloaded and shut down according to manufacturer's/enterprise requirements</p> <p>2.2 Where the gas turbine is a component of a combined cycle unit, the gas turbine exhaust gas flow and power output are adjusted to achieve required steam flow and conditions, observing operating requirements.</p> <p>2.3 Gas turbine and associated plant is placed in a safe condition in accordance with manufacturer's/enterprise requirements</p> <p>2.4 Plant is operated within limits of plant design, enterprise or site requirements</p> <p>2.5 Plant is monitored and observed to detect deviations from required operating conditions</p> <p>2.6 Corrective actions are taken to rectify abnormalities in accordance with manufacturer's and enterprise/site procedures</p>
3 Test plant operation	<p>3.1 Tests are performed in accordance with defined procedures applicable to the operational test</p> <p>3.2 System and plant is observed for correct</p>

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	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
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 in shutting down a gas turbine. All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

The extent of the Essential Knowledge and Associated Skills required follows:

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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 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
- Electrical principles
- a.c. generators types and characteristics
- Transformers types and characteristics
- Generator excitation and cooling systems, types and characteristics
- Relevant state and territory regulations
- Gas turbine principle of operation
- Air intake, types and characteristics
- Air inlet cooling and heating systems, types and characteristics
- Exhaust, types and characteristics
- Lubrication systems, types and characteristics
- Control oil systems, types and characteristics
- Cooling systems, types and characteristics
- Water/steam injection systems, types and characteristics
- Combustion system, types and characteristics
- Generator, types and characteristics
- Generator excitation system, types and characteristics
- Enterprise recording procedures;
- Control and data acquisition systems; computers and software
- Mechanical and electrical supervisory, alarm, protection and control equipment
- The principles of safe and efficient fuel combustion

## REQUIRED SKILLS AND KNOWLEDGE

- Fuel storage, conditioning, transfer and firing equipment types and characteristics
- The objectives, sequence of operations, critical operating parameters and safety precautions associated with a gas turbine shut down
- a.c. and d.c. electrical distribution systems;
- Station water distribution systems;
- Fire protection control systems

T2 Specific skills needed to achieve the Performance Criteria:

- Interpret plant drawings and manufacturers manuals
- Apply relevant state and territory regulations
- Apply enterprise recording procedures
- Communicate effectively
- Plan and prioritise work
- Organise resources
- Identify plant status; prepare plant/equipment for operation
- Use relevant hand tools
- Operate gas turbine and associated plant and equipment
- Apply diagnostic and testing techniques
- Identify and respond to abnormal plant operating conditions
- 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, gas 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 pre-requisites 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 Occupational Health and Safety 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
- Demonstrate an appropriate level of employability skills
- 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 standard operating procedures and safe operating principles; enterprise/site emergency procedures
  - The knowledge of principles and techniques of operation of a gas turbine and associated plant and equipment
  - The knowledge of operational testing of plant
  - The knowledge of system components and the manner in which these components interact with other plant and equipment
  - The knowledge of the principles of fuel combustion and emission control
  - The knowledge of the principles of heat recovery steam generator and feedwater sampling and chemical treatment
  - The ability to prepare and plan work
  - The ability to prepare plant/equipment for operation
  - The ability to monitor and operate plant/equipment in accordance with enterprise/site standard operating procedures and safe operating principles
  - The ability to analyse plant faults
  - 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.

UEPOPS336B Operate and monitor a gas turbine unit

UEPOPS333B Operate and monitor HRSG hot gas control system

UEPOPS433B Start up a heat recovery steam generator unit



## 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: gas turbines; gas turbine emission control equipment; gas turbine exhaust gas control dampers; heat recovery steam generators and auxiliary plant; heat recovery steam generator supplementary duct firing equipment; fuel and fuel delivery systems; fuel management systems; flame detection equipment; steam temperature control equipment; a.c. and d.c. electrical distribution systems; electrical switchgear; electric motors; electric motor driven pumps and fans; diesel engine driven auxiliary plant; station water distribution systems; hydraulic power oil systems; compressed air systems; distributed control systems; supervisory, protection, alarm and control equipment.

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

Information and documentation sources may include verbal or written communications; enterprise safety rules documentation; enterprise operating instructions; computer-based and computer accessed documentation; enterprise/site standing and operating instructions; enterprise log books; manufacturer's operation and maintenance manuals; and equipment and alarm manuals.

Technical and operational indicators may include stimuli (auditory, olfactory, tactile, visual), local indicators and recorders, computers and alarms (visible and/or audible).

Communications may be by direct personal interaction or by means of telephone, verbal or text-based telephone messaging, two way radio, pager, computer (electronic mail) and/or operating logs (written or verbal).

Appropriate personnel for consultation, giving or receiving direction may include: supervisor/team leader or equivalent, power plant operations personnel or equivalent, technical and engineering officers or equivalent, maintenance staff, other operating staff or equivalent, system controller/network controller, field operator, restricted H.V. operators, independent generators and customers and contractor staff.

Operating environment may be remote from the plant and equipment being operated, (in cases where operation is assisted by remote indication of operating parameters and plant status), during inclement or otherwise harsh weather conditions, in hot/wet/noisy/dusty/elevated/confined or enclosed areas or during night periods.

Plant operations (systems requirements) may include:

Returns to service with the heat recovery steam generator in a cold, warm or hot condition, compressor on-load or off load blade washing, operational testing.

Operational tests may include:

Loss of a major auxiliary control response checks; stand-by plant "cut-in" tests; dampers/valves operating checks and pre and post start tests

Faults and abnormal operating conditions may include:

Failure of starting device; excessively high exhaust temperature, excessive blade path temperature spread, excessively high wheel space temperature, excessively high compartment temperatures, excessively high shaft or bearing vibration, excessively

## **RANGE STATEMENT**

high speed (or frequency, when synchronised); reduction in flow or failure of fuel supply; uneven fuel distribution to combustors; loss of a major auxiliary; loss of electrical supply to switchboards, drive motors or valve actuators; automatic control loop(s) malfunctions; high temperatures on/in: motor and/or pump bearings, lubricating oil or motor windings; heat exchange element tube leaks; excessively high heating/cooling rates; high differential pressures on fuel/oil/air filters and strainers; failed field devices; failed/malfunctioning actuators/dampers/valves.

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 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