



Australian Government

Department of Education, Employment and Workplace Relations

UETTDRSO50A Respond to complex power system protection operations

Release: 1

UETTDRSO50A Respond to complex power system protection operations

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This Competency Standard Unit covers the coordination of response to complex protection operations due to system faults.

Application of the Unit

Application of the Unit 2)

This Competency Standard 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/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry safety and compliance, industrial relations, environmental protection, anti discrimination and training. Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

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 plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
UEENEED104A	Use engineering applications software on personal computers
UEENEEE101A	Apply Occupational Health and Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, assemble and dismantle utilities industry components
UEENEEE104A	Solve problems in d.c. Circuits
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEE124A	Compile and produce an energy sector detailed report
UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuits problems
UEENEEE126A	Provide solutions to basic engineering computational problems
UEENEEG101A	Solve problems in electromagnetic devices and related circuits
UEENEEG102A	Solve problems in electromagnetic

Prerequisite Unit(s)**4)**

devices and related circuits

UEENEEG149A

Provide engineering solutions to problems in complex polyphase power circuits

UETTDREL11A

Apply sustainable energy and environmental procedures

UETTDREL16A

Working safely near live electrical apparatus

UETTDRI62A

Implement and monitor the power system organisational OHS policies, procedures and programs

UETTDRI63A

Implement and monitor the power system environmental and sustainable energy management policies and procedures

UETTDRSO41A

Manage power systems transmission networks

UETTDRSO48A

Respond to discrete and interdependent protection operations

UETTDRSO49A

Coordinate power system operations in a regulated energy market

Generation/Distribution and Subtransmission Pathway Unit Group

UETTDRSO34A

Control power systems generating plant

UETTDRSO37A

Develop high voltage distribution and subtransmission switching programs

UETTDRSO40A

Coordinate high voltage distribution and subtransmission networks

Generation/Transmission Pathway Unit Group

UETTDRSO34A

Control power systems generating plant

Prerequisite Unit(s)**4)**

UETTDRSO38A Develop and evaluate power systems transmission switching programs

UETTDRSO47A Coordinate high voltage transmission network

Distribution and Subtransmission Pathway Unit Group

UETTDRSO35A Manage high voltage distribution and subtransmission network demand

UETTDRSO37A Develop high voltage distribution and subtransmission switching programs

UETTDRSO40A Coordinate high voltage distribution and subtransmission networks

Transmission Pathway Unit Group

UETTDRSO38A Develop and evaluate power systems transmission switching programs

UETTDRSO41A Manage power systems transmission networks

UETTDRSO42A Manage power systems transmission network demand

UETTDRSO47A Coordinate high voltage transmission network

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 scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading 5 Writing 5 Numeracy 5

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 response to complex protection operations	1.1 OHS practices/procedures and environmental and sustainable energy procedures, which may influence the preparation of response to complex protection operations, are reviewed and determined. 1.2 Purpose of the response is established after data is analysed and expected outcomes of the work are confirmed with the appropriate personnel. 1.3 Established policies, procedures and specifications for the response are obtained or established with the appropriate personnel. 1.4 Response to complex protection operations are discussed with and/or directed to the appropriate personnel in order to ascertain the scope of the work/testing required. 1.5 Testing parameters are ascertained from established policies, procedures and specifications.

ELEMENT	PERFORMANCE CRITERIA
	1.6 Equipment/tools and personal protective equipment are selected based on specified Performance Criteria and established procedures. 1.7 Work roles and tasks are allocated according to requirements and individuals' competencies. 1.8 Work is prioritised and sequenced for the most efficient/effective outcome, completed within an acceptable timeframe to a quality standard and in accordance with established procedures. 1.9 Liaison and communication issues with other/authorised personnel, authorities and clients are resolved and activities coordinated to carry out work. 1.10 Risk control measures are identified, prioritised and evaluated against the work schedule. 1.11 Need for relevant work permits is identified to coordinate the performance of work according to requirements and/or established procedures. 1.12 Circuit/systems modelling is used to evaluate alternative proposals as per established procedures.
2 Carry out response to complex protection operations	2.1 Strategic plans are developed incorporating organisational initiatives as per established procedures 2.2 OHS and sustainable energy principles, functionality and practices to reduce the incidents of accidents and minimise waste are incorporated into the project in accordance with requirements and/or established procedures. 2.3 Decisions concerning the response to complex protection operations are made on the basis of safety and effective outcomes according to requirements and/or established procedures. 2.4 Stakeholders/customers are kept informed of current status regarding plan progress and recent developments

ELEMENT**PERFORMANCE CRITERIA**

		2.5	Technical advice is given regarding potential hazards, safety risks and control measures so that monitoring and preventative action can be undertaken and/or appropriate authorities consulted, where necessary, in accordance with requirements and established procedures.
		2.6	Essential knowledge and associated skills are applied to analyse specific data and compare it with compliance specifications to ensure completion of the work within an agreed timeframe according to requirements.
		2.7	Testing of the decision to be implemented is undertaken according to requirements and established procedures.
		2.8	Work teams/groups are arranged/coordinated/evaluated to ensure planned goals are met according to established procedures.
		2.9	Solutions to non-routine problems are identified and actioned, using acquired essential knowledge and associated skills, according to requirements.
		2.10	Quality of work is monitored against personal performance agreement and/or established organisational and professional standards.
	3 Complete the response to complex protection operations	3.1	Final review of the response to complex protection operation is undertaken to ensure it complies with all requirements and include all specifications and documentations needed to complete the work.
		3.2	Appropriate personnel are notified of completion and reports and/or completion documents (electronic/paper) are finalised/commissioned.
		3.3	Reports and/or completion documents (electronic/paper) are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval.
		3.4	Approved copies of the response to complex

ELEMENT**PERFORMANCE CRITERIA**

protection operation documents
(electronic/paper) are issued and records are
updated in accordance with established
procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) Essential Knowledge and Associated Skills (EKAS): This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of developing and evaluating transmission switching programs.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TSO50A Complex power system protection operations

Evidence shall show an understanding of complex power system protection operations to an extent indicated by the following aspects:

T1 Protection system types encompassing:

- Requirements of a protection scheme - relationship to primary system design, purpose of protection, safety of persons, protection of plant, system instability, system break up, loss of customers, loss of revenue, protection zones, restricted schemes, unrestricted schemes, duplicate protection, local backup protection, remote backup protection, selectivity, discrimination, stability, sensitivity, reliability
- Components of a protection scheme - current transformers, potential transformers, summation current transformers, interposing transformers, multitapped transformers, all-or-nothing relays, induction relays, balanced beam relays, directional relays, biased relays, solid state relays, microprocessor based relays, gas relays, thermal sensors, hardwired communication, powerline carriers systems, microwave systems, fibre optic systems, need for isolation, need for interfacing
- Protection applied to buses - overload, differential, earth leakage, structure leakage, combined schemes, protection overlap
- Protection applied to transformers - biased differential, gas, winding temperature, oil temperature
- Protection applied to single/radial lines - overcurrent, earth leakage, slow earth leakage, distance, auto reclose, sectionalising, over voltage
- Protection applied to interconnected lines - overcurrent, pilot wire, directional, directional overcurrent, current differential, phase comparison, current comparison, distance, impedance, admittance, offset.

T2 Use of fault information to analyse and develop optimal network restoration strategies encompassing:

- Commonwealth, State/Territory and local government legislation, supply authority regulations Standards, codes, and or enterprise requirements applicable to the analysis of protection targeting
- Requirements for the use of operational manuals, system diagrams/plans and drawings
- Techniques in the collation of protection data
- Techniques in the analyse and assessment of fault information – public, employee,

REQUIRED SKILLS AND KNOWLEDGE

- protection equipment.
- Application methods of fault information to analyse and develop optimal network restoration strategies - public and employee safety, enterprise reliability guidelines.
- resource availability.

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 competency standard 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 component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal 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's 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 in this regard.

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 practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors 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 – UET12”. Evidence shall also comprise:

- A representative body of Performance Criteria 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; and
 - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
 - Demonstrate an understanding of the essential knowledge and associated skills described in this unit to such an extent that the learner’s performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
 - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures;

and

- Demonstrated performance across a representative range of contexts from the prescribed items below:

Range of tools/equipment/materials/procedures/workplaces/other variables		
Group No	The minimum number of items on which skill is to be demonstrated	Item List
A	Develop and evaluate, on at least three (3) occasions all of the following:	Identify complex relay operations by interpreting available alarms and event data. Analyse and diagnose system failures Evaluate response to complex relay operations
B	All of the following:	Describe control and alarms associated with complex protection systems
C	At least one occasion	Dealing with an unplanned event by drawing on essential knowledge and associated 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 preparation of HV Transmission Switching programs

Note:

Access will be needed to: relevant modelling tools, drawings, computerised electrical plant control and monitoring facilities and enterprise operational policies, procedures and work practices.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working in realistic environment and a variety of conditions.

**Method of
assessment**

9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Transmission, Distribution and Rail Traction Industry. 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 associated skills described in this unit.

**Concurrent
assessment and
relationship with
other units**

9.5)

There are no concurrent assessment recommendations for this 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.

This Competency Standard Unit shall be demonstrated in relation to the activities required when responding to complex protection operations as the result of a fault condition. These activities are required to secure the network and develop restoration plans that allow work to be safely performed whilst minimising customer outages and may include the following:

Complex: distance, differential, transformer differential, bus zone, bus overcurrent, revenue metering, current transformer accuracy, SCADA, communications, harmonic control, point on wave, HV plant testing.

Conditions and facilities for the calculation of network loading, planning for the management of the network and multiple outages.

Regulatory and enterprise procedures for the compliance with national electricity code.

The following constants and variables included in the Element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration
- Documenting detail work events, record keeping and or storage of information
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation
- Environmental management documentation
- Established procedures
- Fall prevention
- Hazards
- Identifying hazards
- Inspect

RANGE STATEMENT

- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

Unit Sector(s)

Not applicable.

Competency Field

Competency Field	11)
	System Operation Units