



Australian Government

Department of Education, Employment and Workplace Relations

UETTDRSO36A Develop low voltage distribution switching programs

Release: 1

UETTDRSO36A Develop low voltage distribution switching programs

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This Competency Standard Unit covers the preparation and/or checking of activities required to place the LV distribution network in a state in which work can safely be performed whilst minimising customer outages. The format is typically a written sequence of switching items in a pre-defined format. It includes planning outages and taking into account loading of network components. It also includes planning the management of multiple outages on the LV distribution network and the calculation of network loading conditions to ensure the network is operating within designed parameters.

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

License to practice**3)**

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

Prerequisite Unit(s)**4)**

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
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

UETTDRLS62A

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

UETTDRLS63A

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

**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 for the preparation of LV Distribution switching programs	1.1 OHS practices/procedures and environmental and sustainable energy procedures, which may influence the preparation of LV Distribution switching systems, are reviewed and determined.
	1.2 Purpose of the switching program preparation is established after data is analysed and expected outcomes of the work are confirmed with the appropriate personnel.
	1.3 Organisational established procedures on policies and specifications for the LV Distribution Switching systems are obtained or established with the appropriate personnel.
	1.4 Testing procedures are discussed with/directed to the appropriate personnel in order to ascertain the project brief.
	1.5 Testing parameters are established from organisational established procedures on policies 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, clients and land owners 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 Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures.
2 Carry out the preparation of LV Distribution switching programs	2.1 Circuit/systems modelling is used to evaluate alternative proposals 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 LV Distribution switching program decisions are made on the basis of safety and effective outcomes according to requirements and/or established procedures. 2.4 Mathematical and/or engineering models of the LV Switching systems are used to analyse the effectiveness of the finished project as per requirements and established procedures. 2.5 Technical advice is given regarding potential hazards, safety risks and control measures so that monitoring and preventative action can be

ELEMENT**PERFORMANCE CRITERIA**

		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 project within an agreed timeframe according to requirements.
	2.7	Testing of LV switching program 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.
	2.11	Strategic plans are developed incorporating organisation initiatives as per established procedures.
3	Complete the preparation of LV Distribution switching programs	3.1 Final review of the switching program is undertaken to ensure they comply with all requirements and include all specifications and documentations needed to complete the project. 3.2 Appropriate personnel are notified of completion and reports and/or completion documents are finalised/commissioned. 3.3 Reports and/or completion documents are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval. 3.4 Approved copies of the preparation of LV Distribution Switching programs documents are

ELEMENT**PERFORMANCE CRITERIA**

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 LV distribution switching programs.

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

KS01-TSO36A Low voltage distribution switching programs

Evidence shall show an understanding of low voltage distribution switching programs to an extent indicated by the following aspects:

T1 Transmission, distribution and rail systems encompassing:

- Relationship between the transmission, distribution and rail/tram system within an overall power system - different organisations responsible for generation, transmission, distribution and rail/tram and, how they correlate and their functions
- Characteristics of a transmission, a distribution and a rail system - principal components, typical voltage levels and methods of transmission and distribution including grid type transmission systems, radial, parallel and ring main feeders
- Relationship between an overhead and underground supply systems within an overall power system - advantages/disadvantages, applications and the basic steps for planning and installing an overhead and underground distribution system
- Single line drawings and layouts - drawings and layouts of transmission and distribution systems including, radial, parallel and ring main feeders and the HV equipment associated with substations.

T2 Control of generator systems for synchronisation of a LV genset encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the operation of a portable generator encompassing:
- Safety precautions specific to the synchronisation of gensets - safe working practices and procedures, synchronising procedures
- Techniques in the installation of gensets control systems - the synchronising of generator control systems onto and off the network without interruption to supply, estimation of LV load, assessing the appropriateness of the generator.
- Operating a generator in parallel to a single LV job - overhead systems, indoor systems, customer installations, kiosk substations

LV genset and control system to LV Distribution assets.

T3 Different types and function of distribution components encompassing:

- Commonwealth/State/Territory and local government legislation, Standards, codes, Commonwealth, State/Territory and local government legislation, supply authority regulations and or enterprise requirements applicable to the use and application of distribution components

REQUIRED SKILLS AND KNOWLEDGE

- Requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
- Types, function and characteristics of distribution components
- Safety policies and procedures precautions related to the handling and installing distribution components

T4 Co-ordinating access authority procedures encompassing:

- Specific enterprise processes, policies and procedures to be followed
- Processes of consultation, negotiation and co-ordination - clear and concise instructions and information, methods for the encouragement of feedback and contributions of information and ideas, responsibilities of members of the team.
- Techniques in analysing, planning, co-ordination and organising work for a safe outcome and according to statutory requirements and regulations
- Techniques in the effective utilisation of available resources
- Techniques in the development of an access authority/permit and/or access authority/permit issuing procedures
- Techniques in facilitating and co-ordinating the delivery and issuing of access authorities
- Techniques in gathering, collating and confirming data on different worksites - electrical network diagrams for the specific work site, earth access authorities, safe working area, work to be carried out in confined space or in hazardous environment, specific outsourcing procedures, specific hazard identification, risk classification and management procedures, regulatory requirements such as Occupational Health and Safety and electrical safety
- Techniques in the receiving and co-ordinating the cancellation of access authorities in readiness for restoration
- Methods of conducting audits on correct access authority procedures
- Process of issuing of other access authorities for work permits - working in confined space, if required, co-ordination of access authorities, engaging and briefing contractors on electrical and other work
- Issue and receipt of operating agreements.

T5 Principles of Statutory and safety considerations encompassing:

- Commonwealth/State/Territory legislation, standards, codes, supply authority regulations and or enterprise requirements associated with working on High Voltage
- Particular reference to State and Territory regulations regarding - working near energised conductors, electrical access, heights, confined space, testing procedures, licensing rules.

T6 Principles of isolation and tagging procedures associated with protection testing encompassing:

- Standards, codes, Commonwealth/State/Territory legislation, supply authority regulations and or enterprise requirements associated with the installation, maintenance, isolation and tagging procedures

REQUIRED SKILLS AND KNOWLEDGE

- Requirements for the use of, isolation and tagging, manuals, system diagrams/plans and drawings
- Techniques in documenting isolations
- Techniques in appropriate isolation and tagging procedures as per Commonwealth /State /Territory legislation, supply authority regulations and enterprise standards
- Techniques in the installation and maintenance procedures protection devices as per Commonwealth/State/Territory legislation, supply authority regulations and enterprise standards.

T7 Low voltage switching principles encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of low voltage to a given schedule
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of electrical apparatus, use, characteristics and capabilities of specialised tools and testing equipment, LV network interconnectors source of possible backfeed
- Low voltage switching techniques - identifying hazards, assessing and controlling risks associated with LV switching operations, electrical access permit(s), operational procedures, earthing procedures
- Personnel protective equipment (PPE) for LV switching

T8 LV system switching principles including switching authorisation procedures encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to system switching
- Requirements for the use of manuals, system diagrams/plans and drawings
- Types and characteristics of LV systems and equipment to be switched
- Procedures for obtaining correct LV switching authorization - identification of OHS hazards, assessing and controlling risks, safety procedures and precautions, safe approach distances, responsibilities and protocols, identifying switching resources, procedures for obtaining electrical access permits authorities, requirements for team switching, procedures for coordination of operations.
- Techniques in LV system switching - isolation procedures and proving dead, earthing procedures, pre-switching checks, switching operational procedures, emergency fault procedures, energisation procedures.

T9 Low voltage overhead and substation switching principles encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to low voltage overhead and substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of LV electrical equipment to be switched, use, characteristics and capabilities of specialised tools and testing equipment, role and responsibilities of the LV switching operator.
- Operational forms, access authorities and hazard/risk assessments associated with

REQUIRED SKILLS AND KNOWLEDGE

HV switching - types of operational forms, access authorities and hazard/risk assessments, purpose and procedure for operational forms, access authorities and hazard/risk assessments.

- Use and operation of equipment associated with LV overhead and substation equipment - test instruments, sticks, interrupters, arc strangles.
- LV switchgear – types, categories, application, operating capabilities
- Operation of LV overhead switching or indicating devices - fuses; disconnect fuses; load switching; underslung links, air break switches; disconnects; live line clamps; phasing sticks; phasing tester.
- Operation of protection systems and substation equipment - fault levels and settings; types and applications, protection systems and substation equipment fault levels and settings; types and applications.
- Restrictions pertaining to LV switching equipment
- Procedures for the isolation of LV distributions main and working earths
- Earthing LV electrical apparatus practices and procedures for access authority issuing
- Low voltage switching techniques
- Operate switching apparatus - identifying hazards, assessing and controlling risks associated with LV switchgear operation, systematic and defensive techniques, mobile radio procedures, double isolation procedures.

T10 Preparation of a LV switching instruction encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching sheet schedules
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of LV electrical equipment to be switched, isolation points and earthing, responsibilities of the switching operator.
- Techniques in writing switching schedules - sequence of switching operations, isolation procedures, earthing procedures, switching completion notification procedures.

T11 Enterprise specific — policy and procedure instructions encompassing:

- Responsibilities and duty of care of employer and employee relationship
- Methods of obtaining the up-to-date information on enterprise policy and procedures
- Rules and regulations
- Induction into workplace - location of work area and storage area, timetable, uniform, personal well-being, housekeeping rules, emergency procedures, evacuation procedures
- Techniques when deal with others - working in teams, customer relation, complaint and issues procedures.
- Overview of enterprise professional development - fire fighting procedures, fatigue management, training and competency development - understanding and promotion

REQUIRED SKILLS AND KNOWLEDGE

T12 Enterprises specific — OHS instructions encompassing:

- Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the OHS policies and procedures
- Methods of obtaining the up-to-date information on enterprise OHS policy and procedures
- Specific enterprise personal protection equipment - type and application, where and when to be used, method of replacement, responsibility of maintenance including cleaning inspection and testing, emergency response, rescue, evacuation and First Aid procedures
- Personal well-being – hygiene, fatigue/stress management, drugs/alcohol
- OHS training - induction training, specific hazard training, specific task or equipment training, emergency and evacuation training, training as part of broader programs such as equipment operation
- OHS records including audits, inspection reports, workplace health and environmental monitoring records, training and instruction records, manufacturers and suppliers information such as MSDSs, registers, maintenance reports, workers compensation and rehabilitation records and First Aid/medical records

T13 Enterprise specific switching diagrams and drawing encompassing:

- Types and application of enterprise specific switching drawings and documents - wiring and schematic diagrams and switching symbols, mechanical drawings dealing with switching operations, project charts, switching schedules, graphs, technical manuals and catalogues, instruction/work sheets.
- Interpretation of different system switching diagrams - LV system switching diagrams, DC traction supply sectioning diagrams, HV transmission and distribution system symbols and feeder plans, processes of updating switching diagrams

T14 LV system load calculation principles encompassing:

- Structure of LV systems
- Ratings of LV system components
- Methods of determining load on LV systems
- Records of load on LV systems
- Effect of added load on LV mains - variation of current, voltage, and power factor
- Load flow in parallel operation
- Enterprise specific network coordination 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 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	Item List

	demonstrated	
A	Demonstrate at least three (3) switching programs that between them encompass at least 7 of the following:	A transformer with a LV winding and fixed tap LV busbars LV isolators LHV switchgear (applicable to enterprise equipment) Phasing and phase rotation Commissioning an item of LV plant A planned interruption to an LV customer/s Installation of a mobile generators
B	Prepare switching instructions to isolate, test and earth all of the following	All enterprise transformer types with LV windings All enterprise LV busbar types All enterprise LV feeder types All enterprise LV circuit breakers, isolators or switches
C	Prepare, write and check switching sheets to do all of the following:	Manage load Manage voltage Minimise losses Maximise network reliability
D	Do all of the following:	Check all above types of switching instructions Coordinate all above types of switching instructions

		Calculation of plant loading Application and administration of SCADA or enterprise specific system. Analysis and diagnosis of system failure
E	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 LV Distribution Switching programs.

Note:

Access will be needed to: relevant protection, control, metering, and alarm equipment, network drawings, computerised electrical plant control and monitoring facilities, operational event data, enterprise operational policies, procedures and work practices and enterprise crisis management procedures

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)**

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UETTDRSO3 7A Develop high voltage distribution and subtransmission switching programs

UETTDRSO3 8A Develop and evaluate power systems transmission switching programs

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 preparation and/or checking of activities required to place the LV distribution network in a state in which work can safely be performed whilst minimising customer outages and shall be demonstrated using the following:

LV Distribution feeders/distribution network; Transformers with LV windings; LV busbars; LV isolators; LV switchgear (applicable to enterprise equipment); switching instructions (applicable to enterprise equipment); computers (applicable to enterprise equipment); network diagrams (applicable to enterprise equipment); access authorities; regulatory requirements.

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
- Legislation
- MSDS
- Notification

RANGE STATEMENT

- 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