



**Australian Government**

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

# **UETTDRIS48A Develop high voltage switching schedule**

**Release: 1**

## UETTDRIS48A Develop high voltage switching schedule

### Modification History

Not applicable.

### Unit Descriptor

#### Unit Descriptor

#### 1) Scope:

##### 1.1) Descriptor

This Competency Standard Unit covers the preparation of a basic switching schedule for interconnected HV network plant. It includes planning basic outages and taking into account loading of network components. It also includes 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 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

**License to practice****3)**

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):

Transmission Overhead

Distribution Overhead

Rail Traction

Distribution Cable Jointing

Electrical

Common Unit Group

Unit Code	Unit Title
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
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, codes and specifications
UEENEEG101A	Solve problems in electromagnetic

<b>Prerequisite Unit(s)</b>	<b>4)</b>	
		devices and related circuits
	UEENEEG102A	Solve problems in low voltage a.c. Circuits
	UETTDREL16A	Working safely near live electrical apparatus
	UETTDNIS44A	Perform HV field switching operation to a given schedule
Transmission Overhead Pathway Group		
	Unit Code	Unit Title
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
	UETTDNIS54A	Install and maintain poles, structures, overhead conductors and cables
	UETTDRTTP26A	Install transmission structures and associated hardware
	UETTDRTTP27A	Maintain transmission structures and associated hardware
	UETTDRTTP29A	Install and maintain transmission overhead conductors and cables
Distribution Overhead Pathway Group		
	Unit Code	Unit Title
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDTRDP12A	Maintain overhead energised low voltage conductors and cables
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus

<b>Prerequisite Unit(s)</b>	<b>4)</b>	
	UETTDNIS41A	Install network infrastructure electrical equipment
	UETTDNIS42A	Maintain network infrastructure electrical equipment
	UETTDNIS52A	Install and maintain poles, structures and associated hardware
	UETTDNIS54A	Install and maintain poles, structures, overhead conductors and cables
	UETTDNIS56A	Install and maintain low voltage overhead services
	Rail Traction Pathway Group	
	Unit Code	Unit Title
	UETTDREL11A	Apply sustainable energy and environmental procedures
	UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
	UETTDNIS52A	Install and maintain poles, structures and associated hardware
	UETTDNIS54A	Install and maintain poles, structures, overhead conductors and cables
	UETTDNRRT21A	Install traction overhead wiring systems
	UETTDNRRT22A	Maintain traction overhead wiring systems
	UETTDNRRT23A	Install rail traction bonds
	UETTDNRRT27A	Install overhead traction components and equipment
	UETTDNRRT28A	Maintain overhead traction components and equipment

**Prerequisite Unit(s)****4)**

## Distribution Cable Jointing Pathway Group

Unit Code	Unit Title
UETTDRCJ21A	Lay ESI electrical cables
UETTDRCJ26A	Install and maintain de-energised low voltage underground polymeric cables.
UETTDRCJ27A	Install and maintain de-energised high voltage underground polymeric cables.
UETTDREL11A	Apply sustainable energy and environmental procedures
UETTDREL12A	Operate plant and equipment near live electrical conductors and apparatus
UETTDRCJ41A	Install network infrastructure electrical equipment
UETTDRCJ42A	Maintain network infrastructure electrical equipment
UETTDRCJ55A	Install and maintain low voltage underground services

## Electrical Pathway Group

Unit Code	Unit Title
UEENEEE137A	Document and apply measures to control OHS risks associated with electrotechnology work
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical

<b>Prerequisite Unit(s)</b>	<b>4)</b>	installations
	UEENEEG106A	Terminate cables, cords and accessories for low voltage circuits
	UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
	UEENEEG109A	Develop and connect electrical control circuits
	UEENEEK142A	Apply environmentally and sustainable energy procedures in the energy sector
	UETTDRIS67A	Solve problems in energy supply network equipment

**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 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 Prepare/plan to develop HV switching schedules	<p>1.1 Works schedule(s), including drawings, plans, requirements, established procedures, and material lists, are obtained, analysed, if necessary, by site inspection and the extent of the preparation of the work determined for planning and coordination.</p> <p>1.2 Work is prioritised and sequenced for the most efficient and effective outcome following consultation with others for completion within acceptable timeframes, to a quality standard and in accordance with established procedures.</p> <p>1.3 Risk control measures are identified, prioritised and evaluated against the work schedule.</p> <p>1.4 Relevant requirements and established procedures for the work are communicated to all personnel and identified for all work sites.</p> <p>1.5 Hazards are identified, OHS risks assessed and control measures are prioritised, implemented and monitored including emergency exits kept clear, to ensure safe systems of work are followed and according to established procedures.</p> <p>1.6 Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures.</p> <p>1.7 Resources including personnel, equipment, tools and personal protective equipment required for the job are identified, scheduled and coordinated and confirmed in a safe and technical working</p>



ELEMENT	PERFORMANCE CRITERIA
	order.
	1.8 Clients/Customers are provided with possible solutions and/or options within the scope, acceptable cost and requirements.
	1.9 Personnel participating in the work, including plant operators and contractors, are fully briefed and respective responsibilities coordinated and authorised where applicable in accordance with established procedures.
	1.10 Liaison and communication issues with other/authorised personnel, authorities, clients and land owners are resolved and activities coordinated to carry out work.
2 Carry out the development of HV switching schedules	2.1 OHS and sustainable energy principles and practices to reduce the incidents of accidents and minimise waste are monitored and actioned in accordance with requirements and/or established procedures.
	2.2 Hazard warnings and safety signs are recognised and hazards and assessed OHS risks are reported to the immediate authorised persons for directions according to established procedures.
	2.3 Remedial actions are taken to overcome any shortfalls encountered in the work schedule according to requirements and/or established procedures.
	2.4 Development of HV switching schedules is carried out, in accordance with the work schedule and requirements and/or established procedures.
	2.5 Essential knowledge and associated skills are applied in the safe development of HV switching schedules to ensure completion in an agreed timeframe and, to quality standards with a minimum of waste according to requirements.
	2.6 Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	2.7 Ongoing checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality like outcome is achieved for the client/customer and to a community/industry standard.
3 Complete development of HV switching schedules	3.1 Work undertaken is checked against works schedule for conformance with requirements, anomalies reported and solutions identified in accordance with established procedures.
	3.2 Accidents and/or injuries are reported and followed up in accordance with requirements/established procedures.
	3.3 Ensure Relevant work permit(s) are signed off and plant is returned to service and advised to client/customer in accordance with requirements.
	3.4 Works completion records, reports, as installed /modified drawing(s) and/or documentation and information are confirmed, processed and appropriate personnel notified.

## 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 an HV switching schedule.

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

**KS01-TIS48A**            High voltage switching schedules

Evidence shall show an understanding of developing high voltage switching schedules to an extent indicated by the following aspects:

**T1**    Electrical equipment fundamentals used in the powerline industry encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to the use and care of electrical equipment - HV and LV equipment
- Characteristics, capabilities and application of powerline electrical equipment
- Safety precautions with regards to using electrical equipment
- Techniques in pre-use inspection on the serviceability of electrical equipment
- Techniques in the general maintenance, and care and storage of electrical equipment
- Identifying hazards, assessing and controlling risks associated with their the use of electrical equipment

**T2**    High voltage switching principles encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching of high 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, network interconnectors source of possible backfeed
- Role of the HV switching operator
- Operational forms, access authorities and permits associated with HV switching - types of operational forms, access authorities and permits, purpose and procedure for operational forms, access authorities and permits.
- Use and operation of equipment associated with HV overhead and substation equipment - test instruments, sticks, interrupters, arc stranglers.
- Types and categories of HV switchgear
- Application, function and operating capabilities of switchgear
- Restrictions pertaining to HV switching equipment
- Procedures for the isolation of HV transmission main and working earths
- Earthing HV electrical apparatus practices and procedures for access - purposes of

## REQUIRED SKILLS AND KNOWLEDGE

“Operational” and additional work part “on-site” earths, factors determining the location and effectiveness of “Operational” earthing, acceptable industry procedures, personal protective equipment, high voltage switching techniques.

- Operate switching apparatus - identifying hazards, assessing and controlling risks associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures, double isolation procedures.

T3 High voltage distribution transformer principles encompassing:

- Operation of HV distribution transformers - principle governing factors for transformer ratings, protection and alarms, operating limitations and the relationship between transformer and HV fuse rating, purpose and principle operation of HV distribution transformer tap changers, HV distribution transformer and transformer — cable combination switching practices, paralleling requirements, isolation and earthing procedures for access, common distribution transformer and associated electrical apparatus faults.
- HV underground switching equipment - arc stranglers, switch operation, load break elbows, switching cubicles, canister fuses, bayonet fuses, F and G switching cubicles, voltage indicators and phasing testers.

T4 High voltage SWER system encompassing:

- Application and function of SWER system components
- Circuit arrangement
- Principle of operation
- Hazards and procedures associated with faulty SWER earth systems
- Procedure to isolate, energise and commission SWER substations

T5 Feeder automation system encompassing:

- Function of feeder automation system and the main components
- Operation procedure for a remote field device from a local control station
- Functions of “System Control and Data Acquisition” (SCADA) (or any other relevant Data Acquisition and Control) systems and its main components
- SCADA system security interlocks and access restrictions
- SCADA system operation when switching apparatus or retrieving data via a remote access device such as; Remote Access Terminal (RAT), Dial Up Voice Annunciated System and Local Control Station
- Function of the main components of a local/remote control system
- Operation of a field devices using SCADA systems via a Remote Access Terminal (RAT), Dial Up Annunciated System and Local Control Station.

T6 HV 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 HV systems and equipment to be switched

## REQUIRED SKILLS AND KNOWLEDGE

- Procedures for obtaining correct HV switching authorisation - 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 HV system switching - pre-switching checks, switching operational procedures, isolation procedures and proving dead de-energised, earthing procedures, emergency fault procedures, energisation procedures.

T7 HV overhead and substation switching principles encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to HV overhead and substation switching
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of HV electrical equipment to be switched, use, characteristics and capabilities of specialised tools and testing equipment.
- Role and responsibilities of the HV switching operator
- Operational forms, access authorities and permits hazard/risk assessments associated with HV switching - types of operational forms, access authorities and permits hazard/risk assessments, purpose and procedure for operational forms, access authorities and hazard/risk assessments.
- Use and operation of equipment associated with HV overhead and substation equipment - test instruments, sticks, interrupters, arc stranglers.
- HV switchgear – types, categories, application, operating capabilities.
- Operation of HV overhead switching or indicating devices - fuses; disconnect fuses; load switching; live line indicators; capacitors; reclosers; sectionalisers, underslung links, airbreaks; 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 HV switching equipment
- Procedures for the isolation of HV mains and working earths - earthing HV electrical apparatus practices and procedures for access authority issuing; HV switching techniques.
- Operate switching apparatus - identifying hazards, assessing and controlling risks associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures, double isolation procedures.

T8 Preparation of a HV switching instruction schedule encompassing:

- Legislation, Standards, codes, legislation, supply authority regulations and or enterprise requirements applicable to switching instruction schedules
- Requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of HV electrical equipment to be switched, points of isolation and earthing locations (safety and working earths), responsibilities of the switching operator.

## REQUIRED SKILLS AND KNOWLEDGE

- Techniques in writing switching instructions - sequence of switching operations, isolation procedures, earthing procedures, switching completion notification procedures.

T9 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

T10 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

T11 Enterprises specific — technical drawing and documents encompassing:

- Types and application of enterprise specific drawings and documents - electrical and electronic drawings, mechanical drawings, project charts, schedules, graphs, technical manuals and catalogues
- Instruction/worksheets sheets - types and application of enterprise specific symbols and diagrams
- Title box - description of parts and version control

T12 Enterprise specific switching diagrams and drawing encompassing:

## REQUIRED SKILLS AND KNOWLEDGE

- 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

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency 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 as 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:

<b>Range of tools/equipment/materials/procedures/workplaces/other variables</b>		
<b>Group No</b>	<b>The minimum number of items on which skill is to be demonstrated</b>	<b>Item List</b>
A	All of the following:	Approvals/clearances Access authorities
B	At least one of the following:	Development of an interconnected switching schedule Development of a radial switching schedule
C	All of the following:	Planning of loading of network components, including standby generation. Evaluate load parameters and effects on system, including paralleling and off-loading. Identify unexpected sources of energisation, e.g. generators, UPS, etc. Implementing earthing procedures to reduce induced voltages. Authorising issuance of work-permits.

D	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.
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**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 development of HV switching schedules.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working at realistic heights above ground i.e. above 3 metres, in limited spaces, with different structural/construction types and method and in a variety of environments.

**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 Industry to which this Competency Standard 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 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 the following units:

UETTDNIS49A      Develop low voltage switching schedule

## Range Statement

### RANGE STATEMENT

**10)** This relates to the unit of competency 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 development of HV switching schedules and include the use of system diagrams, data schedules, system loading data and use of computer based systems.

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
- Assessing risk
- Assessment
- Authorisation
- Confined space
- 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
- Hazards
- Identifying hazards
- Inspect
- Legislation
- 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)

Industry Specific Cross-Discipline Units