



**Australian Government**

# **UETDRIS001 Coordinate and direct power system switching schedules**

**Release: 1**

# UETDRIS001 Coordinate and direct power system switching schedules

## Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package Release 2.0.

## Application

This unit covers the coordination and direction of switching the high voltage (HV) and low voltage (LV) system. It includes coordinating switching between operating authorities and HV customers. It also includes the direction of switching on the HV and LV electrical network.

The application of the skills and knowledge described in this unit may require a licence/registration to practice in the workplace subject to regulations for undertaking of electrical work.

Other conditions may apply under state and territory legislative and regulatory licensing requirements which must be confirmed prior to commencing this unit.

## Pre-requisite Unit

All competencies in the Common Unit Group must have been completed, plus all competencies in one (1) of the identified Pathway Unit Group(s).

### Common Unit Group

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 devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UETDREL005 Work safely in the vicinity of live electrical apparatus

### Transmission Overhead Pathway Group

UETDREL001 Apply environmental requirements

UETDREL004 Operate plant and equipment in the vicinity of live electrical apparatus

UETDRIS007 Install and maintain distribution overhead conductors and cables

UETDRIS017 Perform high voltage field switching operation to a given schedule

UETDRTO006 Install and maintain transmission conductors

UETDRTO007 Install and maintain transmission structures and hardware

Distribution Overhead Pathway Group

UETDRDO005 Maintain overhead energised low voltage distribution network

UETDREL001 Apply environmental requirements

UETDREL004 Operate plant and equipment in the vicinity of live electrical apparatus

UETDRIS007 Install and maintain distribution overhead conductors and cables

UETDRIS008 Install and maintain electrical apparatus

UETDRIS010 Install and maintain low voltage overhead services

UETDRIS012 Install and maintain poles, structures and hardware

UETDRIS018 Perform low voltage field switching operation to a given schedule

Rail Traction Pathway Group

UETDREL001 Apply environmental requirements

UETDREL004 Operate plant and equipment in the vicinity of live electrical apparatus

UETDRIS007 Install and maintain distribution overhead conductors and cables

UETDRIS012 Install and maintain poles, structures and hardware

UETDRRT002 Install overhead traction components and equipment

UETDRRT003 Install rail traction bonds

UETDRRT004 Install traction overhead wiring systems

UETDRRT009 Maintain overhead traction components and equipment

UETDRRT011 Maintain traction overhead wiring systems

UETDRRT013 Perform rail traction switching operations to a given schedule

Distribution Cable Jointing Pathway Group

UETDRDU013 Joint, terminate and maintain high voltage underground polymeric cable

UETDRDU015 Joint, terminate and maintain low voltage underground polymeric cable

UETDRDU016 Lay power cables

UETDREL001 Apply environmental requirements

UETDREL004 Operate plant and equipment in the vicinity of live electrical apparatus

UETDRIS008 Install and maintain electrical apparatus

UETDRIS011 Install and maintain low voltage underground services

UETDRIS018 Perform low voltage field switching operation to a given schedule

Electrical Pathway Group

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 low voltage electrical apparatus and circuits

UEENEEG063A Arrange circuits, control and protection for general electrical 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 procedures in the energy sector

UETDRSB001 Perform substation switching operations to a given schedule

UETTDRIS67 Solve problems in energy supply network equipment

## Competency Field

Industry Specific Cross Discipline

## Unit Sector

Not applicable.

## Elements and Performance Criteria

### ELEMENTS

### PERFORMANCE CRITERIA

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

#### **1 Prepare/plan to coordinate and direct switching schedules**

- |            |                                                                                                                                                                                                                                                        |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.1</b> | Work schedules, including drawings, plans, requirements, established procedures and material lists, are obtained and analysed, as necessary, by site inspection and the extent of the preparation of the work determined for planning and coordination |
| <b>1.2</b> | 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                     |
| <b>1.3</b> | Risk control measures are identified, prioritised and evaluated against the work schedule                                                                                                                                                              |

- 1.4** Relevant requirements and established procedures for the work are communicated to all personnel and identified for all worksites
  - 1.5** Hazards are identified, work health and safety (WHS)/occupational health and safety (OHS) risks assessed and control measures prioritised, implemented and monitored, including emergency exits kept clear, to ensure safe systems of work are followed and according to established procedures
  - 1.6** Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures
  - 1.7** Resources, including personnel, equipment, tools and personal protective equipment (PPE), required for the job are identified, scheduled and coordinated and confirmed safe and in technical working order
  - 1.8** Clients/customers are provided with possible solutions and/or options within the scope, acceptable cost and requirements
  - 1.9** Liaison and communication issues with others/authorised personnel, authorities, clients and landowners are resolved and activities coordinated to carry out work
- 2 Carry out coordinate and direct switching schedules**
- 2.1** WHS/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** First aid, pole top rescue and other related work procedures are performed according to requirements and/or established procedures
  - 2.3** Lifting, climbing, working in confined spaces and aloft, and use of power tools/equipment, techniques and practices are safely exercised according to requirements
  - 2.4** Hazard warnings and safety signs are recognised and hazards and assessed WHS/OHS risks are reported to immediate authorised personnel for directions according to established procedures
  - 2.5** Remedial actions are taken to overcome any shortfalls

encountered in the work schedule according to requirements and/or established procedures

- 2.6** Coordination and direction of switching schedules are carried out in accordance with the work schedule and requirements and/or established procedures
- 2.7** Essential knowledge and associated skills are applied in the safe coordination and direction of switching schedules to ensure completion in an agreed timeframe and to quality standards with a minimum of waste according to requirements
- 2.8** Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements
- 2.9** Ongoing checks of quality of the work are undertaken in accordance with requirements and established procedures to ensure a quality outcome is achieved for the client/customer and to a community/industry standard

### **3 Complete coordinate and direct switching schedules**

- 3.1** Work undertaken is checked against work 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** Relevant work permits are signed off and electrical plant is returned to service and client/customer advised in accordance with requirements
- 3.4** Work completion records, reports, as installed/modified drawings and/or documentation and information are confirmed, processed and appropriate personnel notified

## **Foundation Skills**

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

## **Range of Conditions**

Range is restricted to essential operating conditions and any other variables essential to the work

environment.

Non-essential conditions may be found in the UET Transmission, Distribution and Rail Sector Training Package Companion Volume Implementation Guide.

## **Unit Mapping Information**

This unit replaces and is equivalent to UETTDRI51 Coordinate and direct power system switching schedules.

## **Links**

Companion Volume Implementation Guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7>

# Assessment Requirements for UETDRIS001 Coordinate and direct power system switching schedules

## Modification History

Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package Release 2.0.

## Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least two separate occasions and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures
- applying sustainable energy principles and practices
- obtaining all the following:
  - approvals/clearances
  - access permits
- demonstrating all of the following:
  - switching direction
  - switching coordination
  - autonomy of working with network control
- dealing with unplanned events on at least one (1) occasion.

## Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- electrical equipment fundamentals used in the powerline industry encompassing:
  - legislation, standards, codes, supply authority regulations and specific enterprise regulations pertaining to the use and care of electrical equipment - high voltage (HV) and low voltage (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, care and storage of electrical equipment
  - identifying hazards, and assessing and controlling risks associated with the use of electrical equipment
- installation of switchgear and associated equipment encompassing:
  - types and function of various switchgear - isolators, air-break switches, gas-filled

- switches, vacuum type, links, fuses, oil disconnectors, fuse switches, circuit breakers, operating characteristics, advantages and disadvantages of different types of switchgear, installation procedures, earthing, and requirements and techniques
- types of equipment - transformers, reactors, regulators, capacitors, relays, surge arrestors, fault indicators and mobile generators
  - installation procedures for switchgear and equipment - standards, codes, legislation, supply authority regulations and/or enterprise requirements, assembly and erecting procedures, earthing requirements and techniques, and pole mounted locations
  - maintenance procedures for switchgear and equipment - diagnosing and rectifying faults according to electricity supply industry (ESI) standards and procedures
  - testing and commissioning - ESI standards and procedures
  - LV switching principles encompassing:
    - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to switching of LV 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; and LV network interconnectors source of possible back-feed
    - LV switching techniques - identifying hazards, assessing and controlling risks associated with LV switching operations, electrical access permits, operational procedures and earthing procedures
    - personnel protective equipment (PPE) for LV switching
  - HV switching principles encompassing:
    - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to switching of HV 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; and network interconnectors source of possible back-feed
    - 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 procedures for operational forms, access authorities and permits
    - use and operation of equipment associated with HV overhead and substation equipment - test instruments, sticks, interrupters and 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 “operational” and additional work part “on-site” earths, factors determining the location and effectiveness of operational earthing, acceptable industry procedures, PPE and HV switching techniques
    - operate switching apparatus - identifying hazards, assessing and controlling risks

- associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures and double isolation procedures
- HV 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 strangles, switch operation, load break elbows, switching cubicles, canister fuses, bayonet fuses, F and G switching cubicles, voltage indicators and phasing testers
  - HV single wire earth return (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
  - 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 supervisory 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 RAT, dial up voice annunciated system and local control station
  - HV system switching principles, including switching authorisation procedures, encompassing:
    - legislation, standards, codes, 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
    - procedures for obtaining correct HV switching authorisation - identification of WHS/OHS hazards, assessing and controlling risks, safety procedures and precautions, safe approach distances (SAD), responsibilities and protocols, identifying switching resources, procedures for obtaining electrical access permits authorities, requirements for team switching and 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 and energisation procedures
- LV system switching principles, including switching authorisation procedures, encompassing:
    - legislation, standards, codes, 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 authorisation - identification of WHS/OHS hazards, assessing and controlling risks, safety procedures and precautions, safe approach distance, responsibilities and protocols, identifying switching resources, procedures for obtaining electrical access permits authorities, requirements for team switching and 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 and energisation procedures
  - coordinating and directing switching instructions encompassing:
    - legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to switching sheet instructions
    - specific enterprise processes, policies and procedures to be followed
    - processes of consultation, negotiation and coordination - clear and concise instructions and information, methods for the encouragement of feedback and contributions of information and ideas, and responsibilities of members of the team
    - techniques in analysing, planning, coordinating 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 coordination and directing of switching schedules instructions
    - relationship between the operating authorities and HV customers and operating agreements
    - techniques in coordinating and directing HV and LV switching of electrical networks
    - requirements for the use of manuals, system diagrams/plans and drawings - types, characteristics and capabilities of LV and HV electrical equipment to be switched
    - responsibilities of the switching operator
    - techniques in writing switching instructions - sequence of switching operations, isolation procedures, earthing procedures and switching completion notification procedures
    - techniques in gathering, collating and confirming data on switching procedures
  - HV overhead and substation switching principles encompassing:
    - legislation, standards, codes, 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 and hazard/risk assessments associated with HV switching - types of operational forms, access authorities and permits and 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 and arc stranglers
- HV switchgear – types, categories, application and operating capabilities
- operation of HV overhead switching or indicating devices - fuses, disconnect fuses, load switching, live line indicators, capacitors, reclosers, sectionalisers, underslung links, air-breaks switches, disconnects, live line clamps, phasing sticks and 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, and HV switching techniques
- operate switching apparatus - identifying hazards, assessing and controlling risks associated with HV switchgear operation, systematic and defensive techniques, mobile radio procedures and double isolation procedures
- LV overhead and substation switching principles encompassing:
  - legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to LV 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; and role and responsibilities of the LV switching operator
  - operational forms, access authorities and hazard/risk assessments associated with 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 and arc stranglers
  - LV switchgear – types, categories, application and 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 and 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
  - LV switching techniques

- operate switching apparatus - identifying hazards, assessing and controlling risks associated with LV switchgear operation, systematic and defensive techniques, mobile radio procedures and double isolation procedures
- 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); and responsibilities of the switching operator
  - techniques in writing switching instructions - sequence of switching operations, isolation procedures, earthing procedures and switching completion notification procedures
- preparation of a LV switching instruction encompassing:
  - legislation, standards, codes, 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; and responsibilities of the switching operator
  - techniques in writing switching schedules - sequence of switching operations, isolation procedures, earthing procedures and switching completion notification procedures
- enterprise-specific policies and procedure instructions encompassing:
  - responsibilities and duty of care of employer and employee relationship
  - methods of obtaining the up-to-date information on enterprise policies and procedures
  - rules and regulations
  - induction into workplace - location of work area and storage area, timetable, uniform, personal wellbeing, housekeeping rules, emergency procedures and evacuation procedures
  - techniques when dealing with others - working in teams, customer relation, and complaint and issues procedures
  - overview of enterprise professional development - firefighting procedures, fatigue management, and training and competency development - understanding and promotion
- enterprise-specific WHS/OHS instructions encompassing:
  - standards, codes, legislation, supply authority regulations and specific enterprise regulations pertaining to WHS/OHS policies and procedures
  - methods of obtaining the up-to-date information on enterprise WHS/OHS policies and procedures
  - specific enterprise PPE - type and application; where and when to be used; method of replacement; responsibility of maintenance, including cleaning, inspection and testing; and emergency response, rescue, evacuation and first aid procedures
  - personal wellbeing – hygiene, fatigue/stress management and drugs/alcohol
  - WHS/OHS training - induction training, specific hazard training, specific task or equipment training, emergency and evacuation training, and training as part of broader programs, such as equipment operation

- WHS/OHS records - audits; inspection reports; workplace health and environmental monitoring records; training and instruction records; manufacturer and supplier information, such as material safety data sheets (MSDS); registers; maintenance reports; workers compensation and rehabilitation records; and first aid/medical records
- enterprise-specific technical drawings 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
  - instructions/worksheets - types and application of enterprise-specific symbols and diagrams
  - title box - description of parts and version control
- enterprise-specific switching diagrams and drawings 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, and instructions/worksheets
  - interpretation of different system switching diagrams - LV system switching diagrams, direct current (d.c.) traction supply sectioning diagrams, HV transmission and distribution system symbols and feeder plans, and processes of updating switching diagrams.

## Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated conditions involving realistic and authentic activities that replicate operational workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, equipment and PPE currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

## Links

Companion Volume Implementation Guides are found in VETNet -

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