



Australian Government

UETDRSO006 Develop low voltage distribution switching programs

Release: 1

UETDRSO006 Develop low voltage distribution switching programs

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 preparation and/or checking of activities required to place the low voltage (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.

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

UEENEE104A Use engineering applications software on personal computers

UEENEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEE102A Fabricate, assemble and dismantle utilities industry components

UEENEE104A Solve problems in d.c. circuits

UEENEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEE124A Compile and produce an energy sector detailed report

UEENEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEE126A Provide solutions to basic engineering computational problems

UEENEE101A Solve problems in electromagnetic devices and related circuits

UEENEE102A Solve problems in low voltage a.c. circuits

UEENEE149A Provide engineering solutions to problems in complex polyphase power circuits

UETDREL001 Apply environmental requirements

UETDREL005 Work safely in the vicinity of live electrical apparatus

UETDRIS005 Implement & monitor power system environmental & sustainable energy management policies & procedures

UETDRIS006 Implement and monitor the power system organisational WHS/OHS policies, procedures and programs

Competency Field

System Operations

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

PERFORMANCE CRITERIA

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

1 Plan for the preparation of LV distribution switching programs

- | | |
|------------|---|
| 1.1 | Work health and safety (WHS)/occupational health and safety (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 appropriate personnel |
| 1.3 | Organisational established procedures on policies and specifications for the LV distribution switching systems are obtained or established with appropriate personnel |
| 1.4 | Testing procedures are discussed with/directed to appropriate personnel in order to ascertain the project brief |
| 1.5 | Testing parameters are established from organisational established procedures on policies and specifications |
| 1.6 | Equipment/tools and personal protective equipment (PPE) are selected based on specified performance |

criteria and established procedures

- 1.7** Work roles and tasks are allocated according to requirements and individual 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 others/authorised personnel, authorities, clients and landowners 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 in accordance with established procedures
- 2.2** WHS/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 in accordance with 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 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 issued and records are updated in accordance with established procedures

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 UETTDRSO36 Develop low voltage distribution switching programs.

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 UETDRSO006 Develop low voltage distribution switching programs

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
- demonstrating at least three (3) switching programs that between them encompass at least seven (7) of the following:
 - a transformer with a low voltage (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 a LV customer
 - installation of a mobile generators
- preparing 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
- preparing, writing and checking switching sheets to do all of the following:
 - manage load
 - manage voltage
 - minimise losses
 - maximise network reliability
- checking all above types of switching instructions
- coordinating all above types of switching instructions
- calculating plant loading
- applying and administrating supervisory control and data acquisition (SCADA) or

enterprise-specific system

- analysis and diagnosis of system failure
- 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:

- 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 high voltage (HV) equipment associated with substations
- 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, and 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 and assessing the appropriateness of the generator
 - operating a generator in parallel to a single LV job - overhead systems, indoor systems, customer installations and kiosk substations
- different types and function of distribution components encompassing:
 - Commonwealth/state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the use and application of distribution components
 - requirements for the use of overhead line construction manuals, system diagrams/plans and drawings
 - types, functions and characteristics of distribution components
 - safety policies and procedures precautions related to the handling and installing distribution components
- coordinating access authority procedures encompassing:
 - 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, coordination 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 coordinating the delivery and issuing of access authorities
 - techniques in gathering, collating and confirming data on different worksites - electrical network diagrams for the specific worksite; 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 WHS/OHS and electrical safety
 - techniques in receiving and coordinating 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, coordination of access authorities, and engaging and briefing contractors on electrical and other work
 - issuing and receipt of operating agreements
 - principles of statutory and safety considerations encompassing:
 - Commonwealth/state/territory legislation, standards, codes, supply authority regulations and/or enterprise requirements associated with working on LV
 - particular reference to state and territory regulations regarding working near energised conductors, electrical access, heights, confined space, testing procedures and licensing rules
 - principles of isolation and tagging procedures associated with protection testing encompassing:
 - Commonwealth/state/territory legislation standards, codes, supply authority regulations and/or enterprise requirements associated with installation, maintenance, isolation and tagging procedures
 - 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 in accordance with Commonwealth/state/territory legislation, supply authority regulations and enterprise standards
 - techniques in the installation and maintenance procedures protection devices in accordance with Commonwealth/state/territory legislation, supply authority regulations and enterprise standards
 - 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 permit(s), operational procedures and earthing procedures
 - personnel protective equipment (PPE) for LV switching
 - 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 distances, 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
 - 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 LV 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, and 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
- operating 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 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 personal protection equipment (PPE) - type and application; where and when to be used; method of replacement; responsibility for 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 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, 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
- 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.

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, facilities, equipment, protection, control, metering and alarm equipment, computerised electrical plant control and monitoring facilities, and PPE currently used in industry
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice, operational event data, network drawings, crisis management procedures and operation manuals.

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