



Australian Government

UETTD RIS71 Diagnose and rectify faults in electrical energy supply transmission systems

Release: 1

UETTDNIS71 Diagnose and rectify faults in electrical energy supply transmission systems

Modification History

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

Application

This unit covers diagnosing and rectifying faults in electrical energy transmission systems. The unit encompasses applying safe working practices, interpreting diagrams and technical data; applying knowledge of energy supply and transmission systems to logical fault-finding processes; implementing fault rectification, safety and functional testing; and reporting work activities and outcomes.

The application of the skills and knowledge described in this unit requires 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 licencing requirements which must be confirmed prior to commencing this unit.

Pre-requisite Unit

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

UEENEEG006A Solve problems in single and three phase low voltage machines

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

UETTDNIS67 Solve problems in energy supply network equipment

UETTDNIS68 Solve problems in energy supply network protection equipment and systems

UETTDNIS69 Diagnose and rectify faults in energy supply apparatus

Competency Field

Industry Specific Cross Discipline

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to diagnose and rectify faults

PERFORMANCE CRITERIA

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

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) procedures for a given work area are identified, obtained and understood
- 1.2** Established WHS/OHS risk control measures and procedures in preparation for the work are followed
- 1.3** Safety hazards that have not previously been identified are documented and risk control measures devised and implemented in consultation with appropriate personnel
- 1.4** The extent of faults is determined from reports and other documentation and from discussions with appropriate personnel
- 1.5** Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the worksite
- 1.6** Tools, equipment and testing devices needed to diagnose faults are obtained in accordance with established procedures and checked for correct operation and safety

2 Diagnose and rectify faults

- 2.1** WHS/OHS risk control measures and procedures for carrying out the work are followed
- 2.2** The need to test or measure live work is determined in strict accordance with WHS/OHS requirements and, when necessary, conducted within established safety procedures
- 2.3** Circuits/machines/plant are checked as being isolated, where necessary, in strict accordance with WHS/OHS

requirements and procedures

- 2.4 Logical diagnostic methods are applied to diagnose electrical energy transmission system faults employing measurements and estimations of system operating parameters referenced to system operational requirements
- 2.5 Suspected fault scenarios are tested as being the source of system problems
- 2.6 Source of fault is identified and appropriately competent person/s engaged to rectify the fault where it is outside the scope of the control system
- 2.7 Faults in the system components are rectified to raise electrical energy transmission system to its operation standard
- 2.8 System is tested to verify that it operates as intended and to specified requirements
- 2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate personnel and job specifications and requirements
- 2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes
- 2.11 Diagnosis and rectification activities are carried out efficiently without unnecessary waste of materials or damage to system, the surrounding environment or services using sustainable energy practices

3 Complete and report fault diagnosis and rectification activities

- 3.1 WHS/OHS work completion risk control measures and procedures are followed
- 3.2 Worksite is made safe in accordance with established safety procedures
- 3.3 Rectification of faults is documented in accordance with established procedures
- 3.4 Appropriate person/s is notified in accordance with established procedures that the system faults have been rectified

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 Companion Volume Implementation Guide.

Unit Mapping Information

This unit replaces and is equivalent to UETTDRIS71A Diagnose and rectify faults in electrical energy supply transmission systems.

Links

UET Training Package Companion Volume Implementation Guide is found in VETNet - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=229bace1-b7bc-4653-9300-dffb13ecfad7>

Assessment Requirements for UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems

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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
- diagnosing and rectifying faults in electrical energy supply transmission systems, including:
 - applying logical diagnostic methods
 - using fault scenarios to test the source of system faults
 - identifying faults and competency needed to rectify them
 - rectifying faults in system
 - verifying that the system operates correctly
 - documenting fault rectification
 - dealing with unplanned events on at least one occasion.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified

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:

- overview of the transmission system encompassing:
 - lines, buses, transformers and cables; line/bus layouts, including single and double switching, breaker and a half systems and high voltage (HV) crossing methods
- the principles involved in HV alternating current (a.c.) transmission encompassing:
 - tower types and configurations; choice of towers or poles (economic and environmental); insulator types and configuration; types of conductors, their configuration and standard nomenclature; typical line spacing and ground clearances; line ratings based on ambient

- temperature; conductor terminating and clamping equipment, including vibration damping principles and equipment
- principles involved in direct current (d.c.) transmission encompassing:
 - the economics, harmonic generation, VAR requirements and protection difficulties; types of connections and transformer requirements; advantages and disadvantages of d.c. transmission; typical overseas systems and likely (future) use in Australia
- the principles of operation, voltage and current range, breaking capacity and field of use of the following types of circuit breakers
 - bulk oil
 - small oil volume
 - air break
 - air blast
 - air puffer
 - vacuum and
 - SF6 (double pressure and puffer types)
- the types of isolators in use, such as duo-roll, blade and scissor type
- circuit breaker auxiliary systems encompassing:
 - high pressure air systems, and air storage and handling processes
 - d.c. systems, including battery types, charging and protection systems and earth fault detection systems
 - SF6 conditioning, storage and handling system
- the characteristics of lines and cables encompassing:
 - the calculation of R, X and B for different arrangements of conductor; typical values for actual lines; transposition; models based on line length; voltage and line regulation; the transmission of power (P) and VARs (Q)
- control of voltage - conditions leading to voltage collapse and system disintegration, effects on the system of high voltage (HV)/low voltage (LV), and voltage control devices including:
 - voltage regulators applied to generators and synchronous phase modifiers
 - electromagnetic voltage regulators
 - series and parallel capacitors
 - on-load tap changer (OLTC) transformers and static VAR compensations (SVCs)
- range of devices covered by SVCs, including:
 - saturated reactor (SR) compensations
 - thyristor controlled reactor (TCR) compensators
 - combined TCR/TSCs
 - production of wave-form distorting harmonics and control devices
- importance of the location in the system of voltage control devices
- use of graphical methods to calculate the size of VAR regulating plant
- types of communication systems including:
 - telephone, power line carrier, dedicated cable, micro-wave links and fibre optics; quantities and signals to be communicated; Advantages and disadvantages of the various

- systems and equipment requirements
- transient over-voltages in power systems, including:
 - switching and lightning over-voltages and their effect on different plant items; transient over-voltage control and reduction using surge diverters, shield wires and CB control; insulation systems, insulation coordination, insulation grading in plant items, and bushings and capacitor bushings
- factors leading to the generation of corona encompassing:
 - consequences of corona; reduction of corona, including conductor bundling, grading rings and conductor surface treatment.

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 and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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