



Australian Government

UETTD RIS74 Develop engineering solutions for energy supply system protection problems

Release: 1

UETTDRI574 Develop engineering solutions for energy supply system protection problems

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 developing engineering solutions to resolve problems with energy supply system protection. It encompasses working safely; applying extensive knowledge of energy supply system protection operation, protection devices and their application; gathering and analysing data; applying problem-solving techniques and developing and documenting solutions and alternatives.

Typical protection problems are those encountered in meeting performance requirements and compliance standards, revising a protection operating parameters and dealing with protection malfunctions.

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

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

UEENEEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEEE126A Provide solutions to basic engineering computational problems

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

UEENEEG149A Provide engineering solutions to problems in complex polyphase power circuits

UETTDRIS67 Solve problems in energy supply network equipment

UETTDRIS68 Solve problems in energy supply network protection equipment and systems

UETTDRIS69 Diagnose and rectify faults in energy supply apparatus

Distribution Pathway Unit Group

UETTDRIS70 Diagnose and rectify faults in electrical energy distribution systems

Transmission Pathway Unit Group

UETTDRIS71 Diagnose and rectify faults in electrical energy supply transmission systems

Distributed Generation Pathway Unit Group

UETTDRIS72 Diagnose and rectify faults in distributed generation systems

Competency Field

Industry Specific Cross Discipline

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to develop engineering solution for energy supply system protection problems

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) processes and 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** The extent of the protection problem is determined from performance specifications and situation reports and in consultation with relevant personnel
- 1.4** Activities are planned to meet scheduled timelines in

		consultation with others involved in the work
	1.5	Effective strategies are formed to ensure solution development and implementation is carried out efficiently
2 Develop engineering solution for energy supply system protection	2.1	WHS/OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of supply system protection arrangements, operation, device characteristics and applications are applied to developing solutions to supply system protection problems
	2.3	Parameters, specifications and performance requirements in relation to each protection problem are obtained in accordance with established procedures
	2.4	Approaches to resolving supply system protection problems are analysed to provide most effective solutions
	2.5	Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policies
	2.6	Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Test, document and implement engineering solution for energy supply system protection problems	3.1	Solutions to protection problems are tested to determine their effectiveness and modified where necessary
	3.2	Adopted solutions are documented, including instruction for their implementation that incorporates risk control measure to be followed
	3.3	Appropriately competent and qualified person/s required to implement solutions to supply system protection problems is coordinated in accordance with regulatory requirements and enterprise policies
	3.4	Justification for solutions used to solve supply system protection problems is documented for inclusion in work/project development records in accordance with

professional standards

Note: A license to practice in the workplace is required for work involving direct access to plant and equipment connected to installation wiring at voltages above 50 V a.c. or 120 V d.c

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 UETTDRI574A Develop engineering solutions for energy supply system protection problems.

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 UETTDRIS74 Develop engineering solutions for energy supply system protection problems

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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
- developing engineering solutions for energy supply system protection, including:
 - understanding the extent of the protection problem
 - forming effective strategies for solution development and implementation
 - obtaining protection parameters, specifications and performance requirements appropriate to each problem
 - testing and solutions to protection problems
 - documenting instructions for implementation of solutions that incorporate risk control measure to be followed
 - documenting justification of solutions implemented in accordance with professional standards
 - 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:

- protection scheme requirements encompassing:
 - requirements of a protection scheme - relationship to primary system design, purpose of protection, safety of persons, protection of plant, system instability, system break up, loss of customers, loss of revenue, protection zones, restricted schemes, unrestricted schemes, duplicate protection, local backup protection, remote backup protection, selectivity,

discrimination, stability, sensitivity and reliability

- components of a protection scheme - current transformers, potential transformers, summation current transformers, interposing transformers, multi-tapped transformers, all-or-nothing relays, induction relays, balanced beam relays, directional relays, biased relays, solid state relays, microprocessor based relays, gas relays, thermal sensors, hardwired communication, powerline carriers systems, microwave systems, fibre optic systems, need for isolation and need for interfacing
- protection applied to buses - overload, differential, earth leakage, structure leakage, combined schemes and protection overlap
- protection applied to transformers - biased differential, gas, winding temperature and oil temperature
- protection applied to single/radial lines - overcurrent, earth leakage, slow earth leakage, distance, auto reclose, sectionalising and over voltage
- protection applied to interconnected lines - overcurrent, pilot wire, directional, directional overcurrent, current differential, phase comparison, current comparison, distance, impedance, admittance and offset
- discrete protection systems encompassing:
 - earth fault protection - master earth leakage schemes, sensitive earth fault relays and schemes, residual earth fault scheme, core balance earth fault scheme, frame/structure earth leakage scheme, time graded discrimination and backup protection
 - overcurrent protection - feeder overcurrent protection, instantaneous overcurrent schemes, inverse timed overcurrent schemes, types and location of components of an overcurrent scheme, CT summation, time graded discrimination and backup protection
 - alarms and controls - auxiliary relays, voltage regulating relays, line drop compensation, gas relay types, gas relay scheme operation and setting, and over temperature schemes
- interdependent protection systems encompassing:
 - overcurrent and earth leakage intertripping, interlocking and blocking - logic mapping, master control, electromechanical, electronic and shading coils
 - pilot wire, phase comparison - opposed voltage schemes, circulating current schemes, location of components of a scheme and pilot supervisory techniques
 - load shedding, voltage control, parallel operation and load rejection
 - CB failure protection
 - reclose systems - applications, single shot, multi-shot, blocking schemes and synchronisation checking
- complex protection systems encompassing:
 - distance - characteristics, electromechanical, electronic, impedance, mho, offset mho, switched schemes, non-switched schemes, blocking schemes and bus zone
 - differential, transformer differential, bus overcurrent - principles, feeder protection, transformer protection, bias systems, harmonic restraint, CT connections, bus protection, low impedance schemes, high impedance schemes, bus overcurrent schemes, generator protection, CT connections, special considerations and digital systems
 - types of revenue metering
 - applications of supervisory control and data acquisition (SCADA)

- complex protection systems for communications
- harmonic control
- point on wave switching.

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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