



**Australian Government**

# **UETTDRDS51 Manage power system transmission and sub-transmission design process**

**Release: 1**

# **UETTDRDS51 Manage power system transmission and sub-transmission design process**

## **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 the management of transmission, sub-transmission and zone substation design process activities. It applies to all design projects whether they be basic secondary upgrades, supervisory control and data acquisition (SCADA) modifications or new installations on green field sites. The design and management must conform to safety regulations and environmental standards and incorporate the principles of safe design.

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 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

UEENEEE104A Solve problems in d.c. circuits

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

UETTDRDS39 Prepare and manage detailed construction plans for electrical power system infrastructure

UETTDREL11 Apply sustainable energy and environmental procedures

UETTDREL16 Working safely near live electrical apparatus

UETTDRIS62 Implement and monitor the power system organisational WHS/OHS policies, procedures and programs

UETTDRIS63 Implement & monitor power system environmental & sustainable energy management policies & procedures

## Competency Field

Design

## Unit Sector

Not applicable.

## Elements and Performance Criteria

### ELEMENTS

Elements describe the essential outcomes.

#### **1 Plan for and coordinate the management of the transmission, sub-transmission and zone substation design process**

### 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) practices/procedures and environmental and sustainable energy procedures, which may influence the design of substations, are reviewed and determined
- 1.2** Purpose of the design is established and expected outcomes of the work are confirmed with appropriate personnel
- 1.3** Established policies, procedures and specifications for the design are obtained or established with appropriate personnel
- 1.4** Equipment/tools and personal protective equipment (PPE) are selected and coordinated based on specified requirements and established procedures
- 1.5** 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
- 1.6** Risk control measures are identified, prioritised and evaluated against the work schedule
- 1.7** Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures
- 1.8** Resources, including personnel, equipment, tools and PPE, required for the job are identified, scheduled and

- coordinated and confirmed safe and in technical working order
- 1.9** Liaison and communication issues with others/authorised personnel, authorities, clients and land owners are resolved and activities coordinated to carry out work
  - 1.10** Site is prepared according to the work schedule and to minimise risk and damage to property, commerce and individuals in accordance with established procedures
  - 1.11** 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
- 2 Carry out and coordinate the management of the transmission, sub-transmission and zone substation design process**
- 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 incidence of accidents and minimise waste are incorporated into the project in accordance with requirements and/or established procedures
  - 2.3** System design decisions are made on the basis of safety and effective outcomes according to requirements and/or established procedures
  - 2.4** Mathematical models of the system 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

- |                                                                                                                          |            |                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                          | <b>2.7</b> | Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements                             |
|                                                                                                                          | <b>2.8</b> | Quality of work is monitored against personal performance agreement and/or established organisational and professional standards                                             |
| <b>3 Complete and coordinate the management of the transmission, sub-transmission and zone substation design process</b> | <b>3.1</b> | Final checks of the design are undertaken to ensure it complies with all requirements and includes all specifications and documentations needed to complete the design brief |
|                                                                                                                          | <b>3.2</b> | Appropriate personnel are notified of completion and reports and/or completion documents are finalised                                                                       |
|                                                                                                                          | <b>3.3</b> | Reports and/or completion documents are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval                   |
|                                                                                                                          | <b>3.4</b> | Approved copies of design 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 Companion Volume Implementation Guide.

## Unit Mapping Information

This unit replaces and is equivalent to UETTDARDS51A Manage power system transmission and sub-transmission design process.

## 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 UETTDRDS51 Manage power system transmission and sub-transmission design process**

### **Modification History**

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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
- conducting design process commencement activities, including each of the following items:
  - completion of site survey
  - geotechnical and resistivity details
  - completion of environmental considerations
  - acquisition of design project scope document
  - component manufacturer details
  - engagement of necessary consultants/contractors
- conducting design process completion activities, including each of the following items:
  - issue of design documentation to allow construction
  - closure of the design process post-delivery review and implementation of corrective actions
  - issue of corrected design documents reflecting field mark-ups
- conducting two (2) technical projects, including:
  - activities that address the correction of errors in the process
  - application of a design control checklist, which lists all of the required design activities to be carried out in this process
- 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:

- working safely on or around electronic equipment encompassing:
  - risk management and assessment of risk - principle and purpose of risk management and

processes for conducting a risk assessment

- hazards associated with low voltage (LV), extra-low voltage (ELV) and high currents - parts of an electronic systems and equipment that operate at LV and ELV and parts of an electronic systems and equipment where high currents are likely
- risks and control measures associated with high voltage (HV) - parts of an electronic systems and equipment that operate at HV; the terms used - 'touch voltage', 'step voltage', 'induced voltage' and 'creepage' as they relate to the hazards of HV; and control measures used for dealing with the hazards of HV
- risks and control measures associated with LV - risks associated with installation, fault finding, maintenance and repair; control measures before, during and after working on electronic systems or equipment; isolation and tagging procedures; risks and restrictions in live work and control measures for live work
- risks and control measures associated with the high levels of radiation - radio frequency (RF) hazards, maximum exposure levels to RF and maximum exposure to microwave radiation
- optical fibre safety - coherent optical sources and joining procedures, and laser safety class 3a devices or their replacement
- safety, selection, use, maintenance and care of test equipment - safety characteristics of electrical testing devices, chemical cleaning solvents, glues and joining wastes used in electronics, safe use of electrical testing device, and checks and storage methods for maintaining the safety of testing devices
- enterprise-specific equipment installation procedures encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to equipment installation
  - requirements for the use of manuals, substation diagrams/plans and drawings
  - types, characteristics and capabilities of HV substation equipment to be installed
  - identification of components within the equipment to be installed and associated control housings
  - use, characteristics and capabilities of specialised tools and equipment
  - enterprise-specific policies and procedures for equipment to be Installed
  - control equipment and auxiliary relays, flags and alarms
  - techniques in evaluating serviceability of equipment to be installed
  - safety precautions when testing and measuring equipment to be installed - safe working practices and procedures; identification of hazards; assessment and control of WHS/OHS risks; types, selection, maintenance and use of personal protective equipment (PPE); responsibilities and protocols and safe working clearances
  - remote and local operating principles and conventions
- enterprise-specific data management processes encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements applicable to data management
  - requirements for the use of manuals, substation diagrams/plans and drawings
  - types of enterprise-specific computer software
  - techniques in storing and retrieving data and reports from the computer

- techniques in using the data management systems in following necessary commands and protocols in accordance with the enterprise-specific procedures
- calculation of results and data measurements using the computer
- techniques in the preparation of preliminary works creation and closure
- enterprise-specific procedures and work practices relating to critical events encompassing:
  - Commonwealth/state/territory and local government legislation, supply authority regulations, standards, codes and/or enterprise requirements applicable to the procedures and work practices relating to critical events
  - requirements for the use of operational manuals, system diagrams/plans and drawings
  - identifying and interpreting enterprise operating procedures
  - techniques in the applying enterprise operating procedures
- effective management and communication encompassing:
  - Commonwealth/ state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to assisting in effective management and communication
  - enterprise operational principles - workplace WHS/OHS enterprise plan, environmental enterprise policies and procedures, industrial relations policies and procedures, and anti-discrimination policies and procedures
  - relationship between the management and employees - methods used to collate and distribute/disseminate information, responsibilities of each member of the work team, staff development activities and legislation requirements with regard to WHS/OHS training, methods of addressing barriers such as literacy and cultural differences and provisions relating to WHS/OHS issue resolution
  - techniques associated with organisational policies and procedures related to human resources - relevant awards and certified agreements, legislation impacting on people management, and range of support services and expertise available
  - techniques in managing relationships - identifying problems; methods of conflict resolution; methods of consultation, communication and negotiation; and mentoring and strategies for positive feedback
  - techniques in leadership in achieving enterprise strategic and operational plans
  - techniques in managing relationships under stress - stress management
- methodology used in writing enterprise-specific management reports encompassing:
  - Commonwealth, state/territory and local government legislation, supply authority regulations standards, codes and/or enterprise requirements applicable to writing enterprise-specific management reports
  - techniques in researching, collating and analysing information for the report - recording, filing and retrieving systems; and storing and retrieving data from computer systems
  - relationship of management reports to enterprise policies and procedures - enterprise structure and resources, workplace WHS/OHS and risk management enterprise data, financial and operational data, environmental enterprise policies and procedures, industrial relations policies and procedures, and anti-discrimination policies and procedures
  - techniques in writing enterprise-specific management reports - methods used to disseminate information and facilitate enterprise requirements, document proformas, and

compliance and legislative requirements to produce effective reports in the appropriate format

- enterprise-specific procedures and work practices relating to managing critical events encompassing:
  - Commonwealth/state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the procedures and work practices relating to managing critical events
  - requirements for the use of critical event manuals, system diagrams/plans and drawings
  - identifying and interpreting enterprise critical event management procedures
  - techniques in applying enterprise critical event management procedures
- procedure to undertake a visual inspection of a scheme encompassing:
  - standards, codes, Commonwealth/state/territory legislation, supply authority regulations and/or enterprise requirements associated with visual inspection procedures of a scheme
  - requirements for the use of manuals, system diagrams/plans and drawings
  - deficiencies in operating to the standard functionality
  - techniques in determining relay malfunction - targeting and techniques in determining wiring defects
- types, uses and techniques when using the tools and equipment associated with substations encompassing:
  - standards, codes, legislation, supply authority regulations and/or enterprise requirements pertaining to the use of HV or high current test equipment associated with substations
  - safety precautions when using tools and equipment on substations - safe operation procedures; WHS/OHS hazards and precautions; identification of hazards; assessing and controlling risks; types, selection, maintenance and uses of PPE; permit to work systems and isolation procedures; safe working practices when using specialised equipment; and emergency response and rescue, including first aid
  - techniques in the use of tools and equipment associated with substations – recorders, oscilloscopes, real time recorders, storage recorders, data loggers and chart recorders
  - measurements - harmonics, transient capture and point-on-wave assessment and insulation test instruments (digital, analogue instruments up to 5 kV direct current (d.c.) and 10 kV alternating current (a.c.)), techniques including guarding and shielding, measurements of polarisation index, step voltage methods with appropriate temperature correction, dielectric dissipation factor on grounded and ungrounded objects
  - meters and the techniques used to carry out measurements - temperature, winding resistance, conductor resistance, capacitance and inductance, phase angle, frequency, ratio and phase shift and vector group
  - timing measurement tools - sequence timers, event timers and contact timers; measurements on circuit breakers and other interrupter types, such as close-open, open-close, close-open-close, open-close-open sequences
  - equipment used - chain blocks, tension devices, power hand tools, slings and hoists, hydraulic crimping tools, elevated work platforms (EWPs) and other mobile plant used to gain access to work at heights, appropriate hand tools and other mechanical instruments, such as:
    - oscilloscopes, real time recorders, storage recorders, data loggers and chart recorders.

Measurements may include harmonics, transient capture and point-on-wave assessment

- negotiation techniques encompassing:
  - techniques associated with organisational policies and procedures related to human resources - relevant awards and certified agreements, legislation impacting on people management, and range of support services and expertise available
  - techniques in managing relationships - identifying problems; methods of conflict resolution; methods of consultation, communication, negotiation and mentoring; and strategies for positive feedback
  - techniques in client interaction - relationships between client and enterprise, outcomes of the interaction and methods of achieving outcomes
- preparation of policies and procedures encompassing:
  - Commonwealth, state/territory and local government legislation, supply authority regulations, standards, codes and/or enterprise requirements applicable to the preparation of policies and procedures
  - types of standard forms, documentation and data
  - techniques in disseminating policies and procedures
  - techniques in undertaking approval processes
- principles to manage the process of transmission, sub-transmission and zone substation designs encompassing:
  - Commonwealth, state/territory and local government legislation, standards, codes, supply authority regulations and/or enterprise requirements applicable to the substation design management principles
  - requirements for the use of the substation system construction manuals, system diagrams/plans and drawings and for plans such as work method statements for the control of WHS/OHS risks
  - type of design management - design commencement, carrying out and completion activities
  - types of design process commencement activities - acquisition of site survey, acquisition of geotechnical and resistivity details, completion of environmental considerations, acquisition of design project scope documents, component manufacturer details and engagement of necessary consultants/contractors
  - types of design carrying out activities - completion of checklists, sign-off checklists and general design administration/housekeeping activities
  - types of design process completion activities - the issue of design documentation to allow construction, closure of the design process, carrying out of the post-delivery review and implementation of corrective actions, issue of corrected design documents reflecting field mark-ups.

## 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 PPE currently used in industry to undertake management of the transmission, sub-transmission and zone substation design process
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice and operation manuals.

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