



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UETDRDS51A Manage power system transmission and sub-transmission design process**

Release: 1

## **UETTDRDS51A Manage power system transmission and sub-transmission design process**

### **Modification History**

Not applicable.

### **Unit Descriptor**

#### **Unit Descriptor**

#### **1) Scope:**

##### **1.1) Descriptor**

This Competency Standard Unit covers the management of transmission, sub-transmission and zone substation design process activities. This applies to all design projects whether they be basic secondary upgrades, 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.

### **Application of the Unit**

#### **Application of the Unit 2)**

This competency standard Unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

### **Licensing/Regulatory Information**

#### **License to practice 3)**

The skills and knowledge described in this unit may require a licence/registration to practice in the work place subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to Occupational Health and Safety, electricity/telecommunications/gas/water industry

**License to practice**

**3)**

safety and compliance, industrial relations, environmental protection, anti discrimination and training.  
Commonwealth, State/Territory or Local Government legislation and regulations may exist that limits the age of operating certain equipment.

**Pre-Requisites**

**Prerequisite Unit(s)**

**4)**

**Competencies**

**4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Common Unit Group

Unit Code	Unit Title
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 electromagnetic devices and related circuits
UETTDARDS39A	Prepare and manage detailed construction plans for electrical power system infrastructure
UETTDREL11A	Apply sustainable energy and environmental procedures

**Prerequisite Unit(s) 4)**

UETTDREL16A	Working safely near live electrical apparatus
UETTD RIS62A	Implement and monitor the power system organisational OHS policies, procedures and programs
UETTD RIS63A	Implement and monitor the power system environmental and sustainable energy management policies and procedures

**Literacy and numeracy skills 4.2)**

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 “Literacy and Numeracy”

Reading 5      Writing 5      Numeracy 5

## **Employability Skills Information**

**Employability Skills 5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

## Elements and Performance Criteria Pre-Content

- 6) Elements describe the essential outcomes of a competency standard unit. Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan for and coordinate the management of the transmission, sub-transmission and zone substation design process	<p>1.1 OHS practices/procedures and environmental and sustainable energy procedures, which may influence the design of substations, are reviewed and determined.</p> <p>1.2 Purpose of the design is established and expected outcomes of the work are confirmed with the appropriate personnel.</p> <p>1.3 Established policies, procedures and specifications for the design are obtained or established with the appropriate personnel.</p> <p>1.4 Equipment/tools and personal protective equipment are selected and coordinated based on specified requirements and established procedures</p> <p>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</p> <p>1.6 Risk control measures are identified, prioritised and evaluated against the work schedule</p> <p>1.7 Relevant work permits are secured to coordinate the performance of work according to requirements and/or established procedures</p> <p>1.8 Resources including personnel, equipment, tools and personal protective equipment required for</p>

**ELEMENT**

**PERFORMANCE CRITERIA**

		the job are identified, scheduled and coordinated and confirmed in a safe and technical working order
	1.9	Liaison and communication issues with other/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 as per established procedures.
	2.2	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 as per 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

## ELEMENT

## PERFORMANCE CRITERIA

- with compliance specifications to ensure completion of the project within an agreed timeframe according to requirements.
- 2.7 Solutions to non-routine problems are identified and actioned using acquired essential knowledge and associated skills according to requirements
- 2.8 Quality of work is monitored against personal performance agreement and/or established organisational and professional standards.
- 3 Complete and coordinate the management of the transmission, sub-transmission and zone substation design process
- 3.1 Final checks of the design are undertaken to ensure they comply with all requirements and include all specifications and documentations needed to complete the design brief.
- 3.2 Appropriate personnel are notified of completion and reports and/or completion documents are finalised.
- 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 design documents are issued and records are updated in accordance with established procedures.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

**8) Essential Knowledge and Associated Skills (EKAS):** This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of managing transmission, sub-transmission and zone substation design process.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-TDS51A      Power system transmission and sub-transmission design process

Evidence shall show an understanding of managing the power system transmission and sub-transmission design process to an extent indicated by the following aspects:

T1      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, extra-low voltage and high-currents - parts of an electronic systems and equipment that operate at low-voltage and extra-low voltage and parts of an electronic systems and equipment where high-currents are likely
- Risks and control measures associated with high-voltage - parts of an electronic systems and equipment that operate at high-voltage, the terms used - ‘touch voltage’, ‘step voltage’, ‘induced voltage’ and ‘creepage’ as they relate to the hazards of high-voltage and control measures used for dealing with the hazards of high-voltage
- Risks and control measures associated with low voltage - risks associated with installation, fault finding, maintenance and repair, control measures before, while and after working on electronic systems or equipment, isolation and tagging-off procedures, risks and restrictions in working live and control measures for working live
- Risks and control measures associated with the high levels of radiation encompassing: 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

T2      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



## **REQUIRED SKILLS AND KNOWLEDGE**

- 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 OHS risks, types, selection, maintenance and use of personal protective equipment, responsibilities and protocols and safe working clearances
- Remote and local operating principles and conventions

T3 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

T4 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
- Identify and interpret enterprise operating procedures
- Techniques in the applying enterprise operating procedures

T5 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 OHS enterprise plan, environmental enterprise policies and procedures, industrial relations policies and procedures, 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 OHS training, methods of addressing barriers such as literacy and cultural

## REQUIRED SKILLS AND KNOWLEDGE

differences and provisions relating to 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, 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

T6 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 the writing enterprise specific management reports
- Techniques in researching, collating and analysing information for the report - recording, filing, retrieving systems and storing and retrieving data from computer systems
- Relationship of management reports to enterprise policies and procedures - enterprise structure and resources, workplace 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

T7 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
- Identify and interpret enterprise critical event management procedures
- Techniques in the applying enterprise critical event management procedures

T8 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
- Identify obvious deficiencies in operating to the standard functionality
- Techniques in determining relay malfunction - targeting and techniques in

## REQUIRED SKILLS AND KNOWLEDGE

determining wiring defects

T9 Types, uses and techniques when using the tools and equipment associated with substation encompassing:

- Standards, codes, legislation, supply authority regulations and or enterprise requirements pertaining to the use of high voltage or high current test equipment associated with substation
- Safety precautions when using tools and equipment on substations - safe operation procedures, Occupational Health and Safety hazards and precautions, identification of hazards, assessing and controlling risks, types, selection, maintenance and uses of personnel protective equipment, permit to work systems and isolation procedures, safe working practices when using specialised equipment and emergency response and rescue including First Aid etc
- 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 DC and 10 kV AC). Techniques include 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, contact timers. Measurements on circuit breakers and other interrupter types may include 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 and other mobile plant used to gain access to work at height, appropriate hand tools and other mechanical instruments: note examples include oscilloscopes, real time recorders, storage recorders, data loggers and chart recorders. Measurements may include harmonics, transient capture and point-on-wave assessment

T10 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

T11 Preparation of policies and procedures encompassing:

- Commonwealth, State/Territory and local government legislation, supply authority

## **REQUIRED SKILLS AND KNOWLEDGE**

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

T12 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 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's details, engagement of necessary consultants/contractors
- Types of design carrying out activities - completion of checklists, signoff of checklists, 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

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the Performance Criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all component parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

#### Overview of Assessment 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and, Regulatory policy in this regard.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

**Critical aspects of evidence required to demonstrate competency in this unit 9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit is based, shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UET12UET12". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and range; and
  - Apply sustainable energy principles and practices as specified in the Performance Criteria and range; and
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit to such an extent that the learner’s performance outcome is reported in accordance with the preferred approach; namely a percentile graded result, where required by the regulated environment; and
  - Demonstrate an appropriate level of employability skills; and
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures; and
- Demonstrated performance across a representative range of contexts from the prescribed items below:

<b>Range of tools/equipment/materials/procedures/workplaces/other variables</b>		
<b>Group No</b>	<b>The minimum number of items on which skill is to be demonstrated</b>	<b>Item List</b>
A	The design process commencement activities, and to include each of the	Completion of site survey. Geotechnical and

	following items:	<p>resistivity details.</p> <p>Completion of environmental considerations</p> <p>Acquisition of design project scope document</p> <p>Component manufacturer's details.</p> <p>Engagement of necessary consultants / contractors.</p>
B	The design process completion activities, and to include each of the following items:	<p>Issue of design documentation to allow construction.</p> <p>Closure of the design process post delivery review and implementation of corrective actions.</p> <p>Issue of corrected design documents reflecting field mark ups.</p>
C	The two technical projects to include all the following:	<p>Activities that address the correction of errors in the process.</p> <p>Application of a design control checklist, which lists all of the required design activities to be carried out in this process.</p>
D	At least one occasion	<p>Dealing with an unplanned event by drawing on essential knowledge and associated skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.</p>

**Context of and specific resources for assessment** 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual management of the transmission, sub-transmission and zone substation design process

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working realistic environment and a variety of conditions.

**Method of assessment** 9.4)

This Competency Standard Unit shall be assessed by methods given in Volume 1, Part 3 “Assessment Guidelines”.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this Competency Standard Unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and associated skills described in this unit.

**Concurrent assessment and relationship with other units** 9.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed.



## Range Statement

### RANGE STATEMENT

**10)** This relates to the unit of competency as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

This Competency Standard Unit shall be demonstrated in relation to the design housekeeping/management components of transmission, sub-transmission and zone substation design projects.

The following constants and variables included in the element/Performance Criteria in this unit are fully described in the Definitions Section 1 of this volume and form an integral part of the Range Statement of this unit:

- Appropriate and relevant persons (see Personnel)
- Appropriate authorities
- Appropriate work platform.
- Assessing risk
- Assessment
- Authorisation
- Confined space
- Diagnostic, testing and restoration.
- Documenting detail work events, record keeping and or storage of information.
- Drawings and specifications
- Emergency
- Environmental and sustainable energy procedures
- Environmental legislation.
- Environmental management documentation.
- Established procedures.
- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification.
- OHS practices
- OHS issues
- Permits and / or permits to work
- Personnel.
- Quality assurance systems.

## **RANGE STATEMENT**

- Requirements.
- Safe design principles
- Testing procedures
- Work clearance systems

## **Unit Sector(s)**

Not applicable.

## **Competency Field**

**Competency Field**            **11)**  
Design.