



**Australian Government**

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

# **UETTDRSO08B Develop and evaluate transmission switching programs**

**Release: 1**

## **UETTDRSO08B Develop and evaluate transmission switching programs**

### **Modification History**

Not Applicable

### **Unit Descriptor**

#### **Unit Descriptor**

**1)**

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

This Competency Standard Unit covers the development and evaluation of activities required to place the transmission 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 for the management of the network and multiple outages. It encompasses the calculation of network loading conditions to ensure the network will operate within design parameters and in compliance with national electricity code.

### **Application of the Unit**

#### **Application of the Unit     4)**

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

### 1.2) License to practice

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 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) 2)

#### 2.1) Competencies

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

|             |                                                                            |
|-------------|----------------------------------------------------------------------------|
| UEENEED004B | Use engineering application software                                       |
| UEENEEE007B | Use drawings, diagrams, schedules and manuals                              |
| UEENEEE024B | Compile and produce electrotechnology report                               |
| UEENEEG049B | Solve problems in complex polyphase power circuits                         |
| UETTDRIS22B | Implement and monitor organisation's OHS policies, procedures and programs |
| UETTDRIS23B | Implement and monitor environmental and sustainable energy policies and    |

**Prerequisite Unit(s)** 2)

procedures

For the full prerequisite chain details for this unit please refer to Table 3 in Volume 1, Part 2

**Employability Skills Information****Employability Skills** 3)

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:** 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 and coordinate for the preparation of HV Transmission switching programs | 1.1 OHS practices/procedures and environmental and sustainable energy procedures, which may influence the preparation of the switching program, are reviewed and determined. |
|                                                                                 | 1.2 Purpose of the switching program is established after data is analysed and expected outcomes of the work are confirmed with the appropriate personnel.                   |
|                                                                                 | 1.3 Established policies, procedures and specifications for the switching program are                                                                                        |

| ELEMENT                                                                          | PERFORMANCE CRITERIA                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                  | obtained or established with the appropriate personnel.                                                                                                                                                                         |
|                                                                                  | 1.4 Switching procedures are discussed with and/or directed to the appropriate personnel in order to ascertain the project brief.                                                                                               |
|                                                                                  | 1.5 Switching parameters are ascertained from established policies, procedures and specifications.                                                                                                                              |
|                                                                                  | 1.6 Equipment/tools and personal protective equipment are selected based on specified Performance Criteria and established procedures.                                                                                          |
|                                                                                  | 1.7 Work roles and tasks are allocated according to requirements and individuals' 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 other/authorised personnel, authorities and clients 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 and coordinate the preparation of HV Transmission switching programs | 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 incidents of accidents and minimise waste are incorporated into the project in accordance with requirements and/or established procedures. |
|                                                                                  | 2.3 Decisions concerning the preparation of the HV Transmission Switching program are made on                                                                                                                                   |

| ELEMENT                                                                         | PERFORMANCE CRITERIA                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                 | the basis of safety and effective outcomes according to requirements and/or established procedures.                                                                                                                                                                              |
|                                                                                 | 2.4 The effectiveness of the finished project is analysed 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 with compliance specifications to ensure completion of the project within an agreed timeframe according to requirements.                                                       |
|                                                                                 | 2.7 Testing of the 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.                                                                                                                                           |
| 3 Complete and coordinate the preparation of HV Transmission switching programs | 3.1 Final review of the switching program is undertaken to ensure it complies 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.                                                                                                                                                         |

**ELEMENT****PERFORMANCE CRITERIA**

- 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 switching program documents are issued and records are updated in accordance with established procedures.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

**7) 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 developing and evaluating transmission switching programs.

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

The extent of the essential knowledge and associated skills (EKAS) required is given in Volume 2 - Part 2.2 EKAS. It forms an integral part of this unit.

- E2.18.1 Occupational Health and Safety principles
- E2.18.2 Electrical safe working practice
- T2.2.1 Generation power systems
- T2.2.2 Transmission, distribution and rail power systems
- T2.2.3 Substations, power transformers and reactors
- T2.2.35 Live line working up to 132kV with Hotstick
- T2.2.36 Live line work for voltages greater than 132kV and up to 500kV with Hotstick
- T2.2.39 Plant, equipment and tools used for HV live line work
- T2.2.48 Electrical Equipment HV and LV Powerline

## REQUIRED SKILLS AND KNOWLEDGE

- T2.2.49 Coordinating permit process authority procedures
- T2.3.1 Powerline safety practices
- T2.3.3 Statutory and safety considerations
- T3.3.5 Discrete protection schemes isolation and tagging procedures
- T2.4.1 Switchgear installation
- T2.4.3 High voltage switching principles
- T2.4.8 System switching operations and authorisation procedures HV
- T2.4.11 High voltage overhead and substation switching principles
- T2.4.13 High voltage switching instruction preparation
- T2.5.1 Ecological principles for vegetation control
- T2.5.2 Vegetation control techniques
- T2.8.1 Enterprises specific policies and procedure instructions
- T2.8.2 Enterprises specific OHS instructions
- T2.8.3 Enterprises specific technical drawing and documents
- T2.9.1 Interpretation of power distribution network documentation
- T2.10.9 Analyse and interpret results and measurements substations
- T2.10.11 Substation safety practices
- T2.10.15 High voltage insulation system principles substations
- T2.10.19 Substation switching principles

**REQUIRED SKILLS AND KNOWLEDGE**

- T2.11.11 Control of transient overvoltages
- T2.11.14 Fault calculation techniques
- T2.11.15 Visual inspection procedures
- T2.11.16 Commissioning procedures
- T2.11.18 Discrete protection systems
- T2.11.19 Interdependent protection systems
- T2.11.20 Complex protection systems
- T2.11.31 Primary plant testing
- T2.11.40 Harmonics
- T2.11.59 Generator control systems EHV
- T2.11.60 Transmission line component fundamentals
- T2.11.66 EHV transmission system load calculation principles

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the competency standard unit 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.

## EVIDENCE GUIDE

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 shall be considered holistically. Each Element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines - UET09". 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 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> |                                               |           |
|---------------------------------------------------------------------------------|-----------------------------------------------|-----------|
| Group No                                                                        | The minimum number of items on which skill is | Item List |
|                                                                                 |                                               |           |

**EVIDENCE GUIDE**

|   | to be demonstrated                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                              |
|---|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | Develop and evaluate, at least four (4) switching programs that between them integrates all of the following: | <p>A transformer with an EHV winding</p> <p>EHV Busbars;</p> <p>EHV Isolators</p> <p>EHV Switchgear (applicable to enterprise equipment)</p> <p>Phasing and phase rotation</p> <p>Commissioning a project that includes more than one item of EHV plant that includes a transformer</p> <p>A planned liaison with a HV customer/s</p> <p>Activities that address the correction of errors in the process</p> |
| B | Prepare switching instructions, test and earth the following:                                                 | <p>Transformer types</p> <p>Busbar types</p> <p>Transmission line types</p> <p>Circuit breakers, isolators or switches</p>                                                                                                                                                                                                                                                                                   |
| C | All of the following:                                                                                         | <p>Check switching instructions;</p> <p>Calculate plant loading;</p> <p>Manage the development of multiple switching programs</p>                                                                                                                                                                                                                                                                            |
| D | At least one occasion                                                                                         | 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                                                                                                                                                                                                                              |

**EVIDENCE GUIDE**

|  |  |               |
|--|--|---------------|
|  |  | listed items. |
|--|--|---------------|

**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 preparation of HV Transmission Switching programs

Note:

Access will be needed to: relevant modelling tools, drawings, computerised electrical plant control and monitoring facilities and enterprise operational policies, procedures and work practices.

In addition to the resources listed above, in Context of and specific resources for assessment, evidence should show demonstrated competency working in 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 Transmission, Distribution and Rail Traction Industry. 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)**

For optimisation of training and assessment effort, competence in this unit may be assessed concurrently with units:

UETTDRSO06B    Develop LV distribution switching programs

UETTDRSO07B    Develop HV distribution and sub transmission switching programs

## Range Statement

### RANGE STATEMENT

8) This relates to the competency standard unit 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/may be demonstrated in relation to the development and evaluation of activities required to place the transmission network in a state in which work can safely be performed whilst minimising customer outages and may include the following:

EHV transmission network; EHV transmission lines; Transformers with EHV windings ; EHV busbars - indoor and/or outdoor as applicable to enterprise; EHV isolators ; EHV switchgear (applicable to enterprise equipment); switching instructions (applicable to enterprise equipment); computers (applicable to enterprise equipment); network diagrams (applicable to enterprise equipment); access authorities; regulatory requirements.

Conditions and facilities for the calculation of network loading, planning for the management of the network and multiple outages.

Regulatory and enterprise procedures for the compliance with national electricity code.

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

**RANGE STATEMENT**

- Fall prevention
- Hazards
- Identifying hazards
- Inspect
- Legislation
- MSDS
- Notification
- OHS practices
- OHS issues
- Permits and/or permits to work
- Personnel
- Quality assurance systems
- Requirements
- Testing procedures
- Work clearance systems

**Unit Sector(s)**

Not Applicable

**2.2) Literacy and numeracy skills****2.2) Literacy and numeracy skills**

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 |
|---------|---|---------|---|----------|---|

**Competency Field**

**Competency Field** 5)

System Operation Units

