

1. Module details**Module name****High Voltage Switching****Module duration**

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 - 40 hours.

Module code

NUE658

Discipline code

0703120

2. Module purpose

This module provides underpinning skills and knowledge for electrical industry workers in typical industrial and commercial high voltage switching operations including isolation, proving dead and earthing on underground and overhead lines to provide a safe working environment for maintenance and construction. All procedures and practices comply in accordance with electrical supply industry standards, Supply Authority regulations, relevant Australian Standards and OH&S regulations.

3. Prerequisites

NUE057 Applied Electricity 5.

4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from NUEITAB.

5. Content**High voltage switching procedures**

Restrictions and responsibilities applying to HV switching

Terminology

Communications

Components and layout of HV switching systems

Diagrams

Transmission and distribution system layouts

Transmission and distribution equipment and symbols of aerial and underground systems: fuses; disconnection fuses; load switching equipment; live line indicators; reclosers; sectionalisers; air breaks; disconnects; capacitors; live line clamps; load break elbows; switching cubicles; transformers and reactors; canister fuses; bayonet fuses; F & G switching cubicles

Basic protection devices

Operation procedures

High voltage switching procedures using a variety of devices and indicating devices

Reclosers
Sectionalisers
Air breaks
Disconnects
Fuses
Disconnection fuses
Test instruments: phasing sticks; voltage indicators; phasing tester
Operating hazards associated with equipment and test gear
Double isolation procedures

Earthing practices

Operational earths
Onsite earths
Location and effectiveness of earthing systems

Operational requirements, forms and permits

Access authorities
Work permits
Switching requests
System switching
Local switching programs
Emergency switching programs
Switching terminology

Hazards associated with switching

Typical electrical faults
General categories of protection
Hazards caused by metering or protection equipment to workers on lines

6. Assessment strategy

Assessment methods

Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Learning and assessment will take place in an environment that is conducive to a learner's development.

7. Learning outcome details

Learning outcome 1

Outline the role and responsibilities of a high voltage switching operator.

Assessment criteria

- 1.1 Outline OH&S responsibilities of high voltage switching operators in electrical industry including safety dress requirements.
- 1.2 Recall general high voltage operating terminology and common abbreviations.
- 1.3 Communicate effectively with personnel involved in switching operations including mobile radio procedures.

Learning outcome 2

Describe typical components and layout of a HV supply system.

Assessment criteria

- 2.1 Identify HV symbols that represent HV apparatus on single line diagrams.
- 2.2 Identify typical distribution and transmission layouts.
- 2.3 Identify basic HV equipment used for protection and control of transmission systems and describe functions associated with such equipment.
- 2.4 Determine switch operations needed to isolate sections of a HV system using line diagrams.

Learning outcome 3

Identify and operate switching apparatus.

Assessment criteria

- 3.1 List the types and categories of HV switchgear used in electricity supply systems.
- 3.2 State the applications, functions and operating capabilities of switchgear used in HV electricity supply systems.
- 3.3 Define hazards associated with HV switchgear operation and testing.
- 3.4 Demonstrate safe operating procedures associated with HV switchgear and test equipment including the need for a planned schematic and defensive approach.

Learning outcome 4

Outline and demonstrate effective earthing practices and procedures for earthing HV apparatus for access.

Assessment criteria

- 4.1 List reasons for the attachment of operational and additional work party on-site earths prior to working on HV sites.
- 4.2 List the factors determining the location and effectiveness of operational earthing and outline hazards to the operator when attaching earths.
- 4.3 State the accepted HV industry procedures and demonstrate practices that should be followed when attaching operational earths to HV distribution line apparatus.

Learning outcome 5

Outline operational forms and permits associated with HV switching.

Assessment criteria

- 5.1 Identify operational forms, access authorities and permits associated with operation access and work in the vicinity of HV apparatus.
- 5.2 Describe the purpose and use of operational forms, access authorities and permits that are used when accessing HV apparatus.
- 5.3 Prepare operational forms, access authorities and permits.
- 5.4 Prepare switching requests demonstrating a sound knowledge of terminology and procedures.

Learning outcome 6

Identify hazards and requirements associated with routine and fault switching on HV electrical supply systems.

Assessment criteria

- 6.1 List electrical fault types, primary causes and the effects on HV systems.
- 6.2 List the main categories of protective devices and their function in a HV supply system.
- 6.3 Outline work that may require changes to protection schemes or equipment such as auto-reclosers or Potential Transformers (PT's).

8. Delivery of the module

Delivery strategy

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.

Resource requirements

Resources should be sufficient for students to carry-out learning activities on an individual basis. This could include:

- Suitable workshops/laboratories
- Suitable tools and equipment.

Occupational health and safety requirements

A safe and healthy environment will be provided for students and teachers as well as the particular safety procedures followed as part of the learning / teaching activity and content.