



Australian Government

UETTDRS051 Manage network systems power flows

Release: 1

UETTDRSO51 Manage network systems power flows

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 electrical network active and reactive power flows ensuring the network is operated within design parameters at all times. The electrical network includes feeders from distribution to transmission voltages, substation and generation assets that can influence power flows.

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

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

UEENEE104A Use engineering applications software on personal computers

UEENEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEE102A Fabricate, assemble and dismantle utilities industry components

UEENEE104A Solve problems in d.c. circuits

UEENEE107A Use drawings, diagrams, schedules, standards, codes and specifications

UEENEE124A Compile and produce an energy sector detailed report

UEENEE125A Provide engineering solutions for problems in complex multiple path circuits

UEENEE126A Provide solutions to basic engineering computational problems

UEENEE101A Solve problems in electromagnetic devices and related circuits

UEENEE102A Solve problems in low voltage a.c. circuits

UEENEE149A Provide engineering solutions to problems in complex polyphase power circuits

UETTDREL11 Apply sustainable energy and environmental procedures

UETTDREL16 Working safely near live electrical apparatus

UETTDRLS62 Implement and monitor the power system organisational WHS/OHS policies, procedures and programs

UETTDRLS63 Implement & monitor power system environmental & sustainable energy management policies & procedures

UETTDRLSO32 Manage power systems network faults

UETTDRLSO41 Manage power systems transmission networks

UETTDRLSO48 Respond to discrete and interdependent protection operations

UETTDRLSO49 Coordinate power system operations in a regulated energy market

UETTDRLSO50 Respond to complex power system protection operations

Generation/Distribution and Sub-transmission Pathway Unit Group

UETTDRLSO34 Control power systems generating plant

UETTDRLSO37 Develop high voltage distribution and sub-transmission switching programs

UETTDRLSO40 Coordinate high voltage distribution and sub-transmission networks

Generation/Transmission Pathway Unit Group

UETTDRLSO34 Control power systems generating plant

UETTDRLSO38 Develop and evaluate power systems transmission switching programs

UETTDRLSO47 Coordinate high voltage transmission network

Distribution and Sub-transmission Pathway Unit Group

UETTDRLSO35 Manage high voltage distribution and sub-transmission network demand

UETTDRLSO37 Develop high voltage distribution and sub-transmission switching programs

UETTDRLSO40 Coordinate high voltage distribution and sub-transmission networks

Transmission Pathway Unit Group

UETTDRLSO38 Develop and evaluate power systems transmission switching programs

UETTDRLSO41 Manage power systems transmission networks

UETTDRLSO42 Manage power systems transmission network demand

UETTDRLSO47 Coordinate high voltage transmission network

Competency Field

System Operations

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Plan to manage network power flows

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 preparation of any network power flow management decisions, are reviewed and determined
- 1.2** Purpose of the management is established after data is analysed and expected outcomes of the work are confirmed with appropriate personnel
- 1.3** Organisational established policies, procedures and specifications for the management of network power flows are obtained or established with appropriate personnel
- 1.4** Network power flow management decisions are discussed with and/or directed to appropriate personnel in order to ascertain the system conditions
- 1.5** Equipment/tools and personal protective equipment (PPE) are selected based on specified performance criteria and established procedures
- 1.6** Work roles and tasks are allocated according to requirements and individual competencies
- 1.7** 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
- 1.8** Liaison and communication issues with others/authorised personnel, authorities and clients are resolved and activities coordinated to carry out work
- 1.9** Risk control measures are identified, prioritised and evaluated against the work schedule
- 1.10** Need for relevant operating procedures are identified to manage the performance of the network according to requirements and/or established procedures

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| | 1.11 | Circuit/systems modelling is used to evaluate alternative proposals in accordance with established procedures |
| 2 Carry out and management network power flow | 2.1 | Strategic plans are developed incorporating organisational initiatives in accordance with established procedures |
| | 2.2 | WHS/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 | Management decisions are made on the basis of safety and effective outcomes according to requirements and/or established procedures |
| | 2.4 | Stakeholders/customers are kept informed of current status regarding plan progress and recent developments |
| | 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 work within an agreed timeframe according to requirements |
| | 2.7 | Testing of management decisions 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 the management of network power flow | 3.1 | Final review of management decisions is undertaken to ensure it complies with all requirements and includes all specifications and documentations needed to complete |

the work

- 3.2 Appropriate personnel are notified of completion and reports and/or completion documents (electronic/paper) are finalised/commissioned
- 3.3 Reports and/or completion documents (electronic/paper) are submitted to relevant personnel/organisations for approval and, where applicable, statutory or regulatory approval
- 3.4 Where applicable, approved copies of power flow management documents (electronic/paper) 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 UETTDRSO51A Manage network systems power flows.

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 UETTDRSO51 Manage network systems power flows

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
- developing and evaluating, on at least three (3) occasions, network manipulations that encompass the following:
 - maximising system reliability
 - managing voltage
 - minimising loss
 - controlling load
 - dispatching of static/synchronous Volt Ampere Reactive (VAR) compensation (if applicable to enterprise)
 - dispatching of generation (if applicable to enterprise)
- applying calculations and analysing the following:
 - transmission line conditions on the interconnected extra high voltage (EHV) system
 - distribution and sub-transmission line conditions on an interconnected system
- 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:

- enterprise-specific procedures and work practices relating to managing network demand 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 managing network demand
 - requirements for the use of network demand management manuals, system diagrams/plans and drawings

- identifying and interpreting enterprise demand management procedures
- techniques in applying enterprise demand management procedures
- voltage control techniques encompassing:
 - conditions leading to voltage collapse
 - effects on system of high voltage (HV) and low voltage (LV)
 - voltage control devices - voltage regulators applied to generators and synchronous phase modifiers; electromagnetic voltage regulators; series and parallel capacitors; on-load tap changer (OLTC) transformers; and static VAR compensators (SVC), such as SVC saturated reactor compensators, thyristor controlled reactor compensators and combined systems
 - production of harmonics and methods of harmonic control
 - location of voltage control devices within the system
- power flow control encompassing:
 - use of system components to control power flow patterns - base load, spinning reserve, regulating machines, rapid start plant, phase shifting transformers and load shedding
 - principles of automated control
 - synchronising power
 - relationship of power and frequency
 - machine stabilisation techniques
 - system oscillations and stability - damped and undamped oscillation, relationship of fault clearance times and system stability, and critical clearance times
- alternator operation and control encompassing:
 - constructional features of alternators - weights, lengths, lengths, cooling mediums, cooling systems, prime mover types, prime mover attachment, types of windings and core arrangements
 - principle of operation - induction machines and synchronous machines
 - modes of operation - island and infinite bus operation, running up of prime movers, loading the alternator, requirements for synchronising and methods of synchronising
 - use of reactive capability diagram - related diagram types, current circle diagram, performance chart, capability diagram, values represented, per unit representation, and limits representation and meaning
 - automatic voltage regulators - need for voltage control, required attributes of an AVR, range, response time, constraints on AVR capability, desirable attributes of an AVR, power consumption, compensation, rotor stabilisation, automatic changeover systems, and input and output requirements and components
 - operation on an infinite bus - definition of infinite bus, power/angle dependence, reactive flow/voltage dependence, power/angle diagram, effect of saliency, transient conditions, practical and theoretical stability limits, voltage dependence of stability, control of reactive flow using AVR and generator transformer tap changer
- EHV generator control systems encompassing:
 - legislation, standards, codes, supply authority regulations and/or enterprise requirements pertaining to the operation of a portable generator
 - safety precautions specific to the synchronisation of generator sets - safe working

- policies, practices and procedures; and synchronising procedures
- techniques in the installation of generator set control systems - the synchronising of generator control systems onto and off the network without interruption to supply, estimation of EHV load and assessing the appropriateness of the generator
- operating a generator in parallel to a single EHV job - overhead systems, indoor systems, customer installations and kiosk substations
- EHV generator set and control system to EHV distribution assets.

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, modelling tools, computerised electrical plant control and monitoring facilities, and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, relevant industry standards, equipment specifications, regulations, codes of practice, relevant drawings, and operation manuals.

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