



Australian Government

UEERE0046 Solve problems in stand-alone renewable energy (RE) systems

Release: 1

UEERE0046 Solve problems in stand-alone renewable energy (RE) systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to solve problems in stand-alone renewable energy (RE) systems.

It includes preparing to work on stand-alone RE systems, solving problems in stand-alone RE systems, completing work and documenting problem-solving activities.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEERE0025 Carry out basic repairs to renewable energy apparatus

Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to work on stand-alone RE systems

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) processes and procedures for relevant work area are identified and applied in accordance with workplace procedures

1.2 Risk control measures are applied in accordance with

		workplace procedures prior to commencing work
	1.3	Nature of the apparatus problem is identified from documentation or from relevant person/s to determine the scope of work
	1.4	Instructions for coordinating work with others is obtained from relevant person/s and applied
	1.5	Materials required for the work are identified and accessed in accordance with workplace procedures
	1.6	Tools, equipment and testing devices required for work are obtained and checked for correct operation and safety
2	Undertake problem solving in stand-alone RE systems	
	2.1	Need to test or measure live electrical work is determined in accordance with WHS/OHS requirements and conducted in accordance with workplace procedures
	2.2	Circuits are isolated in accordance with WHS/OHS requirements and workplace procedures
	2.3	Stand-alone RE system problems are solved using measured and calculated values of apparatus operating parameters and in accordance with workplace procedures
	2.4	Problems are solved without damage to apparatus, circuits, the surrounding environment and services applying sustainable energy practices
3	Complete work and document problem-solving activities	
	3.1	Worksite is cleaned and made safe in accordance with workplace procedures
	3.2	Justification for solutions used to solve stand-alone RE systems problems is documented
	3.3	Work completion is documented and relevant person/s notified in accordance with workplace procedures

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

RE system problem solving must include at least three of the following problems:

- open circuit
- short circuit
- incorrect connections
- insulation failure
- unsafe condition
- apparatus/component failure
- related mechanical failure

Unit Mapping Information

This unit replaces and is equivalent to UEENEEK128A Solve problems in stand-alone renewable energy systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERE0046 Solve problems in stand-alone renewable energy (RE) systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- understanding the nature of the problem
- using established routines to solve apparatus problems
- providing viable solutions to apparatus problems
- documenting justification for the solutions used
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures and practices, including the use of risk control measures
- applying sustainable energy principles and practices
- checking isolation of circuits/machines/systems
- coordinating work with relevant person/s
- determining live electrical testing/measurement requirements
- identifying and accessing materials, tools, equipment and testing devices.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- stand-alone renewable energy (RE) system components, including:
 - extra-low voltage (ELV) wiring and circuit protection for RE systems encompassing:
 - ELV and low voltage (LV) circuits in a stand-alone or grid connected RE system and the regulatory restrictions regarding work at each level
 - earthing requirements for RE systems over a range of applications and environments
 - required sizes for ELV cabling in a RE system, considering allowable voltage drops and cable current-carrying capacity, in accordance with AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and AS/NZS 4509 Stand-alone power systems
 - selection of suitable direct current (d.c.) circuit protection and isolation for all relevant

- points in a stand-alone RE system in accordance with AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules) and AS/NZS 4509 Stand-alone power systems
- electrical diagrams for a RE system encompassing:
 - functional block diagrams for typical stand-alone RE system configurations
 - circuit schematic of typical RE systems supplying d.c. and/or alternating current (a.c.) loads, including all major components, protection devices, earthing, isolation, switching and metering
 - unit wiring diagram for a typical stand-alone RE system d.c. control board
 - architectural and site diagrams to show the locations of equipment, fittings and cabling
 - batteries encompassing:
 - major features of each of the major types of commercially available batteries for stand-alone RE applications, including basic chemistry, physical structure, advantages and disadvantages
 - factors affecting the life of a battery
 - processes of sulphation and stratification in lead-acid batteries, their causes, effects and methods of prevention or reduction
 - effect of depth of discharge and of temperature on the capacity and life of lead-acid batteries
 - major specifications for a lead-acid battery in a stand-alone RE system application
 - main features of charging regimes suitable for the major types of stand-alone RE system batteries, using real examples
 - life of a stand-alone RE system battery in years, based on manufacturer's cycle life data and given capacity, configuration and operating conditions
 - precautions required when handling, installing or maintaining lead-acid batteries
 - procedures required for safe disposal of the major commercially available types of batteries in accordance with AS/NZS 4509 Stand-alone power systems
 - balance of system components and common loads encompassing:
 - features of commercially available inverters suitable for use in stand-alone RE systems
 - major operating parameters of an inverter, including d.c. voltage operating window, efficiency, output voltage waveform and output voltage regulation over a range of loads up to 5-minute ratings
 - problems that may be caused by non-sine supply voltage waveforms on typical loads, and the solutions used to overcome these
 - significance of low power factor loads for inverter systems and the principle of power factor correction
 - operation of the major types of regulators for use in stand-alone RE systems using commercially available equipment as examples
 - current vs. voltage characteristics, efficiency and charging voltage waveform for a transformer/rectifier type and a switch mode type battery charger suitable for use in stand-alone RE systems

- operation of and applications for MPPTs for photovoltaic (PV) arrays
- basic operation, advantages and disadvantages of mechanical tracking devices for PV arrays
- control parameters or data using digital displays on inverters, regulators or controllers
- basic lighting design encompassing:
 - properties and features of the major lamp types, including their suitability for use in stand-alone RE power systems
 - effect on room lighting levels, of luminaire design and positioning, décor, room construction and windows
 - selection and sizing of suitable lamps and fittings and their placement in a household taking into account usage, lighting levels required by relevant standards and energy efficiency considerations
- generating sets encompassing:
 - major components in the construction of a generating set
 - main components of gas, petrol or diesel internal combustion engines
 - basic principle of operation of internal combustion engines, including different fuel types and ignition methods
 - operating characteristics, advantages and disadvantages of generating sets using different fuel types, aspiration methods, operating speed and number of cylinders
 - major methods of mechanical coupling and power transmission between an engine and alternator
 - function and ratings of mechanical and electronic speed governing systems
 - basic structure and operation of an alternator
 - advantages and disadvantages of different types of excitation system and voltage regulation used for generating set alternators
 - components and basic operation of a brushless excitation system in an alternator, and the principle of self-excitation
- generator set sizing calculations encompassing:
 - major electrical and mechanical ratings which control the performance of a generator set
 - calculations relating to real and apparent power, power factor, mechanical power, voltage regulation and speed droop for single phase gensets
 - derating factor for a generator set given manufacturer's derating data and a given set of operating conditions
 - selection of a suitable generator set given maximum demand and surge loadings and derating factor
 - calculation of the fuel consumption of a generator set given manufacturer's data and operating conditions
- problem-solving techniques, including measuring and calculating value requirements
- relevant manufacturer specifications
- relevant safe work method statements (SWMS)/job safety assessments or risk mitigation processes

- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures.

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 workplace operational situations that replicate 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, equipment and personal protective equipment (PPE) currently used in industry
- resources that reflect current industry practices in relation to solving basic problems in stand-alone RE systems
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>