UEERE0032Y Design wind energy systems

Modification History

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

This unit replaces and is not equivalent to UEERE0032 Design wind energy conversion systems (WECS) rated to 10 kW. Modifications include:

- Unit title changed
- Unit application updated
- Prerequisites changed
- Significant amendments made to Elements and Performance Criteria
- Range of conditions updated
- Significant amendments to Performance and Knowledge Evidence
- Assessment conditions updated.

Application

This unit involves the skills and knowledge required to design wind energy system and their installation.

It includes determining and developing wind energy system design, following design briefs, documenting design calculations and criteria, and obtaining design approval for wind energy system.

The unit covers domestic and small commercial applications. It does not include utility scale wind generation.

Licensing, legislative or certification requirements that apply to this unit may differ between jurisdictions and system types. They should be checked prior to commencing this unit.

Pre-requisite Unit

UEERE9991Y Conduct site survey for off-grid photovoltaic/generating set systems

and

UEEEL0039 Design, install and verify compliance and functionality of general electrical installations

or

UEERE9993Y Apply electrical principles to renewable energy design

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Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Prepare to design wind energy system	**1.1** Work health and safety (WHS)/occupational health and safety (OHS) processes and workplace procedures for a given work area are identified, obtained and applied
	1.2 Scope of the wind energy system is determined from design brief
	1.3 Safety and regulatory requirements to which the electrical installation must comply are identified, obtained and applied
	1.4 Design development work is planned to meet scheduled timelines in consultation with relevant person/s involved in the wind energy system installation or associated work
2 Develop wind energy system design	**2.1** Wind energy system performance standards and compliance methods are applied to the design
	2.2 Safety, functionality and budgetary considerations are incorporated in the wind energy system design
	2.3 Power and energy management requirements are incorporated in design
	2.4 Design aspects are verified with qualified persons
	2.5 Wind energy system design is drafted and checked for compliance with the design brief and regulatory requirements

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2.6	Wind energy system design is documented for submission to relevant person/s for acceptance and approval

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 UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Designing wind energy system must include:	• two different wind energy systems

Unit Mapping Information

This unit replaces and is not equivalent to UEERE0032 Design wind energy conversion systems (WECS) rated to 10 kW.

Links

UEE - Electrotechnology Training Package Companion Volume Implementation Guide at: [sector webpage link here]

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Assessment Requirements for UEERE0032Y Design wind energy systems

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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, performance criteria and range of conditions on at least two occasions and include:

- applying relevant workplace procedures and practices, work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- developing wind energy system design based on site survey data and within safety and functional requirements and budget limitations and meet design brief
- documenting and presenting final design.

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:

- types, construction and operating features of small wind energy system including:
  - basic operation of lift and drag type wind energy system
  - characteristics of wind energy system in terms of power and torque, efficiency (power and output co-efficient), solidity and tip speed ratio
  - major categories and sub-categories of wind energy system
  - advantages and disadvantages of each type of wind energy system

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- suitable materials for the construction of wind energy system taking into consideration fatigue stresses and environmental conditions such as salt air, humidity and ice
- typical system configurations and components for off grid systems
- strategies and/or mechanisms to control mechanical stresses on the wind energy system in gale force winds and power output for battery charging
- appropriate types of wind energy system for a particular application
- relevant manufacturer specifications
- relevant safe work method statements (SWMS)/job safety assessments or risk mitigation processes

- design of small wind energy system, including:
  - wind characteristics including:
    - definition of the terms: weather charts, isobars, fronts and troughs, cyclone and anti-cyclone, gradient wind, wind shear and wind rose
    - major global wind circulations and the formation of major wind flows over the continent
    - factors that effect the available useable wind due to height, topographical features, surface roughness, temperature inversion etc
    - typical diurnal, monthly and seasonal patterns of winds over the local area
    - the formation and likely effects of extreme winds and wind shear
  - wind speed data measurement and analysis including:
    - definition of the terms: porosity, internal boundary layer, speed-up factor, temperature inversion factor, wind speed frequency distribution, lull period and calms
  - site assessment and selection including:
    - the likely effects of local topography, surface roughness, isolated barriers and temperature inversions on a wind energy system at a given site
    - assessment of available local or regional wind speed, wind energy and direction data
    - selection of the most appropriate site-monitoring location taking into consideration factors such as topography, accessibility, surface roughness, shielding from isolated barriers (obstacles), turbulence, temperature inversions, power transmission distance, environmental and heritage impacts e.g. noise, visual, bird life, national parks or Indigenous sites
    - measurement of wind speed and direction data at an appropriate site and height(s) using a data logging anemometer over a sufficient period of time
    - analysis of the recorded wind speed and direction data to determine if the site is suitable for wind energy utilisation
  - selection of wind energy system including:

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    - selection of suitable wind energy system specifications to suit site load and wind speed data according to relevant Australian Standards or industry guidelines, including cut-in, rated and furling wind speeds, blade diameter, rated power at an appropriate rated wind speed and materials of construction
    - suitable commercially available wind energy system that most closely fits the specifications above
    - suitable tower requirements at the site, including site access, soil type and foundations, structural certification and planning approvals
    - calculation of the monthly and annual energy output of the selected wind energy system at the site from wind speed data and load data using appropriate computer software and in accordance with relevant Australian Standards or industry guidelines
    - height of the tower and the size of the wind energy system for optimum use
    - suitable system configurations
    - balance of system components, including battery storage, inverter, regulator, transmission cable, back-up battery charger and generator
    - equipment reliability and manufacturer/supplier back-up service, including availability of spare parts and service personnel
    - capital and life cycle costs of selected system configuration
    - environmental, cultural and social factors that impact on the implementation of a wind energy system such as external costs, , noise levels, visual amenity and RFI
- relevant WHS/OHS requirements, risk assessment and mitigation processes
- relevant manufacturer specifications.

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 suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable 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
- resources that reflect current industry practices in relation to designing wind energy system

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