Australian Government

Assessment Requirements for UEERE0032 Design wind energy conversion systems (WECS) rated to 10 kW

Release: 1

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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:

- developing outlines of alternative designs
- developing the design within the safety and functional requirements and budget limitations
- documenting and presenting design effectively
- successfully negotiating design alteration requests
- obtaining approval for final design
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including:
  - implementing workplace procedures and practices
  - using risk control measures
- applying sustainable energy principles and practices when designing wind energy conversion system (WECS) rated to 10 kilowatt (kW)
- designing WECS rated to 10 kW.

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:

- design of small WECS, including:
  - wind characteristics encompassing:
    - definition of the terms: weather charts, isobars, fronts and troughs, cyclone and anti-cyclone, atmospheric boundary layer, geotropic wind, gradient wind, wind shear and wind rose
    - major global wind circulations and the formation of major wind flows over the continent
    - major features of the atmospheric boundary layer, including variation of wind speed with height according to logarithmic and power laws, and effects of surface roughness

- atmospheric stability and temperature inversions turbulence
- major local winds, including trade winds, sea and land breezes, katabatic and anabatic winds
- likely effects on the major local winds from local topography, surface roughness, isolated barriers and temperature inversions
- 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 encompassing:
  - definition of the terms: porosity, internal boundary layer, speed-up factor, temperature inversion factor, wind speed frequency distribution, lull period and calms
  - interpretation of local and regional wind speed and direction data such as local records (e.g. meteorological bureau data), ecological indicators and wind speed/energy maps
  - wind speed and direction using data logging anemometers
  - manufacturer's calibration curves for anemometers to correct recorded data
  - calculation at a site, monthly and yearly average wind speed, and wind power density from existing, nearby data or on-site measurements, using appropriate software
  - estimation of the wind speed at a WECS tower of suitable height and location given wind speed data recorded at two or more elevations at the site, and wind speed data recorded at one elevation and appropriate surface roughness, temperature inversion and speed-up factors at the site
- site selection encompassing:
  - the likely effects of local topography, surface roughness, isolated barriers and temperature inversions on a WECS 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 WECS encompassing:
  - selection of suitable WECS specifications to suit site load and wind speed data according to AS/NZS 4509 Stand-alone power systems, 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 WECS 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 WECS at the site from wind speed data and load data using appropriate computer software and in

accordance with AS/NZS 4509 Stand-alone power systems
    - height of the tower and the size of the WECS 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
    - installed capital and life cycle costs of various system configurations according to and AS/NZS 4536 Life cycle costing
    - environmental, cultural and social factors that impact on the implementation of a WECS such as external costs, WECS manufacturing processes and embodied energy and energy payback time, noise levels, visual amenity and RFI
- design principles of WECS rated to 10 kW
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications
- 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 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
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to designing WECS rated to 10 kW
- 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