Australian Government

Assessment Requirements for UEERE0022 Solve basic problems in photovoltaic energy apparatus and systems

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 two occasions and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) procedures, including:
  - using risk control measures
  - checking tools, materials, equipment and testing devices for correct operation and safety
  - testing or measuring on live work and operating systems safely
  - ensuring circuits are isolated
- providing viable solutions to apparatus/modules problems, including:
  - using problem-solving techniques to solve photovoltaic (PV) energy apparatus/modules problems from measured and calculated values
  - determining the operating parameters of an existing PV energy apparatus/modules
  - dealing effectively with unplanned events in accordance with workplace procedures
  - documenting justification for the solution used
- using known solutions to predictable problems to solve apparatus/modules problems
- measuring solar irradiance with a solarimeter
- using field measurements and a sun path diagram, the times and dates when a PV array will be shaded by obstacles at a particular site
- calculation of:
  - the daily average irradiation on a horizontal plane given extra-terrestrial irradiation, location constants and sunshine hour data
  - the monthly mean daily irradiation falling on a PV array for each month of the year, adjusted for the effects of shading, using irradiance and irradiation data tables and a sun path diagram and/or appropriate software
  - the power at maximum power point (MPP), and the power under typical battery charging conditions of a PV module, given irradiance and ambient air temperature
  - the daily energy output of a PV array in accordance with relevant industry standards, and by using "rule of thumb" de-rating factors
  - selection of an appropriate tilt angle for fixed and seasonally adjustable PV arrays at a given latitude.

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:

- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace documentation, policies, procedures and standards
- risk mitigation processes
- daily irradiation, including:
  - definition of the terms: declination angle, reflectance, sunshine hours, extra-terrestrial irradiation, latitude, direct and diffuse radiation, azimuth and altitude angles, radiance, solar window, tilt angle, solstice and equinox
  - units and symbols for irradiation and irradiance
  - interpretation of solar radiation data tables and contour maps
  - how radiation varies throughout the year on the surface of a fixed collector
  - factors affecting the optimal tilt and orientation of PV arrays
- PV modules, including:
  - definition of the terms: cell, module, array, mono-crystalline, poly-crystalline, amorphous, band gap energy and semi-conductor
  - diagram of a basic crystalline silicon PV cell, showing its physical structure, with at least five major features labelled
  - major steps in the production of PV modules based on bulk silicon cells in comparison with the production of thin film PV modules
  - basic physical principles of PV cell operation for the main types of commercially available PV modules
  - efficiency, spectral response, cost and typical applications of the main types of commercially available PV modules
  - new PV technologies currently being developed towards commercialisation, and their major features
  - mechanical and electrical features necessary for the long life of a PV module under a wide range of operating conditions
- module characteristics including:
  - definition of the terms: I-V curve, fill factor, operating point, MPP, cell temperature co-efficient, nominal operating cell temperature (NOCT), current, voltage and power output co-efficient
  - equivalent circuit for a PV cell, labelling each of the elements and the polarity of the terminals
  - family of current - voltage (I-V) curves for a PV module, labelling major points and showing the effects of variation in irradiance and variation in cell temperature
  - major ratings of a PV module from manufacturer's information or nameplate data
  - determination of the operating point of a PV module with a resistive load, a constant voltage source or any other load with known I-V characteristics, using the load line

method

- configuration of a typical PV array, including the function, placement and ratings of blocking and bypass diodes
- the effect of partial shading of a PV module or array, the impact of bypass diodes and the significance of their configuration on output current in typical operating conditions
- the scope and content of Australian or international standards relevant to the performance of PV modules
- the electrical characteristics of a PV module according to relevant Australian or international standards, using an outdoor test method.

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
- 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