

UEERE0011Y Design grid-connected photovoltaic power supply 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 UEERE0011 Design grid-connected photovoltaic power supply systems. Modifications include:

- 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
- Updates to performance and knowledge evidence requirements and CVIG content developed

Application

This unit involves the skills and knowledge required to design grid-connected photovoltaic (PV) power supply systems.

It includes designing grid-connected PV power supply system, following design briefs, utilising data/information from site survey to determine design requirements, ensuring safety and performance standards and functional requirements are met, documenting and obtaining approval for design.

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

UEERE9999Y Conduct site survey for grid-connected photovoltaic and battery storage systems and

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

or

UEERE9993Y Apply electrical principles to renewable energy design

Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to design a grid-connected PV power supply system

2 Develop a grid-connected PV power supply system design

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) requirements and workplace procedures are identified and applied

1.2 Potential grid-connected supply system options are determined from interpretation of site survey and available information

1.3 People or organisations involved in the design and installation are identified and roles clarified

1.4 Industry regulations, legal obligations and job requirements are identified and applied to work in accordance with workplace procedures

2.1 Grid-connected power supply systems, performance standards and compliance methods are applied to the design development

2.2 Safety, functional and budgetary considerations are incorporated in design

2.3 Grid-connected power supply system design draft is checked for compliance with the design brief, industry standards and regulations, job requirements and workplace procedures

2.4 Grid-connected power supply system design is documented and submitted in line with industry standards and regulations, job requirements and workplace 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 UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Must provide two PV power systems designs that include:

- different design briefs for different sites
- compliance with industry standards and regulatory requirements

Unit Mapping Information

This unit replaces and is not equivalent to UEERE0011 Design grid-connected photovoltaic power supply systems.

Links

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

Assessment Requirements for UEERE0011Y Design grid-connected photovoltaic power supply 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 and performance criteria 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 grid-connected photovoltaic (PV) power supply 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 and performance criteria and include knowledge of:

- solar resource including:
 - peak sun hours, irradiance, irradiation, latitude, azimuth and altitude angles, tilt angle
 - interpretation of solar irradiation data
 - how irradiation varies throughout the year on the surface of a fixed collector
 - factors affecting the optimal tilt and orientation of PV arrays

- effect on solar resource of tracking
- PV modules, including:
 - cell, module, array
 - types, efficiencies and their typical applications
 - mechanical and electrical features necessary for the long life of a PV module
- module characteristics including:
 - I-V curve, operating point, MPP, power and voltage temperature co-efficient, Standard Test Conditions (STC), nominal operating cell temperature (NOCT)
 - major ratings of a PV module from manufacturer's information or nameplate data
 - configuration of a typical PV array
 - the effect of partial shading of a PV module or array
- verification of site survey data and apply in design
- PV arrays selection including:
 - selection and sizing of PV array for a grid-connected power conversion equipment (PCE), based on energy demand, budget constraints, architectural constraints or limitations on available PCE sizes
 - determining the minimum and maximum number of PV modules in a string for the specified voltage
- system components selection including:
 - balance of the system components, including cabling and wiring systems, circuit protection and isolation equipment for a grid-connected PV system
 - schematic diagrams of common grid-connected PCE circuit configurations, including metering arrangements, isolation and connection with respect to residual circuit devices (RCDs)
 - relevant industry standard requirements for installation of grid-connected PCE
- other design considerations including:
 - energy yield, specific energy yield
 - calculation of incentives
 - regulatory and legal obligations
- PCEs including:
 - types of PCEs used in grid connected systems
 - the basic function of PCEs
 - PCE operation
 - PCE characteristics
- PV grid-connected system operation including operation of grid interactive safety requirements
- grid-connected PCE selection including:
 - operating window of the PCE for the expected minimum and maximum effective cell temperatures

- selection of an PCE rating with respect to the output power of the array/s
- major installation requirements for all system components which will ensure correct operation, long life, safety and ease of maintenance consistent with industry standards and relevant WHS/OHS guidelines
- selection of a suitable location for the PV array, PCE and other components, at a given installation site
- typical installation configurations for grid connection of PV systems via power conversion equipment
- installation requirements for a grid connected system
- labelling and signage requirements
- relevant manufacturer specifications
- relevant 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
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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