

## **UEERE0031Y Design off-grid photovoltaic/generating set 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 UEERE0031 Design stand-alone renewable energy (RE) systems. 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 off-grid photovoltaic (PV) / generating set (Genset) systems.

It includes determining and developing off-grid PV systems design including gensets, following design briefs, documenting design calculations and criteria, and obtaining design approval.

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

### **Competency Field**

Renewable Energy

## Unit Sector

Electrotechnology

## Elements and Performance Criteria

### ELEMENTS

Elements describe the essential outcomes.

#### **1 Prepare to design off-grid PV/genset system**

### 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 workplace procedures for a given work area are identified, obtained and applied

**1.2** Scope of the off-grid PV/genset system and electrical installation is determined from site survey report and 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 off-grid system installation or associated work

#### **2 Develop off-grid PV/genset system design**

**2.1** Off-grid PV/genset system performance standards and compliance methods are applied to the design

**2.2** Safety, functionality and budgetary considerations are incorporated in the off-grid PV/genset system design

**2.3** Power and energy management requirements are incorporated in design

**2.4** Design aspects are verified with qualified persons

**2.5** Off-grid PV/genset system design is drafted and checked for compliance with the design brief and regulatory requirements

**2.6** Off-grid PV/genset 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.

Designing of-grid PV systems must include:

- two different off-grid PV/genset systems

## Unit Mapping Information

This unit replaces and is not equivalent to UEERE0031 Design stand-alone renewable energy (RE) systems.

## Links

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

# Assessment Requirements for UEERE0031Y Design off-grid photovoltaic/generating set systems

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- Assessment conditions updated

## 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 off-grid PV/genset systems 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:

- off-grid PV/genset system design, including:
  - power and energy usage analysis and projected use including maximum demand and surge demand
  - determining the available solar resource
  - incorporating fuel generating plant
  - selecting off grid PV system configuration
  - determining the system operation

- component selection including:
  - selected system configuration and operation requirements
  - matching component rating to required and projected power/energy usage
  - matching power, voltage and current of the individual system components
  - intended installation environment
  - maintenance and serviceability requirements
- selecting cabling, circuit protection and switching requirements in accordance to relevant Australian standard
- off grid PV system installation requirement in accordance with relevant Australian standards and manufacturers requirements
- schematic and wiring diagrams for the off grid PV/genset system showing the general circuit layout and protection between the various system components
- installed capital and life cycle costs of selected system configuration
- energy storage design
- system control requirements and configuration
- fuel storage requirements
- autonomy factors
- 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, maximum power 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
  - effect of temperature on module power output
  - function of blocking and bypass diodes
  - factors affecting the optimal tilt and orientation of PV arrays
- power conversion equipment (PCE) including:
  - types of PCEs used in renewable energy systems
  - the basic function of a PCE

- PCE operation
- PCE characteristics
- generating sets including:
  - types of generating sets
  - the basic function of a generating set
  - generating set operation
  - generating set characteristics
- batteries including:
  - meaning of the terms that define aspects of batteries including:
    - cell
    - battery
    - nominal voltage
    - amp hour capacity
    - watt hour capacity
    - charge and discharge rate
    - fault/short-circuit current
    - useable capacity
    - depth of discharge (DOD)
    - state of charge (SOC)
    - cycle life
    - useable capacity
  - hazards associated with batteries and risk control measures
  - major features of batteries suitable for off-grid systems
  - factors affecting the life of batteries
  - common reasons for failure of batteries
  - charging regimes suitable for batteries
  - procedures for safe disposal and recycling of batteries
- environmental considerations and required approvals
- relevant WHS/OHS requirements, job safety assessments or risk 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, design tasks and/or simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to designing stand-alone RE systems
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

## Links

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