

# **UEERE9994Y Install battery storage to power conversion equipment**

## **Modification History**

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

## **Application**

This unit involves the skills and knowledge required to install battery storage systems to Power Conversion Equipment (PCE).

The skills and knowledge described in this unit require a licence or permit to practice in the workplace where work is carried out on electrical installations which are designed to operate at voltages greater than 50 volt (V) alternating current (a.c.) or 120 V direct current (d.c.).

Competency development activities in this unit are subject to regulations directly related to licensing. Where a licence or permit to practice is not held, a relevant contract of training, such as an Australian Apprenticeship, is required.

Additional and/or other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to work health and safety (WHS)/occupational health and safety (OHS) regulations.

Note: Those holding an Unrestricted Electrician's Licence or equivalent issued in an Australian state or territory meet the prerequisite requirements of UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories. All other prerequisite requirements must be met.

## **Pre-requisite Unit**

UEEEL0012 Install low voltage wiring, appliances, switchgear and associated accessories

And

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

or

UEERE9991Y Conduct site survey for off-grid photovoltaic/genset systems

## **Competency Field**

Renewable and Sustainable Energy

## Unit Sector

Electrotechnology

## Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

### **1 Plan for the installation of battery storage to PCE**

- 1.1** Nature of the installation is verified from design documentation and any design concerns identified are referred to designer
- 1.2** WHS/OHS processes and procedures for work are identified and applied in accordance with workplace procedures
- 1.3** Hazards associated with battery storage systems are identified and the risk control measures are listed in safe work method statements/job safety analysis
- 1.4** Work is planned in consultation with the customer and others impacted by the work and sequenced appropriately
- 1.5** Designer recommendations, relevant industry standards, regulations and manufacturer specifications are identified and applied to planning the system installation
- 1.6** Material, tools, equipment and measuring devices required for installation are obtained in accordance with workplace procedures and checked for correct operation and safety
- 1.7** Live testing, measurement and isolation requirements determined and applied in accordance with WHS/OHS requirements and workplace procedures

### **2 Install battery storage systems to PCE**

- 2.1** Job safety analysis is undertaken or safe work method statement is prepared and used to inform work processes in accordance with regulations and workplace procedures
- 2.2** Battery storage system components are installed in compliance with industry standards, regulations and job/manufacturer specifications, and with sufficient access to enable terminations, adjustment and maintenance
- 2.3** Wiring is terminated at components and associated equipment in accordance with manufacturer specifications and functional and regulatory requirements

- 2.4 System components are programmed in accordance with design, relevant industry standards, regulations and manufacturer specifications
- 2.5 Quality checks of installed apparatus are conducted in accordance with workplace procedures
- 2.6 Testing and commissioning of the system is conducted in accordance with design documentation, regulations, relevant industry standards and manufacturer specifications
- 2.7 Worksite is cleaned and made safe in accordance with workplace procedures
- 2.8 'As-installed' system and associated equipment are documented, manuals produced, and system is handed over to required person/s as per legislation, regulations, industry standards and job requirements

## 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 can be found in the Companion Volume Implementation Guide.

Installing battery storage to PCE must include:

- installation of a section 5 or 6 system

## Unit Mapping Information

This unit replaces and is not equivalent to UEERE4001 Install, maintain and fault find battery storage systems for grid-connected photovoltaic systems

## Links

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

# Assessment Requirements for UEERE9994Y Install battery storage to power conversion equipment

## Modification History

Not applicable.

## 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:

- interpreting system design and verifying installation compliance with relevant industry standards, manufacturer specifications, building codes and regulations and any noncompliance referred to designer
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including using risk control measures
- coordinating work with relevant person/s
- determining and applying live testing, measurement and isolation requirements
- installing battery storage systems including:
  - battery storage components
  - PCE
  - balance of system to PCE
  - program components
- testing and commissioning battery storage system
- completing required documentation
- instruct client on safe and correct system operation recommended maintenance and system documentation.

## 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 the following. Additional advice and definitions for some items is provided in the UEE Training Package Companion Volume Implementation Guide (CVIG).

- batteries including:
  - meaning of the terms that define aspects of batteries including:
    - amp hour capacity
    - battery
    - cell
    - charge and discharge rate
    - depth of discharge (DOD)

- nominal voltage
- primary and secondary cells
- state of charge (SOC)
- watt hour capacity
- usable capacity
- cycle life
- major features of commercially available types of batteries suitable for battery storage systems
- factors affecting the life of commercially available types of batteries including the estimation of battery life
- common reasons for failure of commercially available batteries
- charging regimes suitable for commercially available types of batteries
- hazards associated with handling, installing or maintaining commercially available types of batteries and risk control measures
- hazards during fault conditions
- procedures for safe disposal and recycling of commercially available types of batteries
- battery storage systems including:
  - applications for battery storage including:
    - electrical energy supply during grid outages
    - electrical energy supply direct to loads during periods of high tariffs
    - network / aggregator provider requirements
  - purpose of each component in battery storage systems for PV systems
  - communications, monitoring and metering
  - objectives of battery storage
  - purpose of each component in a battery storage system for PV system
  - typical configurations of battery storage systems for PV systems
- types and applications of PCEs
- diagrams and drawings including:
  - electrical systems circuit diagrams of typical battery storage systems
  - all major components
  - protection devices
  - earthing
  - isolation
  - switching
  - metering
  - equipment location plan/s to show the locations of equipment, fittings and cabling
  - single line diagrams of battery storage systems
  - site diagrams to show the locations of equipment, fittings and cabling
  - power conversion equipment
- battery storage systems fault finding:

- fault finding procedures including:
  - fault finding procedures for individual equipment
  - fault finding procedures for interconnected systems
- maintenance requirements including relevant industry standards, regulations and manufacturer requirements
- battery storage systems maintenance procedures including:
  - maintenance requirements for individual equipment
  - maintenance requirements for interconnected systems.
- battery storage systems testing and commissioning procedures including:
  - safe testing of equipment
  - safe testing of system operation
- commissioning of energy storage system.

## Assessment Conditions

As a minimum, assessors must satisfy applicable regulatory requirements, which include requirements in the Standards for Registered Training Organisations, current at the time of assessment.

As a minimum, assessment must satisfy applicable regulatory requirements, which include requirements in 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:

- Industry Standards
  - relevant industry standards
  - relevant industry product standards
  - AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- Documentation including reporting formats
  - manufacturer technical data site plans
  - system designer documentation relevant to installing the system
  - maintenance checklists and/or testing and commissioning sheet
- Measuring and testing equipment
  - multimeter insulation resistance tester clamp tester (DC and AC)

- Plant
  - an existing installed PV array along with the equipment to facilitate the installation of a battery storage system for PV systems. This equipment shall comprise:
    - battery storage
    - multi-mode PCEs
  - devices for interconnecting solar to system either including PCE and all required balance of system equipment including:
    - cables
    - protection and isolating devices
    - isolators and signage in accordance with relevant industry standards, regulations and industry guidelines
  - appropriate switchboard (or similar) to simulate interconnection of the system with an existing electrical installation
- Safety systems and personal protective equipment (PPE)
  - example of a job safety analysis or safe work method statement form relevant for the practical installation; PPE related to the types of battery storage included in the system
- Software/Systems
  - programming software for the PCE
- Specialist requirements
  - specific manufacturer specifications for the equipment included in the battery storage system for PV systems including:
  - installation manuals and user guides for typical components and those provided for the practical installation
  - special tools as required for installing specific equipment
  - special testing tools or equipment required for testing and commissioning, maintenance and fault finding of specific equipment
- Tools and equipment
  - hand tools and power tools.

## Links

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

## Companion Volume Implementation Guide (CVIG) Content

System performance may include:

- return on investment
- virtual power plants

Typical configurations of battery storage systems for PV systems may include:

- multimode inverter/s for connecting to renewable energy, grid, loads and battery storage; this inverter/s provide backup to dedicated loads on grid failure and may:
  - have a built in PCE for direct connection of a PV array or
  - require a separate PCE to direct current (DC) couple the PV array and battery
- two types of inverters comprising, photovoltaic grid-connected inverters and multimode inverters where:
  - both inverter types are connected to the grid and loads via a switching device that provides backup to dedicated loads during grid failure
  - both inverter types are connected to the grid and only the multimode inverter/s provide backup to dedicated loads on grid failure
  - only the multimode inverter/s are connected to the grid; the grid-connected inverter/s are alternating current (AC) coupled to the multimode inverter/s and both types can provide backup to dedicated loads on grid failure

Energy management strategies may include:

- energy source switching options to reduce the maximum and surge demand, based on load profile analysis
- heat pumps
- tariff optimisation