

UEERE9991Y Conduct site survey for 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.

Application

This unit involves the skills and knowledge required to complete site surveys for off-grid photovoltaic/generating set systems.

It includes safe work practices, site survey processes and procedures, service provider responsibilities, consulting with qualified people to assess of client energy demand requirements and assessing off-grid equipment options to meet client requirements and site conditions. It also covers provision of advice to the client on energy storage standards, codes of practices, government/utilities incentive schemes, and information related to the installation of a off-grid renewable energy generation system.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable

Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

PERFORMANCE CRITERIA

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

- 1 Prepare to conduct site survey**
 - 1.1** Stakeholders are identified and client requirements and expectations for off-grid system obtained
 - 1.2** Work health and safety (WHS)/occupational health and safety (OHS) requirements, relevant legislated requirements, and workplace procedures relevant to site survey are obtained and applied
 - 1.3** Equipment and documentation needed for the site inspection are obtained in accordance with workplace procedures
 - 1.4** Requirements for site survey and roles/responsibilities of people involved in site survey, design and installation are discussed with client
 - 1.5** General information about industry standards, building/electrical regulations and codes, and risk minimisation is provided to client
 - 1.6** Advice on the benefits of renewable energy generation systems and energy management is provided to client
 - 1.7** Current client energy usage data is collected, and future changes identified
 - 1.8** Resources, information sources and other people that will support gathering required site survey information are identified
- 2 Undertake and document site survey**
 - 2.1** Site survey for the proposed installation is safely undertaken
 - 2.2** Current and expected future client energy generation needs are discussed, and expectations are clarified
 - 2.3** Potential locations of equipment are discussed with client and preferences recorded
 - 2.4** Site hazards that may impact installation are identified and documented
 - 2.5** Information about site access, building structures, existing electrical infrastructure including existing RE and generation elements, available RE resources is gathered and included in report

- 2.6** Site survey report is prepared and provided to designer in accordance with workplace procedures
- 2.7** Designer, and other qualified person/s if required, are consulted and briefed on client expectations and requirements
- 2.8** Designer, and other qualified person/s if required, are consulted and briefed on site access, conditions, risks and potential installation issues
- 2.9** Options for off-grid energy generation and storage equipment to meet site requirements and client expectations are discussed with designer, and other qualified person/s if required
- 2.10** Placement of system components is considered, and any restrictions or issues of concern noted
- 2.11** Final site survey report is prepared after consultation with designer

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.

Unit Mapping Information

This is a new unit.

Links

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

Assessment Requirements for UEERE9991Y Conduct site survey for off-grid photovoltaic/generating set 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, 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), and risk assessment and control procedures
- identifying all relevant stakeholders and qualified personnel required to complete site survey
- communicating effectively with clients to discuss:
 - requirements for site assessment and information to be collected
 - roles/responsibilities of people involved in design, installation and maintenance
 - industry standards, building/electrical regulations and codes, and risk minimisation relevant to the installation
 - benefits and options of renewable energy generation systems and energy management
 - expectation of off-grid PV/genset system - operation, performance, location
- undertaking site survey safely and documenting findings including:
 - potential site hazards that may impact installation
 - site access, layout, distances and building structures
 - solar access and shading
 - gathering information about existing electrical installation and any existing energy generation elements
 - current energy usage including maximum power and energy demand
 - current and expected future energy generation needs including maximum power demand
 - working with qualified personnel as required to complete site survey
 - options for suitable renewable generating systems
 - options for suitable renewable storage systems
 - options for placement of system components, any restrictions or issues of concern
 - potential installation problem/s and recommend solutions
- producing final site survey report.

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).

- relevant WHS/OHS requirements including:
 - safe work method statements (SWMS)/job safety assessments or risk mitigation processes
 - legislated requirements
 - procedures for working in remote areas, safety onsite and while travelling
 - roof access and working at heights
 - electrical safety
- communicating effectively with clients to discuss:
 - requirements for site assessment and information to be collected
 - roles/responsibilities of people involved in design, installation and maintenance
 - industry standards, building/electrical regulations and codes, and risk minimisation relevant to the installation
 - benefits and options of renewable energy generation systems and energy management
- basic energy principles
- stakeholders, required personnel and roles and responsibilities of people involved in design, installation and maintenance
- site survey process and information to be gathered, recorded and analysed
- methods for identifying and recording existing electrical infrastructure including existing renewable energy and generation elements
- relevant local, state and commonwealth requirements
- environmental considerations on site and any authorisations/approvals
- techniques to review existing grid connection when customer wants to go independent from grid
- energy assessment and review including:
 - energy services required by the electrical installation
 - power and energy consumption of individual appliances and systems using appropriate meters or other methods such as label review and data logging
 - consideration of the most appropriate energy source for each of these services
 - methods for discussing with client energy use patterns and future growth in energy use
- off-grid PV/genset systems including:
 - different equipment types and their componentry and system configuration
 - factors that impact equipment type selection related to site and usage characteristics
 - considerations when multiple sources are used

- off-grid energy storage systems including:
 - different equipment types and their componentry and system configuration
 - factors that impact equipment type selection related to site and usage characteristics
 - design, installation, and maintenance requirements
- basic operation of integrated off-grid PV/genset systems
- installation consideration and requirements for integrated off-grid PV/genset systems
- smart systems including monitoring and control
- load control and demand management
- methods to identify solar access and shading
- solar resource considerations
- photovoltaic (PV) modules and arrays
- wind resource considerations
- micro-hydro resource considerations
- energy storage systems
- power conversion equipment (PCE) including:
 - types of PCEs
 - the basic function of a PCE
 - PCE operation
 - PCE characteristics
- generating sets including:
 - types of gensets
 - the basic function of a genset
 - genset operation
 - genset characteristics
- electrical diagrams for a RE system including:
 - functional block diagrams for typical off-grid RE system configurations
 - architectural and site diagrams to show the locations of equipment, fittings and cabling.

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

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

CVIG content

Site survey may include:

- sunshine hours irradiation, latitude, azimuth and altitude angles, radiance, tilt angle
- energy efficiency initiatives relevant for domestic dwelling and commercial premises to reduce the electrical energy demand by the site owner
- electricity network requirements and restrictions
- government/utilities incentive schemes
- assessing WHS/OHS risks when working on a particular site
- solar access for the site
- solar resource for the site
- available area for the solar array
- roof is suitable for mounting options for the array
- shading and estimates of its effect on the system
- switchboard or distribution board is located for connecting the output of inverter
- array junction box (if required) and location of inverter
- cabling route and estimates of the lengths of the cable runs
- monitoring panels or screens and determining a suitable location with the site owner
- existing electrical system
- cultural heritage or environmental considerations
- noise considerations
- access for fuel
- access for customer
- access for installation and maintenance personnel

Information about working remotely can be found at:

<https://www.comcare.gov.au/about/forms-publications/documents/publications/safety/remote-or-isolated-work-guide.pdf>

Information about existing electrical installation may include:

- existing RE installation elements
- electrical safety elements
- switchboards and electrical layouts - need to know c/b sizes, what connects to what (when there are sub boards and the like), overhead and underground wiring and other services
- existing grid connection considerations
- safety, protection, reticulation

Energy assessment may include:

- definition of terms energy, power, energy efficiency, end-use energy
- calculations relating to energy, power and time
- units and symbols for energy, power, time and temperature
- conversion of energy and power quantities from one unit to another
- identification of loads throughout site
- working with customer to ensure loading information is considerate of all elements
- identification of power and energy requirements of loads (cycling, typical operation, start up currents)
- seasonality of periodicity of energy use
- maximum demand and diversity of energy use

Basic energy principles may include:

- definition of the terms: energy, power, energy efficiency, end-use energy, primary energy and embodied energy
- system autonomy
- calculation relating to energy, power and time
- units and symbols for energy, power, time and temperature
- conversion of energy and power quantities from one unit to another

Solar resource may include:

- Sunshine hours, irradiation, latitude, azimuth and altitude angles, radiance, tilt angle, likely Watts/m², solar window, direct and diffuse radiation, solstice and equinox
- Variation of solar radiation throughout the day and the year and impact on PV power output
- Solar access for the site
- Solar resource for the site
- Tools for assessing solar resource and impacts of surrounding buildings/vegetation/other
- Sources for solar radiation data

PV Modules and Array may include:

- fundamentals of how PV modules operate (output proportional to light intensity, variable current, relatively non-variable voltage)
- available area for PV array
- roof suitability as mounting option
- ground mounting options
- shading effects
- location with respect to other effects, dust, livestock, etc

Wind resource may include:

- definition of terms: weather charts, isobars, fronts and troughs, clean wind
- major global wind circulations and the formation of major wind flows over the continent
- basic understanding of the variation of wind speed with height according to logarithmic and power laws and effects of surface roughness
- effect of trees and structures on availability of clean wind and basic site requirements for a wind turbine
- basic knowledge on types, construction and operating features of small wind turbines

Micro-hydro resource may include:

- Definition of the terms: potential and kinetic energy, micro-hydro system, gross head, frictional losses (head), net head and flow rate
- Basic relationship between available water power and head and flow
- Basic knowledge on construction and operating features of micro-hydro turbines

Energy storage systems may include:

- Methods of energy storage
- Fundamentals of energy storage – efficiency, cycling, safety, autonomy
- Energy storage technologies
- Life expectancy
- Basic operation of energy storage systems
- Installation considerations for energy storage systems – weight, volume, access and safety

Balance of System components may include:

- Charge controllers, MPPTs, regulators
- Inverters – grid forming/voltage source inverters and grid following/current source inverters; AC and DC coupled systems
- Basic functions, operating principles and difference of the types of inverters
- Marshalling boxes/combiner boxes

- Housing for equipment
 - Data monitoring and system controllers
- Electrical infrastructure may include:
- Switchboard and distribution boards, locations and function; what connects to what
 - Switchboard layouts and space
 - Circuit breakers and isolation switches, sizing and allocation
 - RCD/RCBO protected circuits and any other electrical safety elements
 - General existing electrical system
 - Earthing stake location/s
 - Reticulation (overhead and underground)
 - Any grid connection considerations, and electricity network requirements and restrictions
 - Existing renewable energy or generation infrastructure
 - Existing fuel storage; size, bunding, enclosure
- Site considerations may include:
- Cultural heritage
 - Environmental requirements
 - Identification of land ownership/operational aspects
 - Access to fuel
 - Access for customer
 - Access for installation and maintenance personnel
 - Noise considerations
 - Distances for voltage drop, cable runs
 - Customer expectations and their considerations in the survey report – including generator run time, days of autonomy for energy storage
- Local, state and commonwealth requirements may include:
- Codes
 - Consumer protections (NETCC, ACCC)
 - Safety and technical elements
 - Recognition of competency and where expert skills are required – structural, civil, Geotech, electrical, etc