



Australian Government

UEERE0029 Design micro-hydro systems rated to 6.4 kW

Release: 1

UEERE0029 Design micro-hydro systems rated to 6.4 kW

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 design micro-hydro systems rated to 6.4 kilowatt (kW) and its installation.

It includes determining and developing micro-hydro system design, following design briefs, documenting design calculations and criteria, and obtaining design approval for micro-hydro system.

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

Pre-requisite Unit

UEERE0045 Solve basic problems in micro-hydro systems

Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Prepare to design micro-hydro 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 micro-hydro system electrical installation is determined from design brief

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| | 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 micro-hydro system installation or associated work |
| 2 | Develop micro-hydro system design | |
| | 2.1 | Micro-hydro system performance standards and compliance methods are applied to the design |
| | 2.2 | Alternative micro-hybrid power system designs are considered in accordance with the design brief |
| | 2.3 | Safety, functionality and budgetary considerations are incorporated in the micro-hydro system design |
| | 2.4 | Micro-hydro system design is drafted and checked for compliance with the design brief and regulatory requirements |
| | 2.5 | Micro-hydro system design is documented for submission to relevant person/s for acceptance and approval |
| | 2.6 | Unplanned situations are dealt with safely and effectively in accordance with workplace procedures |
| 3 | Obtain design approval for micro-hydro system | |
| | 3.1 | Micro-hydro system design is presented for approval and any issues clarified with client representative and/or relevant person/s |
| | 3.2 | Requests for alterations to the design are negotiated with relevant person/s within the constraints of workplace policies |
| | 3.3 | Final design is documented and approval obtained from relevant person/s |
| | 3.4 | Quality of work is monitored in accordance with relevant performance agreement and/or workplace procedures or industry standards |

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 micro-hydro systems rated to 6.4 kW must include at least the following:

- two micro-hydro system designs each using different technologies

Unit Mapping Information

This unit replaces and is equivalent to UEENEEK138A Design micro-hydro systems rated to 6.4 kW.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERE0029 Design micro-hydro systems rated to 6.4 kW

Modification History

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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 one occasion and includes:

- developing outlines of alternative designs
- developing the design within the safety and functional requirements and budget limitations
- documenting and presenting design effectively
- successfully negotiating design alteration requests
- obtaining approval for final design
- dealing with unplanned events
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including:
 - implementing workplace procedures and practices
 - using risk control measures
- applying sustainable energy principles and practices when designing micro-hydro systems rated to 6.4 kilowatt (kW)
- designing micro-hydro system rated to 6.4 kW
- preparing to design micro-hydro system in accordance with design brief.

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:

- micro-hydro systems design
- site evaluation encompassing:
 - definition of the terms: potential and kinetic energy, micro-hydro system, gross head, net head and flow rate
 - available head at a site using a dumpy level or theodolite, altimeter, pressure gauge and contour maps
 - the accuracy, advantages and disadvantages of each method for flow and head assessment

- the flow rate of a given site using each of the following methods - catchment area calculations, water diversion to fill a container, stream velocity/area measurement and/or weir construction method
- advantages and disadvantages of each method of head and flow measurement with particular reference to their accuracy
- long-term usable flow rate from long-term stream flow, if available, taking into account environmental considerations
- effects of seasonal variation using long-term weather data
- typical daily and seasonal energy consumption profile at a given site
- effect of the energy demand profiles both daily and seasonally at the site on the system sizing
- government regulatory requirements such as those covered under environmental or water resource legislation
- environmental constraints at a site, including minimum stream flow rates, ecological impacts, visual and noise impacts
- system design encompassing:
 - suitable micro-hydro system characteristics to suit site load, hydraulic head and stream flow rate characteristics and a suitable type of commercially available micro-hydro system to suit
 - frictional losses in delivery pipes using manufacturer's data
 - calculation of the energy output of the selected micro-hydro system at the site from water flow rate, head and manufacturer's data, allowing for seasonal variations in performance and environmental constraints
 - design of any required weirs or dams, open races or penstocks, strainer and intake systems
 - optimum position of the micro-hydro system and size of the micro-hydro system
 - suitable balance of system components, including delivery pipe and fittings, transmission cable and voltage, voltage and frequency regulation, battery storage type and capacity, battery charger, inverter, back-up generator and load dump
 - likely environmental impacts of the micro-hydro system and appropriate measures to minimise these impacts
- system costing encompassing:
 - major costs to be considered in the life cycle costing method
 - calculation of the capital and life cycle cost that includes the cost of various system configurations for a micro-hydro application
 - external costs that might impact on the cost-effectiveness of a micro-hydro system
 - most cost-effective of a number of options on the basis of life cycle costing analysis
- micro-hydro systems installation and maintenance processes encompassing
 - selection of an appropriate micro-hydro system taking into account the topology of the site, local council approvals, environmental considerations, site access and transport of equipment, water and power transmission distances, and daily and seasonal load profiles
 - appropriate methods, using appropriate safety procedures, for dam or weir

- construction, watercourse construction and/or penstock installation, and turbine installation
- appropriate installation, commissioning, fault diagnosis and rectification procedures and maintenance methods using appropriate safety procedures
- maintenance schedule for the system
- schematic and wiring diagrams for the micro-hydro system showing the general circuit layout and protection between the micro-hydro system, batteries, inverter and loads according to AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules), AS/NZS 4509 Stand-alone power systems, and AS 4086.2 Secondary batteries for use with stand-alone power systems - Installation and maintenance requirements
- safety procedures for the installation, commissioning, fault diagnosis and maintenance of system components, seasonal variations in performance and environmental constraints
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications
- 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 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, case studies 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 micro-hydro systems
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

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