



Australian Government

Department of Education, Employment and Workplace Relations

UEPMNT434A Diagnose and Repair Faults in Wind Turbine Control Systems

Release: 1

UEPMNT434A Diagnose and Repair Faults in Wind Turbine Control Systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit deals with the skills and knowledge required to diagnose and repair faults in wind turbine control systems and associated accessories and wiring systems.

Application of the Unit

Application of the Unit 2)

This unit is intended to augment formally acquired competencies. It is suitable for employment-based programs under an approved contract of training.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit may require an electrical licence to practise in the workplace. Practice in this unit is subject to regulations directly related to Occupational Health and Safety and where applicable contracts of training such as apprenticeships and the like.

Pre-Requisites

Prerequisite Unit(s) 4)

Competencies 4.1)

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed.

Common Unit Group

Unit Code	Unit Title
UEPMNT362A	Maintain Wind Turbine Control Systems
UEENEEG108A	Trouble-shoot and repair faults in low voltage electrical apparatus and circuits
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE102A	Fabricate, dismantle, assemble of utilities industry components
UEENEEE104A	Solve problems in d.c. circuits
UEENEEE105A	Fix and secure electrotechnology equipment
UEENEEE107A	Use drawings, diagrams, schedules, standards, cords and specifications
UEENEEG006A	Solve problems in single and three phase low voltage machines
UEENEEG033A	Solve problems in single and three phase low voltage electrical apparatus and circuits
UEENEEG063A	Arrange circuits, control and protection for general electrical installations
UEENEEG101A	Solve problems in electromagnetic

Prerequisite Unit(s) 4)

devices and related circuits

UEENEEG102A Solve problems in low voltage a.c. circuits

UEENEEG106A Terminate cables, cords and accessories for low voltage circuits

Literacy and numeracy skills 4.2)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following levels. A description of what each level entails is provided in Section 2.3.1 Language, Literacy and Numeracy.

Reading 4 Writing 4 Numeracy 4

Employability Skills Information**Employability Skills 5)**

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Plan and prepare the work	1.1 Work requirements are identified from work orders or equivalent and confirmed with appropriate parties or by site inspection. 1.2 Occupational Health and Safety standards, statutory requirements, relevant Australian standards, codes of practice, manufacturers' specifications, environmental requirements and enterprise procedures are identified, applied and monitored throughout the work procedures. 1.3 Resources required to satisfy the work plan are identified, obtained and inspected for compliance with the job specifications. 1.4 Relevant plans, drawings and texts are selected and interpreted in accordance with the work plan. 1.5 Correct size, type and quantity of materials and components are determined, obtained and inspected for compliance with the job specifications. 1.6 Work is planned in detail including sequencing and prioritising and considerations made, where appropriate, for the maintenance of plant security and capacity in accordance with system/site requirements. 1.7 Co-ordination requirements, including requests for isolations where appropriate, are resolved with others involved, affected or required by the work. 1.8 Potential hazards are identified and control measures are implemented. 1.9 Work area is prepared in accordance with work requirements and site procedures. 1.10 Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of on-the-job training.

ELEMENT	PERFORMANCE CRITERIA
2 Verify the fault	2.1 System function and principles are determined and understood by referring to drawings, circuit diagrams, flow charts, equipment manuals and expert personnel.
	2.2 Fault indicators, appropriate technical information, diagnostic techniques are used to verify reported symptoms or faults in accordance with the work plan.
	2.3 Symptoms are reproduced and monitored if practical, whilst due regard for personnel safety and plant security is observed in accordance with the work plan.
3 Find the fault	3.1 Required isolations are confirmed where appropriate in accordance with site requirements.
	3.2 Fault finding is carried out in conjunction with others involved in, or affected by, the work in accordance with enterprise/job requirements.
	3.3 Equipment components, wires, cables, terminations and support fixings are inspected for obvious faults in accordance with the work plan.
	3.4 All appropriate fault finding/diagnostic techniques are identified, selected and used to determine the fault in accordance with the work plan.
	3.5 Faulty system equipment/components are localised/isolated and the malfunction is confirmed by inspection and testing in accordance with site requirements and work plan.
	3.6 Test and measurement instruments are used in accordance with manufacturers' instructions.
4 Determine cause of fault	4.1 All appropriate personnel are consulted in order to obtain as many details relating to the faulty equipment as possible.
	4.2 System monitoring equipment, fault indicators and maintenance records reviewed in order to

ELEMENT	PERFORMANCE CRITERIA
5 Repair or rectify the fault	obtain as many details relating to the faulty equipment as possible.
	4.3 Valid conclusions about the nature and cause of the fault are reached from analysis of available evidence in accordance with the work plan.
	5.1 Required isolations are confirmed where appropriate in accordance with site requirements.
	5.2 Appropriate repair procedures are undertaken in conjunction with others involved in, or affected by, the work in accordance with the work plan.
	5.3 Faulty, worn, damaged or unsecured equipment/components are replaced, repaired or secured in accordance with the work plan.
	5.4 Equipment/components are selected and replaced as required in accordance with appropriate specifications and the work plan.
	5.5 Components disconnected for testing are reconnected having been proven free of faults and all terminations are then checked to ensure they are electrically and mechanically sound in accordance with the work plan.
	5.6 All faults are repaired or rectified in accordance with the work plan.
6 Complete the work	5.7 Correct operation of the system is confirmed in accordance with site requirements and work plan.
	5.8 Final job inspection is performed and permits are relinquished as required in accordance with the work plan.
	6.1 Work is completed and appropriate personnel notified in accordance with site/enterprise requirements.
	6.2 Work area is cleared of waste, cleaned, restored and secured in accordance with site/enterprise procedures.

ELEMENT**PERFORMANCE CRITERIA**

- 6.3 Plant, tools and equipment are maintained and stored in accordance with site/enterprise procedures.
- 6.4 Work completion details are finalised in accordance with site/enterprise procedures.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the Essential Skills and Knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired diagnosing and repairing faults in wind turbine control systems.

The extent of the Essential Knowledge and Associated Skills required follows:

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T1 Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant Environmental, Occupational Health and Safety legislation and regulations.
- Relevant plant and equipment, and its location.
- Technical drawings and manufacturers manuals.
- Introduction to and typical arrangements of wind farm power production plant.
- Relevant state and territory regulations.
- Relevant Australian standards.
- Equipment and material required to perform the work.
- Isolation procedures.
- Wind farm control systems principles and practices.
- Electronic principles and applications.
- Instrument calibration techniques.
- Wind farm control systems equipment.
- Generator control systems.
- Test and measurement of control system equipment.
- Testing and commissioning techniques and procedures.
- Operational requirements of the equipment.
- Electronic electrical equipment.
- Electrical principles.
- Test and measurement instruments.
- Engineering and electronic workshop practices.

T2 Specific skills needed to achieve the Performance Criteria:

- Interpret technical drawings and manufacturers manuals.
- Apply relevant state and territory regulations.
- Apply electronic principles.
- Apply relevant Australian standards.
- Use tools and relevant equipment.
- Use test and measurement instruments.
- Verify and identify faults.
- Use appropriate fault finding and diagnostic techniques.
- Determine the cause of faults.

REQUIRED SKILLS AND KNOWLEDGE

- Repair faults.
- Identify and select materials for the job.
- Apply electrical fundamentals.
- Carry out work completion details.
- Apply distributed control system theory.
- Communicate effectively.
- Apply data analysis techniques and tools.
- Apply engineering and electronic workshop practices.

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and regulatory policy. Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries

risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment. Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practiced. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included in the Assessment Guidelines of this Training Package.

**Critical aspects
of evidence
required to
demonstrate
competency in
this unit** 9.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines – UEP12". Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
 - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
 - Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
 - Demonstrate an understanding of the essential knowledge and associated skills as described in 6) of this unit
 - Demonstrate an appropriate level of employability skills
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated performance across a representative range of contexts from the prescribed items below:
 - The knowledge and application of relevant sections of

Occupational Health and Safety legislation, statutory legislation, enterprise/site safety procedures; enterprise/site emergency procedures.

- Preparation and planning of work; Verification techniques; Diagnostic and fault finding techniques and procedures associated with electrical work; Repair techniques and procedures; Completion of work procedures
- Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment **9.3)**

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working, in limited spaces, with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

Method of assessment **9.4)**

This unit shall be assessed by methods given in 1.3.00 Assessment Guidelines.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended

for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent
assessment and
relationship with
other units**

9.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.
Nil

Range Statement

RANGE STATEMENT

10) This relates to the competency standard unit as a whole providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Inspection should be planned with the appropriate parties to determine access, conditions and work requirements.

Wind farm control systems may include: generator excitation systems, inverter systems, speed control systems, rectifier systems, blade pitch systems, wind direction sensing systems and yaw control systems.

Wind farm control systems communication systems may include: TCP/IP network, ethernet, fibre optic, wireless, field bus, hart protocol, profibus, internet and hard wired.

Wind farm control systems may include one or a combination of: electronic systems, distributive control systems, SCADA, electrical systems, pneumatic systems, hydraulic systems, mechanical systems and PLC systems.

Equipment may include: circuit boards, circuit breakers, transformers, rectifiers, inverters, pressure gauges, electric motors, control cabinets, protection equipment, transmitters, switches, temperature sensors, indicators, meters, proximity probes, fire detectors, smoke detectors and vibration detectors, fibre optic cables, Category 5 cables, wireless transmitters and receivers.

Components may include: fuses, circuit breakers, timers, contactors, contacts, coils, relays, resistors, inductors, capacitors, bridge rectifiers, diodes, heat sinks, solenoids, overloads, plug in printed circuit boards, switches, plugs, cables and thermistors.

Fixed wiring tests can refer to: polarity, loop impedance, insulation resistance and continuity tests.

Materials may refer to: insulation tapes, heat shrink, sleeving, spiral binding, cable ties, solder, lubricants, oil, greases, sealants, lugs, connectors, terminal blocks, cable markers and identification labels.

Tools, equipment and test and measurement instruments may include: multimeter, decade box, d.c., I/V standard, potentiometer, radiation meter, hand-held communicator, frequency counter, frequency generator, CRO, variac, hand tools, power tools lifting equipment and specialised test equipment.

Fault find and diagnostic techniques may include: linear approach, half split rule, sensory detection/insulation/resistance and continuity test.

Fault indicators may include: self test systems, DCS logs, indication lamps, alarms and flag relays.

Work may be performed in service or out of service.

Work completion details may include: plant and maintenance records, job cards, check sheets and on device labelling updates.

Work site environment may be affected by nearby plant or processes, e.g. heat, noise, dust, oil, water height and chemicals.

Isolations can refer to electrical/mechanical or other associated processes.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Section 2.1 Preliminary Information

RANGE STATEMENT

and Glossaries.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**
Maintenance.