

# Level 5 and 6 Diploma in Electrical Power Engineering - Wind Turbine Operations and Maintenance (2339-16/43)

Unit handbook for centres



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## Unit handbook for centres

Date and version number	Change detail	Section
May 2012 V2.0	Amendments to details within units	Units
	Amendment unit numbering (633-636) to (634-637)	Summary of units Individual units
January 2016 v2.1	Change in the City & Guilds Group statement	Page 2
	Phone numbers deleted	Useful contacts

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# 1 Units

## Structure of units

The units in these qualifications are written in a standard format and comprise the following:

- City & Guilds reference number
- title
- level
- credit value
- unit aim
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

## Summary of units

<b>City &amp; Guilds unit number</b>	<b>Title</b>	<b>Level</b>	<b>Credits</b>
801	Complying with statutory regulations and organisational safety requirements	5	5
805	Work with other people	5	6
820	Develop yourself in the work role	5	6
831	Protect the environment during wind turbine maintenance activities	6	12
601	Inspect and maintain pitch components	5	10
602	Inspect and maintain yaw components	5	10
603	Inspect and maintain control components	5	8
604	Inspect and maintain low voltage components	5	10
605	Inspect and maintain convertor components	5	9
606	Inspect and maintain hydraulic components	5	11
607	Inspect and maintain lubrication and drive train components	5	11
608	Inspect and maintain turbine structures	5	8
609	Remove and replace wind turbine components	5	20
632	Fault location and diagnosing faults on pitch systems and components	6	10
634	Fault location and diagnosing faults on yaw systems and components	6	10
635	Fault location and diagnosing faults on convertor systems and components	6	10
636	Fault location and diagnosing faults on control systems and components	6	10
637	Fault location and diagnosing faults on low voltage systems and components	6	10
642	Configure pitch systems	6	8
643	Configure yaw systems	6	8
644	Configure control systems	6	7
645	Configure converter systems	6	7

## Unit 801

# Complying with statutory regulations and organisational safety requirements

**Level:** 5

**Credit value:** 5

### Unit aim

This unit covers the skills and knowledge required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.

Learners are expected to comply with all relevant regulations that apply to the area of work, as well as general responsibilities as defined in the Health and Safety at Work Act.

Learners will need to identify the relevant qualified first aiders and know the location of the first aid facilities. Learners will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. Learners will also need to be fully conversant with organisation procedures for fire alerts and the evacuation of premises.

Learners are required to identify the hazards and risks that are associated with their job. Typically, these will focus on the working environment, the tools and equipment use the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

Learners should be able to demonstrate the above from carrying out normal work activities associated with wind turbine operation and maintenance.

### Learning outcomes

There are **two** learning outcomes to this unit. The learner will:

1. Comply with statutory regulations and organisational safety requirements
2. Know how to comply with statutory regulations and organisational safety requirements

### Guided learning hours

It is recommended that **35** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Assessment

This unit will be assessed by:

- Portfolio of evidence. It is recommended that workplace performance evidence be mandatory for this unit. The use of simulation is not recommended.

## Unit 801

# Complying with statutory regulations and organisational safety requirements

## Outcome 1

### Comply with statutory regulations and organisational safety requirements

#### Assessment Criteria

The learner can:

1. Comply with their duties and obligations as defined in the Health and Safety at Work Act
2. Demonstrate their understanding of their duties and obligations to health and safety by:
  - applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act
  - identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as:
    - eye protection and personal protective equipment (PPE)
    - COSHH regulations
    - Risk assessments
  - identifying the warning signs and labels of the main groups of hazardous or dangerous substances
  - complying with the appropriate statutory regulations at all times
3. Present themselves in the workplace suitably prepared for the activities to be undertaken
4. Follow organisational accident and emergency procedures
5. Comply with emergency requirements, to include:
  - identifying the appropriate qualified first aiders and the location of first aid facilities
  - identifying the procedures to be followed in the event of injury to themselves or others
  - following organisational procedures in the event of fire and the evacuation of premises
  - identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment
6. Recognise and control hazards in the workplace
7. Identify the hazards and risks that are associated with the following:
  - their working environment
  - the equipment that they use
  - materials and substances (where appropriate) that they use
  - working practices that do not follow laid-down procedures
8. Use correct manual lifting and carrying techniques
9. Demonstrate one of the following methods of manual lifting and carrying:
  - lifting alone
  - with assistance of others
  - with mechanical assistance
10. Apply safe working practices and procedures to include:
  - maintaining a tidy workplace, with exits and gangways free from obstruction
  - using equipment safely and only for the purpose intended
  - observing organisational safety rules, signs and hazard warnings
  - taking measures to protect others from any harm resulting from the work that they are carrying out.

## Unit 801

# Complying with statutory regulations and organisational safety requirements

## Outcome 2

Know how to comply with statutory regulations and organisational safety requirements

### Assessment Criteria

The learner can:

1. Describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation (such as The Management of Health and Safety at Work Regulations, Workplace Health and Safety and Welfare Regulations, Personal Protective Equipment at Work Regulations, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations)
2. Describe the specific regulations and safe working practices and procedures that apply to their work activities
3. Describe the warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations
4. Explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed
5. Explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces)
6. Describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace
7. Describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures)
8. Describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments)
9. Describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury
10. Explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is injured
11. Describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report their presence at the appropriate assembly point
12. Describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them
13. Describe the protective clothing and equipment that is available for their areas of activity
14. Explain how to safely lift and carry loads, and the manual and mechanical aids available
15. Explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping
16. Describe the importance of safe storage of tools, equipment, materials and products
17. Describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve.

# Unit 801                      Complying with statutory regulations and organisational safety requirements

## Notes for guidance

### Evidence requirements:

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1.        You must provide evidence from your normal work activities that shows you have demonstrated **all of the following**:
  - Identified sources of information and guidance on health & safety issues such as:
    - I.        Personal protective equipment
    - II.        COSH regulations
    - III.        Risk assessments
    - IV.        Warning signs and labels
  - Followed accident and emergency procedures such as:
    - I.        Identifying first aiders & location of first aid facilities
    - II.        Fire/evacuation procedures
    - III.        Dangerous occurrences procedures
  - Recognised and controlled hazards in the work location
  - Manual lifting and handling either alone, with assistance of others or with mechanical assistance
  - Applied safe working practices to include:
    - I.        Maintaining a tidy workplace
    - II.        Using equipment safely
    - III.        Observing safety rules
    - IV.        Observing signs & hazard warnings
    - V.        Taking measures to protect others from harm
2.        Evidence should come from performance at work **over a period of time**.  
Examples of evidence:

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- Your assessor may observe you carrying out your normal work activities and comparing it with the standards to be met.
- Your assessor may wish to speak to your work colleagues

### Reports and records

- log books, job reports, specifications and other work related documentation that show you have successfully carried out this type of work and when
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of work activities

### **Written or spoken questioning**

- showing you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various safety assessment methods and techniques
- showing that you understand the types of hazards involving processes, tools, equipment and materials
- showing that you understand how to communicate and present the information
- showing that you are aware of the organisational information systems and procedures
- showing that you know the organisational reporting lines and procedures.

### **Assessment Guidance**

This unit must be assessed in a work environment and must be assessed in accordance with the 'Common Requirements for National Vocational Qualifications (NVQ) in the QCF' which can be downloaded from Semta's website:

**[http://www.semta.org.uk/training\\_providers\\_\\_awarding/national\\_occupational\\_standard/qca\\_assessment\\_requirements.aspx](http://www.semta.org.uk/training_providers__awarding/national_occupational_standard/qca_assessment_requirements.aspx)**

Additional assessment requirements have been published by Semta. These additional assessment requirements are set down in Semta's unit assessment strategies which can be downloaded from Semta's website:

**[http://www.semta.org.uk/training\\_providers\\_\\_awarding/national\\_occupational\\_standard/qca\\_assessment\\_requirements.aspx](http://www.semta.org.uk/training_providers__awarding/national_occupational_standard/qca_assessment_requirements.aspx)**

## Unit 805

## Work with other people

**Level:** 5

**Credit value:** 6

### Unit aim

This unit is about making an effective individual contribution to the work of a team or group. It involves taking an active role, and when necessary a lead role, in providing colleagues with guidance and advice when planning and completing work activities.

Learners will need to show that they can work effectively with other people, sharing information and advice to achieve the work objectives and contributing to the planning that needs to take place before work starts.

In taking on a lead role for a given work activity, learners will need to show that they can plan work to ensure that it is carried out safely, effectively, efficiently and to time. Learners will also need to allocate responsibilities for different aspects of the work, taking account of the strengths of your colleagues. Effective communication is one of the most important aspects of this responsibility both as a member of a work group, keeping up to date on work activities, and in a lead role, giving information and advice to others and reporting on progress.

By completing this unit, learners show they are competent to

- Perform work with others
- Take a lead role in joint activities
- Use and communicate data and information
- Resolve problems effectively and efficiently.

### Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Perform work with others
2. Take a lead role in joint activities
3. Use and communicate data and information
4. Resolve problems effectively and efficiently
5. Know and understand how to use general knowledge
6. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **36** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Assessment

This unit will be assessed by:

- Portfolio of evidence. Evidence should come from real work situations but simulation in a RWE is acceptable for part of the evidence.

**Assessment Criteria**

The learner can:

1. Play an active role in determining and agreeing the tasks you and others need to undertake complete the work activity
2. Agree what each of you will do and what work methods need to be used to complete tasks before starting the job in accordance with work instructions
3. Finish the tasks you have been given on schedule and to the required quality standards and in a way that does not interfere with the work being undertaken by others
4. Share ideas and experiences with colleagues on how improvements can be made to the way work is undertaken and to the quality of the finished product
5. Collaborate and cooperate with others to find effective ways to deal with work problems
6. Monitor the status and progress of others' work to establish if and where it interferes with and negatively impacts on your own
7. Follow procedures and precautions to safeguard personnel, plant and the environment in accordance with health and safety regulations, environmental legislation and company procedures
8. Conduct a risk assessment in accordance with health and safety and environmental legislation.

**Assessment Criteria**

The learner can:

1. Develop and communication of the work plan
2. Make sure the work plan specifies the resources required, the objectives to be met, the allocation of responsibilities and the timescale for each aspect of the work
3. Use and follow the work plan to monitor the progress of the work being undertaken
4. Follow procedures and precautions designed to safeguard personnel, plant and the environment in accordance with health and safety regulations, environmental legislation and company procedures.

## **Unit 805**

### **Outcome 3**

## **Work with other people**

### **Use and communicate data and information**

#### **Assessment Criteria**

The learner can:

1. Communicate ideas and information in a clear and concise way
2. Seek feedback to make sure that ideas, data and information have been communicated and understood by others
3. Make sure that everyone contributing to the work activity complies with work instructions and quality assurance standards and requirements
4. Inform the team of the work plan and the work activities they are personally responsible for completing
5. Communicate the status and progress of the work being undertaken in accordance with company reporting systems and procedures.

## **Unit 805**

Outcome 4

## **Work with other people**

Resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. Report problems outside the limits of personal responsibility to designated personnel
2. Resolve problems with working relationships
3. Refer problems with working relationships that cannot be resolved by yourself to appropriate personnel.

## **Unit 805**

### Outcome 5

## **Work with other people**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. State the main principles of health and safety and environmental legislation and regulations
2. State the company reporting lines and authorisation roles and responsibilities
3. State the company policies and procedures that directly impact on the work to be undertaken.

## Unit 805

### Outcome 6

## Work with other people

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. Demonstrate how to read and interpret procedures and information sources to make sure that tools and equipment are fit for purpose and safe to use
2. Identify what personal protective equipment needs to worn when undertaken work activities
3. Identify what materials and substances are dangerous and hazardous to health
4. Know how to maintain safe working and environmental practices throughout the duration of the work
5. Know how to minimise risks to self and others when undertaking work activities
6. State company work instruction, information and reporting systems and documentation
7. Know how to respond to the different types and categories of emergency situations that might occur
8. Know how to devise deliverable work plans that reflect the skills and competencies of the individual and the work team
9. Discuss planning methods and techniques
10. Describe problem solving tools and techniques
11. Know how to recognise and report incorrect and inaccurate work instructions and supporting documentation in accordance with company.

# Unit 805      Work with other people

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You will need to provide evidence to show that you have worked with other people under all of the following situations:
  - working with one other person
  - working as a member of a team
  - taking a lead role in joint activities
2. Evidence should come from performance at work over a period of time.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

#### Assessor observation of work activities

- your assessor may watch while you and your colleagues agree the allocation of work on a job
- your assessor may watch while you discuss the progress of your work and theirs with a colleague
- your assessor may watch while you give advice and information to a team member to help his/her performance of a given task

#### Assessor observation of demonstrations

- your assessor may set up a situation where there is a problem and watch what contribution you make to dealing with it
- your assessor may specifically designate you to be the leader of a work team on a set activity and observe how you go about that role

#### Reports and records

- work logs showing what you did and when
- work plans you have produced
- memos and other notes written to pass on information and advice to team members
- progress reports you have produced
- risk assessments that you have carried out

#### Written or spoken questioning

- showing that you understand the basic principles of work planning
- showing that you understand the importance of good team work and how to achieve it
- showing that you are aware of your own skills and knowledge and those of the people you are working with
- showing that you know what information to exchange with others so that you are all aware of each other's work progress
- showing that you know who to turn to for help if problems arise in working relationships that you cannot deal with yourself.

## Unit 820

## Develop yourself in the work role

**Level:** 5

**Credit value:** 6

### Unit aim

This unit is about playing an active role in reviewing and setting objectives to improve upon and maintain personal performance. It involves the use of self assessment methods to establish and agree, with line management, how to achieve development objectives.

This unit is suitable for learners who are able to play an active role in reviewing and setting objectives for their own development within a wind turbine maintenance based job role.

Learners have this responsibility; they will be able to develop objectives related to all competences which are required currently and in the foreseeable future for your work role and other roles. Learners will be able to carry out self assessment through reflection or the use of diagnostic aids and agree with line management how to achieve your development objectives.

All information needed for effective development assessment and review must be provided and be understood. All required record systems, forms and personal development plans must be maintained throughout the process.

By completing this unit, learners show they are competent to

- Develop yourself in the work role.

### Learning outcomes

There are **three** learning outcomes to this unit. The learner will:

1. Develop yourself in the work role
2. Know and understand how to use general knowledge
3. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **36** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Assessment

This unit will be assessed by:

- Portfolio of evidence. It is a mandatory requirement that workplace performance evidence form a significant component of the evidence for this unit. The use of evidence from simulations is not permitted for this unit.

## Unit 820

Outcome 1

## Develop yourself in the work role

Develop yourself in the work role

### Assessment Criteria

The learner can:

1. Assess your current levels of competence and establish where areas of personal development are needed
2. Agree, with input of your supervisor, the period of time and resources you need to achieve the personal development objectives
3. Devise and agree a personal development plan, including deadlines, with the support of your supervisor
4. Implement, with the support of your supervisor, your personal development plan
5. Review progress against meeting the objectives of your personal development plan and decide on future development actions
6. Actively seek feedback and advice from your supervisor and work colleagues on how you can maintain and improve your level of performance.

## Unit 820 Outcome 2

## Develop yourself in the work role Know and understand how to use general knowledge

### Assessment Criteria

The learner can:

1. State the main principles of health and safety and environmental legislation and regulations
2. State the company reporting lines and authorisation roles and responsibilities
3. State the company policies and procedures that directly impact on the work to be undertaken.

## **Unit 820**

### Outcome 3

## **Develop yourself in the work role**

Know and understand how to use industry and context specific knowledge

### **Assessment Criteria**

The learner can:

1. Understand where to find training and development opportunities to support personal development plans and objectives
2. Describe self assessment processes and techniques
3. Know how to build personal development plans
4. Know how to write personal development objectives.

# Unit 820 Develop yourself in the work role

Notes for guidance

## Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out all of the following.
  - Played an active role in reviewing and developing yourself in the work role, whilst demonstrating that you understand the techniques and processes involved.
  - Actively sought feedback and guidance from sources such as; line management, personnel or training specialists, colleagues in your work team.
  - Participated in work role development activities by providing records of; courses, competence assessment, personal development plans, certificates.
2. Evidence should come from performance at work over a period of time.

## Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe your development review meeting with your line manager, comparing it with the standards to be met

### Reports and records

- records you have developed during development meetings
- training reports and certificates that show you have attended appropriate development programmes
- N/SVQ/QCF unit certificates or full qualifications and the associated assessment documentation and feedback reports
- CPD documentation

### Written or spoken questioning

- showing that you know about the different sorts of information that should be provided to identify development needs
- showing that you understand how to communicate clearly on all matters relating to your development
- showing that you seek feedback on your performance and development
- showing that you understand training and development opportunities
- showing that you know what records need to be kept
- showing that you understand the need for maintaining good working relationships.

## Unit 831

# Protect the environment during wind turbine maintenance activities

**Level:** 6  
**Credit value:** 12

### Unit aim

This unit is about minimising risks to life and property in a wind turbine environment and requires that particular care is taken to minimise pollution and physical disturbance and the risk to life.

This unit is suitable for learners who are responsible for minimising risks to life, property and the environment in wind turbine work areas. These include onshore and offshore locations which may be on the property of customers or the organisation and may require particular care to minimise pollution and physical disturbance e.g. sites of special scientific interest, work alongside waterways etc.

The hazards and risks may arise from the use of plant, equipment and materials or from features within the immediate working environment and are in relation to life, property and the environment. In relation to the environment, hazards and risks maybe in terms of chemical, visual or noise pollution, physical disturbance to the site and/or wildlife.

The action taken to minimise risks involves the use of controls which may be documentary, eg. Permit to Work schemes, or physical, e.g. barriers, warning notices, shut down of plant/equipment, and would also involve the selection and use of Personal Protective Equipment (PPE). Learners will also be responsible for ensuring that the correct action is taken, as specified in the safety management system, for working in ways that minimise environmental damage, ensuring the safe disposal of wastes and seeking authorisation for further actions as needed.

Learners will be required to work safely at all times, complying with health and safety guidelines, and be able to deal promptly and effectively with problems within your control.

### Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to plan to minimise risk to life, property and the environment
2. Be able to determine priorities and monitor risk to life, property and the environment
3. Be able to restore and reinstate work location
4. Be able to use and communicate data and information
5. Be able to resolve problems effectively and efficiently
6. Know and understand how to use general knowledge
7. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **72** hours should be allocated for this unit, although patterns of delivery are likely to vary.

**Support of the unit by a sector or other appropriate body**

This unit is endorsed by EU Skills.

**Assessment**

This unit will be assessed by:

- portfolio of evidence; it is recommended that workplace performance evidence be mandatory for this unit. The use of simulation is not recommended.

## **Unit 831**

## **Protect the environment during wind turbine maintenance activities**

### Outcome 1

Be able to plan to minimise risk to life, property and the environment

#### **Assessment Criteria**

The learner can:

1. plan and carry out all work in line with company policy and procedures
2. conduct a site specific risk assessment in accordance with company policy and in line with health and safety and environmental regulations.

## **Unit 831**

## **Protect the environment during wind turbine maintenance activities**

### Outcome 2

Be able to determine priorities and monitor risk to life, property and the environment

#### **Assessment Criteria**

The learner can:

1. establish potential hazards and assess the severity of the risk
2. prioritise and determine the actions necessary to minimise the risk in agreed timescale
3. monitor risk control measures and take corrective and remedial actions to minimise risk
4. follow and maintain safe working and environment practices consistent with control measure and in accordance with Health and safety regulations and environmental legislation.

## Unit 831

## Protect the environment during wind turbine maintenance activities

### Outcome 3

Be able to restore and reinstate work location

#### Assessment Criteria

The learner can:

1. store tools and equipment on completion of work activity in accordance with company procedures
2. dispose of waste materials and hazardous substances in accordance with health and safety and environmental regulations
3. leave the work area in a condition that is in line with health and safety regulations and good housekeeping practice.

## **Unit 831**

## **Protect the environment during wind turbine maintenance activities**

### Outcome 4

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. provide information necessary to maintain and update safety systems records
2. inform those affected by the risk of the risk control measures put in place and clarify the impact and implications that the measures will have on them personally
3. read and interpret company work instructions and supporting documentation connected with the work activity.

## **Unit 831**

## **Protect the environment during wind turbine maintenance activities**

### Outcome 5

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. report problems outside the limits of personal responsibility to designated personnel
2. report problems outside job role responsibility to designated personnel.

## **Unit 831**

## **Protect the environment during wind turbine maintenance activities**

### **Outcome 6**

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 831

## Protect the environment during wind turbine maintenance activities

### Outcome 7

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain how to read and interpret procedures and information sources to make sure that tools and equipment are fit for purpose and safe to use
2. explain what personal protective equipment needs to worn when undertaken work activities
3. explain what materials and substances are dangerous and hazardous to health
4. explain how to maintain safe working and environmental practices throughout the duration of the work
5. explain how to minimise risks to self and others when undertaking work activities
6. state company work instruction, information and reporting systems and documentation
7. explain how to respond to the different types and categories of emergency situations that might occur
8. explain what are the types and application of construction elements
9. demonstrate lifting and handling equipment methods and techniques
10. explain what are the methods and techniques for dismantling access structures
11. explain what type of actions can be taken to minimise risk from hazards
12. state how to recognise and report inaccurate and incorrect work instructions and specification documents.

# Unit 831      Protect the environment during wind turbine maintenance activities

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You must provide evidence from your normal work activities that shows you have carried out all of the following:
  - Planned to minimise risk to life, property and the environment.
  - Determined priorities and monitored risk to life, property and the environment.
  - Restored and reinstated the work location.
  - Used and communicated data and information.
  - Resolved problems effectively and efficiently.
2. Evidence should come from performance at work over a period of time

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe you setting up risk control measures and comparing it with the standards to be met
- your assessor may wish to see risk control measures you have carried out previously

### Reports and records

- log books, job reports, specifications and other work related documentation that show you have successfully carried out this type of work and when
- any risk assessments carried out previously
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of risk control measures in place

### Written or spoken questioning

- showing you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various safety assessment methods and techniques
- showing that you understand the types of hazards involving processes, tools, equipment and materials
- showing that you understand how to communicate and present the information
- showing that you are aware of the organisational information systems and procedures
- showing that you know the organisational reporting lines and procedures

**Level:** 5  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine pitch system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain pitch components
2. Be able to prepare to inspect and maintain pitch components
3. Be able to inspect and maintain pitch components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 601**

### Outcome 1

## **Inspect and maintain pitch components**

Be able to plan to inspect and maintain pitch components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 601**

### Outcome 2

## **Inspect and maintain pitch components**

Be able to prepare to inspect and maintain pitch components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the pitch components to be inspected and maintained in accordance with work instructions.

## **Unit 601**

Outcome 3

## **Inspect and maintain pitch components**

Be able to inspect and maintain pitch components

### **Assessment Criteria**

The learner can:

1. inspect and maintain pitch components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 601**

Outcome 4

## **Inspect and maintain pitch components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 601**

Outcome 5

## **Inspect and maintain pitch components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 601**

Outcome 6

## **Inspect and maintain pitch components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 601**

Outcome 7

## **Inspect and maintain pitch components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 601

### Outcome 8

## Inspect and maintain pitch components

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 601      Inspect and maintain pitch components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on pitch systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Hydraulic pumps, accumulators, pipework, valves, seals, filters, fluids.
- Gearboxes and gears.
- DC motors, AC to DC converter, solenoid & brakes, batteries, limit switches, relays and contactors.
- Measurement transducers and detectors.
- Digital and analogue processors, encoders.

## **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem.

Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

# Unit 602            Inspect and maintain yaw components

**Level:**            5  
**Credit value:**    10

## Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine yaw system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation. If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

## Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain yaw components
2. Be able to prepare to inspect and maintain yaw components
3. Be able to inspect and maintain yaw components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

## Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

## Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

## Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 602**

### Outcome 1

## **Inspect and maintain yaw components**

Be able to plan to inspect and maintain yaw components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 602**

### Outcome 2

## **Inspect and maintain yaw components**

Be able to prepare to inspect and maintain yaw components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the yaw components to be inspected and maintained in accordance with work instructions.

## **Unit 602**

Outcome 3

## **Inspect and maintain yaw components**

Be able to inspect and maintain yaw components

### **Assessment Criteria**

The learner can:

1. inspect and maintain yaw components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 602**

Outcome 4

## **Inspect and maintain yaw components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 602**

### Outcome 5

## **Inspect and maintain yaw components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 602**

Outcome 6

## **Inspect and maintain yaw components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 602**

Outcome 7

## **Inspect and maintain yaw components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 602

### Outcome 8

## Inspect and maintain yaw components

### Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 602      Inspect and maintain yaw components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on yaw systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- AC motors, gearboxes, bearings, solenoids, brake systems.
- Rotation sensors, limit switches

## **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem.

Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

**Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

**Level:** 5

**Credit value:** 8

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine control system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain control components
2. Be able to prepare to inspect and maintain control components
3. Be able to inspect and maintain control components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **40** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 603**

### Outcome 1

## **Inspect and maintain control components**

Be able to plan to inspect and maintain control components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 603**

### Outcome 2

## **Inspect and maintain control components**

Be able to prepare to inspect and maintain control components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the control components to be inspected and maintained in accordance with work instructions.

**Unit 603**  
Outcome 3

**Inspect and maintain control components**

Be able to inspect and maintain control components

**Assessment Criteria**

The learner can:

1. inspect and maintain control components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 603**

Outcome 4

## **Inspect and maintain control components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 603**

Outcome 5

## **Inspect and maintain control components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 603**

Outcome 6

## **Inspect and maintain control components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 603**

Outcome 7

## **Inspect and maintain control components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 603

### Outcome 8

## Inspect and maintain control components

### Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 603      Inspect and maintain control components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on control systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Programmable logic controllers:
- Processors – parameters
- Digital I/O and interfacing
- Analogue I/O and interfacing
- Remote I/O
- Communications serial link and fibre optic
- External monitoring – IP addressing, networking, hub, switch
- Instrumentation – anemometer, windvane

## **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem.

Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

### **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

**Level:** 5  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine low voltage system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain low voltage components
2. Be able to prepare to inspect and maintain low voltage components
3. Be able to inspect and maintain low voltage components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 604**

### Outcome 1

## **Inspect and maintain low voltage components**

Be able to plan to inspect and maintain low voltage components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 604**

### Outcome 2

## **Inspect and maintain low voltage components**

Be able to prepare to inspect and maintain low voltage components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the low voltage components to be inspected and maintained in accordance with work instructions.

**Unit 604**  
Outcome 3

**Inspect and maintain low voltage components**

Be able to inspect and maintain low voltage components

**Assessment Criteria**

The learner can:

1. inspect and maintain low voltage components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 604**

Outcome 4

## **Inspect and maintain low voltage components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 604**

### Outcome 5

## **Inspect and maintain low voltage components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 604**

### Outcome 6

## **Inspect and maintain low voltage components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 604**

### Outcome 7

## **Inspect and maintain low voltage components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 604

### Outcome 8

## Inspect and maintain low voltage components

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 604      Inspect and maintain low voltage components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on low voltage systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Generator & associated equipment
- Motors, transformers
- Bus bars, circuit breakers, contactors, cables, switches, fuses, relays, protection equipment
- Single and three phase power supplies – UPS - ELV

## **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem.

Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

**Level:** 5

**Credit value:** 9

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine converter system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Manuals.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain converter components
2. Be able to prepare to inspect and maintain converter components
3. Be able to inspect and maintain convertor components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **45** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 605**

### Outcome 1

## **Inspect and maintain converter components**

Be able to plan to inspect and maintain converter components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 605**

### Outcome 2

## **Inspect and maintain converter components**

Be able to prepare to inspect and maintain converter components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the converter components to be inspected and maintained in accordance with work instructions.

## **Unit 605**

### **Outcome 3**

## **Inspect and maintain converter components**

Be able to inspect and maintain converter components

### **Assessment Criteria**

The learner can:

1. inspect and maintain converter components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 605**

Outcome 4

## **Inspect and maintain converter components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 605**

Outcome 5

## **Inspect and maintain converter components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 605**

Outcome 6

## **Inspect and maintain converter components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 605**

Outcome 7

## **Inspect and maintain converter components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

**Unit 605**  
Outcome 8

**Inspect and maintain converter components**  
Know and understand how to use industry and context specific knowledge

**Assessment Criteria**

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 605      Inspect and maintain converter components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on converter systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## Equipment and Components

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Converters: AC/DC – DC/AC
- Inverters, cables, contactors, switches, fuses, relays, protection equipment
- Synchronisation controllers
- Rotor position absolute encoder

## Maintenance Checks

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem. Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## Inspection methods and procedures

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## Adjustments

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

**Level:** 5  
**Credit value:** 11

**Unit aim**

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine hydraulic system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

**Learning outcomes**

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain hydraulic components
2. Be able to prepare to inspect and maintain hydraulic components
3. Be able to inspect and maintain hydraulic components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

**Guided learning hours**

It is recommended that **55** hours should be allocated for this unit, although patterns of delivery are likely to vary.

**Support of the unit by a sector or other appropriate body**

This unit is endorsed by EU Skills.

**Assessment**

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 606**

### Outcome 1

## **Inspect and maintain hydraulic components**

Be able to plan to inspect and maintain hydraulic components

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 606**

### Outcome 2

## **Inspect and maintain hydraulic components**

Be able to prepare to inspect and maintain hydraulic components

### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the hydraulic components to be inspected and maintained in accordance with work instructions.

**Unit 606**  
Outcome 3

**Inspect and maintain hydraulic components**

Be able to inspect and maintain hydraulic components

**Assessment Criteria**

The learner can:

1. inspect and maintain hydraulic components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 606**

Outcome 4

## **Inspect and maintain hydraulic components**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 606**

Outcome 5

## **Inspect and maintain hydraulic components**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 606**

Outcome 6

## **Inspect and maintain hydraulic components**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 606**

Outcome 7

## **Inspect and maintain hydraulic components**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## **Unit 606**

### Outcome 8

## **Inspect and maintain hydraulic components**

Know and understand how to use industry and context specific knowledge

### **Assessment Criteria**

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 606      Inspect and maintain hydraulic components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on hydraulic systems and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## Equipment and Components

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Pumps, accumulators, pipework, valves, connections, seals, filters, fluids
- Brake units: - callipers – brake pads
- Pressure sensors, solenoids

## Maintenance Checks

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem. Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## Inspection methods and procedures

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## Adjustments

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

## Unit 607

# Inspect and maintain lubrication and drive train components

**Level:** 5  
**Credit value:** 11

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine lubrication and drive train system equipment and components which control the start up, shut down and operation of the wind turbine.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain lubrication and drive train components
2. Be able to prepare to inspect and maintain lubrication and drive train components
3. Be able to inspect and maintain lubrication and drive train components
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **55** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 1

Be able to plan to inspect and maintain lubrication and drive train components

#### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 2

Be able to prepare to inspect and maintain lubrication and drive train components

#### **Assessment Criteria**

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the lubrication and drive train components to be inspected and maintained in accordance with work instructions.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 3

Be able to inspect and maintain lubrication and drive train components

#### **Assessment Criteria**

The learner can:

1. inspect and maintain lubrication and drive train components in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 607**

## **Inspect and maintain lubrication and drive train components**

### Outcome 7

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 607

## Inspect and maintain lubrication and drive train components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 607      **Inspect and maintain lubrication and drive train components**

## Notes for guidance

### **Assessment in a Realistic Work Environment (RWE)**

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### **Evidence requirements**

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on lubrication and drive train systems and components on three occasions

### **Examples of evidence**

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

### **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Gearboxes, couplings, bearings, pumps, brakes, shafts seals, filters
- Lubricants: oil and grease
- Greasing: auto and manual. Yaw, rotor, blade bearings
- Cooling system: radiator – motor – valves
- Vibration detectors

### **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem. Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage#
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

### **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

## Unit 608

## Inspect and maintain turbine structures

**Level:** 5

**Credit value:** 8

### Unit aim

This unit is suitable for learners who are authorised for the inspection and maintenance of wind turbine structures.

Maintenance is the inspection and adjustment of components or settings to return them to operational requirements. This can be either as a result of routine maintenance or fault investigation.

If learners have this authority they should be able to identify the maintenance techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to read, understand and implement Operation and Service Schedules.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to inspect and maintain turbine structures
2. Be able to prepare to inspect and maintain turbine structures
3. Be able to inspect and maintain turbine structures
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **40** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body (if required)

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- A portfolio of evidence; **workplace performance evidence will be a mandatory component on at least two occasions.**

## **Unit 608**

### Outcome 1

## **Inspect and maintain turbine structures**

Be able to plan to inspect and maintain turbine structures

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## Unit 608 Outcome 2

## Inspect and maintain turbine structures Be able to prepare to inspect and maintain turbine structures

### Assessment Criteria

The learner can:

1. carry out pre use checks on tools and equipment to be used to complete the inspection and maintenance work in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. apply with and follow control measures in line with safe control systems requirements
4. locate and establish the turbine structure to be inspected and maintained in accordance with work instructions.

## **Unit 608**

Outcome 3

## **Inspect and maintain turbine structures**

Be able to inspect and maintain turbine structures

### **Assessment Criteria**

The learner can:

1. inspect and maintain turbine structures in accordance with equipment specification and inspection and maintenance procedures and work instructions
2. determine the defects and measure variations in the performance of system against its specification and performance criteria
3. record defects and determine variations in the performance of the system against its operating specification and performance criteria
4. inspect and adjust finished product for compliance with work instructions and operating specifications
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## Unit 608

Outcome 4

## Inspect and maintain turbine structures

Be able to restore and reinstate work location

### Assessment Criteria

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and hazardous substances
3. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 608**

Outcome 5

## **Inspect and maintain turbine structures**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report the completion of work activities in accordance with organisational requirements.

## Unit 608 Outcome 6

## Inspect and maintain turbine structures Be able to resolve problems effectively and efficiently

### Assessment Criteria

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 608**

Outcome 7

## **Inspect and maintain turbine structures**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

**Assessment Criteria**

The learner can:

1. state the company procedures and processes for reporting problems with tools and equipment
2. know how to read and interpret procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. state the processes and procedures to be followed and complied with when inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. identify what personal protective equipment needs to worn when undertaking work activities
6. identify what materials and substances are dangerous and hazardous to health
7. know how to maintain safe working and environmental practices throughout the duration of the work
8. know how to minimise risks to self and others when undertaking work activities
9. state the procedures and documentation used for reporting problems
10. state company work instruction, information and reporting systems and documentation
11. describe how to respond to the different types and categories of emergency situations that might occur
12. describe how to maintain plant and apparatus using specified assemble principles, methods, processes and procedures
13. know what handling techniques and equipment to adopt and use when maintaining plant and apparatus
14. identify how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 608      Inspect and maintain turbine structures

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have carried out the inspection and maintenance as part of routine maintenance work on turbine structures and components on three occasions

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work where and when
- candidate reports supported by product evidence
- pictures/photographs of plant and equipment
- witness testimonies from colleagues and others who understand the requirements of this unit

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand maintenance schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you know the reporting lines and procedures if you encounter problems
- showing that you know how and where to dispose of waste materials
- showing that you know the relevant documentation to be completed to meet organisational requirements

## **Equipment and Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Tower components
- Access ladders
- Barriers
- Doors
- Cable trays
- Lights
- Fittings.

## **Maintenance Checks**

Checks are the inspections carried out to ascertain the condition and functioning of the equipment and components when compared with expected specifications. They may be carried out as part of routine maintenance and during the course of an investigation into a problem. Visual checks may be carried out when in an operational or test mode.

Checks involve comparing against standards in relation to some or all of the following characteristics:

- levels of contamination and cleanliness
- levels of erosion, wear, tear and damage
- levels of corrosion
- examination of components
- security and integrity of fittings
- levels of consumables

## **Inspection methods and procedures**

Inspections cover the evaluation of equipment and components and may be as detected by:

- sight
- sound
- smell
- monitoring
- testing
- analysis

The person carrying out the inspection has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

## **Adjustments**

Adjustments are made to ensure that performance is optimised within specified limits and may be made so as to restore compliance with reference standards or to achieve a different standard to meet changed operating requirements.

Adjustments are made in line with work instructions and the individual carrying out this function is authorised to make such adjustments as are needed to achieve the required specification without recourse to further authorisation. They are also responsible for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures.

## **Specification**

Quality standards and tolerances are clearly detailed for each item and may be set down in relation to:

- organisational requirements
- manufacturers' recommendations
- statutory requirements

**Level:** 5  
**Credit value:** 20

**Unit aim**

This unit is suitable for learners who are authorised for the removal and replacement of wind turbine system equipment and components from/to their normal plant location/position. Removal and replacement may be relatively simple to achieve where the equipment or components are readily accessed or it may be complex to achieve due to difficult access or where there is a need for prior removal of other equipment or components.

If learners have this authority, they should be able to identify the removal and replacement techniques, methods and equipment to be used and ensure that they are correct for the situation. Learners should be able to carry this out without damaging any equipment or components and should use the approved tools, equipment, lifting and handling techniques.

Learners should be able to show that you have selected the correct replacement components, have replaced them in the right sequence and that they can make any necessary adjustments to the components to ensure they function correctly.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, deal promptly with problems, keep others informed and complete the relevant documentation. Learners should also be aware of and have an understanding of Wind Turbine Safety Rules (accepted as industry best practice).

**Learning outcomes**

There are **eight** learning outcomes to this unit. The learner will:

1. Plan for work activities
2. Prepare for work activities
3. Remove and replace wind turbine systems and components
4. Restore and reinstate work location
5. Use and communicate data and information
6. Resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

**Guided learning hours**

It is recommended that **120** hours should be allocated for this unit, although patterns of delivery are likely to vary.

**Assessment**

This unit will be assessed by:

- Portfolio of evidence. It is recommended that workplace performance evidence be mandatory for this unit. The use of simulation is not recommended.

## **Unit 609**

# **Remove and replace wind turbine components**

### **Outcome 1**

### **Plan for work activities**

#### **Assessment Criteria**

The learner can:

1. Determine work location using company documentation and information sources
2. Conduct a site specific risk assessment in accordance with health and safety regulations
3. Determine the content and sequence of tasks needed to complete work activity
4. Inform parties directly and indirectly responsible for completing work activity of the intended work plan
5. Plan and carry out work in line with company policy and work procedures.

## Unit 609

## Remove and replace wind turbine components

### Outcome 2

Prepare for work activities

#### Assessment Criteria

The learner can:

1. Select and prepare equipment, materials and resources required to complete work activity in accordance with work instructions and equipment specifications
2. Select and wear required personal protective equipment to complete work activities in accordance with health and safety regulations
3. Apply control measures in line with safe control systems requirements
4. Obtain the appropriate systems or components to be replaced; making sure its specification meets its intended use and purpose.

## Unit 609

## Remove and replace wind turbine components

### Outcome 3

Remove and replace wind turbine systems and components

#### Assessment Criteria

The learner can:

1. Make sure that stored energy is released before work to remove systems or components commences in accordance work instructions
2. Take precautions to prevent damage to before and during their removal and replacement
3. Remove systems or components in accordance with equipment specification and work instructions
4. Replace systems or components in accordance with work instructions
5. Set and adjust systems or components making sure that the finished work meets operational and performance requirements
6. Follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 609**

## **Remove and replace wind turbine components**

Outcome 4

Restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. Store tools and equipment on completion of the work activity
2. Dispose of waste materials and hazardous substances
3. Leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 609**

## **Remove and replace wind turbine components**

### Outcome 5

Use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. Report unavailable or defective tools, equipment and resources
2. Read and interpret company work instructions and supporting documentation
3. Maintain documentation and report the completion of work activities in accordance with organisational requirements.

## **Unit 609**

## **Remove and replace wind turbine components**

Outcome 6

Resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. Deal with problems within the limits of own job role responsibility
2. Report problems outside job role responsibility to designated personnel.

## **Unit 609**

## **Remove and replace wind turbine components**

### Outcome 7

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. State the main principles of health and safety and environmental legislation and regulations
2. State the company reporting lines and authorization roles and responsibilities
3. State the company policies and procedures that directly impact on the work to be undertaken.

## Unit 609

## Remove and replace wind turbine components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. Explain the company procedures and processes for reporting problems with tools and equipment
2. Explain how to read and interpret the procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. Explain processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. Read and interpret instructions on how to use tools and equipment safely and the processes and requirements for undertaking routine checks
5. Identify what personal protective equipment needs to worn when undertaken work activities
6. Identify what materials and substances are dangerous and hazardous to health
7. Explain how to maintain safe working and environmental practices throughout the duration of the work
8. Explain how to minimise risks to self and others when undertaking work activities
9. State the procedures and documentation used for reporting problems
10. Explain company work instruction, information and reporting systems and documentation
11. Explain how to respond to the different types and categories of emergency situations that might occur
12. Explain how to replace plant and apparatus using specified principles, methods, processes and procedures
13. Demonstrate how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 609      Remove and replace wind turbine components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWEs and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the removal and replacement of wind turbine system components on three occasions.
2. You must provide evidence to show that you have carried out disconnections and reconnections and used mechanical lifting techniques.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor will observe you carrying out inspection and maintenance activities.
- your assessor may also set up a realistic work environment (RWE) and assess how you carry out inspection and maintenance activities.

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of removed components

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the component removal methods and techniques
- showing that you know how to identify the various components and their possible defects
- showing that you understand quality control systems and documentation procedures for labelling and storage of components
- showing that you know how and where to dispose of unwanted components and substances
- showing that you know the reporting lines and procedures if you encounter problems

### **Systems**

The integral systems associated with the start up, shut down and operation of wind turbines may include the following examples:

- Pitch systems - Electrical and Mechanical (hydraulic)
- Yaw systems
- Emergency systems (eg overspeed)
- Drive, transmission and gearbox systems
- Converter systems
- Low voltage systems
- Control systems
- Hydraulic systems
- Instrumentation

### **Equipment and Components**

Components are integral parts of the wind turbine systems without which they cannot function correctly and may include the following examples:

- Hydraulic pumps, accumulators, pipework, valves, seals, filters, fluids
- Drives, linkages, gearboxes, bearings, gears, brakes, seals, filters, fluids, lubricants
- Motors, generators, cables, circuit boards
- Circuit breakers, contactors, switches, cables, links, relays, fuses, protection devices
- Computers, PLC's, controllers, recorders, gauges, transmitters, sensors

### **Removal and replacement techniques**

The techniques and procedures to be applied cover mechanical, electrical and manual techniques for:

- the release and re-connection of the item (eg. by use of threaded fasteners, male female plug-in connectors, cutting, soldering)
- safe handling and lifting (eg. use of lifting equipment, working in partnership with a colleague)
- the protection of equipment, components and circuits

Procedures also cover the sequence of actions to be followed in removing and replacing equipment and components. You should exhibit methodical approach – production of a procedure if not covered by existing procedure etc.

Removal and replacement may be relatively simple to achieve where the equipment and components are readily accessed and can be easily lifted clear of the location. Removal and replacement may also be complex to achieve in situations where access may be difficult, where it requires the prior removal of other components and/or where the environmental conditions make the work less straightforward (eg. working at heights or in restricted spaces, or working on or near live equipment in accordance with the relevant legislation and regulations.) you may be required to liaise with a third party who may be providing a specialist service such as lifting components using a crane.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Responsibility also extends to the application of best practice in the use of methods, tools and procedures and for ensuring that the item is protected from damage while being worked on. While many defined procedures exist, and the person carrying out the work is expected to follow these, they are also responsible for determining the best way of applying that procedure in the specific context of each job.

### **Specification**

The work specification details the quality standards or tolerances to be achieved.

### **Problems**

The sorts of problems which may be experienced relate to:

- difficulty in accessing the equipment/components
- difficulty with lifting and handling
- difficulty in releasing/making connections
- difficulty in achieving alignment
- difficulty in avoiding contamination
- difficulty in achieving required standards or tolerances in the physical condition of the replaced equipment/components
- difficulty in achieving required standards or tolerance in the functioning of the replaced equipment/components.

The person carrying out this role has responsibility for resolving problems which can be overcome using standard working procedures, techniques and tools and within the time frame allocated for the job. Problems which fall outside these characteristics must be reported to the appropriate person.

## Unit 632

# Fault location and diagnosing faults on pitch systems and components

**Level:** 6  
**Credit value:** 10

### Unit aim

This unit is suitable for learners if they are responsible for and have the appropriate level of authority for locating and diagnosing faults on wind turbine systems, equipment and components.

The faults investigated will be of an electrical, mechanical or control and instrumentation nature, either intermittent or continual. The faults may be associated with breakdowns, performance out of specification, deteriorating condition, abnormal readings or other returned data. The investigations that learners carry out may require a range of diagnostic approaches and they will be responsible for determining and following up the information and procedures needed to allow the nature of the problem(s) to be clearly and accurately determined.

To meet the requirements of this unit, learners are required to investigate a number of different pieces of plant and equipment and the application of several different techniques. Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines and be able to; plan, prepare for and carry out fault location and diagnosis, use and communicate data and information and resolve problems.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated – obtaining authority to work on the turbine is required for all work including fault finding etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to locate and diagnose faults
2. Be able to prepare to locate and diagnose faults
3. Be able to locate and diagnose faults
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- a portfolio of evidence; **workplace performance evidence will be a mandatory component for at least one fault** identified.

## Unit 632

## Fault location and diagnosing faults on pitch systems and components

### Outcome 1

Be able to plan to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. determine work location using company documentation and information sources
2. determine the content and sequence of tasks needed to complete the work activity
3. conduct a site specific risk assessment in accordance with health and safety regulations
4. plan and carry out all work in line with company policy and work procedures.

## Unit 632

## Fault location and diagnosing faults on pitch systems and components

### Outcome 2

Be able to prepare to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. select and prepare the tools and fault diagnostic equipment in accordance with work instructions and equipment specification
2. inform parties directly and indirectly responsible for completing work activity of the intended work plan in accordance with work instructions and health and safety regulations
3. select and wear the required personal protective equipment to complete work activities in accordance with health and safety regulations.

## Unit 632

## Fault location and diagnosing faults on pitch systems and components

### Outcome 3

Be able to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. review and use all relevant information on the symptoms and problems associated with the fault
2. use diagnostic tools, techniques and procedures to locate the root cause of the fault in accordance with work instructions
3. locate the fault and recommend actions needed to effect a repair
4. determine the implications and impact the fault will have on other work and for safety considerations
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 632**

## **Fault location and diagnosing faults on pitch systems and components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 632**

## **Fault location and diagnosing faults on pitch systems and components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report findings of the fault diagnosis work in accordance with organisational requirements.

## **Unit 632**

## **Fault location and diagnosing faults on pitch systems and components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 632**

## **Fault location and diagnosing faults on pitch systems and components**

### **Outcome 7**

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 632

## Fault location and diagnosing faults on pitch systems and components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. explain the processes, procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. explain the processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use and maintain fault diagnosis tools and equipment
5. identify what personal protective equipment needs to worn when undertaken work activities
6. identify what materials and substances are dangerous and hazardous to health
7. explain how to maintain safe working and environmental practices throughout the duration of the work
8. describe how to minimise risks to self and others when undertaking work activities
9. state company work instruction, information and reporting systems and documentation
10. explain how to respond to the different types and categories of emergency situations that might occur
11. identify what fault finding and diagnostic tools, techniques and procedures should be used for a given purpose and situation
12. explain how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 632      Fault location and diagnosing faults on pitch systems and components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWE's and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the diagnosis of at least **two different faults** in wind turbine pitch systems and components.
2. You must provide evidence to show that you have used four of the following diagnostic techniques:
  - sight, sound, smell, touch
  - use of diagnostic test equipment
  - use of direct monitoring
  - seeking advice and other opinions
  - peripheral device responses
  - non destructive testing
  - functional tests
  - condition/sample/vibration analysis
3. You must provide evidence that you have carried out the fault diagnosis of at least **two from the following three**:
  - One mechanical fault.
  - One electrical fault.
  - One control fault.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor may observe you carrying out the diagnosis of faults on wind turbine systems and components against the required standards
- your assessor may also set up a realistic work environment (RWE) and assess how you locate and deal with a fault.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of faults or faulty equipment

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the fault finding methods and techniques
- showing that you know how to identify the various components and their possible faults
- showing that you understand fault analysis methods and techniques
- showing that you know and understand the possible risks arising from the faults
- showing that you know how to select the appropriate test equipment and how to test and look after it
- showing that you know the appropriate documentation and reporting lines and procedures

### **Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Hydraulic pumps, accumulators, pipework, valves, seals filters, fluids.
- Gearboxes and gears.
- DC motors, AC to DC converter, solenoid and brakes, batteries, limit switches, relays and contactors.
- Measurement transducers and detectors.

### **Faults**

Faults are within wind turbine systems, equipment and components and are of an electrical, mechanical or control and instrumentation origin. They may be indicated by:

- breakdowns
- performances out of specification
- deteriorating condition
- abnormal readings
- other data being returned
- safety issues
- environmental conditions

Faults may be intermittent or continual and may be relatively straight forward or difficult to diagnose.

## Investigations

Investigations are carried out to identify the location, nature and causes of a fault/faults. The sorts of investigation approach may include:

- sight, sound, smell, touch
- peripheral device responses
- use of direct monitoring
- condition/sample/vibration analysis
- oil, lubricant, gas sampling and analysis
- functional checks
- non destructive testing
- use of diagnostic test equipment
- seeking advice and opinions
- plant/component history records

Often a fault investigation will need to involve a range of approaches and the person carrying it out is responsible for determining and following up the information and diagnostic procedures needed to allow the nature of the problem to be clearly and accurately determined.

## Records

Maintaining documentation and fault report findings would include the use of text and diagrams, and may be documentary or computer-based. Documentary records follow standardised formats and may involve the completion of checklists and the writing of short descriptions of actions carried out and test results

Recording the tests and findings for communicating to a third party who will provide expert advice for further investigation when unable to identify fault. Ability to follow instructions given by third parties for fault investigation and provide useful feed back on outcome of applied instructions.

## Unit 634

# Fault location and diagnosing faults on yaw systems and components

**Level:** 6  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for locating and diagnosing faults on wind turbine systems, equipment and components.

The faults investigated will be of an electrical, mechanical or control and instrumentation nature, either intermittent or continual. The faults may be associated with breakdowns, performance out of specification, deteriorating condition, abnormal readings or other returned data. The investigations may require a range of diagnostic approaches and learners will be responsible for determining and following up the information and procedures needed to allow the nature of the problem(s) to be clearly and accurately determined.

To meet the requirements of this unit, the fault-finding you carry out should not be of a straight forward nature and will require the investigation of a number of different pieces of plant and equipment and the application of several different techniques, before a conclusion can be drawn.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines and be able to; plan, prepare for and carry out fault location and diagnosis, use and communicate data and information and resolve problems.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated – obtaining authority to work on the turbine is required for all work including fault finding etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to locate and diagnose faults
2. Be able to prepare to locate and diagnose faults
3. Be able to locate and diagnose faults
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

## Assessment

This unit will be assessed by:

- a portfolio of evidence; **workplace performance evidence will be a mandatory component for at least one fault** identified.

## **Unit 634**

# **Fault location and diagnosing faults on yaw systems and components**

### Outcome 1

Be able to plan to locate and diagnose faults

#### **Assessment Criteria**

The learner can:

1. determine work location using company documentation and information sources
2. determine the content and sequence of tasks needed to complete the work activity
3. conduct a site specific risk assessment in accordance with health and safety regulations
4. plan and carry out all work in line with company policy and work procedures.

## Unit 634

## Fault location and diagnosing faults on yaw systems and components

### Outcome 2

Be able to prepare to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. select and prepare the tools and fault diagnostic equipment in accordance with work instructions and equipment specification
2. inform parties directly and indirectly responsible for completing work activity of the intended work plan in accordance with work instructions and health and safety regulations
3. select and wear the required personal protective equipment to complete work activities in accordance with health and safety regulations.

## Unit 634

# Fault location and diagnosing faults on yaw systems and components

### Outcome 3

Be able to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. review and use all relevant information on the symptoms and problems associated with the fault
2. use diagnostic tools, techniques and procedures to locate the root cause of the fault in accordance with work instructions
3. locate the fault and recommend actions needed to effect a repair
4. determine the implications and impact the fault will have on other work and for safety considerations
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 634**

## **Fault location and diagnosing faults on yaw systems and components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 634**

## **Fault location and diagnosing faults on yaw systems and components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report findings of the fault diagnosis work in accordance with organisational requirements.

## **Unit 634**

## **Fault location and diagnosing faults on yaw systems and components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 634**

## **Fault location and diagnosing faults on yaw systems and components**

### **Outcome 7**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 634

## Fault location and diagnosing faults on yaw systems and components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. explain the processes, procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. explain the processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use and maintain fault diagnosis tools and equipment
5. identify what personal protective equipment needs to worn when undertaken work activities
6. identify what materials and substances are dangerous and hazardous to health
7. explain how to maintain safe working and environmental practices throughout the duration of the work
8. describe how to minimise risks to self and others when undertaking work activities
9. state company work instruction, information and reporting systems and documentation
10. explain how to respond to the different types and categories of emergency situations that might occur
11. identify what fault finding and diagnostic tools, techniques and procedures should be used for a given purpose and situation
12. explain how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 634      Fault location and diagnosing faults on yaw systems and components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWE's and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the diagnosis of at least **two different faults** in wind turbine pitch systems and components.
2. You must provide evidence to show that you have used four of the following diagnostic techniques:
  - sight, sound, smell, touch
  - use of diagnostic test equipment
  - use of direct monitoring
  - seeking advice and other opinions
  - peripheral device responses
  - non destructive testing
  - functional tests
  - condition/sample/vibration analysis
3. You must provide evidence that you have carried out the fault diagnosis of at least **two from the following three**:
  - One mechanical fault.
  - One electrical fault.
  - One control fault.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor may observe you carrying out the diagnosis of faults on wind turbine systems and components against the required standards
- your assessor may also set up a realistic work environment (RWE) and assess how you locate and deal with a fault.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of faults or faulty equipment

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the fault finding methods and techniques
- showing that you know how to identify the various components and their possible faults
- showing that you understand fault analysis methods and techniques
- showing that you know and understand the possible risks arising from the faults
- showing that you know how to select the appropriate test equipment and how to test and look after it
- showing that you know the appropriate documentation and reporting lines and procedures

### **Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- AC motors, gearboxes, bearings, solenoids, brake systems
- Rotation sensors, limit switches

### **Faults**

Faults are within wind turbine systems, equipment and components and are of an electrical, mechanical or control and instrumentation origin. They may be indicated by:

- breakdowns
- performances out of specification
- deteriorating condition
- abnormal readings
- other data being returned
- safety issues
- environmental conditions

Faults may be intermittent or continual and may be relatively straight forward or difficult to diagnose.

## **Investigations**

Investigations are carried out to identify the location, nature and causes of a fault/faults. The sorts of investigation approach may include:

- sight, sound, smell, touch
- peripheral device responses
- use of direct monitoring
- condition/sample/vibration analysis
- oil, lubricant, gas sampling and analysis
- functional checks
- non destructive testing
- use of diagnostic test equipment
- seeking advice and opinions
- plant/component history records

Often a fault investigation will need to involve a range of approaches and the person carrying it out is responsible for determining and following up the information and diagnostic procedures needed to allow the nature of the problem to be clearly and accurately determined.

## **Records**

Maintaining documentation and fault report findings would include the use of text and diagrams, and may be documentary or computer-based. Documentary records follow standardised formats and may involve the completion of checklists and the writing of short descriptions of actions carried out and test results

Recording the tests and findings for communicating to a third party who will provide expert advice for further investigation when unable to identify fault. Ability to follow instructions given by third parties for fault investigation and provide useful feed back on outcome of applied instructions.

## Unit 635

# Fault location and diagnosing faults on converter systems and components

**Level:** 6  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for locating and diagnosing faults on wind turbine systems, equipment and components.

The faults that learners are investigating will be of an electrical, mechanical or control and instrumentation nature, either intermittent or continual. The faults may be associated with breakdowns, performance out of specification, deteriorating condition, abnormal readings or other returned data. The investigations may require a range of diagnostic approaches and learners will be responsible for determining and following up the information and procedures needed to allow the nature of the problem(s) to be clearly and accurately determined.

To meet the requirements of this unit the fault-finding carried out will not be of a straight forward nature and will require the investigation of a number of different pieces of plant and equipment and the application of several different techniques, before a conclusion can be drawn.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines and be able to; plan, prepare for and carry out fault location and diagnosis, use and communicate data and information and resolve problems.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated – obtaining authority to work on the turbine is required for all work including fault finding etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to locate and diagnose faults
2. Be able to prepare to locate and diagnose faults
3. Be able to locate and diagnose faults
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### **Support of the unit by a sector or other appropriate body**

This unit is endorsed by EU Skills.

### **Assessment**

This unit will be assessed by:

- a portfolio of evidence; **workplace performance evidence will be a mandatory component for at least one fault** identified.

## **Unit 635**

# **Fault location and diagnosing faults on converter systems and components**

### Outcome 1

Be able to plan to locate and diagnose faults

#### **Assessment Criteria**

The learner can:

1. determine work location using company documentation and information sources
2. determine the content and sequence of tasks needed to complete the work activity
3. conduct a site specific risk assessment in accordance with health and safety regulations
4. plan and carry out all work in line with company policy and work procedures.

## Unit 635

## Fault location and diagnosing faults on converter systems and components

### Outcome 2

Be able to prepare to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. select and prepare the tools and fault diagnostic equipment in accordance with work instructions and equipment specification
2. inform parties directly and indirectly responsible for completing work activity of the intended work plan in accordance with work instructions and health and safety regulations
3. select and wear the required personal protective equipment to complete work activities in accordance with health and safety regulations.

## Unit 635

# Fault location and diagnosing faults on converter systems and components

### Outcome 3

Be able to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. review and use all relevant information on the symptoms and problems associated with the fault
2. use diagnostic tools, techniques and procedures to locate the root cause of the fault in accordance with work instructions
3. locate the fault and recommend actions needed to effect a repair
4. determine the implications and impact the fault will have on other work and for safety considerations
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 635**

## **Fault location and diagnosing faults on converter systems and components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 635**

## **Fault location and diagnosing faults on converter systems and components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report findings of the fault diagnosis work in accordance with organisational requirements.

## **Unit 635**

## **Fault location and diagnosing faults on converter systems and components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 635**

## **Fault location and diagnosing faults on converter systems and components**

### Outcome 7

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 635

## Fault location and diagnosing faults on converter systems and components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. explain the processes, procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. explain the processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use and maintain fault diagnosis tools and equipment
5. identify what personal protective equipment needs to worn when undertaken work activities
6. identify what materials and substances are dangerous and hazardous to health
7. explain how to maintain safe working and environmental practices throughout the duration of the work
8. describe how to minimise risks to self and others when undertaking work activities
9. state company work instruction, information and reporting systems and documentation
10. explain how to respond to the different types and categories of emergency situations that might occur
11. identify what fault finding and diagnostic tools, techniques and procedures should be used for a given purpose and situation
12. explain how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 635      Fault location and diagnosing faults on converter systems and components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWE's and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the diagnosis of at least **two different faults** in wind turbine pitch systems and components.
2. You must provide evidence to show that you have used four of the following diagnostic techniques:
  - sight, sound, smell, touch
  - use of diagnostic test equipment
  - use of direct monitoring
  - seeking advice and other opinions
  - peripheral device responses
  - non destructive testing
  - functional tests
  - condition/sample/vibration analysis
3. You must provide evidence that you have carried out the fault diagnosis of at least **two from the following three**:
  - One mechanical fault.
  - One electrical fault.
  - One control fault.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor may observe you carrying out the diagnosis of faults on wind turbine systems and components against the required standards
- your assessor may also set up a realistic work environment (RWE) and assess how you locate and deal with a fault.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of faults or faulty equipment

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the fault finding methods and techniques
- showing that you know how to identify the various components and their possible faults
- showing that you understand fault analysis methods and techniques
- showing that you know and understand the possible risks arising from the faults
- showing that you know how to select the appropriate test equipment and how to test and look after it
- showing that you know the appropriate documentation and reporting lines and procedures

### **Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Converters: AC/DC – DC/AC
- Inverters, cables, contactors, switches, fuses, relays, protection equipment
- Synchronisation controllers
- Rotor position absolute encoder

### **Faults**

Faults are within wind turbine systems, equipment and components and are of an electrical, mechanical or control and instrumentation origin. They may be indicated by:

- breakdowns
- performances out of specification
- deteriorating condition
- abnormal readings
- other data being returned
- safety issues
- environmental conditions

Faults may be intermittent or continual and may be relatively straight forward or difficult to diagnose.

## **Investigations**

Investigations are carried out to identify the location, nature and causes of a fault/faults. The sorts of investigation approach may include:

- sight, sound, smell, touch
- peripheral device responses
- use of direct monitoring
- condition/sample/vibration analysis
- oil, lubricant, gas sampling and analysis
- functional checks
- non destructive testing
- use of diagnostic test equipment
- seeking advice and opinions
- plant/component history records

Often a fault investigation will need to involve a range of approaches and the person carrying it out is responsible for determining and following up the information and diagnostic procedures needed to allow the nature of the problem to be clearly and accurately determined.

## **Records**

Maintaining documentation and fault report findings would include the use of text and diagrams, and may be documentary or computer-based. Documentary records follow standardised formats and may involve the completion of checklists and the writing of short descriptions of actions carried out and test results

Recording the tests and findings for communicating to a third party who will provide expert advice for further investigation when unable to identify fault. Ability to follow instructions given by third parties for fault investigation and provide useful feed back on outcome of applied instructions.

## Unit 636

# Fault location and diagnosing faults on control systems and components

**Level:** 6  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for locating and diagnosing faults on wind turbine systems, equipment and components.

The faults that learners are investigating will be of an electrical, mechanical or control and instrumentation nature, either intermittent or continual. The faults may be associated with breakdowns, performance out of specification, deteriorating condition, abnormal readings or other returned data. The investigations may require a range of diagnostic approaches and learners will be responsible for determining and following up the information and procedures needed to allow the nature of the problem(s) to be clearly and accurately determined.

To meet the requirements of this unit the fault-finding carried out will not be of a straight forward nature and will require the investigation of a number of different pieces of plant and equipment and the application of several different techniques, before a conclusion can be drawn.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines and be able to; plan, prepare for and carry out fault location and diagnosis, use and communicate data and information and resolve problems.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated – obtaining authority to work on the turbine is required for all work including fault finding etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to locate and diagnose faults
2. Be able to prepare to locate and diagnose faults
3. Be able to locate and diagnose faults
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### **Support of the unit by a sector or other appropriate body**

This unit is endorsed by EU Skills.

### **Assessment**

This unit will be assessed by:

- a portfolio of evidence; **workplace performance evidence will be a mandatory component for at least one fault** identified.

## **Unit 636**

# **Fault location and diagnosing faults on control systems and components**

### Outcome 1

Be able to plan to locate and diagnose faults

#### **Assessment Criteria**

The learner can:

1. determine work location using company documentation and information sources
2. determine the content and sequence of tasks needed to complete the work activity
3. conduct a site specific risk assessment in accordance with health and safety regulations
4. plan and carry out all work in line with company policy and work procedures.

## Unit 636

# Fault location and diagnosing faults on control systems and components

### Outcome 2

Be able to prepare to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. select and prepare the tools and fault diagnostic equipment in accordance with work instructions and equipment specification
2. inform parties directly and indirectly responsible for completing work activity of the intended work plan in accordance with work instructions and health and safety regulations
3. select and wear the required personal protective equipment to complete work activities in accordance with health and safety regulations.

## Unit 636

# Fault location and diagnosing faults on control systems and components

### Outcome 3

Be able to locate and diagnose faults

#### Assessment Criteria

The learner can:

1. review and use all relevant information on the symptoms and problems associated with the fault
2. use diagnostic tools, techniques and procedures to locate the root cause of the fault in accordance with work instructions
3. locate the fault and recommend actions needed to effect a repair
4. determine the implications and impact the fault will have on other work and for safety considerations
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 636**

## **Fault location and diagnosing faults on control systems and components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 636**

## **Fault location and diagnosing faults on control systems and components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report findings of the fault diagnosis work in accordance with organisational requirements.

## **Unit 636**

## **Fault location and diagnosing faults on control systems and components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 636**

## **Fault location and diagnosing faults on control systems and components**

### **Outcome 7**

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 636

## Fault location and diagnosing faults on control systems and components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. explain the processes, procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. explain the processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use and maintain fault diagnosis tools and equipment
5. identify what personal protective equipment needs to worn when undertaken work activities
6. identify what materials and substances are dangerous and hazardous to health
7. explain how to maintain safe working and environmental practices throughout the duration of the work
8. describe how to minimise risks to self and others when undertaking work activities
9. state company work instruction, information and reporting systems and documentation
10. explain how to respond to the different types and categories of emergency situations that might occur
11. identify what fault finding and diagnostic tools, techniques and procedures should be used for a given purpose and situation
12. explain how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 636      Fault location and diagnosing faults on control systems and components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWE's and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the diagnosis of at least **two different faults** in wind turbine pitch systems and components.
2. You must provide evidence to show that you have used four of the following diagnostic techniques:
  - sight, sound, smell, touch
  - use of diagnostic test equipment
  - use of direct monitoring
  - seeking advice and other opinions
  - peripheral device responses
  - non destructive testing
  - functional tests
  - condition/sample/vibration analysis
3. You must provide evidence that you have carried out the fault diagnosis of at least **two from the following three**:
  - One mechanical fault.
  - One electrical fault.
  - One control fault.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor may observe you carrying out the diagnosis of faults on wind turbine systems and components against the required standards
- your assessor may also set up a realistic work environment (RWE) and assess how you locate and deal with a fault.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of faults or faulty equipment

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the fault finding methods and techniques
- showing that you know how to identify the various components and their possible faults
- showing that you understand fault analysis methods and techniques
- showing that you know and understand the possible risks arising from the faults
- showing that you know how to select the appropriate test equipment and how to test and look after it
- showing that you know the appropriate documentation and reporting lines and procedures

### **Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Programmable logic controllers
- Processors – parameters
- Digital I/O and interfacing
- Analogue I/O and interfacing
- Remote I/O
- Communications serial link and fibre optic
- External monitoring – IP addressing, networking, hub, switch
- Instrumentation – anemometer, windvane

### **Faults**

Faults are within wind turbine systems, equipment and components and are of an electrical, mechanical or control and instrumentation origin. They may be indicated by:

- breakdowns
- performances out of specification
- deteriorating condition
- abnormal readings
- other data being returned
- safety issues
- environmental conditions

Faults may be intermittent or continual and may be relatively straight forward or difficult to diagnose.

## **Investigations**

Investigations are carried out to identify the location, nature and causes of a fault/faults. The sorts of investigation approach may include:

- sight, sound, smell, touch
- peripheral device responses
- use of direct monitoring
- condition/sample/vibration analysis
- oil, lubricant, gas sampling and analysis
- functional checks
- non destructive testing
- use of diagnostic test equipment
- seeking advice and opinions
- plant/component history records

Often a fault investigation will need to involve a range of approaches and the person carrying it out is responsible for determining and following up the information and diagnostic procedures needed to allow the nature of the problem to be clearly and accurately determined.

## **Records**

Maintaining documentation and fault report findings would include the use of text and diagrams, and may be documentary or computer-based. Documentary records follow standardised formats and may involve the completion of checklists and the writing of short descriptions of actions carried out and test results

Recording the tests and findings for communicating to a third party who will provide expert advice for further investigation when unable to identify fault. Ability to follow instructions given by third parties for fault investigation and provide useful feed back on outcome of applied instructions.

## Unit 637

# Fault location and diagnosing faults on low voltage systems and components

**Level:** 6  
**Credit value:** 10

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for locating and diagnosing faults on wind turbine systems, equipment and components.

The faults that learners are investigating will be of an electrical, mechanical or control and instrumentation nature, either intermittent or continual. The faults may be associated with breakdowns, performance out of specification, deteriorating condition, abnormal readings or other returned data. The investigations may require a range of diagnostic approaches and learners will be responsible for determining and following up the information and procedures needed to allow the nature of the problem(s) to be clearly and accurately determined.

To meet the requirements of this unit the fault-finding carried out will not be of a straight forward nature and will require the investigation of a number of different pieces of plant and equipment and the application of several different techniques, before a conclusion can be drawn.

Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines and be able to; plan, prepare for and carry out fault location and diagnosis, use and communicate data and information and resolve problems.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated – obtaining authority to work on the turbine is required for all work including fault finding etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to locate and diagnose faults
2. Be able to prepare to locate and diagnose faults
3. Be able to locate and diagnose faults
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **50** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### **Support of the unit by a sector or other appropriate body**

This unit is endorsed by EU Skills.

### **Assessment**

This unit will be assessed by:

- a portfolio of evidence; **workplace performance evidence will be a mandatory component for at least one fault** identified.

## **Unit 637**

# **Fault location and diagnosing faults on low voltage systems and components**

### Outcome 1

Be able to plan to locate and diagnose faults

#### **Assessment Criteria**

The learner can:

1. determine work location using company documentation and information sources
2. determine the content and sequence of tasks needed to complete the work activity
3. conduct a site specific risk assessment in accordance with health and safety regulations
4. plan and carry out all work in line with company policy and work procedures.

## **Unit 637**

# **Fault location and diagnosing faults on low voltage systems and components**

## **Outcome 2**

Be able to prepare to locate and diagnose faults

### **Assessment Criteria**

The learner can:

1. select and prepare the tools and fault diagnostic equipment in accordance with work instructions and equipment specification
2. inform parties directly and indirectly responsible for completing work activity of the intended work plan in accordance with work instructions and health and safety regulations
3. select and wear the required personal protective equipment to complete work activities in accordance with health and safety regulations.

## **Unit 637**

# **Fault location and diagnosing faults on low voltage systems and components**

## **Outcome 3**

Be able to locate and diagnose faults

### **Assessment Criteria**

The learner can:

1. review and use all relevant information on the symptoms and problems associated with the fault
2. use diagnostic tools, techniques and procedures to locate the route cause of the fault in accordance with work instructions
3. locate the fault and recommend actions needed to effect a repair
4. determine the implications and impact the fault will have on other work and for safety considerations
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 637**

## **Fault location and diagnosing faults on low voltage systems and components**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. leave the work area in a condition which is in line with good housekeeping practice.

## **Unit 637**

# **Fault location and diagnosing faults on low voltage systems and components**

### Outcome 5

Be able to use and communicate data and information

#### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and supporting documentation
3. maintain documentation and report findings of the fault diagnosis work in accordance with organisational requirements.

## **Unit 637**

# **Fault location and diagnosing faults on low voltage systems and components**

### Outcome 6

Be able to resolve problems effectively and efficiently

#### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 637**

## **Fault location and diagnosing faults on low voltage systems and components**

### **Outcome 7**

Know and understand how to use general knowledge

#### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state the company policies and procedures that directly impact on the work to be undertaken.

## Unit 637

## Fault location and diagnosing faults on low voltage systems and components

### Outcome 8

Know and understand how to use industry and context specific knowledge

#### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. explain the processes, procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. explain the processes and procedures to be followed for inspecting and preparing tools and equipment prior to use
4. read and interpret instructions on how to use and maintain fault diagnosis tools and equipment
5. identify what personal protective equipment needs to worn when undertaken work activities
6. identify what materials and substances are dangerous and hazardous to health
7. explain how to maintain safe working and environmental practices throughout the duration of the work
8. describe how to minimise risks to self and others when undertaking work activities
9. state company work instruction, information and reporting systems and documentation
10. explain how to respond to the different types and categories of emergency situations that might occur
11. identify what fault finding and diagnostic tools, techniques and procedures should be used for a given purpose and situation
12. explain how to recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 637      Fault location and diagnosing faults on low voltage systems and components

## Notes for guidance

### Assessment in a Realistic Work Environment (RWE)

Organisations wishing to operate a realistic work environment must operate an environment which reflects a real work setting. This will ensure any competence achieved in this way will be sustained in real employment. (See Energy & Utility Skills assessment strategy for vocational qualifications)

When a Nacelle is used in a realistic work environment (RWE) it should be at a minimum height above ground level of 2 metres.

Note. Test rigs are not considered to be RWE's and should be used for training not assessment.

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

1. You need to provide evidence to show that you have carried out the diagnosis of at least **two different faults** in wind turbine pitch systems and components.
2. You must provide evidence to show that you have used four of the following diagnostic techniques:
  - sight, sound, smell, touch
  - use of diagnostic test equipment
  - use of direct monitoring
  - seeking advice and other opinions
  - peripheral device responses
  - non destructive testing
  - functional tests
  - condition/sample/vibration analysis
3. You must provide evidence that you have carried out the fault diagnosis of at least **two from the following three**:
  - One mechanical fault.
  - One electrical fault.
  - One control fault.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### **Assessor observation of work activities**

- your assessor may observe you carrying out the diagnosis of faults on wind turbine systems and components against the required standards
- your assessor may also set up a realistic work environment (RWE) and assess how you locate and deal with a fault.

### **Reports and records**

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- candidate reports supported by product evidence
- witness testimonies from colleagues and others who understand the requirements of this unit
- pictures/photos of faults or faulty equipment

### **Written or spoken questioning**

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand engineering drawings and related specifications
- showing that you understand the fault finding methods and techniques
- showing that you know how to identify the various components and their possible faults
- showing that you understand fault analysis methods and techniques
- showing that you know and understand the possible risks arising from the faults
- showing that you know how to select the appropriate test equipment and how to test and look after it
- showing that you know the appropriate documentation and reporting lines and procedures

### **Components**

Components are the integral parts of the wind turbine system without which they cannot function correctly and may include the following examples:

- Generator and associated equipment
- Motors, transformers
- Bus bars, circuit breakers, contactors, cables, switches, fuses, relays, protection equipment
- Single and three phase power supplies – UPS – ELV

### **Faults**

Faults are within wind turbine systems, equipment and components and are of an electrical, mechanical or control and instrumentation origin. They may be indicated by:

- breakdowns
- performances out of specification
- deteriorating condition
- abnormal readings
- other data being returned
- safety issues
- environmental conditions

Faults may be intermittent or continual and may be relatively straight forward or difficult to diagnose.

## **Investigations**

Investigations are carried out to identify the location, nature and causes of a fault/faults. The sorts of investigation approach may include:

- sight, sound, smell, touch
- peripheral device responses
- use of direct monitoring
- condition/sample/vibration analysis
- oil, lubricant, gas sampling and analysis
- functional checks
- non destructive testing
- use of diagnostic test equipment
- seeking advice and opinions
- plant/component history records

Often a fault investigation will need to involve a range of approaches and the person carrying it out is responsible for determining and following up the information and diagnostic procedures needed to allow the nature of the problem to be clearly and accurately determined.

## **Records**

Maintaining documentation and fault report findings would include the use of text and diagrams, and may be documentary or computer-based. Documentary records follow standardised formats and may involve the completion of checklists and the writing of short descriptions of actions carried out and test results

Recording the tests and findings for communicating to a third party who will provide expert advice for further investigation when unable to identify fault. Ability to follow instructions given by third parties for fault investigation and provide useful feed back on outcome of applied instructions.

**Level:** 6

**Credit value:** 8

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for carrying out the configuration of wind turbine pitch systems. This unit is most likely to be applicable following maintenance/fault finding work or when a new or replacement system has been fitted which subsequently requires the pitch system to be set up. Pitch systems can be configured whilst in service, or when isolated/on test

Learners should be complying with recommended methods, techniques and procedures and must report any difficulties which cannot be resolved. Learners must ensure that on completion of this activity the pitch system works to operational requirements. Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, keep others informed and complete the relevant documentation.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Obtaining authority to work on the turbine is required for all work including fault finding, configurations, testing etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to configure pitch systems
2. Be able to prepare to configure pitch systems
3. Be able to configure pitch systems
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **40** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- portfolio of evidence; it is recommended that workplace performance evidence be a mandatory component for this unit.

## **Unit 642**

## **Configure pitch systems**

Outcome 1

Be able to plan to configure pitch systems

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 642**

Outcome 2

## **Configure pitch systems**

Be able to prepare to configure pitch systems

### **Assessment Criteria**

The learner can:

1. inspect, prepare and carry out pre use checks on tools equipment in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment when completing work activities in accordance with health and safety regulations
3. locate and establish the pitch systems to be configured in accordance with authorisation procedures and work instructions.

## Unit 642

Outcome 3

## Configure pitch systems

Be able to configure pitch systems

### Assessment Criteria

The learner can:

1. comply with control measures in line with safe control systems requirements
2. follow prescribed setting-up procedures for the equipment to be configured
3. configure the system in accordance with work instructions and operating specifications
4. check the configured system meets its specified operating parameters and performance requirements
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 642**

Outcome 4

## **Configure pitch systems**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and substances in accordance with company procedures, health and safety and environmental regulations
3. leave the work area in a condition which is consistent with good housekeeping practice.

## **Unit 642**

Outcome 5

## **Configure pitch systems**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and documentation
3. report results and findings test activities.

## **Unit 642**

Outcome 6

## **Configure pitch systems**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 642**

Outcome 7

## **Configure pitch systems**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 642

### Outcome 8

## Configure pitch systems

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. read and interpret the procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. identify what personal protective equipment needs to worn when undertaken work activities
4. explain how to maintain safe working and environmental practices throughout the duration of the work
5. explain how to minimise risks to self and others when undertaking work activities
6. identify company work instruction, information and reporting systems and documentation
7. explain how to respond to the different types and categories of emergency situations that might occur
8. explain how to read, interpret and apply prescribed “setting-up” documentation and procedures for configuring equipment
9. recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 642      Configure pitch systems

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have configured pitch systems on **two separate occasions**.
- Configuration may typically need to be carried out when plant characteristics change or replacement components have been fitted.
- You will need to provide evidence to show that the pitch system operated successfully when configuration had been completed.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe you configuring pitch systems, comparing this with the standards to be met

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- witness testimonies from colleagues and others who understand the requirements of this unit
- calibration/configuration sheets
- operation charts, logs or readouts that confirm the pitch system is working to the required standards

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various types of pitch systems used and the configuration methods, techniques and procedures
- showing that you understand configuration schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you are aware of the possible difficulties and have taken action to reduce them
- showing that you know the procedure to report any difficulties you find

### Pitch Systems

- Configuration is of pitch systems used within wind turbines.
- Pitch systems can be electrical or hydraulic
- Pitch systems can be configured stand alone or in sequence with other equipment.
- Pitch systems provide a means to stop a turbine in normal operation and in emergency situations, it is vital this function is tested as part of this unit.

### **Configuration procedures**

Configuration methods, techniques and procedures are tightly controlled and fully defined in the specification. The person carrying out the work is responsible for complying with those methods, techniques and procedures and must report any difficulties which cannot be resolved through their use. All configuration procedures are carried out in compliance with local rules and safety management systems.

Configurations may be relatively simple or complex to achieve. In all cases the standard to be reached is clearly identified in the specification for the item of plant, apparatus or equipment being configured. The person carrying out this role is responsible for ensuring that the required standard is achieved and that the configured item matches specifications.

### **Specification**

The specification to be achieved includes details of the quality standards and accuracy needed and may have been set by a manufacturer or the organisation. In the context of this unit, quality and acceptance levels are fully specified and can be readily achieved by following the specified configuration procedures detailed in the company manuals, switching schedules, safety documentation or other such documentation. The specification gives explicit instructions which must be followed.

**Level:** 6

**Credit value:** 8

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for carrying out the configuration of wind turbine yaw systems.

This unit is most likely to be applicable following maintenance/fault finding work or when a new or replacement system has been fitted which subsequently requires the pitch system to be set up. Pitch systems can be configured whilst in service, or when isolated/on test

Learners should be complying with recommended methods, techniques and procedures and must report any difficulties which cannot be resolved. Learners must ensure that on completion of this activity the pitch system works to operational requirements. Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, keep others informed and complete the relevant documentation.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Obtaining authority to work on the turbine is required for all work including fault finding, configurations, testing etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to configure yaw systems
2. Be able to prepare to configure yaw systems
3. Be able to configure yaw systems
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **40** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- portfolio of evidence; it is recommended that workplace performance evidence be a mandatory component for this unit.

## **Unit 643**

## **Configure yaw systems**

Outcome 1

Be able to plan to configure yaw systems

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 643**

Outcome 2

## **Configure yaw systems**

Be able to prepare to configure yaw systems

### **Assessment Criteria**

The learner can:

1. inspect, prepare and carry out pre use checks on tools equipment in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment when completing work activities in accordance with health and safety regulations
3. locate and establish the pitch systems to be configured in accordance with authorisation procedures and work instructions.

## Unit 643

Outcome 3

## Configure yaw systems

Be able to configure yaw systems

### Assessment Criteria

The learner can:

1. comply with control measures in line with safe control systems requirements
2. follow prescribed setting-up procedures for the equipment to be configured
3. configure the system in accordance with work instructions and operating specifications
4. check the configured system meets its specified operating parameters and performance requirements
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 643**

## **Configure yaw systems**

Outcome 4

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and substances in accordance with company procedures, health and safety and environmental regulations
3. leave the work area in a condition which is consistent with good housekeeping practice.

## **Unit 643**

Outcome 5

## **Configure yaw systems**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and documentation
3. report results and findings test activities.

## **Unit 643**

Outcome 6

## **Configure yaw systems**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 643**

Outcome 7

## **Configure yaw systems**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 643

### Outcome 8

## Configure yaw systems

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. read and interpret the procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. identify what personal protective equipment needs to worn when undertaken work activities
4. explain how to maintain safe working and environmental practices throughout the duration of the work
5. explain how to minimise risks to self and others when undertaking work activities
6. identify company work instruction, information and reporting systems and documentation
7. explain how to respond to the different types and categories of emergency situations that might occur
8. explain how to read, interpret and apply prescribed “setting-up” documentation and procedures for configuring equipment
9. recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 643      Configure yaw systems

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have configured pitch systems on **two separate occasions**.
- Configuration may typically need to be carried out when plant characteristics change or replacement components have been fitted.
- You will need to provide evidence to show that the pitch system operated successfully when configuration had been completed.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe you configuring pitch systems, comparing this with the standards to be met

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- witness testimonies from colleagues and others who understand the requirements of this unit
- calibration/configuration sheets
- operation charts, logs or readouts that confirm the pitch system is working to the required standards

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various types of pitch systems used and the configuration methods, techniques and procedures
- showing that you understand configuration schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you are aware of the possible difficulties and have taken action to reduce them
- showing that you know the procedure to report any difficulties you find

### Yaw Systems

- Configuration is of yaw systems used within wind turbines.
- Yaw systems can be electrical or mechanical/hydraulic.
- Yaw systems can be configured stand alone or in sequence with other equipment.

### **Configuration procedures**

Configuration methods, techniques and procedures are tightly controlled and fully defined in the specification. The person carrying out the work is responsible for complying with those methods, techniques and procedures and must report any difficulties which cannot be resolved through their use. All configuration procedures are carried out in compliance with local rules and safety management systems.

Configurations may be relatively simple or complex to achieve. In all cases the standard to be reached is clearly identified in the specification for the item of plant, apparatus or equipment being configured. The person carrying out this role is responsible for ensuring that the required standard is achieved and that the configured item matches specifications.

### **Specification**

The specification to be achieved includes details of the quality standards and accuracy needed and may have been set by a manufacturer or the organisation. In the context of this unit, quality and acceptance levels are fully specified and can be readily achieved by following the specified configuration procedures detailed in the company manuals, switching schedules, safety documentation or other such documentation. The specification gives explicit instructions which must be followed.

**Level:** 6

**Credit value:** 7

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for carrying out the configuration of wind turbine control systems.

This unit is most likely to be applicable following maintenance/fault finding work or when a new or replacement system has been fitted which subsequently requires the pitch system to be set up. Pitch systems can be configured whilst in service, or when isolated/on test

Learners should be complying with recommended methods, techniques and procedures and must report any difficulties which cannot be resolved. Learners must ensure that on completion of this activity the pitch system works to operational requirements. Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, keep others informed and complete the relevant documentation.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Obtaining authority to work on the turbine is required for all work including fault finding, configurations, testing etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to configure control systems
2. Be able to prepare to configure control systems
3. Be able to configure control systems
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **35** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- portfolio of evidence; it is recommended that workplace performance evidence be a mandatory component for this unit..

## **Unit 644**

## **Configure control systems**

Outcome 1

Be able to plan to configure control systems

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 644**

### **Outcome 2**

## **Configure control systems**

Be able to prepare to configure control systems

### **Assessment Criteria**

The learner can:

1. inspect, prepare and carry out pre use checks on tools equipment in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment when completing work activities in accordance with health and safety regulations
3. locate and establish the pitch systems to be configured in accordance with authorisation procedures and work instructions.

## **Unit 644**

Outcome 3

## **Configure control systems**

Be able to configure control systems

### **Assessment Criteria**

The learner can:

1. comply with control measures in line with safe control systems requirements
2. follow prescribed setting-up procedures for the equipment to be configured
3. configure the system in accordance with work instructions and operating specifications
4. check the configured system meets its specified operating parameters and performance requirements
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 644**

Outcome 4

## **Configure control systems**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and substances in accordance with company procedures, health and safety and environmental regulations
3. leave the work area in a condition which is consistent with good housekeeping practice.

## **Unit 644**

Outcome 5

## **Configure control systems**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and documentation
3. report results and findings test activities.

## **Unit 644**

Outcome 6

## **Configure control systems**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 644**

Outcome 7

## **Configure control systems**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 644

### Outcome 8

## Configure control systems

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. read and interpret the procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. identify what personal protective equipment needs to worn when undertaken work activities
4. explain how to maintain safe working and environmental practices throughout the duration of the work
5. explain how to minimise risks to self and others when undertaking work activities
6. identify company work instruction, information and reporting systems and documentation
7. explain how to respond to the different types and categories of emergency situations that might occur
8. explain how to read, interpret and apply prescribed “setting-up” documentation and procedures for configuring equipment
9. recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 644      Configure control systems

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have configured pitch systems on **two separate occasions**.
- Configuration may typically need to be carried out when plant characteristics change or replacement components have been fitted.
- You will need to provide evidence to show that the pitch system operated successfully when configuration had been completed.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe you configuring pitch systems, comparing this with the standards to be met

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- witness testimonies from colleagues and others who understand the requirements of this unit
- calibration/configuration sheets
- operation charts, logs or readouts that confirm the pitch system is working to the required standards

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various types of pitch systems used and the configuration methods, techniques and procedures
- showing that you understand configuration schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you are aware of the possible difficulties and have taken action to reduce them
- showing that you know the procedure to report any difficulties you find

## **Control Systems**

- Configuration is of control systems used within wind turbines.
- Control systems can consist of main system controller with sub controllers, possibly a main controller for overall turbine control with sub controllers for pitch and converter for example they are generally microprocessor/PLC based. The control systems need to interface/communicate together.
- Control systems can be for; power factor correction, pitch control, condition monitoring, and power output control.
- Control systems can be configured stand alone or in sequence with other equipment.

## **Configuration procedures**

Configuration methods, techniques and procedures are tightly controlled and fully defined in the specification. The person carrying out the work is responsible for complying with those methods, techniques and procedures and must report any difficulties which cannot be resolved through their use. All configuration procedures are carried out in compliance with local rules and safety management systems.

Configurations may be relatively simple or complex to achieve. In all cases the standard to be reached is clearly identified in the specification for the item of plant, apparatus or equipment being configured. The person carrying out this role is responsible for ensuring that the required standard is achieved and that the configured item matches specifications.

## **Specification**

The specification to be achieved includes details of the quality standards and accuracy needed and may have been set by a manufacturer or the organisation. In the context of this unit, quality and acceptance levels are fully specified and can be readily achieved by following the specified configuration procedures detailed in the company manuals, switching schedules, safety documentation or other such documentation. The specification gives explicit instructions which must be followed.

**Level:** 6

**Credit value:** 7

### Unit aim

This unit is suitable for learners who are responsible for and have the appropriate level of authority for carrying out the configuration of wind turbine converter systems.

This unit is most likely to be applicable following maintenance/fault finding work or when a new or replacement system has been fitted which subsequently requires the pitch system to be set up. Pitch systems can be configured whilst in service, or when isolated/on test

Learners should be complying with recommended methods, techniques and procedures and must report any difficulties which cannot be resolved. Learners must ensure that on completion of this activity the pitch system works to operational requirements. Learners should work safely at all times, complying with health and safety and other relevant regulations and guidelines, keep others informed and complete the relevant documentation.

The person carrying out the function has responsibility for ensuring that it is safe to carry out the work. This includes obtaining the authority to proceed, such as the appropriate safety clearance (eg. Permit for Work/Approved Written Procedure AWP (WTSR)) and confirming that the services to the item are isolated. Obtaining authority to work on the turbine is required for all work including fault finding, configurations, testing etc.

### Learning outcomes

There are **eight** learning outcomes to this unit. The learner will:

1. Be able to plan to configure converter systems
2. Be able to prepare to configure converter systems
3. Be able to configure converter systems
4. Be able to restore and reinstate work location
5. Be able to use and communicate data and information
6. Be able to resolve problems effectively and efficiently
7. Know and understand how to use general knowledge
8. Know and understand how to use industry and context specific knowledge

### Guided learning hours

It is recommended that **35** hours should be allocated for this unit, although patterns of delivery are likely to vary.

### Support of the unit by a sector or other appropriate body

This unit is endorsed by EU Skills.

### Assessment

This unit will be assessed by:

- portfolio of evidence; it is recommended that workplace performance evidence be a mandatory component for this unit.

## **Unit 645**

## **Configure converter systems**

Outcome 1

Be able to plan to configure converter systems

### **Assessment Criteria**

The learner can:

1. determine the work location using company documentation and work instructions
2. conduct a site specific risk assessment in accordance with health and safety regulations
3. determine the content and sequence of tasks needed to complete the work activity
4. inform parties directly and indirectly responsible for completing the work activity of the work plan
5. plan and carry out all work in line with company policy and work procedures.

## **Unit 645**

Outcome 2

## **Configure converter systems**

Be able to prepare to configure converter systems

### **Assessment Criteria**

The learner can:

1. inspect, prepare and carry out pre use checks on tools equipment in accordance with work instructions and equipment specifications
2. select and wear required personal protective equipment when completing work activities in accordance with health and safety regulations
3. locate and establish the pitch systems to be configured in accordance with authorisation procedures and work instructions.

## Unit 645

Outcome 3

## Configure converter systems

Be able to configure converter systems

### Assessment Criteria

The learner can:

1. comply with control measures in line with safe control systems requirements
2. follow prescribed setting-up procedures for the equipment to be configured
3. configure the system in accordance with work instructions and operating specifications
4. check the configured system meets its specified operating parameters and performance requirements
5. follow and maintain safe working and environment practices in accordance with health and safety regulations and environmental legislation throughout the duration of the work.

## **Unit 645**

Outcome 4

## **Configure converter systems**

Be able to restore and reinstate work location

### **Assessment Criteria**

The learner can:

1. store tools and equipment on completion of the work activity
2. dispose of waste materials and substances in accordance with company procedures, health and safety and environmental regulations
3. leave the work area in a condition which is consistent with good housekeeping practice.

## **Unit 645**

Outcome 5

## **Configure converter systems**

Be able to use and communicate data and information

### **Assessment Criteria**

The learner can:

1. report unavailable or defective tools, equipment and resources
2. read and interpret company work instructions and documentation
3. report results and findings test activities.

## **Unit 645**

Outcome 6

## **Configure converter systems**

Be able to resolve problems effectively and efficiently

### **Assessment Criteria**

The learner can:

1. deal with problems within the limits of own job role responsibility
2. report problems outside job role responsibility to designated personnel.

## **Unit 645**

Outcome 7

## **Configure converter systems**

Know and understand how to use general knowledge

### **Assessment Criteria**

The learner can:

1. state the main principles of health and safety and environmental legislation and regulations
2. state the company reporting lines and authorisation roles and responsibilities
3. state company policies and procedures that directly impact on the work to be undertaken.

## Unit 645

### Outcome 8

## Configure converter systems

Know and understand how to use industry and context specific knowledge

### Assessment Criteria

The learner can:

1. explain the company procedures and processes for reporting problems with tools and equipment
2. read and interpret the procedures and information sources used to make sure that tools and equipment are fit for purpose and safe to use
3. identify what personal protective equipment needs to worn when undertaken work activities
4. explain how to maintain safe working and environmental practices throughout the duration of the work
5. explain how to minimise risks to self and others when undertaking work activities
6. identify company work instruction, information and reporting systems and documentation
7. explain how to respond to the different types and categories of emergency situations that might occur
8. explain how to read, interpret and apply prescribed “setting-up” documentation and procedures for configuring equipment
9. recognise and report inaccurate and incorrect work instructions and documentation.

# Unit 645      Configure converter systems

## Notes for guidance

### Evidence requirements

You need to provide evidence to show that the way you work matches the National Standard. To do this you will need to cover the requirements below:

- You need to provide evidence to show that you have configured pitch systems on **two separate occasions**.
- Configuration may typically need to be carried out when plant characteristics change or replacement components have been fitted.
- You will need to provide evidence to show that the pitch system operated successfully when configuration had been completed.

### Examples of evidence

Evidence can come in several different forms. You and your assessor will need to decide what evidence it would be best for you to provide in your particular circumstances. To give you some ideas, here are a few examples:

### Assessor observation of work activities

- your assessor may observe you configuring pitch systems, comparing this with the standards to be met

### Reports and records

- log books, job reports and other work related documentation that show you have successfully carried out this type of work and when
- witness testimonies from colleagues and others who understand the requirements of this unit
- calibration/configuration sheets
- operation charts, logs or readouts that confirm the pitch system is working to the required standards

### Written or spoken questioning

- showing that you are aware of current health and safety implications with regard to this work activity
- showing that you understand the various types of pitch systems used and the configuration methods, techniques and procedures
- showing that you understand configuration schedules and related specifications
- showing that you understand the limits of your personal authority
- showing that you are aware of the possible difficulties and have taken action to reduce them
- showing that you know the procedure to report any difficulties you find

### Converter Systems

- Configuration is of converter systems used within wind turbines.
- They can include elements of AC and/or DC processes and can be configured stand alone or in sequence with other equipment.

## **Configuration procedures**

Configuration methods, techniques and procedures are tightly controlled and fully defined in the specification. The person carrying out the work is responsible for complying with those methods, techniques and procedures and must report any difficulties which cannot be resolved through their use. All configuration procedures are carried out in compliance with local rules and safety management systems.

Configurations may be relatively simple or complex to achieve. In all cases the standard to be reached is clearly identified in the specification for the item of plant, apparatus or equipment being configured. The person carrying out this role is responsible for ensuring that the required standard is achieved and that the configured item matches specifications.

## **Specification**

The specification to be achieved includes details of the quality standards and accuracy needed and may have been set by a manufacturer or the organisation. In the context of this unit, quality and acceptance levels are fully specified and can be readily achieved by following the specified configuration procedures detailed in the company manuals, switching schedules, safety documentation or other such documentation. The specification gives explicit instructions which must be followed.

# **Appendix 1 Sources of general information**

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on [www.cityandguilds.com](http://www.cityandguilds.com).

**Centre Guide – Delivering International Qualifications** contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

### ***Providing City & Guilds qualifications – a guide to centre and qualification approval***

contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

**Ensuring quality** contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:

- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

**Access to Assessment & Qualifications** provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden**  
Find out how to register and certificate candidates on line
- **Events**  
Contains dates and information on the latest Centre events
- **Online assessment**  
Contains information on how to register for GOLLA assessments.

City & Guilds  
**Skills for a brighter future**



[www.cityandguilds.com](http://www.cityandguilds.com)

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# Useful contacts

## UK learners

### General qualification information

E: [learnersupport@cityandguilds.com](mailto:learnersupport@cityandguilds.com)

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## International learners

General qualification information

E: [intcg@cityandguilds.com](mailto:intcg@cityandguilds.com)

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## Centres

Exam entries, Registrations/enrolment, Certificates, Invoices, Missing or late exam materials, Nominal roll reports, Results

E: [centresupport@cityandguilds.com](mailto:centresupport@cityandguilds.com)

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## Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

E: [singlesubjects@cityandguilds.com](mailto:singlesubjects@cityandguilds.com)

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## International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

E: [intops@cityandguilds.com](mailto:intops@cityandguilds.com)

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## Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, GOLLA, Navigation, User/menu option, Problems

E: [walledgarden@cityandguilds.com](mailto:walledgarden@cityandguilds.com)

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## Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: [business\\_unit@cityandguilds.com](mailto:business_unit@cityandguilds.com)

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## Publications

Logbooks, Centre documents, Forms, Free literature

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**Published by City & Guilds  
1 Giltspur Street  
London  
EC1A 9DD  
[www.cityandguilds.com](http://www.cityandguilds.com)**

**A company registered in England  
and Wales (company number  
16513878)**