Wind Turbine Technician Skill Standards

TEXAS WORKFORCE INVESTMENT COUNCIL

WIND TURBINE TECHNICIAN SKILL STANDARDS

Critical Work Function	Key Activity	Key Activity	Key Activity	Key Activity
1. Operate and maintain wind turbine equipment and machinery	1.1 Assist with installation/commissioning of wind turbines	1.2 Start up wind turbine operation	1.3 Monitor wind turbine operation	1.4 Maintain and repair wind turbine parts and equipment
2. Perform Diagnostic and Repair Activities	2.1 Conduct condition analysis	2.2 Troubleshoot electrical/electronic system malfunctions		
3. Conduct General Maintenance Activities	3.1 Conduct scheduled maintenance on structural components and rotating equipment	3.2 Conduct material condition inspections	3.3 Conduct facilities maintenance	3.4 Keep records and maintain documentation
4. Conduct Mechanical Maintenance	4.1 Operate and maintain hydraulic systems	4.2 Operate and maintain heating/cooling system	4.3 Diagnose and repair mechanical malfunctions	
5. Maintain Electrical System	5.1 Assemble and maintain electronic, electrical, or electromechanical equipment	5.2 Conduct electrical inspection and testing	5.3 Service wiring and circuitry components	
6. Maintain and Follow Safety Procedures	6.1 Communicate site safety information	6.2 Respond to emergencies	6.3 Conduct site safety inspections	6.4 Maintain tools and equipment

Occupational Title: Wind Turbine Technician			
Critical Work Function 1. Operate and Maintain Wind Turbine Equipment and Machinery		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
1.1 Assist with installation and commissioning of wind turbines	1.1.1 Contractor installation and testing is monitored and reported 1.1.2 Appropriate quality control inspections on repairs and maintenance functions provided by subcontractors are conducted 1.1.3 Damage to or incorrect placement of equipment is reported 1.1.4 Equipment/materials needed for repair/service work are hoisted according to required safety guidelines. 1.1.5 Inspection reports are prepared presented as required. 1.1.6 Tag line is properly secured for assistance with rigging activities	Cranes and rigging Emergency procedures Fall protection procedures General electrical safety Lockout/tagout procedures Rigging procedures Tower climb/rescue procedures	Climbing harness Emergency descent devices Flashlight and inspection mirror Generator alignment kit Hoist Lockout tags and padlocks Multimeter Personal protective equipment Schematics, charts, diagrams Torque wrench Two-way radio/cell phone
1.2 Start up wind turbine operation	1.2.1 Appropriate communication with remote access individuals to start or stop machine occurs 1.2.2 Gearbox, generator, and main bearing are adjusted according to manufacturer specifications 1.2.3 Measuring and control devices such as sensors, accumulators and actuators are adjusted to exact position, as defined by manufacturer specifications 1.2.4 Turbine feedback control loops are adjusted to manufacturer specifications 1.2.5 Startup checklist and procedures are followed.	Computers and electronics Electrical systems and equipment Fall protection procedures General electrical safety Lockout/tagout procedures Wind turbine manufacturer specific safety policies and procedures	Clamp-on ammeter Climbing harness Emergency descent devices Lockout tags and padlocks Lubricants Multimeter Personal protective equipment Schematics, charts, diagrams Torque wrench Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 1. Operate and Maintain Wind Turbine Equipment and Machinery		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
1.3 Monitor wind turbine operation	1.3.1 Alarms/fault codes on wind turbine computer network system are monitored and appropriate action taken, including communication to supervisors 1.3.2 Computer equipment is maintained according to manufacturing specification 1.3.3 Site supervisor is informed of work in progress 1.3.4 Appropriate communication procedures are established within the team 1.3.5 Appropriate communication occurs to landowners and other members of the public per company guidelines 1.3.6 Wind turbine conditions are reported to site supervisor as appropriate 1.3.7 Wind turbine data is collected for research or analysis as required by company policy 1.3.8 Information/documentation needed to carry out the operation is collected as required 1.3.9 Managerial or supervisory personnel are consulted as necessary or as required by company policy 1.3.10 Appropriate staff coverage for work to be performed is established 1.3.11 Environmental variables such as wind speed and weather changes are monitored and appropriate operational or maintenance actions executed	Computers and electronics Electrical systems and equipment Fault code procedures Industrial controls and motors Turbine specific networking system Wind turbine manufacturer specific safety policies and procedures	Binoculars Climbing harness Multimeter Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone SCADA data

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 1. Operate and Maintain Wind Turbine Equipment and Machinery		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
1.4 Maintain and repair wind turbine parts and equipment	1.4.1 Machine/equipment is shut down as appropriate to ensure safety for equipment repairs 1.4.2 Pre-identified or unidentified faults in wind turbine are appropriately located and resolved. 1.4.3 Interconnecting cables are maintained according to manufacturer requirements 1.4.4 Measuring and control devices are repaired according to manufacturer specifications 1.4.5. Turbine corrosion is rectified to ensure proper operation 1.4.6 Wind turbine generator is repaired according to manufacturer specification 1.4.7 Wind turbine service reports are regularly reviewed and updated as required. 1.4.8 Tower climbing safety procedures are followed 1.4.9 Rotor blades are replaced when determined defective, as indicated by manufacturer specification	Confined space entry Electrical systems and equipment Hydraulic/pneumatic systems and equipment Inspection procedures Lockout/tagout procedures Mechanical systems and equipment Tower climb/rescue procedures	Clamp-on ammeter Climbing harness Emergency descent devices Lockout tags and padlocks Multimeter Personal protective equipment Schematics, charts, diagrams Tensioner pump Torque wrench Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 1: Operate and Maintain Wind Turbine Equipment and Machinery

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 1 Operate and Maintain Wind Turbine Equipment and Machinery																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	3	3	3	3	3	4	3	3	3	2	3	3	2

Statement of Assessment for Critical Work Function 1:

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills.
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

Occupational Title: Wind Turbine Technician			
Critical Work Function 2. Perform Diagnostic and Repair Activities		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
2.1 Conduct condition analysis	2.1.1 Reported fault data is analyzed and appropriate corrective action determined 2.1.2 Appropriate options for gaining access to rotor blades are exercised 2.1.3 Nominal and actual conditions are compared and documented 2.1.4 Detailed blueprints, schematics, specifications, or technical drawings are used as appropriate to troubleshoot problems 2.1.5 Troubleshooting assignments are planned according to determination of corrective action and company site policy	Computers and electronics Electrical systems and equipment Fault code procedures Hydraulic/pneumatic systems and equipment Mechanical systems and equipment Turbine specific networking system	Circuit tester Clamp-on ammeter Climbing harness Flashlight and inspection mirror Infrared testers Multimeter Personal protective equipment Schematics, charts, diagrams SCADA data
2.2 Troubleshoot electrical/electronic system malfunctions	2.2.1 Input/output modules (AC and DC) are examined and malfunction is accurately identified 2.2.2 Memory modules (AC and DC) are examined and malfunction is accurately identified 2.2.3 Programmable logic control (PLC) operations are analyzed and malfunction is accurately identified 2.2.4 Proper lockout/tagout procedures are demonstrated 2.2.5 Computer equipment operations are tested to ensure software is in proper working order	Computers and electronics Electrical systems and equipment Fault code procedures General electrical safety Industrial controls and motors Lockout/tagout procedures	Clamp-on ammeter Climbing harness Emergency descent devices Lockout tags and padlocks Megohmmeter Multimeter Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone Wire stripping tools

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 2: Perform Diagnostic and Repair Activities

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 2 Perform Diagnostic and Repair Activities																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	4	4	3	3	3	4	3	3	2	2	3	3	2

Statement of Assessment for Critical Work Function 2:

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

Occupational Title: Wind Turbine Technician			
Critical Work Function 3. Conduct General Maintenance Activities		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
3.1 Conduct scheduled maintenance on structural components and rotating equipment	3.1.1 Oil, dust filter, and drying agents are changed according to maintenance schedule 3.1.2 Components are checked for corrosion according to maintenance schedule 3.1.3 Torque on bolts is verified and determined adequate in accordance with preventative maintenance guidelines to ensure safety 3.1.4 Remote monitoring system is placed in appropriate status 3.1.5 Equipment or machinery is cleaned according to manufacturer specification to ensure optimum performance 3.1.6 Lubricants, coolants, and hydraulic systems are filled up according to manufacturer specification and are at correct levels for safe operation 3.1.7 Equipment is lubricated according to service plan 3.1.8 Samples of lubricants, coolants, and hydraulic systems are taken to meet specifications 3.1.9 Proper electrical lockout/tagout procedures are demonstrated 3.1.10 Appropriate tools gathered to conduct necessary work	Confined space entry Hydraulic/pneumatic systems and equipment Inspection procedures Lockout/tagout procedures Mechanical systems and equipment Tower climb/rescue procedures	Climbing harness Emergency descent devices Generator alignment kit Personal protective equipment Tensioner pump Torque wrench Torque multiplier Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 3. Conduct General Maintenance Activities		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
3.2 Conduct material condition inspections	3.2.1 Rotor blades are inspected visually for damage and abnormal conditions reported as appropriate 3.2.2 Symptoms of overloading such as seals, leaks, abrasions, cracks, moisture, and noise levels are investigated and documented 3.2.3 Turbine condition is inspected for deteriorating material condition before approaching	Electrical systems and equipment Hydraulic/pneumatic systems and equipment Inspection procedures Lockout/tagout procedures Mechanical systems and equipment Wind turbine manufacturer specific safety policies and procedures	Binoculars Cleaning agents Climbing harness Emergency descent devices Flashlight and inspection mirror Lockout tags and padlocks Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone
3.3 Conduct facilities maintenance	3.3.1 Structural surfaces are painted according to manufacturer specification 3.3.2 Service/utility trucks are maintained according to manufacturer specification	Electrical systems and equipment Environmental protection procedures Fire extinguisher procedures Hazardous materials regulation Inspection procedures Inventory control Mechanical systems and equipment	Cleaning agents Fire extinguisher Infrared testers Lockout tags and padlocks Multimeter Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone
3.4 Keep records and maintain documentation	3.4.1 Parts used for the repair/maintenance of wind turbines are documented as required by company policy. 3.4.2 Time worked on the repair/maintenance of wind turbines is documented as required by company policy 3.4.3 Tower component history is current and up to date, including an accurate recording of fault types 3.4.4 Equipment logs are up to date 3.4.5 Parts inventories are accurate with respect to log sheets compared with physical count	Computers and electronics Hazardous materials regulation Inspection procedures Inventory control	Laptop computer Schematics, charts, diagrams

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 3: Conduct General Maintenance Activities

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 3: Conduct General Maintenance Activities																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	2	2

Statement of Assessment for Critical Work Function 3:

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

Occupational Title: Wind Turbine Technician			
Critical Work Function 4. Conduct Mechanical Maintenance		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
4.1 Operate and maintain hydraulic systems	4.1.1 Pressure and flow metering devices are calibrated to manufacturer specification 4.1.2 Hydraulic equipment, components, and/or system are inspected according to established maintenance schedule 4.1.3 Hydraulic systems, actuators, and valves are serviced according to manufacturer specification 4.1.4 High torque pump is controlled according to what manufacturer specification 4.1.5 Hydraulic accumulator is tested pre-charge according to manufacturer specification 4.1.6 Valves and accumulators are without leaks upon inspection 4.1.7 Hydraulic system malfunctions are diagnosed and repaired according to manufacturer specification 4.1.8 Hydraulic accumulator and other components are replaced according to manufacturer maintenance schedules	Electrical systems and equipment Environmental protection procedures Hydraulic/pneumatic systems and equipment Lockout/tagout procedures Mechanical systems and equipment	Climbing harness Gasket sealant Gaskets Lockout tags and padlocks Multimeter Personal protective equipment Pressure gauge Schematics, charts, diagrams Two-way radio/cell phone
4.2 Operate and maintain heating/cooling system	4.2.1 Heat shrink or connecting lug interconnecting cables are maintained according to industry standard 4.2.2 Heat distributing units are repaired and in functional working order 4.2.3 Radiator cooling unit is repaired and/or replaced according to manufacturer specification	Electrical systems and equipment Inspection procedures Lockout/tagout procedures Mechanical systems and equipment	Climbing harness Flashlight and inspection mirror Lockout tags and padlocks Multimeter Personal protective equipment Pressure gauge Schematics, charts, diagrams Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 4. Conduct Mechanical Maintenance		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
4.3 Diagnose and repair mechanical malfunctions	4.3.1 Mechanical equipment, components, or system are inspected according to equipment maintenance schedule 4.3.2 Coupling alignment between generator and gearbox is within specified tolerance according to manufacturer specification 4.3.3 Fasteners on wind turbine equipment are secured	Hydraulic/pneumatic systems and equipment Industrial controls and motors Lockout/tagout procedures Mechanical systems and equipment	Climbing harness Emergency descent procedures Lockout tags and padlocks Personal protective equipment Schematics, charts, diagrams Torque wrench Torque multiplier Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 4: Conduct Mechanical Maintenance

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 4: Conduct Mechanical Maintenance																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	3	3	3	3	3	3	4	3	3	3	2	3	3	2

Statement of Assessment for Critical Work Function 4:

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

Occupational Title: Wind Turbine Technician			
Critical Work Function 5. Maintain Electrical System		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
5.1 Assemble and maintain electronic, electrical, or electromechanical equipment	5.1.1 Electronic equipment and instruments are calibrated to specification 5.1.2. Components are connected to electrical assemblies properly, according to specification 5.1.3 Input/output modules are selected for installation according to manufacturer specification 5.1.4 Electrical wiring and components are repaired according to manufacturer specification 5.1.5 Electrical transformer replaced as needed, and according to manufacturer specification 5.1.6 Electrical/electronic equipment, components, or systems are replaced as needed, and according to manufacturer specification 5.1.7 Programmable Logic Controller (PLC) system components are replaced as needed, and according to manufacturer specification 5.1.8 Electrical/electronic circuit connections are serviced according to industry specification 5.1.9 Electronic system test equipment is connected to components according to manufacturer instructions 5.1.10 Energy sources such as hydraulic, electrical, springs, or weights are located and isolated (locked out) 5.1.11 Wires are properly marked before they are disconnected	Computers and electronics Electrical systems and equipment Fault code procedures General electrical safety Lockout/tagout procedures Mechanical systems and equipment Types of electrical component damage	Clamp-on ammeter Climbing harness Infrared testers Lockout tags and padlocks Multimeter Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 5. Maintain Electrical System		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
5.2 Conduct electrical inspection and testing	5.2.1 Appropriate parts, accurate estimated time of completion, and adequate number of personnel needed to address problem are determined 5.2.2 Wind turbine equipment voltage or amperage is accurately determined. 5.2.3 Electrical equipment, components, or system are properly inspected according to manufacturer specification 5.2.4 Electrical transformer is inspected for defects and results properly logged 5.2.5 Electric system test equipment is properly set up and monitored, and results recorded with required data 5.2.6 Battery test and charge cycle is performed and results logged 5.2.7 Electrical/electronic wiring, equipment, systems, components, connections, or fixtures are tested and results logged 5.2.8 Current flow is accurately calculated based on resistance level measurement	Electrical systems and equipment Fault code procedures General electrical safety Inspection procedures Lockout/tagout procedures Types of electrical component damage	Clamp-on ammeter Climbing harness Flashlight and inspection mirror Lockout tags and padlocks Megohmmeter Multimeter Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 5. Maintain Electrical System		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
5.3 Service wiring and circuitry components	5.3.1 Electrical equipment is properly connected to power circuit 5.3.2 Flow and level control circuits are constructed as defined in manufacturer specification 5.3.3 Fiber optic cables and connectors are maintained according to industry standards 5.3.4 Electrical/electronic connections/components are properly soldered or brazed, with flux appropriately applied to work piece before soldering. 5.3.5 Electric cables are spliced according to industry standard	Computers and electronics Electrical systems and equipment Fault code procedures General electrical safety Lockout/tagout procedures Types of electrical component damage	Circuit tester Clamp-on ammeter Climbing harness Emergency descent devices Lockout tags and padlocks Megohmmeter Multimeter Personal protective equipment Two-way radio/cell phone Wire crimper Wire stripping tools

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 5: Maintain Electrical System

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 5: Maintain Electrical System																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
3	3	3	4	4	4	3	2	3	4	3	3	2	3	3	3	3

Statement of Assessment for Critical Work Function 5:

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event.
4) Illustrate by individual performance the attained levels of knowledge and skills
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question

Occupational Title: Wind Turbine Technician			
Critical Work Function 6. Maintain and Follow Safety Procedures		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
6.1 Communicate site safety information	6.1.1 Emergencies are communicated to appropriate personnel 6.1.2 Equipment shutdown needs and lock-out notifications are communicated to appropriate personnel 6.1.3 Hazardous waste containers are properly labeled and MSDS book is updated in compliance with state requirements 6.1.4 Site is clean and free of debris 6.1.5 Site log is current and up to date 6.1.6 Site safety information is communicated and posted as required by company policy	Emergency procedures Environmental protection procedures Fall protection procedures General electrical safety Lockout/tagout procedures Tower climb/rescue procedures Wind turbine manufacturer specific safety policies and procedures	Schematics, charts, diagrams Two-way radio/cell phone Laptop computer
6.2 Respond to emergencies	6.2.1 Incidents and accidents are reported and documented as required by company policy 6.2.2 Emergency response adequately addresses emergency situation e.g. fire alarm sounded, fires in or around wind turbine equipment extinguished 6.2.3 Rescue procedures are rehearsed per schedule determined by company policy	Confined space entry Emergency procedures Fall protection procedures Fire extinguisher procedures General electrical safety Tower climb/rescue procedures Wind turbine manufacturer specific safety policies and procedures	Bee spray Binoculars Climbing harness Emergency descent devices Fire extinguisher Load straps and rigging devices Lockout tags and padlocks Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone Winches

WIND TURBINE TECHNICIAN SKILL STANDARDS

Occupational Title: Wind Turbine Technician			
Critical Work Function 6. Maintain and Follow Safety Procedures		**Occupational Skills, Knowledge & Conditions**	
Key Activity	**Performance Criteria** *How do we know when the key activity is performed well or performed successfully?*	**Occupational Skills & Knowledge** *What should the technician know and what skills should the technician have in order to do the activity?*	**Conditions** *What tools must the technician use in order to do the activity?*
6.3 Conduct site safety inspections	6.3.1 Hazardous waste storage area inspections are conducted as required by company safety program 6.3.2 Safety inspections particular to repair activity or critical evolution in process are performed 6.3.3 Site is clean and free of debris 6.3.4 Site log is current and up to date	Emergency procedures Environmental protection procedures Fire extinguisher procedures General electrical safety Inspection procedures Lockout/tagout procedures	Emergency descent devices Fire extinguisher Flashlight and inspection mirror Lockout tags and padlocks Personal protective equipment Schematics, charts, diagrams Two-way radio/cell phone
6.4 Maintain Tools and equipment	6.4.1 Tools and equipment (including fire extinguishers, test equipment, and PPE) are calibrated and in safe working order based on manufacturer specifications 6.4.2 Lightning protection (such as grounding wires and drainage holes) is intact and properly functioning and recorded in maintenance log 6.4.3 Specific tools or equipment appropriate to particular job are selected and utilized 6.4.4 FAA anti-collision light is determined to be functioning and operational 6.4.5 Vehicle is parked at site pad with brake set, front of vehicle facing against the wind, and at required distance (if specified in policy) 6.4.6 Hazardous waste materials are properly handled according to MSDS. 6.4.7 Grounding cables are properly grounded according to standard and documented accordingly	Electrical systems and equipment Emergency procedures Fall protection procedures General electrical safety Inspection procedures Lockout/tagout procedures Mechanical systems and equipment Tower climb/rescue procedures Wind turbine manufacturer specific safety policies and procedures	Circuit tester Cleaning agents Lubricants Multimeter Personal protective equipment Torque wrench Torque multiplier Two-way radio/cell phone Volt or current meters Wire stripping tools

WIND TURBINE TECHNICIAN SKILL STANDARDS

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 6: Maintain and Follow Safety Procedures

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occupational Title: Wind Turbine Technician																
CWF 6 : Maintain and Follow Safety Procedures																
Listening	Speaking	Using Information and Communication Technology	Gathering and analyzing Information	Analyzing and Solving Problems	Making Decisions and Judgments	Organizing and Planning	Using Social Skills	Adaptability	Working in Teams	Leading Others	Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	3	3	3	3	3	3	3	3	4	3	3	2	3	4	2	2

Statement of Assessment for Critical Work Function 6

The statements of assessment can do any of several things:

- *Define tools or strategies that industry could use to assess the level of competency a worker has attained in a particular critical work function.*
- *Define for trainers and educators how to assess the level of competency a student has attained relevant to the critical work function.*
- *Define the level of mastery of the critical work function that indicates that a worker or student has achieved an entry-, intermediate-, or advanced level of mastery of a critical work function.*

A. Tests could include:

1) Multiple choice and essay questions that demonstrate an understanding of knowledge being assessed.
2) Preparation and justification of a reasonable solution to a problem scenario.

B. Hands-on exercises or simulations to demonstrate acquisition of knowledge and skills that could:

1) Apply relevant knowledge or skills
2) Focus on the application of knowledge and skills to a new situation
3) Demonstrate an ability to plan, organize, and create a product, service, or an event
4) Illustrate by individual performance the attained levels of knowledge and skills
5) Include observation of events, groups, and individuals that focuses on the relevant traits of the skill in question