



Industry subsector: MANAGEMENT OF INSTALLATION AND MAINTENANCE IN WIND ENERGY

KPA 2	MANAGE THE MAINTENANCE OF WIND PLANTS		
KPA Description	Analyze and design maintenance programs for wind plants, coordinating and supervising the maintenance processes.	N° of ECVET credits:	EQF level: 5
Performance Criteria Description:	Criticality / Priority:	Means of verification:	
<b style="color: green;">UNITS of the LO <ul style="list-style-type: none"> - Analyse the general operation of the wind plants - Design and develop maintenance programs - Coordinate the preventive maintenance work - Supervise the corrective maintenance processes - Carry out specialised corrective maintenance operations 			
U1. Title: Analyse the general operation of the wind plants	Description Analyse the general operation of the wind plants to establish the maintenance plan		
U2. Title: Design and develop maintenance programs	Description Design and develop maintenance programs for wind plants		
U3. Title: Coordinate the preventive maintenance work	Description Coordinate the preventive maintenance work of the equipments and components of the wind plant		



U4. Title: Supervise the corrective maintenance processes	Description Supervise the corrective maintenance processes of the wind plants.
U5. Title: Carry out specialised corrective maintenance operations	Description Carry out specialised corrective maintenance operations in the wind plants.

Title of the LO	MANAGE THE MAINTENANCE OF WIND PLANTS		
Title UNIT 1:	Analyse the general operation of the wind plants		
LO UNIT Reference info:	Reference document / link		
N° of ECVET credits:		EQF level:	5
LO UNIT Performance Criteria / Success Indicators	#	Criteria / Indicator Description	Critically Means of verification
Knowledge	<ul style="list-style-type: none"> - Wind park: - General drawings - Mechanic drawings - Electric diagrams - Wind park substation: - General drawings. - Electric cupboards - One-line diagrams - Electricity generating machines. Wind turbines - Wind turbine components and present trends - Wind turbine control systems: - Kinds of control - Principles of regulation and control - Programmable control systems, PLC and PC - Remote control systems - Wind turbine operation states - Kinds of conventional wind generators. 		

Skills	<ul style="list-style-type: none"> - Interpret drawings - Describe a conventional wind generator and its components - Identify the components
Competence	<ul style="list-style-type: none"> - Collaboration and integration in a working team - Tidy and clean works and activities - Autonomy and responsibility to organize and control one's own work
Means of verification	<ul style="list-style-type: none"> • Describe the operation of a wind plant from the corresponding technical documents, identifying its parts, equipment and components. • Point out the elements of a wind plant on which we can operate manually or automatically and the consequences of this manipulation. • Identify in a wind plant drawing the different elements to carry out preventive maintenance on, from certain maintenance program. • Reason the consequences, for a particular plant, of the breakdowns in its critical points.

Title of the KPA	MANAGE THE MAINTENANCE OF WIND PLANTS			
Title UNIT 2:	Design and develop maintenance programs			
LO UNIT Reference info:	Reference document / link			
N° of ECVET credits:		EQF level:	5	
LO UNIT Performance Criteria / Success Indicators	#	Criteria / Indicator Description	Critically	Means of verification
Knowledge		<ul style="list-style-type: none"> - Maintenance structure. Function, objectives, kinds. - Organisation of the maintenance. - Inspections. - Preparation and planning the launching. - System breakdowns: Techniques of diagnose and localisation. - Maintenance of equipments and elements. - Procedures and means. - Vibration monitoring systems. Oil analysis. - Economic management of the maintenance. - The integral maintenance cost. - Maintenance productivity. - Storage and materials of maintenance. - Supplies. - Organisation and management of the maintenance storage. - Suppliers' homologation. - Technical specifications of spare parts. - Computing management programs. 		
Skills				<ul style="list-style-type: none"> - Elaborate maintenance programs according to the technical information supplied by the equipment and wind parks manufacturers

	<ul style="list-style-type: none"> - Ensure that the maintenance program includes the task definition, procedures and methods for intervention and disassembly/assembly checking ranges, times and the human and material resources required for its execution in the time and cost expected. - Establish the quality control criteria in the different stages configuring maintenance. - Consider the equipment and park critical points involving stopping risk - Optimise own resources, determine the needs for external support and ensure the compliance with the production objectives. - Update the procedures used in the preventive and corrective maintenance, adding improvements. - Collaborate and participate in periodical meetings with the design engineering of the suppliers for the continuous improvement of the product to make it loyal and to share the Operation and Maintenance Department experience.
<p>Competence</p>	<ul style="list-style-type: none"> - Collaboration and integration in a working team - Tidy and clean works and activities - Autonomy and responsibility to organize and control one's own work
<p>Means of verification</p>	<ul style="list-style-type: none"> • Prepare and update maintenance programs from the technical information provided by the wind plant equipment manufacturers. • Incorporate to the maintenance program, the definition of tasks, procedures and intervention and assembly/disassembly methods, checking ways, times and the human and material resources required for their execution in the estimated time and money. • Analyse, in the framework of the maintenance program, the critical points of the equipment and the plant involving personal risks, environmental risks or risks for the good work of the plant. • Determine, in the elaborated programs, the optimisation of own resources and the definition of external supports. • Manage the spare parts and their systematic storage. • Establish the quality control criteria in the different stages composing the maintenance.

Title of the KPA	MANAGE THE MAINTENANCE OF WIND PLANTS		
Title UNIT 3:	Coordinate the preventive maintenance work		
LO UNIT Reference info:	Reference document / link		
N° of ECVET credits:		EQF level:	5
LO UNIT Performance Criteria / Success Indicators	#	Criteria / Indicator Description	Critically Means of verification
Knowledge	<ul style="list-style-type: none"> – Maintenance program. – Planning and management of preventive maintenance. – Parameters measurement: Procedures to get and register them. – Predictive maintenance. – Thermographic analysis, vibration and oil analysis. – Maintenance safety: Hazards, prevention measures, emergencies. 		
Skills	<ul style="list-style-type: none"> – Analyse the technical and administrative documents received and generated and use them to organise and survey the preventive maintenance. – Elaborate the specifications for the spare materials or parts – Manage the spare parts and their storage basing on the manufacturers' technical documents and the history of the machines and equipment – Coordinate the work of the different people intervening in preventive maintenance. – Determine the corrective measures to perform when there are any mistakes – Carry out a surveillance of the preventive maintenance program, controlling the execution and cost quality. – Adopt the company safety plan and make it complied with, performing preventive works, adopting the established measures and complying with the standards and laws in force in the wind plant maintenance. 		

<p>Competence</p>	<ul style="list-style-type: none"> - Evaluate the importance of the preventive management - Commitment with the encouragement of safe behaviours - Controlled and safe attitude against possible contingencies. - Initiative in emergency situations.
<p>Means of verification</p>	<ul style="list-style-type: none"> • Reason the need to carry out preventive maintenance operations in the wind plant equipment and components according to an established method. • Describe the procedures of each preventive maintenance operations that should be carried out on the wind plant equipment and components. • From a practical case of a wind plant with different elements and in operation: <ul style="list-style-type: none"> - Identify the elements to carry out the preventive maintenance operations on. - Design a plan to carry out the checking and fitting operations on the grip torques, greasing and oil removal operations, checking and correcting operations of the general state of the equipment and premises regarding corrosion and sealing. - Describe the procedures to check the electric isolation of the equipment and the plant. - Define the suitable values of the plant characteristic parameters and describe the proceedings to collect and check them. - Check the correct work of the subsystems of orientation, braking and pitch - Develop the documents associated with the results of the inspections and operations carried out.

Title of the KPA	MANAGE THE MAINTENANCE OF WIND PLANTS			
Title UNIT 4:	Supervise the corrective maintenance processes			
LO UNIT Reference info:	Reference document / link			
N° of ECVET credits:		EQF level:	5	
LO UNIT Performance Criteria / Success Indicators	#	Criteria / Indicator Description	Critically	Means of verification
Knowledge	<ul style="list-style-type: none"> – Wind turbine automation and control systems. Kinds of control. – Regulation and control principles. – The computer as a control element. – The programmable automaton. – Control and remote control of the premises. – Final control elements. – Typical circuits of pneumatic, hydraulic and electric control in wind generators. – Measurement of physical variables. – Transducers. 			
Skills	<ul style="list-style-type: none"> – Analyse the technical and administrative documents received and generated and use them to organise and survey the corrective maintenance. – Elaborate the specifications for the spare materials or parts – Manage the spare parts and their storage basing on the manufacturers' technical documents and the history of the machines and equipment – Coordinate the work of the different people intervening in corrective maintenance. – Determine the corrective measures to perform when there are any mistakes – Carry out a surveillance of the corrective maintenance program, controlling the execution and cost quality. – Adopt the company safety plan and make it complied with, performing corrective works, adopting the established measures and complying with the standards and laws in force in the wind plant maintenance. 			



Competence	<ul style="list-style-type: none">- Evaluate the importance of the preventive management- Commitment with the encouragement of safe behaviours- Controlled and safe attitude against possible contingencies.- Initiative in emergency situations.
Means of verification	<ul style="list-style-type: none">• Analyse and use the technical and administrative documents received and generated to organise and supervise the corrective maintenance and to repair the wind plant equipments• Coordinate the work of the different people taking part in the corrective maintenance, taking care of the compliance with the programmed objectives.• Determine and implement the corrective measures to take when there are any bias from the efficient work of the plant.• Check the quality in the maintenance, rationalising the costs, solving the contingences with the maximum efficiency and complying with the programmed objectives.

Title of the KPA	MANAGE THE MAINTENANCE OF WIND PLANTS		
Title UNIT 5:	Carry out specialised corrective maintenance operations		
LO UNIT Reference info:	Reference document / link		
N° of ECVET credits:		EQF level:	5
LO UNIT Performance Criteria / Success Indicators	#	Criteria / Indicator Description	Critically Means of verification
Knowledge	<ul style="list-style-type: none"> - Breakdown diagnose in wind plants - Procedures for mechanic and electrical isolation of the different components. - Methods to repair the different components of the plants. - Management of the equipments and components replacement. - Reduction of environmental impact. - Integral use of the plant. 		
Skills	<ul style="list-style-type: none"> - Detect, analyse and classify and evaluate the breakdowns - Establish the performance sequence for specialized breakdowns - Coordinate and replace the damaged element, checking its operation - Recover the plant operation, as quickly as required and with the required quality and safety. - Write suitably the reports on the repair carried out. 		
Competence	<ul style="list-style-type: none"> - Collaboration and integration in a working team - Tidy and clean works and activities - Autonomy and responsibility to organize and control one's own work 		

Means of verification

- Diagnose the usual breakdowns occurring in the wind plants, determining their cause.
- Describe the procedures of each corrective maintenance operation that should be carried out in the equipments and components of the plants.
- Repair the orientation, braking and pitch circuits.
- From different practical cases, duly characterised, of faulty wind plants:
 - Identify the possible breakdowns and their causes.
 - Describe the repairing procedure
 - Repair the breakdowns in specialised situation.
 - Fill in the performance report.
 - Review and maintain in operative state the equipment and tools used in maintenance.