Subsector: ORGANISATION AND DEVELOPMENT OF SOLAR PHOTOVOLTAIC INSTALLATION PROJECTS

Title of the LO	**Developing projects for photovoltaic solar installations.**		
Learning Outcome Definition	To analyse and define the various types of photovoltaic solar installations and describe their components, in order to draw up plans, reports, budgets and the other technical documentation required to assemble, maintain and use a photovoltaic installation.	**Nº of ECVET credits:**	**EQF level:**5

UNITS of the LO

- Defining the characteristics of a photovoltaic solar installation
- Determining the components of a photovoltaic solar installation
- Drawing up plans
- Drawing up budgets
- Drawing up health and safety plans
- Administrative processes

U1. Title: Defining the characteristics of a photovoltaic solar installation	**Description** To analyse the various types of photovoltaic solar installations and select the one most suited to the type of building, the user's energy needs and regulations applicable.
U2. Title: Determining the components of a photovoltaic solar installation	**Description** To determine the various elements comprising photovoltaic solar installations, using established means and complying with required standards and regulations.
U3. Title: Drawing up plans	**Description** To draw plans, operating principles, general and exploded diagrams on a suitable platform to provide graphic documentation for assembling the photovoltaic solar installation.
U4. Title: To draw up reports and budgets	**Description** Drawing up reports, budgets and other technical documentation required to assemble, maintain and use the photovoltaic solar installation.

U5. Title: Drawing up health and safety plans	**Description** Drawing up health and safety plans to assemble photovoltaic solar installations.
U6. Title: Administrative processes	**Description** Drawing up documentation required for administrative authorisation and obtaining any subsidies that may be available.

Title of the LO	Developing projects for photovoltaic solar installations.		
Title UNIT 1:	Defining the characteristics of a photovoltaic solar installation		
Nº of ECVET credits:		**EQF level**: 5	
Knowledge	• Basics of direct current and alternating current electrical circuits. • Rectifiers and converters. • Power factor in an electrical installation. • Calculating sections in an electrical installation. • Low voltage grids. • Systems for connecting neutral and earth in electricity grids. • General specifications. Installation systems. • Protective tubes and channels. • Surge protection. Over-voltage protection. Protection from direct and indirect contact. • Interior installations in dwellings. Number of circuits and characteristics. • General specifications for the installation. Installations in premises with special characteristics or purposes. • Very low voltage installations. • Installations at special voltages. • Low voltage generation installations. • Installation of receivers, lighting, heating apparatus, cables and radiant heat-sheets in dwellings, motors transformers and autotransformers, reactances, rectifiers and condensers. • Installations for systems of automation, technical energy management and health and safety in dwellings and offices. • Authorised installers. Documentation and start-up of installations. Verification and inspection.		
Skills	• Checking that the selected elements comply with standard technology for the sector and approval standards. • Determining the characteristics of the elements, units, components and materials though technical calculation based on objective, reliable data, using manuals, tables and computerised calculation programs. • Checking and comparing the calculations made with other installations that operate at optimum levels. • Ensuring that the different elements of the photovoltaic solar installation are compatible with each other and with other elements in auxiliary installations and receivers, to guarantee the performance, reliability and production capacity of the installation as a whole.		

	• Choosing components, taking into account their interchangeability, supply and cost.
Competence	• Rigorous drawing up of plans and diagrams. • Orderly, methodical and participative attitude in searching for information. • Respect for established procedures and standards. • Organisation and method in work. • Initiative in finding and handling information. • Rigorous work methods. • Independence and responsibility in organising one's own work.
Performance Criteria	• Enumerate the main standards and regulations applying to photovoltaic solar installations. • Describe the characteristics of various solutions for photovoltaic solar installations connected to a network. • Describe the characteristics of various solutions for stand-alone photovoltaic solar installations. • Describe the characteristics of various back-up units for photovoltaic solar installations. • In a practical case, properly described, of a photovoltaic installation connected to a network: -Describe the functions of different elements comprising the installation. -Identify and select the technical, administrative and quality standards, whether or not these are compulsory, affecting the process of the project. -Determine the documentation to be drawn up, according to regulations. -Draw up a report on requirements: technical specifications; characteristics of materials; standards and regulations; health and safety. • In a practical case, properly described, of a stand-alone photovoltaic installation: -Describe the functions of different elements comprising the installation. -Identify and select the technical, administrative and quality standards, whether or not these are compulsory, affecting the process of the project. -Determine the documentation to be drawn up, according to regulations. -Draw up a report on requirements: technical specifications; characteristics of materials; standards and regulations; health and safety.

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Title UNIT 2:	Determining the components of a photovoltaic solar installation		
Nº of ECVET credits:		**EQF level**: 5	
Knowledge	• Requirements to be taken into account in projects for setting up photovoltaic solar installations. Receiver installation. • Information sources. • Assessment of alternatives. • Technological and economic criteria. • Components in a project: data involved, standards required, specifications and supporting documents, plans, terms and conditions, budgets. • Health and safety plan.		
Skills	• Presentation and support for the photovoltaic solar installation, complying with technological criteria for power supply, also standards and strategic criteria, among others. • Giving a overview of specifications for the installation though an analysis of its operation. • Proving support for the dimensions and specifications of the various parts and for different components, using numerical calculations, if necessary. • Analysing the safety and protection systems designed, the automations used and other critical points of the installation in the report or specifications. • Drawing up and operation and maintenance manual for the installation, taking into account the type of building and the various support systems, and setting up security and maintenance operations according to the model required by regulations. • Drawing up a formal document corresponding to the report or specifications, using a normal IT program.		
Competence	• Rigorous use of technical documentation. • Coherence in justifying decisions taken on technical grounds for the cases proposed. • Respect for established procedures and standards. • Rigorous calculations. • Organisation and method in work. • Independence and responsibility in organising one's own work. • Rigorous planning and control of work.		

Performance Criteria	• Calculating the electricity produced in photovoltaic installations, based on solar radiation data and taking into account the forecast daily and seasonal consumption, contributions from auxiliary installations and the overall efficiency of the installation. • Determining the characteristics of the elements, units, components and materials though technical calculation based on objective, reliable data, using manuals, tables and computerised calculation programs. • In a practical case, properly described, of a photovoltaic solar installation connected to a network: -Identify elements in the installation. -Draw up or complete diagrams for the various parts of the installation. -Describe the characteristics of different elements comprising the installation. -Select various units and materials according to characteristics described in commercial catalogues. -Dimension supports, beds and other elements subject to mechanical forces. • In a practical case of a photovoltaic solar installation supported by a generator group or wind power: -Identify elements in the installation. -Draw up or complete diagrams for the various parts of the installation. -Describe the characteristics of different elements comprising the installation. -Select various units and materials according to characteristics described in commercial catalogues. -Dimension supports, beds and other elements subject to mechanical forces.

Title of the LO	Developing projects for photovoltaic solar installations.		
Title UNIT 3:	Drawing up plans		
Nº of ECVET credits:		**EQF level**: 5	
Knowledge	• Design of panels and electrical circuits. • Civil works plans, as required. • Electrical scheme drawings. • Exploded drawings. • Assembly diagrams for the elements comprising the installation. • Computer assisted design programs.		
Skills	• Obtaining the information required to draw up the building plan directly from the building, or in the building project. • Systematically noting the most salient points and irregularities of the building and its structures that will affect the solar installation. • Complying with requirements on proportion and clear drawings so that the diagrams can be interpreted correctly. • Drawing up plans for the site of the installation, complying with regulations. • Optimising the drawing process by incorporating plans and/or technical specifications for standard elements. • Drawing the parts and circuits in the installations with standard symbols and conventions. • Determining the position of panels and units and the layout, dimensions and technical specifications for the installation, taking into account the calculations made in the specifications, and complying with requirements for implementation and safety. • Taking the strength and waterproofing of the building into account for the construction work in assembling and maintaining the installation. • Including the code and specifications for parts in the project in the lists of materials. • Drawing up the formal document with plans using computer assisted design programs.		
Competence	• Rigorous drawing up of plans and diagrams. • Meticulous implementation of connections and verification. • Compliance with reliability and quality parameters. • Rigorous use of technical documentation. • Compliance with current legislation. • Rigorous, reliable calculations.		

	• Rigorous work methods. • Initiative in searching for technical information. • Willingness to perform tasks assigned. • Organisation and method in work.
Performance Criteria	• In a practical case, properly described, of a photovoltaic solar installation: -Choose the best system for the drawings. -Select the standards used for the drawings. -Select the best tools, platforms and formats to make the plan. -Identify name each of the plans for the project. -Draw and insert the dimensions on plans clearly and concisely.

Title of the LO	Developing projects for photovoltaic solar installations.		
Title UNIT 4:	To draw up reports and budgets		
Nº of ECVET credits:		**EQF level**: 5	
Knowledge	• The most important variables and calculation factors. • Methods used. • Calculations for photovoltaic installations connected to a network. • Number of panels. • Calculations for stand-alone photovoltaic installations. • Calculation for the accumulation system. • Calculation of support systems using conventional generator groups. • Calculation of support systems using wind power. • Calculation of independent pumping and irrigation systems using photovoltaic systems. • Computer assisted calculation programs.		
Skills	• Inclusion of the commercial reference, code and technical specifications for elements in the project in the lists of materials. • Detailing unit and total price for each material and unit. • Obtaining the total price for each item and the whole installation. • Quantifying labour costs for each professional working on the assembly of the photovoltaic solar installation. • Applying general costs, industrial benefit and VAT to the various items and at the legal percentages. • Detailing and defining the project and budget for the installation so that unforeseen costs do not exceed 5% of the total budget.		
Competence	• Coherence in justifying decisions taken on technical grounds for the cases proposed. • Compliance with current standards and regulations. • Rigorous, reliable calculations. • Organisation and method in work. • Rigorous work methods. • Independence and responsibility in organising one's own work.		

Performance Criteria	• Preparation of the technical document with calculations and support for the parts of the photovoltaic solar installation. • Drafting budgets for installations, detailing the various items in the cost and analysing the possibility of subsidies and the forecast energy return time. • Drawing up assembly diagrams for elements in the project, paying special attention to calculations of dimensions and orientation. • Drawing up the operating manual to include instructions for installation, start-up, use and maintenance, with the corresponding diagrams. • Good composition and orderly presentation of documents for the project and the technical file.

Title of the LO	Developing projects for photovoltaic solar installations.		
Title UNIT 5:	Drawing up health and safety plans		
Nº of ECVET credits:		**EQF level**: 5	
Knowledge	• Risks from falls. • Electrical hazard. • Thermal hazard. • Health and safety plan. • Personal protection equipment. • Environmental regulations. • Dealing with accidents.		
Skills	• Identifying and assessing the importance of risks from falls, becoming trapped and falling objects. • Identifying and assessing the importance of thermal hazards arising in the solar installation. • Identifying electrical hazards from external circuits, high temperatures and other extreme conditions. • Integrating the planning for an emergency plan in the documentation for the project. • Preparing the health and safety plan for the project. • Identifying all the occupational hazards and proposing corrective measures to remove, reduce reasonably and control. • Compare the effects on the environment and implement criteria to minimise the same.		
Competence	• Attention to standards and current regulations. • Attention to current safety regulations. • Respect for established procedures and standards. • Meticulous implementation of connections and verification. • Rigorous preparation of the health and safety plan for the project. • Compliance with reliability and quality parameters. • Rigorous use of technical documentation.		
Performance Criteria	• Defining the risks from falls on the same or to a different level, becoming trapped and falling objects. • Defining thermal hazard arising from the photovoltaic solar installation. • Defining electrical hazards from external circuits, high temperatures and other extreme conditions.		

	• Detailing the emergency plan to be implemented during assembly of the photovoltaic solar installations. • Preparing and documenting the emergency plan to be implemented during assembly of the photovoltaic solar installations. • Describing the effects on the environment caused during assembly of the photovoltaic solar installations.

Title of the LO	Developing projects for photovoltaic solar installations.		
Title UNIT 6:	Administrative processes		
Nº of ECVET credits:		**EQF level:**5 5	
Knowledge	• Policy framework for subsidies. • Legislation and tenders. • Processing subsidies. • Technical and administrative documentation. • Promoting and managing installations. • Bid presentation.		
Skills	• Ensuring that technical and administrative regulations for the installation are complied with before starting authorisation procedures with the corresponding official bodies. • Fulfilling, organising and processing the technical and administrative documentation required to obtain installation permits. • Ensuring that administrative and other requirements are fulfilled in order to apply for possible subsidies. • Fulfilling, organising and processing the technical and administrative documentation required to apply for subsidies for the installation. • Following up administrative procedure relating to authorisation and permits to implement the installation and those relating to applications for subsidies, so that the installer cannot be held responsible for files not being processed.		
Competence	• Independence and responsibility. • Commitment to deadlines for finishing tasks. • Initiative in searching for technical information. • Compliance with current legislation. • Initiative in finding and handling information.		
Performance Criteria	• Describing administrative processes involved for the file authorising the installation. • Drawing up documents required for administrative authorisation of the installation. • Describing administrative processes involved for the file to obtain subsidies. • Drawing up the specifications and other documents to obtain subsidies. • In a practical case of a photovoltaic solar installation where technical and architectural solutions have already been decided:		

	-Define the standards and procedures required to receive authorisation for the installation. -Define any legal framework for obtaining subsidies, and list the requirements and procedure to follow in applying for these.. -Make a study of the energy return time for the installation, with reasonable estimates of energy consumption, operation of the installation, sunlight and energy price.