

**FIELD OF STUDY: RENEWABLE ENERGY**

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## 1. Technical Operation

**Description:** Competences related to operate and maintain equipment which produces electrical energy from renewable sources such as offshore wind power, wave power, or tidal currents. Technical monitoring by measuring equipment to ensure the safety of operations, and that the production needs are met. Reaction to system problems, and repair faults.

### 1.1. Theoretical Knowledge

**Description:** Basic knowledge of engineering, electrical power safety regulations, renewable energy technologies, constructions and facilities, electronics and mechanics, technical drawings, maintenance operations, sensors, control engineering, robotics.

**Q1: In the context of wind turbine maintenance, what is the purpose of the yaw system?**

To control the pitch of the turbine blades for optimal performance	
To convert kinetic energy into electrical energy	
To align the wind turbine rotor with the wind direction	X
To provide braking to the turbine in high wind conditions	
I don't know	

**Q2: Renewable Energy produces...**

Fewer carbon emissions	X
0 carbon emissions	
More carbon emissions than fossil fuels	
The same amount of carbon emissions and fossil fuel fuels	
None of the above	

**Q3: What is the fastest growing renewable energy technology?**

Wind Power	
Solar photovoltaics	X
Geothermal Energy	
Hydropower	
I don't know	

**Q4: Which term refers to the change of velocity with time?**

Acceleration	X
Distance	
Motion	
Velocity	
I don't know	

**Q5: What is the purpose of Safe Operating Procedures (SOPs) in the workplace?**

To control identified hazards and ensure employee safety	X
To increase productivity and efficiency	
To document workplace incidents and accidents	
To enforce disciplinary actions for non-compliance	
I don't know	

**1.2. Practical Skills**

**Description:** Skills of installing and maintaining technical equipment, install automation components, manage qualitative data, operate 3D computer software, resolve equipment malfunctions, ensure safety in electrical power operations.

**Q1: What are the three key stages of qualitative data analysis, known as the Three Cs?**

Culling, collecting, and critiquing.	
Coding, conceptualizing, and critiquing.	
Compiling, categorizing, and critiquing.	
Coding, categorizing, and concepts.	X
I don't know	

**Q2: What is a recommended approach for managing qualitative data during analysis?**

Ignoring key ideas and focusing on emerging themes.	
Using long sentences to describe themes for better understanding.	
Organizing related themes into major categories using symbols (codes).	X

Combining all themes into a single file for easy access.	
I don't know	

**Q3: In a practical context, which software would you use for creating parts in rapid manufacturing, and which one would you choose for creating organic designs used in animations and special effects?**

3D modeling software for rapid manufacturing, 3D CAD for animations and special effects.	
3D CAD for rapid manufacturing, 3D modeling software for animations and special effects.	X
Both 3D modeling software and 3D CAD can be used interchangeably for both purposes.	
Neither 3D modeling software nor 3D CAD can be used for either rapid manufacturing or animations and special effects.	
I don't know	

**Q4: What is the recommended course of action when dealing with malfunctioning equipment?**

Continue using the equipment cautiously until the malfunction is resolved.	
Shut down the equipment immediately and keep it operational until repaired.	
Secure the equipment and prevent anyone from using it until the malfunction is identified and fixed.	X
Attempt to repair the equipment without shutting it down to avoid downtime.	
I don't know	

**Q5: What are some key electrical safety operating procedures?**

Use damaged power tools and equipment, and avoid insulated tools when working around electricity.	
Stay at least 5 feet away from overhead power lines and touch wet electric tools with bare hands.	

Always wear non-conducting gloves and touch wet electric cords to test their functionality.	
Use insulated tools and proper personal protective equipment, and stay at least 10 feet away from overhead power lines.	X
I don't know	

### 1.3. IT Skills

**Description:** Skills related to data storage, ICT software specifications, 3D modeling, CAD software, sensors

#### Q1: What is the role of ICT standards?

Ensuring monopolies in the ICT industry	
Limiting consumer choices in product selection	
Facilitating interoperability of new technologies	X
Restricting innovation and technological advancements	
I don't know	

#### Q2: What is the primary purpose of CAD (computer-aided design) software?

To create spreadsheets and manage data	
To edit and manipulate digital photographs	
To aid in the design processes for engineers and designers	X
To develop and test computer software applications	
I don't know	

#### Q3: Hard Disk Drives are a form of ... storage

Optical	
Magnetic	X
Sequential	
Superficial	
I don't know	

**Q4: What is the purpose of 3D modeling technology?**

To create two-dimensional representations of objects	
To determine the color and lighting of an object	
To simulate real-world physics and dynamics	
To create three-dimensional representations of objects or surfaces	X
I don't know	

**Q5: In 3D modeling, which of the following Drawing View Types can be used to show the internal geometry?**

Auxiliary view	
Detail view	
Section view	X
Horizontal view	
I don't know	

**2. Energy Management**

**Description:** Competences related to the energy use and implementation of policies for increased sustainability and decrease of cost and environmental impact. Good understanding of energy tariffs, energy consumption and carbon footprint by using energy efficient products and methods.

2.1. Theoretical Knowledge

**Description:** Basic knowledge of electricity consumption, energy efficiency, energy performance of buildings, corporate social responsibility, manufacturing processes, electrical power safety regulations, energy market, contract law, renewable energy technologies and smart grid systems.

**Q1: Energy efficiency means using less energy...**

While reducing the level of consumption	X
While increasing its consumption	
Continuing doing the same task	
While decreasing its consumption	

I don't know	
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**Q2: “The European Parliament is voting on a proposal to revise the Energy Performance of Buildings Directive in March. The aim is to achieve a minimum 55% reduction in greenhouse gas emissions by 2030 and decarbonize the building stock by 2050. The European Commission's proposal requires all new buildings to be zero-emission by 2030, while the Council of the EU proposes exceptions for historical and defense buildings. The Parliament's ITRE committee suggests an earlier deadline for new buildings to be zero-emission (2028) and mandates solar technologies. Residential and non-residential buildings must meet specific energy performance standards by certain deadlines. Fossil fuels in new heating systems should be phased out by 2035.”<sup>1</sup>**

**After reading the above text by a report of the European Parliamentary Research Service, answer the following question: What is the main objective of the proposed revision to the Energy Performance of Buildings Directive?**

Achieve a minimum 30% reduction in greenhouse gas emissions by 2030.	
Ensure all new buildings are equipped with solar technologies by 2028.	
Attain a zero-emission and fully decarbonized building stock by 2050.	X
Implement exceptions for public social housing from energy performance standards.	
I don't know	

**Q3: Through Corporate Social Responsibility a company can...**

Practice charity	
Take a political stance	
Embrace a business management concept	X
Create a new business plan	
I don't know	

<sup>1</sup>

[https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739377/EPRS\\_ATA\(2023\)739377\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739377/EPRS_ATA(2023)739377_EN.pdf)



**Q4: What is a vital component of the smart grid that allows utilities to quickly detect and resolve service issues?**

Dependence on customers to report outages	
Leveraging the Internet of Things (IoT) for data collection	X
Connection of renewable energy sources like solar and wind	
Effective management and distribution of hydrogen	
I don't know	

**Q5: Which of the following actions is included in energy management?**

Conducting regular energy audits to identify areas of energy consumption	X
Implementing a recycling program within the organization	
Setting up a composting system for organic waste	
Promoting employee wellness programs	
I don't know	

## 2.2. Practical Skills

**Description:** Skills of developing energy policies, developing business case, conducting energy audits, developing manufacturing policies, managing staff, liaising with managers, managing logistics and suppliers, striving for company growth and identifying energy needs.

**Q1: What are some steps involved in auditing your business energy consumption?**

Identify cost and carbon savings, develop an action plan, and finance your projects.	
Conduct a site walk round, assess your current energy use, and present your business case.	
Assess your current energy use, conduct a site walk round, and develop an action plan.	X
Use the checklist, assess your current energy use, and identify cost and carbon savings.	
I don't know	

**Q2: In energy management, which of the following represents the three main aspects involved in the overall process?**

Energy generation, energy consumption, and energy distribution.	
Energy production, energy transmission, and energy use.	X
Energy storage, energy transportation, and energy conservation.	
Energy import, energy export, and energy trading.	
I don't know	

**Q3: What are the five critical steps for creating a business case?**

Step 1: Conduct a SWOT Analysis Step 2: Define Key Performance Indicators (KPIs) Step 3: Develop a Marketing Strategy Step 4: Identify Target Audience Step 5: Create a Financial Forecast	
Step 1: Conduct Market Research Step 2: Define Project Goals Step 3: Establish a Project Team Step 4: Create a Risk Management Plan Step 5: Monitor Project Progress	
Step 1: Confirm the Opportunity Step 2: Analyze and Select the Short-listed Options Step 3: Evaluate the Options Step 4: Develop the Implementation Strategy Step 5: Develop the Recommendations and Get the Approval from Decision-Makers	X
Step 1: Identify Business Objectives Step 2: Define Key Success Factors Step 3: Conduct a Competitive Analysis Step 4: Determine Pricing Strategy Step 5: Secure Funding Sources	
I don't know	

**Q4: What are the typical steps involved in conducting an energy audit?**

Analyzing scenarios, estimating costs, defining the purpose, and collecting data	
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Estimating costs, defining the purpose, analyzing scenarios, and collecting data	
Collecting data, analyzing scenarios, estimating costs, and defining the purpose	
Defining the purpose, analyzing collected data, providing scenarios, and estimating costs	X
I don't know	

**Q5: Which are the key steps involved in an energy management strategy?**

Appoint an energy manager, understand the issues, plan and organize, develop an action plan, involve staff, and control and monitor progress	X
Appoint an energy manager, develop an action plan, involve staff, and monitor issues	
Understand the issues, plan and organize, involve staff, and report progress	
Get commitment, analyze data, develop an action plan, and monitor staff involvement	
I don't know	

**2.3. IT Skills**

**Description:** Skills related to performing smart grids, writing scientific publications, calculating utility payments, Microsoft Office tools and general computer skills.

**Q1: What are the six key components of a smart grid?**

Cables, circuit breakers, electric power substations, smart meters, wind turbines, and solar panels	
Circuit breakers, collector nodes, distribution and transmission lines, controllers, electric power generators, and smart meters	X
Electric power substations, distribution and transmission lines, solar panels, wind turbines, smart meters, and control centers	
Cables, controllers, electric power generators, smart meters, control centers, and collector nodes	

I don't know	
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**Q2: Which technology is commonly used in smart grids?**

Analog systems and mechanical switches	
Telepathic communication and manual controls	
Digital technologies, sensors, and software	X
Morse code and pneumatic devices	
I don't know	

**Q3: In Smart grids, AMI stands for:**

Advanced metering infrastructure	X
Automatic meter inference	
Advanced manual interference	
Automatic Manual Infrastructure	
I don't know	

**Q4: What is the purpose of energy management system (EMS) software?**

To generate electricity for small-scale systems like microgrids	
To monitor and maintain the stability of transmission lines	
To control and optimize the performance of electric utility grids	X
To provide real-time weather updates for energy production	
I don't know	

**Q5: What is the primary function of a smart energy management system (SEM)?**

To monitor and optimize energy consumption in buildings or office complexes	X
To provide internet connectivity to energy devices	

To track weather patterns for efficient energy utilization	
To generate renewable energy for sustainable power supply	
I don't know	

### 3. Energy Analysis

**Description:** Competences related to evaluation of the consumption of energy in buildings, recommendation of cost-effective alternatives, suggestion of efficiency improvements, business analyses and participation in the development of policies

#### 3.1. Theoretical Knowledge

**Description:** Basic knowledge of energy, energy transformation, energy performance, renewable energy technologies, zero-energy building design, energy sector policies, energy efficiency, energy market and solar energy.

##### Q1: What is energy transformation?

Converting energy from liquid to gas	
Converting energy from one type into another	X
Changing energy from blue to red	
None of the above	
I don't know	

##### Q2: What distinguishes zero-energy buildings (ZEBs) from traditional buildings?

ZEBs generate their own energy on-site and consume less energy than traditional buildings	X
ZEBs rely solely on fossil fuel-based energy sources	
ZEBs are entirely disconnected from the electricity grid	
ZEBs consume more energy from the national grid	
I don't know	

**Q3:** Which renewable energy technology is currently considered the most efficient method of sustainable energy production?

Solar power	
Hydroelectric power	

Wind power	X
Geothermal power	
I don't know	

**Q4: What is the purpose of building energy performance analysis?**

To assess the structural integrity of a building	
To determine the highest contributing factors towards energy consumption in a building	X
To calculate the total energy consumption of a building	
To evaluate the aesthetic design of a building	
I don't know	

**Q5: How would you define energy transformation?**

The process of changing energy from one form to another	X
The transfer of energy from one object to another without changing its form	
The conversion of matter into energy through nuclear reactions	
The process of generating energy from fossil fuels	
I don't know	

3.2. Practical Skills

**Description:** Skills of renewable energy systems, mathematical abilities, logical and analytical thinking skills, market analysis, energy performance, solar energy, energy transformation.

**Q1: Which of the following is an example of analytical and logical thinking?**

Memorizing facts and figures for a quiz	
Identifying patterns in data to predict future trends	X
Generating creative ideas for a new project	
Intuitively making decisions based on gut feelings	
I don't know	

**Q2: When evaluating the energy consumption of a building, which of the following is the most effective method to identify areas of high energy usage?**

Visual inspection of the building's exterior	
Reviewing the monthly utility bills	
Conducting an energy audit using specialized equipment	X
Interviewing the building's occupants about their energy habits	
I don't know	

**Q3: Which of the following would be considered a cost-effective alternative to improve energy efficiency in an existing commercial building?**

Replacing all windows with stained glass	
Installing a centralized heating, ventilation and air-conditioning (HVAC) system without programmable thermostats	
Upgrading to LED lighting and installing motion sensors in common areas	X
Repainting the interior walls with a new color	
I don't know	

**Q4: Which formulas can be used to calculate energy for different types of objects?**

$K.E = \frac{1}{2} mv^2$ and $P.E = mgh$	X
$K.E = mgh$ and $P.E = \frac{1}{2} mv^2$	
$K.E = mv^2$ and $P.E = mgh$	
$K.E = mgh$ and $P.E = mv^2$	
I don't know	

**Q5: Which item would have this energy transformation: Chemical energy thermal and light energy?**

Candle burning	X
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Wind turbine turning	
Solar calculator	
Car moving	
I don't know	

### 3.3. IT Skills

**Description:** Skills related to specific software programmes (SAS, R, Python or other languages), database programs (SQL, Oracle), MS Office Applications (Word, PowerPoint, Outlook, Excel), Calculate and interpret basic statistics.

#### Q1: What is the purpose of SQL (Structured Query Language) in technology?

SQL is a programming language for building websites	
SQL is used for graphic design and image editing	
SQL is a language for storing and processing information in a relational database	X
SQL is a communication protocol for networking	
I don't know	

#### Q2: What are some common operations performed using SQL?

SQL is primarily used for graphic design and image editing	
SQL is used for data storage and backup purposes	
SQL commands are used for manipulating data in databases, such as inserting, selecting, and updating data	X
SQL is a programming language for creating mobile applications	
I don't know	

#### Q3: Which of the following best describes the main purpose of Microsoft Office in terms of computer productivity?

To play video games and watch movies.	
To design and edit 3D models for animation.	



To help with productivity and complete common tasks on a computer.	X
To browse the internet and check emails.	
I don't know	

**Q4: What are the steps involved in interpreting basic statistics?**

Describing the size of the sample, describing the center, assessing shape and spread, and comparing data from different groups	X
Comparing data from different groups, assessing shape and spread, describing the size of the sample, and describing the center	
Assessing shape and spread, comparing data from different groups, describing the center, and describing the size of the sample.	
Describing the center, comparing data from different groups, assessing shape and spread, and describing the size of the sample	
I don't know	

**Q5: What are the three main types of software programs?**

System software, development software, and programming software	
Utility software, programming software, and application software	
System software, utility software, and application software	X
Development software, programming software, and application software	
I don't know	

**4. Energy Engineering**

**Description:** Competences related to researching sources of energy in order to design systems for renewable energy production. The main target is the optimization of energy production from renewable resources and reducing production of expenses and environmental strain. Main focus on design systems that aim to energy sustainability and efficiency.

#### 4.1.Theoretical Knowledge

**Description:** Basic knowledge of environmental engineers, fluid mechanics, solar energy, renewable energy technologies, electrical engineering, bioeconomy, engineering processes, power engineering, civil engineering, biogas energy production.

**Q1: What is fluid mechanics used for?**

Fluid mechanics enables to comprehend the behaviour of fluids under various temperatures only	X
Fluid mechanics enables to comprehend the behaviour of solid fluids under pressure	
Fluid mechanics enables to comprehend the behaviour of fluids under a variety of forces and atmospheric conditions.	
None of the above	
I don't know	

**Q2: How is biogas primarily produced?**

By burning fossil fuels in a controlled environment.	
Through the conversion of solar energy into electricity.	
By the decomposition of organic matter, such as food scraps and animal waste.	X
Through the fusion of hydrogen atoms in a nuclear reactor.	
I don't know	

**Q3: When an alternative voltage is applied to a purely resistive circuit, the...**

Current is in phase with the voltage	
Voltage lags the current	
Current leads the voltage	X
None of the above	
I don't know	

**Q4: How would you define bioeconomy?**

The utilization of renewable energy sources for economic growth.	
The production and utilization of biological resources and processes for sustainable economic development.	X
The application of artificial intelligence and automation in economic sectors.	
The extraction and use of fossil fuels for economic activities.	
I don't know	

**Q5: A positive ion is an atom which has...**

Given up one or more electrons	
Captured one or more protons	X
Captured one or more electrons.	
Not captured any electron	
I don't know	

4.2. Practical Skills

**Description:** Skills of using thermal management, adjusting engineering designs, ensuring compliance with safety legislation, carrying out energy management of facilities, making electrical calculations, performing project management, designing wind turbines.

**Q1: Thermal management in energy systems provides...**

Performance enhancement and reliable operation conditions	X
Operation conditions	
A rotating solution for this kind of systems	
All of the above	
I don't know	

**Q2: When talking about electrical engineering, if the current is 12 amperes and the voltage is 15 volts, what is the resistance?**

0.75 ohms	
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0.80 ohms	
1.25 ohms	X
0.90 ohms	
I don't know	

**Q3: How big can wind turbine blades be?**

15 m	
20 m	
30 m	X
45 m	
I don't know	

**Q4: To what electricity generating capacity can a wind turbine arrive?**

15 megawatts	X
18 megawatts	
20 megawatts	
21 megawatts	
I don't know	

**Q5: How is project management utilized in engineering?**

Engineering managers oversee the technical aspects of a project	
Project managers handle the financial aspects of engineering projects	
Project managers design and develop engineering solutions	
Engineering managers create project timelines and assign tasks to team members	X
I don't know	

#### 4.3. IT Skills

**Description:** Skills related to using CAD software, creating AutoCAD drawings, performing data mining, data analytics, data storage, smart grid systems, Microsoft Office tools and general computer skills.

**Q1: In the CAD software which SketchUp tool moves the camera around the object?**

Zoom	
Orbit	X
Pan	
Enter	
I don't know	

**Q2: Which CAD software is most commonly used for designing and drafting renewable energy systems? (QUESTION 57)**

Adobe Photoshop	
AutoCAD	X
Microsoft Excel	
MATLAB	
I don't know	

**Q3: When analyzing data to optimize the performance of a solar power system, which Microsoft Office tool would be most appropriate for performing complex calculations and visualizing data trends? (QUESTION 58)**

Microsoft Word	
Microsoft Excel	X
Microsoft PowerPoint	
Microsoft Access	
I don't know	

**Q4: Which of the options below is wrong about the type of AutoCad drawing units?**

Architectural	
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Decimal	
Millimeter	X
Square	
I don't know	

**Q5: When using autoCAD, by selecting which one of the following, the objects on the layer are not visible and are not considered when the drawing is regenerated?**

When you froze the layer	X
When you lock the layer	
When you click the layer	
None of the above	
I don't know	