ERGU Tutorial Week No: 12 – Energy Audits, Surveys, etc

Q.1

What are the 5 main issues/challenges associated with the United Kingdom Energy Scene and compare to the sub-Saharan scene?

Q.2

How many electricity area boards were created after the Second World War in the UK?

Q.3

In the electricity industry what does SSEB and BEA mean?

Q.4

In the UK, in 1957 the Central Electricity Authority was replaced by which board?

Q.5

The UK electricity supply industry is vertically divided into four stages what are these stages?

Q.6

When was the electricity market in the United Kingdom open for competition?

Q.7

Mention any 6 electricity suppliers in the United Kingdom and name the electricity suppliers in Sub-Saharan Africa.

Q.8

Give five examples of renewable energy and non-renewable energy technologies

Q.9

There emerging technologies embedded within renewable energy, give example of 3 types of emerging technologies

Q.10

What percentage of Scotland's energy is expected to be generated by renewable technologies by the year 2020?

Q.11

Define the following terms

- Energy Assets
- Energy Audit
- Asset Management

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Q.12

Energy audit process are split into three distinct components, what are these components

Q.13

You are appointed as an Energy Engineer in an engineering company. The line manager has given you the task of identifying the types of energy audit that could be applicable to the company's Lighting system, HVAC systems and HVAC distribution systems. Briefly discuss the types of energy audit levels you may consider and present to your line manager.

Q.14

There are three phases that and energy auditor would need to conduct and energy audit on a facility, list the three phases of energy audit, discuss and give examples of the three phases.

Q.15

The monitoring phase of energy audit require survey instrumentation, what type of instrument used to measure the following;

- Electrical currents
- Water leakage into roof insulation
- Inspection of cooling coils for plug tubes
- Temperature and humidity
- Amount of light that falls on a surface
- Measure power quality
- Water flow measurement
- Air flow measurement
- Pressure measurement
- Combustion efficiency

Q.16

Who are the main people to keep in mind when writing an energy audit report?

Q.17

Give an overview of the structure of an audit report.

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Q.18

The energy auditor starts at the utility meter to locate all energy sources coming into the facility, what are the three most important things he/she need to do before continuing investigation.

Q.19

What are the seven main steps taken for accurate evaluation of energy consumption?

Q.20

Define the following terms:

- Energy Use Index
- Power factor
- Load factor

Q.21

What is the difference between the base load and seasonal load; illustrate the difference with a graphical example?

Q.22

How does the Rolling 12-Months method works in conducting electricity use trend analysis?

Q.23

Calculate the load factor for a continuously operating facility that consumed 1800,000 kWh of energy during a 60 day billing period and establish the peak demand of 2000 kW?

Q.24

What is the term ECM mean?

Q.25

The DECC has set out 3 stages to roll-out smart energy, what are these 3 stages.

Q.26

What are the different types of charges and rates that are applicable to Utility bills? Describe any four charges or rates structure you know.

Q.27

Give an expression of how to calculate a **simple payback** period, and state the advantages and disadvantages of the simple payback period.

Q.28

The time value for money can be evaluated using four main methods, list the four methods and describe any two of these methods.

Q.29

List the **six common discounting factors** used by many companies to solve their investment problems.

Q.30

An evaluation need to be made by an auditor to replace all 40-watts florescent lamps with a new lamp that saves 12% or 4.8 watts that gives the same output. The cost of each lamp is $2.80. Assuming the rate of return before taxes of 25% is required; can the immediate replacement be justified? Hours of operation are 5800 and the lamp life is 2 year. Electricity cost is 7.0 ¢/kWh.

Q.31

An electrical energy audit indicates electrical motor consumption is 4×10^6 kWh per year. By upgrading the motor spares with high efficiency motor a 10% savings can be realised. The additional cost for these motors is estimated at $80,000. Assuming an 8¢ per kWh energy charge and 20 year life is the expenditure justified based on minimum rate return of 20% before taxes? Solve the problem using the **present worth and annual cost methods**.

Q.32

A new water line must be constructed from an existing station reservoir. Estimates of construction and pumping costs are for each pipe has been made. The table below gives you the estimates

Pipe size	Estimated Construction Costs	Cost/Hour for Pumping
8	$80,000	$4
10	$100,000	$3
12	$160,000	$1.5

The annual cost is based on 16 years and a desired return on investment, before taxes of 10%. Calculate and choose the most economical pipe size for pumping 4000 hour/year?

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Group Exercise

The excessive use of energy in the industrial sectors always necessitate to questions on how energy can be used more efficiently. Performing an energy audit would enable the energy audit analyst carefully evaluate the efficient use of energy. Problems are likely to occur when conducting energy audits for industrial/manufacturing than for smaller commercial facilities or even large buildings since the equipment and operation of industrial facilities are more complex.

In this exercise pair up with your colleague or colleagues, choose an industrial asset or a commercial facility of your choice and perform an energy audit on it. Identify areas where potential problems of the inefficient use of energy can occur. Develop methods and clearly explain the approaches from the lecture notes that you can consider to address the problems.

- List the equipment/facility you intend to consider
- Use at least two Energy Conservation Measures (ECM) categories and consider the energy streams by discrete functions (for example electricity, natural gas, steam, air etc…).

In the context of the industrial equipment or commercial facility you have chosen, do the following tasks.

[1]- Discuss the preliminaries of energy audit and industrial audit opportunities. Clearly define the types of energy audits and show how it applies to the industrial facility under study.

[2]- State the phases of energy audit and show how execute the tasks in the phases.

[3]- Give an explanation on how to use the three distinct energy audit process components (pre-site work, site visit and post site work) relating to the industrial facility chosen.

NOTE: A clear understanding of your description of your approach should be demonstrated and aligned to the assets/facility in question.

End of Tutorial – Week No: 12