Unit 4: Energy Management

Unit code: T/602/6494

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

This unit enables learners to gain a knowledge of energy management legislation and international agreements, and the need to improve energy efficiencies to reduce carbon emissions. Learners will develop skills and techniques in planning and conducting an energy management audit and will also gain an understanding of how to monitor and target energy savings.

Unit introduction

Energy management is becoming increasingly important in terms of climate change and energy conservation, and is relevant to all human activity. Greater gains, both environmentally and economically, can be achieved by cutting down on waste, recycling and maximising the efficient use of energy. This means developing both a cultural and behavioural change. Managers in organisations require an awareness of current legislation, and through their leadership have to raise awareness of the need to conserve energy, establish policies and procedures and reward employees who have good ideas about energy efficiency. Software is now available to enable organisations to track their energy performance and set future targets.

Learners will gain a knowledge of energy conservation, including energy conservation awareness for both an organisation and the personnel employed.

The principal focus for the unit is establishing and developing an energy audit in the context of an organisational environment. Learners will develop the skills and techniques needed to carry out an energy management audit and monitor the processes adopted.

Learning outcomes

On completion of this unit a learner should:

1 Know about energy management

2 Be able to plan for an energy management audit

3 Be able to conduct an energy management audit

4 Understand how to monitor and target energy savings.

Unit content

1 Know about energy management

Legislation and international agreements: UK legislation (Climate Change Act); EU legislation, international protocols and accords

Sectors: business and public sector; energy intensive industries; small businesses; energy suppliers

Terminology: key terminology eg low carbon economy; carbon footprint; global emissions, energy consumption risk

Energy conservation techniques: saving energy eg insulation, equipment, lighting, waste management, recycling, resource management, heating, ventilation and air conditioning, energy generation methods

Energy emerging technologies: saving energy eg advanced photovoltaic cells, industrial energy efficiency accelerator, low carbon buildings accelerator

2 Be able to plan for an energy management audit

Energy source suppliers: fossil and non-fossil (biomass) fuels; electricity; gas; costs

Organisation policies: energy policy statements

Practices and procedures: eg energy usage, daytime, night-time, weekends; transport; notices; communication; rewards

Employer/employees: attitudes; commitment; leadership; communication; organisation structure; accountability

Buildings/equipment/materials/transport vehicles: eg insulation; usage; age; alternatives; life cycle replacement

Action plan: approval; aims; objectives; checklist

Audit procedures: checklist; logs; metering and measurements; frequency

3 Be able to conduct an energy management audit

Energy audit: tours with key staff; employer and employee discussions

Energy usage checklist: energy suppliers; energy tariff; range of quantifiable procedures and practices; costing procedure; equipment age, maintenance; materials used; buildings, doors, windows, insulation; lighting; recycling; waste

Information and data collection: qualitative and quantitative information; database; report; benchmarking; patterns; deviations; results analysis; strengths and areas for improvement; recommendations for energy savings

4 Understand how to monitor and target energy savings

Targeting: performance indicators, benchmarking; patterns; deviations

Monitoring: collection techniques; timelines; frequency; data analysis; patterns; accuracy

Review: practices; policies; procedures; employer/employee commitment; targets versus actual energy savings; energy wastage

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 describe the main current legislation, agreements and accords/protocols for energy		
P2 describe, using appropriate terminology, four main types of energy conservation techniques		
P3 complete an appropriate plan for an energy management audit	**M1** explain the importance of planning for an energy management audit	
P4 carry out an energy management audit for a selected organisation [IE1, 2, 3; SM1]		
P5 report relevant results from an energy management audit [IE 4]	**M2** explain relevant results from an energy management audit	**D1** analyse relevant results from an energy management audit
P6 describe proposed strengths and areas for improvement from an energy management audit	**M3** explain proposed strengths and areas for improvement from an energy management audit.	**D2** justify recommendations for further improvement in energy management following an audit.
P7 explain how to set and monitor targets for energy savings for a selected organisation. [RL1, 2]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key			
	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit could be delivered in conjunction with *Unit 12: Using Statistics in Science* or with any of the practical units in order to contextualise the learning and generate meaningful data in an environmental and sustainable context. Learners need to understand how databases are used and gain some awareness of the vast amount of information available on energy management.

For learning outcome 1, learners could research and produce a list of legislation and international agreements/accords appropriate to energy management. Many organisations and committees provide information and data in the field of energy conservation techniques. Learners could use the internet to gather information to describe the main types and build up a classification.

Learning outcome 2 lends itself to discussion and research on planning an energy management audit. Learners could look at some case studies, plan how to carry out an audit at home and then progress to planning an energy management audit for a selected small-to-medium-sized organisation.

For learning outcome 3, learners need to conduct their energy management audit, complete their audit checklist and gather relevant information/data that they need to present in their report. They need to interpret the data/information for strengths and areas for improvement, including energy saving recommendations.

For learning outcome 4, learners need to explain how they would monitor and set targets for energy savings identified from their energy management audit. This can be done by checking against any indicators/benchmarks.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and assessment
Introduction to unit and stages involved in energy management and how it fits in with other relevant units in the qualification.
Formal session to introduce energy legislation/protocols/accords/agreements. Terminology used in energy management, government and non-government agencies/organisations and movements towards energy-saving techniques and the new, emerging technologies.
Learner activity – researching types of organisations and committees engaged in energy management.
Assignment 1: Importance of Energy Management (P1, P2) Tutor introduces the assignment brief.
Formal lectures on organisations and their energy suppliers and the policies, procedures and practices they use.
Discussion about attitudes, culture and employer/employee responsibilities in reducing energy usage.
Case studies of organisations and management of energy.
Formal lectures on types of fuel, costs per unit, suppliers and ways of reducing energy consumption from buildings and their services.
Learner activity – learners to put together a proposed checklist for an audit.

Topic and suggested assignments/activities and assessment
Assignment 2: Energy Audit Plan (P3, M1)
Tutor introduces the assignment brief.
Tutorials on individual energy audit plans.
Demonstrations on data collection and the processes involved.
Formative learner activities on data/information collection and analysis, benchmarking and performance indicators.
Assignment 3: Energy Management Audit (P4, P5, P6, M2, M3, D1, D2)
Tutor introduces the assignment brief.
Independent learner activities: conducting an energy management audit.
Assignment 4: Setting Targets and Monitoring Energy Savings (P7)
Tutor introduces the assignment brief.
Theory session: benchmarking and setting targets.
Learner activity on techniques of monitoring.
Discussions on reviewing actual energy savings and setting more targets.
Review of unit and assessment.

Assessment

So that learners can generate the required evidence, the unit should be adapted to suit the resources within a centre and to enable learners to work with an organisation to complete a real or virtual energy management audit. Evidence could be provided using secondary sources of information/data in case studies, verifiable performance indicators/benchmark sources and interpretation exercises. Literature searches and reviews would also be appropriate.

For P1 and P2, learners need to demonstrate a knowledge of current, relevant legislation/agreements in energy conservation and management and describe four main techniques used to conserve energy.

For P3, learners need to complete an appropriate plan to enable them to carry out an energy management audit. The plan should cover the unit content as stated under learning outcome 2.

For P4 and P5, learners need to carry out an energy management audit for a selected organisation and report relevant results. The energy management audit conducted can be real or virtual.

For P6, learners need to use the results from the audit to propose strengths and areas for improvement, including recommendations for energy savings.

For P7, learners need to explain how to set and monitor realistic targets for energy savings. Learners should provide reasons and/or evidence to support their explanation.

For M1, learners need to explain the importance of planning for an energy management audit. Learners should consider the need for correct resources to carry out an audit, and consult the organisation's staff for information about buildings, employer attitudes etc.

For M2, learners need to explain the results from their audit, including any patterns/deviations. Correct terminology and units must be used.

For M3, learners need to explain why they propose the strengths and areas for improvement following the energy management audit.

For D1, learners need to analyse the results from the energy management audit by stating how factors identified in the audit contribute to the results and how they are related.

For D2, learners need to justify recommendations they make for further improvements. Learners should give reasons or evidence to support their opinions or views to clearly show how they arrived at their conclusions.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2	Importance of Energy Management	You are an energy consultant and have been asked to produce materials for a new client on energy conservation.	Leaflet or booklet.
P3, M1	Energy Audit Plan	In your role working for an energy company, draw up an energy audit plan for a customer.	Plan. Presentation. Observation record.
P4, P5, P6, M2, M3, D1, D2	Energy Management Audit	As an energy specialist for a local authority, check an organisation's energy conservation performance.	Report.
P7	Setting Targets and Monitoring Energy Savings	As an energy expert, advise an organisation about setting targets and monitoring the energy savings.	Report.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC in Environmental Sustainability sector suite. This unit has particular links with the following units in the BTEC Environmental Sustainability suite:

Level 3
Informatics for Environmental and Sustainability Industries
Using Statistics in Science
Sustainable Transport
Waste Management
Sustainable Facilities Management

Essential resources

Learners need access to appropriate computer facilities, software, tutorial support and library resources. Learners also require access to small organisations to complete the real or virtual energy management audit. The use of case studies should be encouraged.

Employer engagement and vocational contexts

The government has set up a number of organisations such as the Carbon Trust, and there are a large number of consultant companies engaged in energy conservation. Commercial industrial oil companies are also seeking new ways of reducing fossil fuel usage and university departments are exploring different forms of renewable energies.

Input from technicians and scientists working in a range of energy conservation organisations and use of energy laboratory situations would help to make the unit vocationally relevant. The Science, Technology, Engineering and Mathematics (STEM) Network has developed resources for anyone interested in science and technology. Visit www.stemnet.org.uk for details.

Indicative reading for learners

Textbooks

Beggs C – *Energy: Management, Supply and Conservation* (Butterworth-Heinemann, 2009) ISBN 9780750686709

Patra S C, Kusre B C, Kataki R (editors) – *Renewable Energy and Energy Management* (International Book Distributing Co, 2007) ISBN 9788181891945

Simantee S – *Energy Management: An Overview* (ICFAI Books, 2009) ISBN 9788131412466

Websites

Carbon Trust	www.carbontrust.co.uk
Department for Business, Innovation and Skills	www.bis.gov.uk
Department for Environment, Food and Rural Affairs (Defra)	www.defra.gov.uk
Energy Institute Press	www.energybooks.com
Gas and electricity regulator	www.ofgem.gov.uk
Gas and electricity watchdog	www.energywatch.org.uk
Government Department Energy Consumption	www.govspark.org.uk

Journals

Energy Efficiency

Energy and Environment

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	carrying out an energy management audit reporting results from an energy management audit
Reflective learners	explaining how to set and monitor targets for organisational energy savings
Self-managers	carrying out an energy management audit.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	reflecting on data and information collected
Self-managers	exploring sustainable facilities management.

Functional skills – Level 2

Skill	When learners are ...
ICT – using ICT	
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	using an appropriate database
Manage information storage to enable efficient retrieval	managing data and information collected in the audit
ICT – finding and selecting information	
Select information from a variety of sources to meet requirements of a complex task	using the internet to source information and data
ICT – developing, presenting and communicating information	
Enter, develop and refine information using appropriate software to meet requirements of a complex task	presenting their reports and plans
Use appropriate software to meet the requirements of a complex data-handling task	collecting and analysing data for their energy audit plan
Mathematics – analysing	
Apply a range of mathematics to find solutions	calculating energy savings and costs
Mathematics – interpreting	
Draw conclusions and provide mathematical justifications	presenting energy savings and costings results
English – Speaking, Listening and Communication	
Make a range of contributions to discussions in a range of contexts, including those that are unfamiliar, and make effective presentations	conducting tours with key personnel for the energy audit
English – Writing	
Write a range of texts, including extended written documents, communicating information, ideas and opinions, effectively and persuasively	communicating their results and findings from the energy management audit.