## Higher National Unit specification

## General information for centres

## Unit title: Energy and the Environment

## Unit code: F6BL 35

**Unit purpose:** This Unit is designed to enable candidates to acquire knowledge of the energy mix of the UK, the sources of energy and the uses for that energy. It creates an awareness of the power generation options in use in the UK, and considers the environmental impact of energy generation and use. The principal technologies are considered, including those based on fossil fuels and renewables, as well as combined energy plant. The sustainable use of energy is explored through the use of energy in buildings, allowing students to evaluate building management techniques.

On completion of the Unit the candidate should be able to:

1 Explain national and global energy exploitation and politics.
2 Explain the technical and environmental consequences of power generation techniques.
3 Evaluate techniques to reduce building energy consumption.

**Credit points and level:** 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** There are no specific prior knowledge requirements for this Unit. However a basic grounding in science, an awareness of environmental issues and land use options would be advantageous. This might be evidenced by the possession of the Units *Environmental Awareness, Chemistry and Physics for the Life Sciences, Environmental Science, Renewable Energy Systems: Overview of Energy Use, Renewable Energy Systems: Microgeneration Systems* or other similar Units.

**Core Skills:** There are opportunities to develop the Core Skills of *Communication* and *Numeracy* both at level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Context for delivery:** If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

**Assessment:** This Unit may be assessed using two instruments of assessment. Outcomes 1 and 2 may be jointly assessed using an assignment with restricted and extended response questions. Outcome 3 may be assessed by a case study.

# Higher National Unit specification: statement of standards

## Unit title: Energy and the Environment

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

## Outcome 1

Explain national and global energy exploitation and politics

### Knowledge and/or Skills

- Energy sources and uses
- Energy trends
- Global energy agreements
- National and international energy bodies

### Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can explain the:

- current energy mix of the UK by an analysis of the sources and uses of energy in the economy at a gross level
- trends in energy production and their environmental effect at a national level for three fossil fuels, and three renewable energy sources
- trends in energy consumption and their environmental effect for the domestic sector, industry, and transport on a national and global scale
- influence of significant global energy agreements, and the output of national and international energy bodies on the policies and actions of the UK national government

### Assessment Guidelines

This Outcome may be assessed by means of a short assignment with restricted and extended response questions to be done under open-book, unsupervised conditions. A response of 700 words or equivalent plus supporting diagrams/sketches should be sufficient to supply the required evidence. The assessment of this Outcome may be combined with the assessment for Outcome 2. Please see further details under Assessment Guidelines for Outcome 2.

## Higher National Unit specification: statement of standards (cont)

## Unit title: Energy and the Environment

## Outcome 2

Explain the technical and environmental consequences of power generation techniques

### Knowledge and/or Skills

- Power generation principles and technology
- Environmental consequences of power generation
- Economics of power generation
- Combined energy plant

### Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- explain the principles of operation of power generation plant using one named fossil fuel, two contrasting renewable energy sources and using nuclear technology
- compare and contrast the technological, environmental and economic consequences of power generation using fossil fuel, renewable, and nuclear energy sources
- explain the principles of operation and the environmental consequences of one form of combined energy plant.

### Assessment Guidelines

This Outcome may be assessed by means of a short assignment to be done under open-book, unsupervised conditions, with restricted and extended response questions. A response of 800 words or equivalent plus supporting diagrams/sketches should be sufficient to supply the required evidence. The assessment of this Outcome may be combined with the assessment for Outcome 1 in which case a submission of 1,500 words or equivalent should be sufficient to generate all evidence for both Outcomes.

## Higher National Unit specification: statement of standards (cont)

## Unit title: Energy and the Environment

## Outcome 3

Evaluate techniques to reduce building energy consumption

### Knowledge and/or Skills

- Building energy performance
- Benchmarking
- Legislation and standards
- Energy action plans

### Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- collect, collate and analyse building energy data sufficient to enable an assessment of building energy performance
- evaluate the energy performance of a building against benchmark data
- produce a prioritised action plan to reduce the energy consumption of a building that conforms to current UK building energy legislation
- critically evaluate, giving two or more strengths and weaknesses, two of the proposed actions from the action plan

This is an open-book assessment. A submission date should be agreed with candidates.

### Assessment Guidelines

This Outcome may be assessed by means of a short investigative case study in which the candidate uses self-collected and provided data to formulate an action plan for the future management of a building. A response of 1,500 words or equivalent plus supporting diagrams/sketches should be sufficient to supply the required evidence.

## Administrative Information

**Unit code:** F6BL 35

**Unit title:** Energy and the Environment

**Superclass category:** QB

**Original date of publication:** August 2008

**Version:** 01

**History of changes:**

| Version | Description of change | Date |
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**Source:** SQA



SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

## Higher National Unit specification: support notes

## Unit title: Energy and the Environment

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

## Guidance on the content and context for this Unit

The world's energy consumption is increasing, but the patterns of consumption are in a state of constant flux as some energy sources are depleted and others are developed. Consequently, energy security is increasingly seen as a major objective of national governments and there is an increased need for energy consumers to consider the factors influencing their energy balance between supply and demand. This in turn can inform development decisions.

This Unit is designed to develop an awareness of the global and national energy supply issues and the complex array of technologies available for power generation from both fossil fuels and renewable sources in order to better understand development decisions particularly with regard to national policies and building energy management. It enables candidates to discuss the options for the efficient and effective use of energy from a detailed knowledge of the technological and political climate.

The broad aim of Outcome 1 is to study the trends in energy demand and supply to try to project the likely changes in the future so that a sensible, informed debate on future energy strategy is possible. This will be presented alongside the evidence of global climate change which can be partly attributed to man's pattern of energy use. However the debate is also influenced by global agreements. For example, the Kyoto agreement led to nationally binding targets for greenhouse gas emissions which in turn influenced national policies such as the rates for vehicle excise duty. Similarly the reports of the Intergovernmental Panel on Climate Change have impacted on global and national thinking and strategies. Candidates should be aware of the principal provisions and impacts of such international agreements and bodies and be able to identify examples of the consequences at least at a national level. The trends considered should include the major divisions of energy supply and demand as reported by Government statistics

Outcome 2 is more concerned with power production as one element of energy supply as electricity may well become the dominant energy source of the future. The impact of the various power production technologies (fossil fuel, nuclear, hydro, wind, tidal, solar, biomass) should be considered from a wide range of angles that should include the technological (for example the need for new transmission infrastructure), the environmental (for example the influence on marine biology of a tidal barrage), and the economic (for example consideration of the lifetime cost of a nuclear power plant including decommissioning). Candidates should consider both large scale corporate power plants and the smaller domestic or community energy schemes and hence the Outcome also considers the impacts of combined energy plant.

## Higher National Unit specification: support notes (cont)

## Unit title: Energy and the Environment

The Unit concludes with Outcome 3 where the influence of the individual on energy can be best demonstrated, in buildings. The aim of the Outcome is to develop a simple strategy for the development of a building to improve its energy performance, based on evidence. This evidence should be based on an analysis of collected data that may include data such as electricity meter readings, degree day data, and building use. This should be compared to benchmark data to devise a simple but prioritised strategy. It is suggested that the benchmark data is in a simple comparative form, rather than derived from complex benchmarking models such as those required for building warrant applications

## Guidance on the delivery and assessment of this Unit

This Unit is specifically designed for use as part of a Group Awards in environmental protection and sustainability and it is best studied in this context. Ideally this Unit should be delivered using a variety of methods and media, including lectures, seminars, and workshops together with one or more site visits particularly to renewable power plant. Visits are useful to illustrate concepts and underline the importance of site-specific issues in subsequent work.

It is suggested that candidates are encouraged to investigate energy data from a variety of sources including government, the energy industry and environmental pressure groups so that various presentations and perspectives of the same basic data can be considered. Similarly it may be instructive to consider international agreements from the perspectives of developed and developing nations. However, the overriding aim should be to explain energy supply and demand at a gross level, and care must be taken to avoid excessive quantification (of toe, cubic meters etc) as these are relatively little significance compared to comparative values and trends.

When considering the technology of power production again it is comparative study that should predominate. So candidates should for example be aware that carbon emissions per kWh are higher from an oil fired power station than a gas fired power station. The absolute values are obviously significant but they are of less value for the purposes of this Unit.

However, when it comes to the final Outcome, then it is more appropriate to consider some detailed quantitative study, particularly with regard to energy use. Nevertheless an analysis of trends will still be of relevance in formulating the energy strategy. Candidates should be encouraged to collect data for analysis themselves rather than use pre-recorded material. This way they can get a better feel for energy quantities. It may also be helpful in creating an improved awareness of instrumentation although this is not part of this Unit.

It is suggested the assessment for Outcomes 1 and 2 could be an assignment with a combination of short answer and extended response questions. Whereas, Outcome 3 could be assessed by means of a report, about 1500 words long, that examines a specific case study, and requires the students to identify appropriate measures to reduce energy consumption.

## Higher National Unit specification: support notes (cont)

## Unit title: Energy and the Environment

***Opportunities for developing Core Skills***

There are opportunities for the candidate to develop the Written Component of *Communicatio*n at SCQF level 6 in the assessment of all Outcomes. The development may be facilitated through the use of short exercises. For example, recording the energy monitoring procedures used, comparing sources of energy information, and reporting on the effectiveness of alternative energy action plans. In completing the assessed work for the Outcomes candidates will prepare assignment and case study reports in which they present ideas, information and supporting detail in a structured manner and using a format and language appropriate to a technical audience. This will provide a further opportunity to develop the Written Component of *Communication*. Candidates when completing their responses to Outcomes will also have to present essential ideas/information and supporting information in the form of calculated or statistical numerical data presented in a logical and effective order. Hence there is also the opportunity to develop the Core Skill of *Numeracy* also to level 6.

## Open learning

This Unit would be suitable for delivery on an open (distance) learning basis.

## Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

## General information for candidates

## Unit title: Energy and the Environment

The development of nations has historically been closely associated with the availability and use of energy and today's developing countries are using ever increasing amounts of energy. Unfortunately much of this energy development is based on fossil fuels which are a finite resource.

The Unit explores energy sources that are available to us, and considers the extent to which they are capable of meeting the demand of nations now and into the future by looking carefully at how we use energy and the alternative energy sources that may be available. It also looks at power generation alternatives and you will explore the technological, environmental and economic consequences of selecting one power supply over another. The energy sources considered include traditional fossil fuels, large-scale hydro and nuclear energy, as well as the emerging renewable technologies such as wind and biomass, and related technologies such as combined heat and power plants.

You will consider the role of the international community in shaping the energy policy of a country and how this impacts on government actions.

Finally you will look at energy use. You will consider a building and you will measure its energy use and learn how to make an action plan to reduce its energy use so that you can make your own impact on the country's energy demand. Hence you will consider the heat and power resources used by a building, how these are related to climate and industrial productivity and the techniques that can be used to control heat and power use to reduce both cost and emissions. By completing this Unit you will be well equipped to understand the complex issues surrounding energy supply and demand, you will be better able to manage your own energy use, and you will be better able to influence decision makers.

Your performance in the Unit is assessed by means of two pieces of work completed in your own time, a short assignment considering global and national energy issues, and a case study looking at the energy performance of a building. During your progress through the Unit there will be opportunities for you to develop your skills in handling numerical and graphical data, and in writing reports of a technical nature, and so you can develop your Core Skills profile.