



Higher National Unit specification

General information for centres

Unit title: Farm Scale Renewable Energy

Unit code: F2G9 35

Unit purpose: This Unit is designed to enable candidates to develop the Knowledge and Skills to investigate the feasibility of a land-based renewable energy project. Candidates will be introduced to the sources and uses of energy, then move on to a more detailed look at energy from biomass. Candidates will investigate a farm scale renewable energy project from a technical, financial and environmental standpoint.

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

- 1 Evaluate the impact of renewable energy technologies in the rural environment.
- 2 Evaluate the options and processes involved in the establishment of a farm scale energy-from-biomass enterprise.
- 3 Evaluate the viability of a farm scale renewable energy project in a rural context.

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 F2G8 34 *Environmental Awareness* and F2GA 35 *Land Use Systems*.

Core Skills: There are opportunities to develop the Core Skills of *Communication* and *Numeracy* at SCQF 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: Outcomes 1 and 2 could be assessed together by means of a closed-book test comprising a set of both short answer and extended response questions. Outcome 3 could be assessed by a report which involves candidates evaluating the viability of a project proposal.

Higher National Unit specification: statement of standards

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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

Evaluate the impact of renewable energy technologies in the rural environment

Knowledge and/or Skills

- ◆ Energy
- ◆ Land-based renewable energy
- ◆ Environmental impacts
- ◆ Energy conversions

Evidence Requirements

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

- ◆ explain the current UK energy mix by considering types, sources, and uses for, energy
- ◆ evaluate three contrasting land-based renewable energy or low carbon technologies in terms of their farm scale development potential and impact on the environment
- ◆ evaluate two energy conversion processes associated with renewable energy production using the 1st and 2nd laws of thermodynamics

Assessment Guidelines

It is recommended that this assessment be combined with the assessment for Outcome 2. Please see Outcome 2 for details.

Higher National Unit specification: statement of standards (cont)

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Outcome 2

Evaluate the options and processes involved in the establishment of a farm scale energy-from-biomass enterprise

Knowledge and/or Skills

- ◆ Biomass sources
- ◆ Biomass production
- ◆ Biomass conversion

Evidence Requirements

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

- ◆ evaluate the relative merits of two contrasting materials that can be used as a biomass energy source
- ◆ explain the establishment and harvesting of a specified biomass crop for energy production
- ◆ evaluate two processes used to convert biomass to energy for their applicability to farm scale operation

Assessment Guidelines

It is recommended that the assessment for this Outcome be combined with the assessment for Outcome 1. It is suggested that an assessment consists of short answer and extended response questions that could be conducted under closed-book conditions.

Higher National Unit specification: statement of standards (cont)

Unit title: Farm Scale Renewable Energy

Outcome 3

Evaluate the viability of a farm scale renewable energy project in a rural context

Knowledge and/or Skills

- ◆ Technical support
- ◆ Financial support
- ◆ Rated power
- ◆ Energy yield
- ◆ Energy markets
- ◆ Effect of renewable energy projects on land use
- ◆ Evaluation techniques

Evidence Requirements

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

- ◆ evaluate the technical and financial support available for a selected farm-scale RE project
- ◆ explain the relationship of rated power to the energy yield for a selected RE project
- ◆ evaluate the operation of the electricity, gas and liquid fuel energy markets in the UK as far as they impact on rural renewable schemes
- ◆ evaluate the effect of renewable energy projects on land use
- ◆ evaluate a selected renewable energy project in terms of its overall financial viability and environmental impact

Assessment Guidelines

This Outcome may be assessed by means of a report that examines the technical, environmental and financial considerations of establishing a small RE installation. The report may be about 1,500 words in length.

Administrative Information

Unit code: F2G9 35
Unit title: Farm Scale Renewable Energy
Superclass category: QB
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Version	Description of change	Date

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Higher National Unit specification: support notes

Unit title: Farm Scale Renewable Energy

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 intended context of this Unit is a small to medium scale land-based rural enterprise in the UK. A farm would typify this.

The Unit begins with an overview of energy types, sources and uses, then considers biomass energy systems in some detail, and finally looks at factors affecting the viability of a small scale RE project (not necessarily biomass).

Outcome 1 provides an underpinning appreciation of the common types, sources and uses of energy. The common types of energy (chemical, electrical, potential etc) will be outlined. Sources of energy will be sub-divided into fossil and renewable, but with the emphasis quite definitely on the latter, as land-based renewable energy (wind, solar, hydro and biomass) is the focus of this Unit. The end uses of energy, such as transport, heat and light etc, will be considered and how the characteristics of each source dictate its selection for a specific use. The important concept of energy conversions and their efficiency will be investigated with reference to the 1st and 2nd laws of thermodynamics, which will lead to consideration of the environmental and sustainability issues of energy use. These would include those associated with renewable energy systems and its infrastructure (for example: land use, visual intrusion, effects on wildlife) as well as the more obvious pollution and resource depletion issues of fossil fuel use.

Outcome 2 investigates the use of biomass as an energy source. It considers the range of materials that can be used as a fuel source or feed stock, including waste materials. Purpose-grown energy crops to be included will most likely be those relevant to a UK climate, such as short rotation coppice (willow, poplar) and miscanthus, but not forgetting mainstream arable crops that can yield biofuels such as oil seed rape, cereals and sugar beet. The Unit will then investigate some of these in more detail, looking at their crop establishment and crop protection requirements, followed by consideration of harvesting, handling and processing of the crop. This part of the Unit could conclude with an overview of the conversion of biomass into heat energy, both direct combustion but also, briefly, indirect methods like gasification, pyrolysis, fermentation, esterification and anaerobic digestion.

Outcome 3 investigates the viability of a farm scale RE project, either as a paper-based exercise or with reference to a real project. As all RE projects are capital-intensive, funding possibilities should be explored together with sources of technical assistance. Alongside this would be an examination of the UK markets for electricity and renewable fuels. Key to the viability of a project will be its energy yield, so methods for predicting and calculating this must be covered. As the principal driver for any RE project is, ultimately, sustainability, the environmental impacts of specific RE projects will be critically examined. Consideration should also be given to the potential impact of the increase in land being used for renewable energy and the balance of land use between food production and energy production etc.

Higher National Unit specification: support notes (cont)

Unit title: Farm Scale Renewable Energy

Guidance on the delivery and assessment of this Unit

Ideally this Unit should be delivered using a variety of methods and media. There is a huge amount of resource material on RE available, so it is important that what is used is clearly relevant to the context of this Unit — that is: small scale RE projects in a rural setting. A site visit would be useful to underline the importance of site-specific issues in any project.

The assessment for Outcomes 1 and 2 could be a closed-book class test with a combination of short answer and extended response questions. A large amount of knowledge is covered by these two Outcomes.

Outcome 3 could be assessed by means of a report, about 1,500 words long, that examines the technical, environmental and financial considerations of establishing a small RE installation.

Opportunities for developing Core Skills

There are opportunities for the candidate to develop Written Communication at SCQF level 6 in the assessment of all Outcomes. If candidates complete written work for each Outcome a they will an opportunity to develop the general skill ‘produce well structured written communication on complex topics’. Candidates when completing their responses to Outcomes will have to present essential ideas/information and supporting detail in a logical and effective order.

Open learning

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

General information for candidates

Unit title: Farm Scale Renewable Energy

Our sources of energy must change from the current dependence on fossil fuels. There are important roles to play in the responsible development of renewable energy systems. This Unit aims to equip you with the knowledge and skills required to understand the technological, financial and environmental factors involved in setting up a small scale renewable energy system in a rural environment.

After an initial overview of energy — the different types, sources, uses and the physical laws governing it — the Unit focuses on renewable energy systems appropriate to small scale land-based situations. Environmental issues surrounding renewable energy systems are considered alongside those associated with fossil fuel use.

You will go on to investigate the use of biomass, and in particular, purpose-grown ‘energy crops’, as a source of energy. The crop requirements of selected energy crops will be looked at, following through to harvesting and handling methods. You will consider the range of technologies for converting biomass to bio-fuels, and then bio-fuels to energy.

Finally, you will examine the viability of a small-scale renewable energy system. To be able to do this, we will also cover sources of funding and technical assistance available, and look at the operation of the UK energy markets in the context of renewable energy. When evaluating a small RE system, we will consider its environmental impact, as well as the technological and financial factors.