National Unit Specification: general information

UNIT Energy: An Introduction (Intermediate 2)

CODE F3FN 11

COURSE Energy (Intermediate 2)

SUMMARY

This Unit is mandatory in the Intermediate 2 Skills for Work Energy Course. It is intended for candidates who are interested in a career within the energy sector, or who wish to gain some practical skills and knowledge of how the energy sector operates and the resources it needs, to operate effectively. This Unit can also be taken as a stand-alone Unit.

The aim of the Unit is to provide candidates with an overview of traditional and renewable energy systems and explain where we get our energy from, including the systems that convert it into a more convenient form, and the energy conversion processes that take place. Industrial and domestic systems are investigated to ensure as wide a range as possible is undertaken.

This Unit has been designed with secondary school candidates in mind but may be also be suitable for other candidate groups.

OUTCOMES

1 Investigate energy power systems in accordance with a given brief.
2 Investigate energy conservation and conversion processes in accordance with a given brief.
3 Investigate an installed energy system according to a given brief.
4 Contribute to a group presentation on a specified energy system in accordance with a given brief.

RECOMMENDED ENTRY

Entry is at the discretion of the centre.

Administrative Information

Superclass: QB

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CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**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.*

CORE SKILLS

There is no automatic certification of Core Skills in this Unit.

Opportunities for developing aspects of Core Skills are highlighted in *Guidance on Learning and Teaching Approaches for this Unit.*

National Unit Specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Investigate energy power systems in accordance with a given brief.

Performance Criteria

(a) Gather relevant information from a variety of sources according to the given brief.
(b) Gather information on the subsystems used in conventional and renewable electricity power generation systems.
(c) Gather information on the efficiency of conventional and renewable electrical power generation systems.
(d) Organise information gathered to produce clear summary information of subsystems and efficiency of conventional and renewable electricity power generation systems.
(e) Check that all steps have been completed in accordance with the given brief, including completing the work to the agreed timescale.

OUTCOME 2

Investigate energy conservation and conversion processes in accordance with a given brief.

Performance Criteria

(a) Gather relevant information from a variety of sources according to the given brief.
(b) Gather information on energy conservation techniques used in buildings.
(c) Gather information on types of energy used in the production of heat and electricity.
(d) Gather information on methods of energy conversion processes used in generating power.
(e) Organise information gathered to produce summary information on energy conservation, types of energy and energy conversion processes.
(f) Check that all steps have been completed in accordance with the given brief, including completing the work to the agreed timescale.

OUTCOME 3

Investigate an installed energy system according to a given brief.

Performance Criteria

(a) Gather relevant information from a variety of sources according to the given brief.
(b) Gather information on the sub-systems used in the energy system.
(c) Gather information on the impact of the energy system on the environment.
(d) Organise information gathered to produce evaluations of its energy sub-systems and the effect the system has on the environment.
(e) Check that all steps have been completed in accordance with the given brief, including completing the work to the agreed timescale.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Contribute to a group presentation on a specified energy system in accordance with a given brief.

(a) Contribute constructively to a group discussion to agree roles, tasks, and timescales to meet the brief.
(b) Carry out agreed role and tasks within the timescales set.
(c) Contribute to the selection of relevant information on the functions of components used in the specified energy system.
(d) Contribute to the selection of relevant information on the impact which the energy system has on the environment.
(e) Contribute to the production of the final group presentation.
(f) Carry out a quality check of the final presentation and feed back comments to the group.

EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Performance and product evidence is required for this Unit. The evidence should be gathered at appropriate points throughout the Unit, in open-book conditions, in response to a given brief.

Performance and product evidence for Outcomes 1, 2, and 3

Candidates will carry out an individual investigation according to the instructions in a given brief which covers all Outcomes and Performance Criteria. Findings will be gathered in a folio which the assessor will discuss with the candidate to check that all steps have been carried out as specified. The assessor will then complete and retain checklists for each candidate as evidence that all steps have been carried out as specified in the brief.

Energy generation systems should be investigated in terms of inputs, outputs, sub-systems, components, efficiency, and environmental effects.

The investigation should include three from the five Conventional Energy Generation Systems listed below:

- coal power system
- oil power system
- gas power system
- hydro power system
- nuclear power system

The investigation should include two from the four Renewable Energy Generation Systems listed below:

- heat system — solar hot water system
- heat system — ground source heat pump
- electrical system — solar photovoltaic
- electrical system — wind turbine

Energy conservation techniques should include loft, wall and floor insulation, double glazing, and draft proofing.

The investigation should include four from eight practical demonstrations — energy conversion processes listed below:

- solar energy to electrical energy — photovoltaic
- electrical energy to light energy — bulb
- electrical energy to rotational energy — motor
- rotational energy to electrical energy — generator
- potential energy to kinetic energy — hydro
- solar energy to heat energy — solar hot water
- wind energy to rotational energy to electrical energy — wind turbine
- steam energy to rotational — turbine

Product evidence for Outcome 4

In response to a given brief, candidates will work in groups on an energy system specified by the assessor and participate; in a group presentation on that system. The group will select an appropriate method of communication — written, oral, electronic, diagrammatic, pictorial — are all acceptable. The group may also choose the form of the presentation — poster, leaflet, short PowerPoint presentation, short group talk — are all acceptable provided the Performance Criteria are met. The Criteria focus on the candidate's team working skills and individual contribution, rather than on the quality of the final group presentation. The assessor will complete an observation checklist to confirm and record the candidate's achievement.

The National Assessment Bank (NAB) item for this Unit contains an appropriate brief which covers the investigation and presentation requirements of the Unit and an assessor observation checklist. Centres wishing to devise their own assessments must refer to the NAB to ensure a comparable standard.

National Unit Specification: support notes

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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 20 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The *Energy: An Introduction* Unit has been designed to provide candidates with an introduction to power generation systems that produce heat or electricity as an output. The focus of this Unit is on the investigation skills that the candidate will use to access and organise relevant information, and finally, to present their findings in a clear format.

Conservation of energy in domestic buildings will be investigated to ensure candidates realise the need to get maximum value from energy generated.

Candidates will be introduced to a range of energy systems where they will study the sub-systems or components which make up the system and how these sub-systems or components function to generate energy. Candidates will develop an understanding of energy, the technology used to convert it into more useful forms and how these conversion technologies can be used to give out heat or electrical power which is essential for our homes, industry, and businesses.

Sub-systems should be taken to mean smaller systems, eg a wind turbine has the following sub-systems turbine blades, generator, and column; components are single parts within the system or sub-system, eg the turbine blades sub-system would include the blades, hub, and main shaft.

The principles involved in this Unit are best demonstrated in a practical environment where students can be involved in the setting up and running of demonstrations. Where practical demonstrations cannot be provided, video or computer simulations should be used.

Candidates will be introduced to a large range of energy systems, from large power stations/systems which feed into the national grid to small renewable energy systems (microgeneration systems) which mostly give energy to domestic buildings. These systems would ideally be introduced by a series of site visits, video, computer simulations, or internet sites.

The generic employability skills which are developed in this Unit are:

- maintaining good timekeeping and attendance
- seeking feedback and advice
- working co-operatively with others
- checking quality of work
- working to agreed deadlines
- organising work effectively
- working confidently
- working independently
- developing investigation skills
- developing presentation skills
- developing creativity skills

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that a thorough induction is given to candidates at the start of this Unit so that they understand that the main learning approach will be candidate-centred. Candidates should work independently on a given investigation brief and should develop and use skills in accessing and organising information from a variety of sources. Sources might include:

- family and friends
- manufacturer's instructions
- internet
- reference books
- laboratory exercises
- visiting speakers

It is envisaged that some tutor support is given to candidates in the initial stages and at regular intervals throughout this Unit. However, the intention is to encourage candidates to work as independently as possible.

Candidates will be given responsibility, following lecturer/teacher support, for making choices on the format and style of the presentation of their key findings.

The candidate will be central to the learning and teaching of this Unit. They should be proactive in detailing the energy systems under investigation, the types of energy used, and how they are used in power generation, and in engineering systems. The investigation in Outcome 3 into an installed energy generation system would be best done through a site visit where they would see the system in its real environment. This would allow candidates an opportunity to visualise the system's impact on the environment as well the size of the components or sub-systems involved.

An important part of the learning and teaching in this Unit will be on the generic employability skills which are developed. Candidates should be aware that these skills are transferable and are valued by employers in the workplace.

When candidates are presenting their findings in this Unit, there are good learning opportunities for the whole class group. The sharing of information and the different methods used for presentations provide useful opportunities for reflection and discussion. The assessment process itself can be used as a valuable part of the learning in the Unit.

Where this Unit is delivered as part of the Intermediate 2 Energy Course, there are good opportunities to integrate the practical skills with the development and assessment of generic employability skills in the *Energy: Employability and Careers* Unit. The candidate's review of progress in employability skills could be based on the practical activities carried out in this Unit.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

In this Unit there are good opportunities for candidates to develop the Core Skill of *Information Technology*:

- in the investigation of energy power generation systems
- in the use of ICT to present findings

There are opportunities to develop aspects of the Core Skill of *Communication* both in the investigation and presentation of findings.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Formative assessment exercises involving candidates in identifying energy sub-systems, components and efficiencies, types of energy used and energy conversion processes, energy conservation techniques and environmental effects, will play an important part in building up the candidate's knowledge, understanding and confidence in relation to this Unit.

The recommended approach to summative assessment in this Unit is as follows:

Outcome 1

Candidates will carry out an investigation according to a given brief. In doing this, they will gather their findings in a folio which will be used as the basis for a discussion between the assessor and the candidate. The assessment evidence will be the completed signed assessor checklist which will detail the essential steps in the process as expressed in the Performance Criteria.

National Unit Specification: support notes (cont)

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Outcome 2

Candidates will carry out practical investigations according to a given brief. In doing this, they will gather their findings in a folio which will be used as the basis for a discussion between the assessor and the candidate. The assessment evidence will be the completed signed assessor checklist which will detail the essential steps in the process as expressed in the Performance Criteria.

Outcome 3

Candidates could carry out a practical investigation during a site visit according to a given brief. In doing this, they will gather their findings in a folio which will be used as the basis for a discussion between the assessor and the candidate. The assessment evidence will be the completed signed assessor checklist which will detail the essential steps in the process as expressed in the Performance Criteria.

Environmental effects investigated could include, noise, emissions, aesthetics, effect on wildlife, effect on the countryside or waterways, health, etc.

Outcome 4

The assessment is based on the end product of the Outcome which will be a presentation in a form of the candidate's choosing. Forms of presentation might include, for example, a short talk, poster, leaflet, diagram, or PowerPoint presentation.

An assessor checklist identifying the critical aspects of the presentation, regardless of form, should be completed and retained for each candidate.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.