Unit title: Energy: Conventional Technologies and the Grid (National 5)

Unit code: J132 75

Superclass: QB

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Unit purpose

This is an optional unit of the National 5 Skills for Work Energy course. This unit can also be taken as a stand-alone unit.

Learners will investigate how conventional energy generation plants support the UK’s total energy needs, and review the effect each of them has on the environment. They will investigate systems used to generate electricity using coal, oil, gas, hydro, and nuclear energy as a power source. The national grid and the distribution of energy/power will be investigated from both present and projected future needs.

This unit has been designed with secondary school learners in mind but is also suitable for a wide range of learner groups.

Outcomes

On successful completion of the unit the learner will be able to:

1. Investigate conventional energy systems in accordance with a given brief.
2. Investigate electricity transmission and distribution through the national grid system in accordance with a given brief.
3. Present findings on own energy consumption according to a given brief.
Credit points and level

0.5 national unit credit at SCQF level 5: (3 SCQF credit points at SCQF level 5)

Recommended entry to the unit

Entry is at the discretion of the centre.

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill

None

Core Skill component

Critical Thinking at SCQF level 4

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Context for delivery

If this unit is delivered as part of a course, it is recommended that it should be taught and assessed within the subject area of the course to which it contributes.

The assessment support pack (ASP) for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA’s website (http://www.sqa.org.uk/sqa/46233.2769.html).

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.
National unit specification: statement of standards

Unit title: Energy: Conventional Technologies and the Grid (National 5)

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 conventional energy 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 contribution of selected energy systems to the UK.
(c) Gather information on the environmental effects of selected energy systems.
(d) Organise information gathered to produce clear summaries on the energy contribution and environmental effects of conventional energy 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 electricity transmission and distribution through the national grid system 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 ways of transmitting electricity through the national grid.
(c) Gather information on ways of distributing electricity to the consumer.
(d) Gather information on the environmental issues raised when using a national grid system.
(e) Organise information gathered to produce clear summaries on the transmission and distribution of electricity, including environmental effects.
(f) Check that all steps have been completed in accordance with the given brief, including completing the work to the agreed timescale.

Outcome 3

Present findings on own energy consumption according to a given brief.

Performance criteria

(a) Present clear summary information on the contribution of conventional energy systems.
(b) Present clear summary information on the environmental effects of conventional energy systems.
(c) Present clear summary information on the transmission and distribution of electricity.
(d) Present clear summary information on the environmental issues of the national grid.
Evidence requirements for this unit

Evidence is required to demonstrate that learners 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

Learners 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 learner to check that all steps have been carried out as specified. The assessor will then complete and retain an observation checklist for each learner as evidence that all steps have been carried out as specified in the brief.

Product evidence

Each learner will produce a presentation which meets the performance criteria in outcome 3. The method of communication in the presentation may be chosen by the learner — written/oral, diagrammatic, graphical, and electronic — are all acceptable. The learner may also choose different forms of communication — poster, leaflet, short talk, PowerPoint presentation — are all acceptable, provided the performance criteria are met.

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

- summary information must be clear
- summary information of the contribution of convention energy systems to the UK
- summary information on the environmental effects of conventional energy systems
- summary information on the transmission of electricity
- summary information on electricity distribution systems
- summary information on the environmental effects of the national grid

Summary information of the contribution of convention energy systems must cover three of the following; coal power, oil power, gas power, hydro power or nuclear power.

Summary information on the environmental effects for conventional energy systems should include, where appropriate; carbon emissions, sustainability of fuel, fuel pipe lines, waste products, radiation, wildlife, climate change, or health.

Summary information on transmission lines should include; cables, pylons, underground cables, efficiencies, and high voltages.

Summary information on distribution systems should include; supply transformer stations, step down voltages (133kV or 174kV), distribution to consumers (230V), and domestic uses.

The ASP 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 ASP to ensure a comparable standard.
Development of Skills for Learning, Skills for Life and Skills for Work

It is expected that learners will develop broad, generic skills through this unit. Employability is a key aspect of Skills for Work and is present throughout the unit. In addition, there are a number of other skills that learners will be expected to improve on and develop as they undertake this unit, these can be drawn from the main skills areas listed below. These must be built into the unit where there are appropriate opportunities.

1 Literacy
1.1 Reading
1.2 Writing
1.3 Listening and talking

4 Employability, enterprise and citizenship
4.1 Employability

5 Thinking Skills
5.1 Remembering
5.2 Understanding
5.3 Applying
5.4 Analysing and evaluating
5.5 Creating

Amplification of these is given in SQA’s Skills Framework: Skills for Learning, Skills for Life and Skills for Work. The level of these skills should be at the same SCQF level as the unit and be consistent with the SCQF level descriptor. Further information on building in Skills for Learning, Skills for Life and Skills for Work is given in the ‘National unit support notes’ section.
National unit support notes

Unit title: Energy: Conventional Technologies and the Grid (National 5)

Unit support notes are offered as guidance and 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: Conventional Technologies and the Grid (National 5) unit has been designed to provide learners with an introduction to the size and relevance of the conventional energy power generation sector in the UK, and how the national grid is used to transmit this electrical power to the domestic market. Issues that arise from these generation and transmission technologies are also investigated. The focus of this unit is on the investigation skills that the learner will use to access and organise relevant information, and finally, to present their findings in a clear format.

This unit should give learners the opportunity to determine the importance of conventional power systems to the total energy used in the UK. They will also gain an understanding of the environmental issues linked to each of the energy systems, from CO₂ emissions to the disposal of waste products.

The transmission and distribution of electricity using the national grid will be investigated to give learners an understanding of how domestic electricity is distributed to the consumer.

The national grid should be evaluated in terms of it meeting the needs of the UK today and in the future. Renewable energy systems will come into consideration when looking at the future of the national grid, ie generating large amounts of electrical power in remote locations, eg off-shore wind farms, and not having power lines to transmit the power to where the main population in Scotland is. Learners will also consider the environmental effects of the national grid and investigate the effect of any changes anticipated for it.

The following is a guide to the content in this unit:

- Total UK energy produced:
  - individual technologies
  - energy produced for:
    - coal power
    - oil power
    - gas power
    - hydro power
    - nuclear power
Environmental issues:
- carbon emissions
- depletion of fuel available
- fuel pipe lines
- electricity power lines
- waste products
- radiation
- wildlife
- climate change
- health

The national grid:
- aluminium cables
- steel cores
- pylons
- underground cables
- efficiencies
- high voltages

Transmission and distribution:
- supply transformer stations
- step down voltage (132kV or 174kV)
- distributed to consumers
- step down voltage (230V)
- domestic uses

Grid environmental issues:
- overhead power lines, pylons, large pylons, cost, maintenance, aesthetics
- underground cables, insulation, cost, maintenance, aesthetics

The generic employability skills which are developed in this unit are:
- maintaining good timekeeping and attendance
- seeking feedback and advice
- 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 approaches to delivery of this unit

It is recommended that a thorough induction is given to learners at the start of this unit so that they understand that the main learning approach will be learner-centred. Learners 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
- visiting speakers

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

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

The learner will be central to the learning and teaching of this unit. They should be proactive in detailing the raw fuels/materials used to generate power and the refining processes they may need to undergo to make them suitable for use. Also in the size of the total power generated by conventional power stations, comparing these values, and evaluating how dependent we are on each of these technologies, and gaining an understanding of the environmental issues connected to each of the energy generation technologies.

They will also be proactive in investigating why a national grid is used to distribute power around the UK, and investigate the environmental issues connected with having a national grid, and any effects that a future national grid could have.

When learners 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 National 5 Skills for Work 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 (National 5) unit. The learner’s review of progress in employability skills could be based on the practical activities carried out in this unit.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Formative assessment exercises involving learners in identifying the size and value of the energy produced through conventional power stations and the use of a national grid system,
will play an important part in building up the learner’s knowledge, understanding, and confidence in relation to this unit.

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

Outcomes 1 and 2

Learners 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 learner. The assessment evidence will be the completed signed assessor observation checklist which will detail the essential steps in the process as expressed in the performance criteria.

Outcome 3

The assessment is based on the end product of the outcome which will be a presentation in a form of the learner’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 learner.

Opportunities for 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 Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA’s qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core Skills

In this unit there are good opportunities for learners to develop the Core Skill of Information Technology in the:

♦ investigation of the size and value of conventional power and using a national grid system
♦ 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.

This unit has the Critical Thinking component of Problem Solving embedded in it. This means that when learners achieve the unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 4.
General information for learners

Unit title: Energy: Conventional Technologies and the Grid (National 5)

This section will help you decide whether this is the unit for you by explaining what the unit is about, what you should know or be able to do before you start, what you will need to do during the unit and opportunities for further learning and employment.

This unit focuses on how energy generation plants support the country’s energy needs and the effect they have on the environment. You will learn how to:

- Investigate conventional energy systems used to generate electricity.
- Investigate electricity transmission and distribution through the national grid system.
- Present your findings on energy consumption.

You do not need to have any previous qualifications or experience, but it would help if you have already finished, or are in the process of finishing, the following units:

- Energy: Employability and Careers (National 5)
- Energy: Domestic Wind Turbine Systems (National 5)
- Energy: Domestic Solar Hot Water Systems (National 5)
- Energy: Oil/Gas Extraction (National 5)
- Energy: An Introduction (National 5)
- Energy and the Individual (National 5)

After you finish this unit, there may be opportunities to study other qualifications in this area, and/or further develop skills that will help in employment.
Administrative information

Published: August 2018 (version 3.0)

History of changes to national unit specification

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<thead>
<tr>
<th>Version</th>
<th>Description of change</th>
<th>Date</th>
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<tbody>
<tr>
<td>3.0</td>
<td>Unit moved to a new template and re-coded to align with corresponding course 2 code. No change to unit content. Core Skill component Critical Thinking at SCQF level 4 embedded.</td>
<td>August 2018</td>
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