Learning and Skills Development Agency
Vocational Learning Support Programme: 14–16
GCSE work-related assignments

Title: Renewable energy sources

Sector and subject: Product design brief

Assignment number: 3

Brief statement about coverage of the strands:

GCSE Engineering; how to set up **electrical circuits**; **renewable energy sources**; the **costs of electrical components**; how much **energy is used by household appliances**; carry out risk assessments; produce a set of safety procedures; tools and equipment needed and how to maintain them; advantages and disadvantages of a range of renewable energy.

About this assignment
Assignment 3 is based on Hudson Electrical, but could be adapted to similar companies. Students will learn about electrical circuits, renewable energy sources, the costs of electrical components and the amount of energy used by household appliances.

Getting ready for work-related learning

Before starting your work placement and any of the assignments in this booklet, you should read this section and complete the details in the boxes as soon as possible. You should then give a copy to your key contact at Hudson Electrical.

Name:

Home address:

Parent/carer emergency contact telephone number:

Key contact name at Hudson Electrical:

Any medical problems to inform Hudson Electrical, eg, asthma, diabetes, epilepsy:

School or college name and telephone number:

Date(s) of placement:

Time of arrival at Hudson Electrical:

Time of departure:

Method of transport to and from Hudson Electrical:

Questions to ask the key contact on the first day:

1.

2.

3.

4.

5.

Some practical tips
Before going to observe an area within the factory you should:

- write down any questions you are going to ask, leaving a space for the answers. Practise your questions on each other, note the answers you receive and be ready to respond
- ask beforehand if there are any photographs or written information about the area that you could copy
- get permission if you want to take any photographs (this is not normally allowed in production areas)
- look at the company's website as this will give you an insight into what the company does. Details of a wide range of manufacturers from this sector are available on the following site: www.beama.org.uk/beama_what_is_beams.htm You can also look at the sector to which Hudson belongs.

When visiting an area in the factory you should:

- make sure you obey any health and safety rules and pay attention to health and safety signs in the area
- ask politely if you wish to talk to an employee, taking care not to startle anyone who might not hear you in a noisy area or see you if they are concentrating on a task
- write down any answers to questions that you may have
- always thank employees that you talk to.

After your placement, you should:

- write a formal letter of thanks to the company (this could be used as portfolio evidence for the key skills of ICT or Communication)
- ask Hudson Electrical if it would like to comment on how the placement went, for example, could anything have been organised better or could anything be improved?
- do a short presentation to your class or teaching group about your placement. You might want to have this assessed for the key skill of Communication. You could also prepare a PowerPoint presentation, which can be used as portfolio evidence for the key skill of ICT.

Learning objectives
By completing this assignment you will learn:

- how to set up **electrical circuits**
- about **renewable energy sources**
- about the **costs of electrical components**
- about how much **energy is used by household appliances**.

Learning outcomes
When you successfully complete this assignment you will be able to:

- carry out risk assessments for electrical circuits
- produce a set of safety procedures and instructions for an electrical circuit, which anyone could follow
- describe the tools and equipment needed and how to maintain them
- explain the advantages and disadvantages of a range of renewable energy sources, for example there are a number of proposals to build large, wind-powered generators in areas of outstanding natural beauty
- draw a range of electrical circuit diagrams beginning with some basic circuits and moving towards the more complex. Make sure you explain why you have used the type of drawings or diagrams selected and pay strict attention to all symbols and conventions.

Key concepts/knowledge/skills and understanding covered by this assignment

- full understanding of electrical circuits, such as switches, relays sensors and resistors
- the safe working of electrical circuits and safety measures, such as circuit breakers
- how to calculate the complete values for a circuit and all components involved.

Guided learning hours
The time spent in class for this assignment is approximately five hours. The total amount of time you will need to spend on this assignment is approximately 20–25 hours including self-directed study and research.

Key skills opportunities
You can use this assignment to generate evidence for key skills. Below is a list of suggestions:

ICT

- Use software such as PC Wizard and Croc Clips to design circuits and test possible solutions to the design brief, print out all solutions and show the development process.
- Use all office software such as Word, Excel and PowerPoint to present your information and findings of circuits.
- Use Excel and Word to present tables and information about possible components which are to be used in your final solution.
- Use the internet to research possible renewable energy sources such as wind, solar and hydraulic power.

- Use images collected from the internet, scanned from articles and ones you have taken yourself. These can either be scanned in or used digitally to outline the brief and justify the specification.

Communication

- Using the question templates, you can ask a range of questions to all company employees.
- Either as preparation for your circuit designs or as a final check, you may benefit from the input of company employees. You could ask them if your design would work and request any advice or suggestions that they may have.

Application of Number

- Produce a table of common household electrical appliances. Find out the exact type of energy used by each appliance and calculate the approximate amount of energy it would use in a week.

Broader key skills
There are areas within these assignments where you can show evidence of developing broader key skills such as Problem Solving, Being Enterprising, Working with Others and Improving own Learning and Performance.

Problem Solving
Most of the assignments within this paper will test your problem-solving techniques, such as developing a solution to the brief or calculating the average household's use of energy.

There may also be the opportunity while on the placement for you to shadow a skilled person conducting some fault-finding of circuits and components. It may be possible for you to try this under supervision while taking full account of health and safety regulations and procedures.

Being Enterprising
Once you understand how a circuit is produced and can find any faults in it, draw the circuit and suggest ways in which you could improve it, for example cheaper components or a different circuit arrangement.

Working with Others
There are possible team activities in this assignment. In class, discuss possible questions to which you would like answers. List the top five questions and write down the predicted answers.

Once you have completed the assignments within this paper, show them to the supervisor for his or her feedback.

Improving own Learning and Performance
During your placement you will have the opportunity to test some strategies to improve your own performance, the main one being time management. This can be improved by completing a Gantt chart that shows the schedule for your placement.

Experience of work
This assignment will be suitable for a work-related learning placement one day a week for a one-term placement (six weeks). This will give you enough time to complete all the research required for the assignment.

Student preparation
Before you start the assignment, it would be useful for you to find out the following information:

- How many employees does Hudson Electrical employ?
- How is the company organised. Can you obtain or draw a company tree?
- Who does the company belong to? Is it family-owned or a public company?
- Who are the main customers that Hudson Electrical deals with and how is this done? For example, does Hudson use internet sales?
- Who supplies Hudson Electrical with its components? What are the most popular products and what are the quantities required
- See if you can discover the British government's policy on renewable energy sources.
- What is the European Policy on Renewable Energy Sources?
- Who does your school use for purchasing its electrical components?

Recording evidence
For some of the assignments in this booklet you will need to use some tables and forms that have been provided for you. These are available from the school's computer network. How you then choose to display information is up to you. Think about what is the most appropriate and effective method.

Each day during your placement you will be expected to keep a record of what you have found out and what you have observed. This may lead you to ask other questions that you think are important. Never be afraid to ask.

Tasks

Renewable energy sources and circuit designs
This booklet has several different tasks. Before you attempt any of them, read this booklet thoroughly and ensure that you fully understand what is required of you.

Background
The company has a customer who has a remote building and requires a form of power source for the building in which he intends to live. The required amount of power will be sufficient for running household lights, a laptop and basic appliances such as a refrigerator and kettle. There is no mains electricity supply to the building and the customer wishes to compare the cost of a renewable energy source with that of laying on mains electricity.

Your task will be to investigate sources of energy and how much energy is needed for the average house. You will then present your findings.

In the table below list five main electrical hazards and the precautions that would normally be taken. Check your answers with the company and see if you agree.

Electrical hazards	Precautions

During your placement you are going to meet a variety of people with different jobs. In the table below put in as many different job titles as you can, write a brief description of the job and list the tools of the trade. In the final column list the qualification required for each job.

Job title	Job description	Tools of the trade	Qualifications

Tools and equipment

In order to carry out many day-to-day jobs and activities you will need many specialised tools and equipment. While on your placement, list and draw all equipment that you observe being used. You might find some of these above. If you can, take a photograph of the tools and equipment.

Tool	Drawing and annotation
1) _____	
2) _____	
3) _____	
4) _____	
5) _____	
6) _____	

As you spend more time at your placement you may see more tools and equipment being used. Attach additional sheets as required.

Circuit design

Before you can attempt the final task, you will need to learn some basics about circuits. Draw the symbols for the components below. You may have already done this at school.

Component	Symbol	Function
Power source/battery		
Bulb		
Capacitor		
Resistor		
Diode		
Switch		

Household appliances
Household appliances are usually rated for their energy efficiency. Look at the list below and see if you can put them in order.

Rating		Order
E	=	_____
AA	=	_____
D	=	_____
C	=	_____
B	=	_____
A	=	_____

For the list opposite:

1 = least energy consumption

5 = greatest energy consumption

For the list below find out the energy consumption of each appliance. This value may vary from model to model and with each manufacturer. However, where possible, write down the efficiency value for the appliance below. If you need any help please ask.

Appliance		**Energy consumption (units)**
Cooker	**=**	**_____**
Fridge	**=**	**_____**
Freezer	**=**	**_____**
Kettle	**=**	**_____**
Microwave	**=**	**_____**
Computer	**=**	**__.4kW/h_____**

Weekly consumption
Now that you have found out how much energy the basic household appliances need to work, you will need to investigate how long the appliances are used for. You can calculate the total amount of energy used for each appliance.

Consumption value (kW) (of the appliance)	**x**	**Hours used (h)**	**=**	**Consumption per hours (KW/h)**

An example for a computer is given below.

Item	**Energy needed**		**Time used/day**		**Total needed/day**	**Total needed/week**
Computer	**0.4 (kW/h)**	**x**	**3(h)**	**=**	**1.2 (kW)**	**8.4 kW**

For you to work out the total amount of energy needed for the average household you might need to do a quick survey to find out the following information.

How many times in one week are the following appliances used:

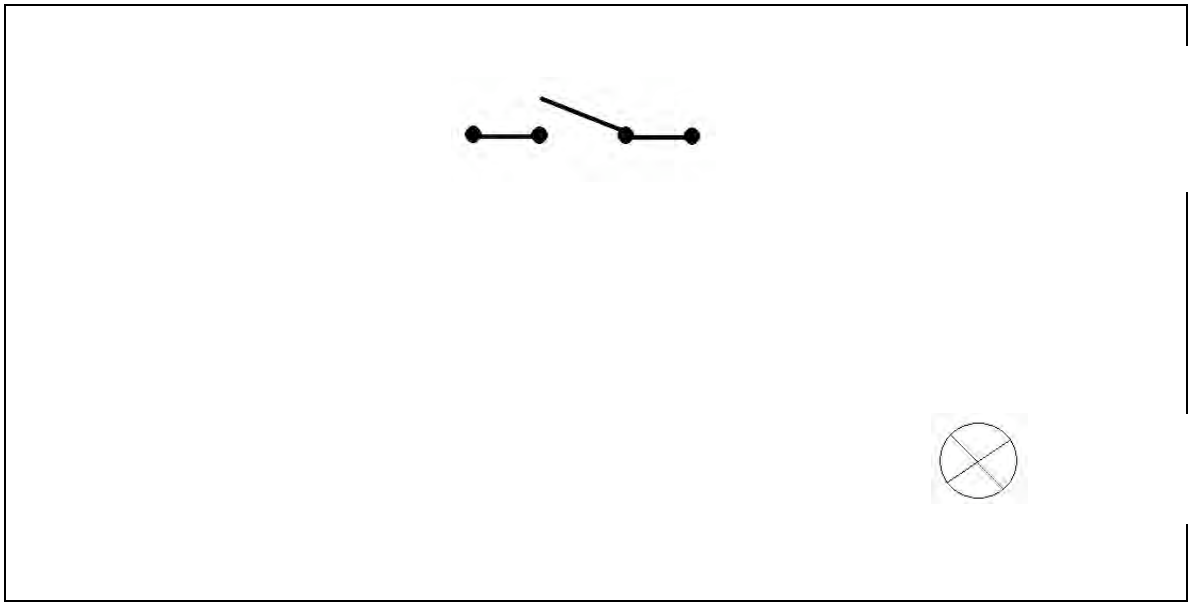
- kettle
- cooker
- microwave
- computer.

For how long are these appliances used? Put all the information into the table provided on the next sheet.

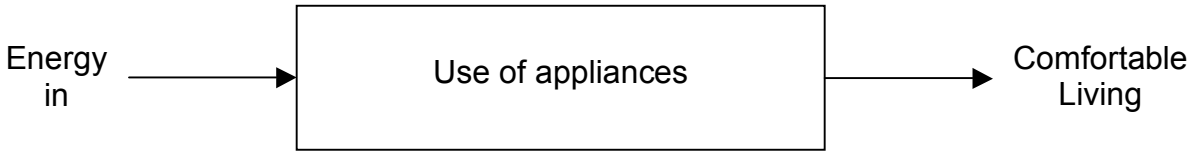
Item	Energy needed	X	Time used/day	=	Total needed/day	X 7 =	Total Needed/ week	X 52 =	Total needed/year
Cooker		x		=		X 7 =		X 52 =	
Fridge		x		=		X 7 =		X 52 =	
Freezer		x		=		X 7 =		X 52 =	
Kettle		x		=		X 7 =		X 52 =	
Microwave		x		=		X 7 =		X 52 =	
Computer		x		=		X 7 =		X 52 =	
Total									

Renewable energy

Using the space below, draw a simple circuit that has a light and a switch. The switch will be used to turn the light on and off. Don't forget to put in a suitable power supply.



The circuit above could be used to display how much energy is needed to run the average house. Below is a simple block diagram that shows the relationship between energy consumption and modern, comfortable living.



Comfortable living = enough energy to run all appliances, therefore:

Appliances need _____kW, so the amount of energy needed from the chosen energy source (wind, sun or water), needs to be equal to or more than the value above.

1) Name three types of renewable energy and explain the advantages when compared with normal forms of supply.

Source of energy	Advantage of the source
_____	_____
	_____
	_____
	_____
	_____
	_____
	_____
_____	_____
	_____
	_____
	_____
	_____
	_____
	_____
_____	_____
	_____
	_____
	_____
	_____
	_____
	_____

2) From the list above, list as many strengths and weaknesses for each renewable energy source.

Energy Source	Strengths	Weaknesses
_____	1) _____	1) _____
	2) _____	2) _____
	3) _____	3) _____
	4) _____	4) _____
_____	1) _____	1) _____
	2) _____	2) _____
	3) _____	3) _____
	4) _____	4) _____
_____	1) _____	1) _____
	2) _____	2) _____
	3) _____	3) _____
	4) _____	4) _____

Internet activities
Below you will find some website addresses with some questions. Use the addresses to answer the questions, write the answers in the space provided.

Web page: www.oilvoice.com/m/uploadDetail_public.asp?upload_ID=3593

Question: What part of the UK is making the most from renewable energy sources?

Answer:

_____

_____

Web page: www.politics.co.uk/campaignsite/national-energy-action-$1587944$6.htm

Question: What is fuel poverty?

What are the two main government strategies highlighted?

Answer:

_____

_____

Web page: www.edie.net/news/news_story.asp?id=9810&channel=0

Question: What percentage of the UK's electricity could be produced by waste?

Answer:

_____

_____

Web page: www.dti.gov.uk/renewables

Question: How much of the UK's electricity is currently supplied by renewable energy?

How much should be produced by the year 2010?

Answer:

_____

_____

Web page: www.cse.org.uk/cgi-bin/projects.cgi?featured&&917

Question: List the eight main advantages of renewable energy.

Answer:

1 _____ 5 _____

2 _____ 6 _____

3 _____ 7 _____

4 _____ 8 _____

From doing your research, you should now have found some useful information about the three main renewable energy sources (wind, sun and water). With the aid of PowerPoint, Word and Excel, present your findings in no more than 500 words. Take into account the following:

- Use images to help explain your decision.
- Your PowerPoint presentation should be no larger than 10 slides.
- Present your decision to your teacher first and once it has been fully checked present it to your supervisor at Hudson Electrical.

Task evaluation:

What software did you use?

_____

_____

Did you find it easy to decide on a renewable energy source?

_____

Which energy source did you choose? _____

If you were to do this task, again would you choose the same energy source?

_____

Teacher evaluation

	Excellent				Poor
Preparation	**5**	**4**	**3**	**2**	**1**
Presentation	**5**	**4**	**3**	**2**	**1**
Justification	**5**	**4**	**3**	**2**	**1**

Teachers' notes

This paper has been written for students to gather information on, and to help produce evidence for, Unit 2: engineered products. The areas covered by this paper are a, b, c and d. The following website provides links to manufacturers in all parts of the country: www.beama.org.uk/beama_what_is_beama.htm

Once all the tasks have been completed, students will be more aware of the topics covered. Having accessed all the information and presented in the appropriate format, the information will form a significant part of Unit 2.

Students must be fully aware that the placement is potentially dangerous and they must carry out a personal health and safety check of all the surroundings including all tools and equipment. In addition, they must carry out an industrial health and safety check and print this off before the placement.

Differentiation

The writing frames in this assignment are intended to provide assistance to the student to obtain the **minimum** evidence needed to **achieve** the assessment criteria. Extension tasks provide an opportunity for students to gain higher grades. However, students should be encouraged to work independently and investigate other areas of using renewable energy in everyday situations as well as realising and investigating electrical circuits and components. They could also attempt the following tasks.

- **Renewable energy for the home**. Is it suitable for all? What are the limitations? What are the costs of replacing the system?
- **Circuit investigation**. Using software such as Croc Clips, students could design more advanced circuits which would incorporate more than one household, possibly a small, isolated community.
- **Web page**. Students could produce a web page to go on the school's intranet covering topics such as health and safety concerns within electrical engineering, and renewable energy sources and what we can all do to help the environment.
- **PowerPoint**. Students could produce a PowerPoint presentation for other students going on work experience at a similar company covering general health and safety.

Assessment

On completion of the tasks within this assignment, students should be encouraged to submit them for marking. Ideally, teachers may carry out formative assessment and provide feedback to the students so that they can improve their work, perhaps be set further extension tasks and/or learn from any areas that they have struggled with. Finally, the completed assignment should be

submitted for grading assessment. It is also suggested that the placement company assesses each task so that its feedback can also be added to the portfolio.

Opportunities for careers education

Students should be encouraged to discuss career options with their school or college service or personal adviser, and visit the Connexions website: www.connexions.gov.uk

Placement evaluation

Student evaluation = improvement for all

For us to evaluate your placement correctly, please fill in the form below.

Surname _____

Forename _____

School/educational establishment _____

Work placement company _____

Work placement contact name _____

Placement started on _____

Placement finished on _____

Name of assignment undertaken _____

		Disagree				Agree
		1	**2**	**3**	**4**	**5**
i)	All tasks were achievable	**1**	**2**	**3**	**4**	**5**
ii)	All tasks were interesting	**1**	**2**	**3**	**4**	**5**
iii	I was able to gather all Information needed	**1**	**2**	**3**	**4**	**5**
iv)	I had enough time to complete all tasks	**1**	**2**	**3**	**4**	**5**
v)	The placement was suitable	**1**	**2**	**3**	**4**	**5**
vi)	I would recommend the placement	**1**	**2**	**3**	**4**	**5**

Changes

Now that you have completed your time at the placement and worked through this paper, spend a little time to help improve any areas which you did not enjoy or found difficult. Use the space below to write down your suggestions.

Suggested changes to the tasks	
Task number	**Suggested change**

Information for the employer

The student should read through all tasks and guidance notes before starting the placement. The student will hand this to the supervisor and ask them to fill this in so that they are aware of what you are being asked to do.

What would you allow the student to do while with you?

Actions	Yes	No	Unsure
Observe all employees while in a safe environment			
After suitable observation and while under supervision they can practise connecting components and fittings in a safe environment			
Under supervision they can test their work using suitable test equipment			

Please use the following spaces to outline any activities, which you feel need highlighting.

The students who have submitted these to you are currently working towards GCSE Engineering. Their time with you will be spent working through the supplied booklet, completing tasks which have been set out and observing relevant, everyday procedures. The students, who may be unfamiliar with your working environment, will require explanations of topic-specific words, phrases and terminology. If you have any relevant literature or other resources which you feel would be of relevance in this area, please supply these to the students.

The marking criteria for the qualification which the students are working towards can be found at
www.ocr.org.uk/OCR/WebSite/docroot/qualifications/qualificationhome/showQualification.do?qual_oid=2120&site=OCR&oid=2120&server=PRODUKTION