

Topic: Energy and Electricity

Links from prior learning: KS3 -

Key words:

Lesson Objectives:

- To consider the usefulness of electricity as an resource
- To calculate the amount of energy transferred from the mains
- To calculate the cost of energy transferred from the mains

Lesson 1: Using Electrical devices

Teaching Activities:

Starter- You are washed up on a desert island with no power. Then a solar generator washes up on the beach. What 3 electrical devices would you want on the island? Energy devices2 PPT

Main- Show picture of domestic electricity meter. Take reading. Discuss unit of KWhr and why it is preferred to joules. Show electricity bill and discuss key points.

Update electricity meter and get pupils to calculate bill.

Do calculations for various devices left on for different times.

Worksheet electricity costs questions

Plenary- look at EU energy efficiency label and present homework task. You may want to get everyone to do a different device and need to allocate devices.

Resources:

25v supply
nichrome wire
electromagnet
worksheets kWhr
and electricity costs
questions

Learning Outcomes:

Be able to appreciate why electricity is a useful form of energy

Recognise where energy is wasted in various electrical devices

Be able to interpret an electricity bill and read a meter

Be able to calculate the cost of using various devices

Safety:

Homework: Choose an electrical device . Prepare a poster about it. Include an explanation of how it works, what energy changes occur, how powerful it is, how much it costs to run for a year etc

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Lesson Objectives: To evaluate which electrical device is most suited to a task.
Recognise the advantages and disadvantages of using one device over another.

Lesson 2: Which Device?

Teaching Activities:

Starter- ppt of different TV types. Which one would the pupils rather have? Why? What makes it desirable/more useful? Or could get pupils to assess each others posters from last lesson (word doc 'Device' is for this purpose)

Main- 'Which device' worksheet. Question 1 compares electric heaters , question 2 compares old and new fridges.

Plenary- watch first part of interview with Trevor Baylis about Clockwork radio. Discuss why this radio is more suitable for Africa than battery powered radio.

Resources:

Worksheet – 'which device?'

Learning Outcomes:

Pupils understand that some devices are more suited to an application for others and can give valid reasons why.

Safety:

Homework:

Additional information: HSW

Topic: Energy and Electricity**Links from prior learning:** KS3 -**Key words:** renewable, non-renewable**Lesson Objectives:** Compare the advantages and disadvantages of using different energy sources to generate electricity
Know the main renewable and non-renewable energy sources and how each one works**Lesson 3-5: Energy resources****Teaching Activities:**

Some CHEMISTRY groups did a similar exercise to this last year. Probably worth checking if your class has done a presentation on different energy resources before you do this, this year.
Computer room needed for initial research
Main- Pupils to work in groups to produce powerpoint presentations on main sources of energy. Must include how source works, advantages, disadvantages, pollution produced, environmental impact and potential for UK (small scale and large scale). www.darvill.clara.net is an ideal starting point but students should also be able to find more detailed websites.
AQA Text book has some useful info.
P1a 4.1 Fossils and nuclear
P1a 4.2 Wind and water
P1a 4.3 Solar and geothermal

Need to examine: wind, fossil fuel, nuclear, biomass, wave/tidal, hydroelectric, geothermal, solar cells, solar heating, solar towers.

Plenary- Pupil summary of main energy resources

Resources:

Internet access

Sheet to fill in information

Learning Outcomes:

Be able to explain the energy changes taking place in each power station
Be able to describe the disadvantages of each energy source
Be able to describe the advantages of each energy source

Safety:**Homework:****Additional information:** HSW

Topic: Energy and Electricity

Links from prior learning: KS3 -		
Key words: renewable, non-renewable, CHP		
Lesson Objectives: Know the main parts of a fossil power station Know where energy is lost in a fossil station Know that efficiency can be increased by using CHP		
Lesson 3: Energy resources emphasis on fossils		
Teaching Activities: Starter: Give out envelopes containing energy resources. Sort into 1) renewable/non renewable 2) depend on sun/don't depend on sun 3) we use a lot at the moment (>10%) / we hardly use (this might give you some idea of how good a job chemistry have done!) Main: Watch DVD 33 first prog (1 st 8 minutes) Do first 2 questions on fossil power station sheet. Ask why power station is so inefficient. How can it be made more efficient? Introduce idea of CHP. Watch http://www.youtube.com/watch?v=-TvHL7nfXIE shows new CHP biomass plant (Sweden) (3m28s) and/or http://www.youtube.com/watch?v=mCIPkmr5LY8&feature=related animation introducing benefits of CHP (2m32s) Plenary: Watch last 5 minutes of DVD for disadvantages of fossils (also brief mention of transformers, changes in demand, start up time, Dinorwig)	Resources: Fossil power station worksheet Dvd p33	Learning Outcomes: Be able to explain the energy changes taking place in a fossil powered power station Be able to describe the advantages of a CHP station
Safety:		
Homework:		
Additional information:		

Topic: Energy and Electricity**Links from prior learning:** KS3 -**Key words:** pumped storage**Lesson Objectives:** To show how pumped storage can provide electricity when there are surges in demand**Lesson 4: Pumped storage****Teaching Activities:****Starter:** Watch clip of national grid having to meet demand after tv programme<http://www.youtube.com/watch?v=UTM2Ck6XWHg>**Main:** Pumped storage PPT – look at spikes in demand curve during brief intervals when we all went to brew up. Look at how a pumped storage station works. At end of PPT show video of Dinorweg
http://www.youtube.com/watch?v=7VONAYCsLRc&feature=player_embedded
(only show about 2 min) .**Plenary:** Dinorweg worksheet**Resources:**Dinorweg worksheet
Pumped storage
worksheet**Learning Outcomes:**Be able to explain how a
pumped storage system
works**Safety:****Homework:** Pumped storage question sheet**Additional information:** HSW

Topic: Energy and Electricity

Links from prior learning: KS3 -		
Key words: renewable, non-renewable, barrage, Pelamis		
Lesson Objectives: To show that over 90% of our electricity is from non renewable fuels To show that no one renewable could replace fossil fuels		
Lesson 5: Renewables		
Teaching Activities: Starter: Show 'These are the main fuels' ppt . Look at the fuels that we use to make electricity. Main: Worksheet Electricity production in the UK. Most of our electricity is from non-renewable fuels. Could renewable be used instead? Use worksheet to explore 5 options, each group does the calculations for 1 option. Also consider any problems with reliance on this source. Plenary: Groups report back on their findings.	Resources: Electricity production in the UK- worksheet Can renewables replace fossil – worksheet Renewable energy map - worksheet	Learning Outcomes: Be able to give the main fuels used to produce electricity Be able to assess whether renewable resources could provide enough electricity
Safety:		
Homework: Renewable energy map – worksheet		
Additional information:		

Topic: Energy and Electricity**Links from prior learning:** KS3 -**Key words:****Lesson Objectives:** use information provided about an island and its resources to suggest the best way of meeting the islands future energy demand**Lesson 6: Awassa Island****Teaching Activities:****Starter: Show** a map of Awassa Island. Current electricity is from oil. How else could the island produce electricity?**Main:** Assign pupils in groups (4 or 5). Give out information sheet(1 each?). Each person does calculation for one energy sources and thinks about adv and disadv. Give out summary sheets group compiles findings on sheet and reaches a conclusion.**Plenary:** Groups report back their conclusions.**Resources:**

Awassa Island sheets

Learning Outcomes:

Be able to assess whether renewable resources could provide enough electricity

Safety:**Homework:****Additional information:** HSW

Links from prior learning: KS3 -		
Key words:		
<ul style="list-style-type: none"> • Lesson Objectives: Compare various factors of energy production methods and recognise the strong and weak points of each. • Explore the principles of carbon capture 		
Lesson 7: Comparing energy generation		
Teaching Activities: Starter- Global warming ppt or watch first 5 minutes of Climate change dvd p79 Main- video clip below introduces some ways of reducing CO ₂ in atmosphere. http://news.bbc.co.uk/player/nol/newsid_7010000/newsid_7015100/7015116.stm?bw=bb&mp=wm&asb=1&news=1&ms3=22&ms_javascript=true&bbcws=2 Use sea tubes pdf to discuss idea of sea tubes. Pupils complete diagram on p 3 Why is it useful? Pupils look at the idea of sea tubes and complete the diagram. Then rate statements (on p4) as positive or negative. Then in pairs create a script for a tv show (see pdf) Plenary- CCS ppt looks at chemical ways of removing CO ₂ and a scheme in Scotland.	Resources: Dvd 7P9 Sea tubes notes, Sea tubes p 3 & 4 pdf (printed)	Learning Outcomes: Be able to compare methods of generating electricity in terms of start up time, cost per unit etc. Understand the principles of carbon capture and explain a variety of methods of utilising it.
Safety:		
Homework: Research how soil and forests can be used to capture carbon, and produce a leaflet aimed at Year 7 to explain this technology.		
Additional information:		

Topic: Energy and Electricity

Links from prior learning:
Key words:
Lesson Objectives: Review work covered in the last few lessons

Lesson 8: Energy resources		
Teaching Activities: Starter- Use Sim2 (ideally in computer room) to select various renewable sources to power a house Main- Question sheet has 9 questions (last one in very detailed) Divide class into 8/9 group. Each group is given a question and 5/10 mins to work out the answer. Then they present to the rest of the class. Plenary- Crossword	Resources: IT room Energy resource questions Energyresources cross	Learning Outcomes:
Safety:		
Homework: Write up answers to all questions		
Additional information: HSW		

Topic: Energy and Electricity

Links from prior learning:

Key words: pitch

Lesson Objectives: What does the output of a wind turbine depend on? Investigating either pitch of blades or number of blades.

Lesson 9: Wind Power

Teaching Activities:

Starter- Model wind turbine with all blades stripped off, what is this? Have it connected up to a voltmeter and LED. Add a blade and start the fan. How will the output of the wind turbine depend on the number of blades? Test this.

Main- Pupils should then use the fans and model wind turbines to investigate how the output of the turbine depends on the pitch (angle) of the blades. 0-90 degrees to the fan.

Draw graph, and try to find the angle which produces the most electrical output.

Plenary- pupils compete to see who can produce the most P.D/get the LED the brightest.

Resources:

Fans,
Model wind turbines,
Voltmeter,
Leads,
Crocodile clips,
LED

Learning Outcomes:

Understand how and why changing the pitch of the blades affects the output of a wind turbine.

Safety:

Homework: Answer the following question: Why is it preferable for a wind turbine to be able to rotate to 'follow' the wind?

Additional information:

Topic: Energy and Electricity

Links from prior learning: KS3 - voltage		
Key words: transformer, step-up, step-down, national grid		
Lesson Objectives: electricity is transferred from power stations to consumers along the national grid The uses of step-up and step down transformers in the National grid Increasing voltage reduces current and hence reduces energy losses in the cable		
Lesson 10:Transformers		
Teaching Activities: Starter- PPT on transformers to introduce idea of national grid and need for transformers Main- Demo to show why transformers are used with pylons Pupils to make their own transformers from iron C cores and 2m lengths of wire. Change number of turns to see effect on secondary voltage. Plenary- Worksheet 'Transformers' to summarise	Resources: Pylon demo 2V ac power supply 2x 2m lengths of insulated wire 2x iron C cores ac voltmeter 2x croc clips	Learning Outcomes: Know that the National Grid is a network of cables and transformers Know what step-up and step-down transformers do Know why electricity is transmitted at high voltage
Safety: trapped fingers between C cores		
Homework: Research for CA style experiment (how does light intensity affect voltage from solar cell), 1 side of A4 notes for next lesson.		
Additional information: HSW		

Topic: Energy Transfer

Links from prior learning: KS3 – 8I		
Key words:		
Lesson Objectives: learn how to carry out a CA		
Lesson 11/12/13		
Teaching Activities: 11: Using their 1 side of A4 research notes pupils sit part 1 of the CA under exam conditions. 12: Pupils carry out practical investigation using their own plan, or one supplied by teacher if plan unsuitable. Record results in a suitable table 13: Draw graph, self or peer mark section 1, graph and table.	Resources:	Learning Outcomes:
Safety:		
Homework:		
Additional information:		

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Links from prior learning:		
Key words:		
Lesson Objectives:		
Lesson 14:Test		
Teaching Activities: Starter- 2 mins revision Main – test Plenary – collect in	Resources:	Learning Outcomes:
Safety:		
Homework:		
Additional information:		