6th Form

What's the truth about nuclear power?

Info sheet answers.

1) Say if each article is for or against nuclear power. Or are they truly impartial?

Nuclear "not the answer":	against
Nuclear "short term answer":	for
Gordon Brown goes nuclear:	slightly for, but ostensibly impartial
Nuclear "not the answer" say Lib Dems:	impartial

2) For each article, find two facts and two opinions.

Article 1:
Facts:
• EU target = 20% UK energy from renewable by 2020
• Replacement nuclear plants would deliver 4-5% of power
• 50yrs of nuclear power, and still no strategy for waste
Opinions:
• New nuclear plants are not the answer
• Will do little to help tackle climate change
• Construction of nuclear plants is "irrational, unfortunate."
• Britain can meet its needs through renewables, energy efficiency, etc.
• New nuclear programme would encourage other nations to go down "dangerous nuclear route"
• Government's public consultation was a sham

Article 2:
Facts:
• Earliest time for new nuclear power plant = around 2017
• Nuclear power generates dangerous, long-lasting waste
• Billions of tons of carbon dioxide produced every year.
• Nuclear waste can be buried.
• At least another decade before CO_2 can be buried
Opinions:
• Environmental groups' opinions are as foolish as arguing against wind power because the wind doesn't blow every day
• Probably would have been better if we had spent the last 50yrs investing in renewables
• Senseless to ignore what nuclear can offer in the meantime

Article 3
Facts:
• Britain to build new generation of nuclear plants
• At least 40% of energy will come from new generation plants – twice the current output
• Nuclear could provide all energy
• UK –20% of energy from nuclear
• France – 80% from nuclear
• Britain can't cope for 50yrs on current coal, oil & gas stocks
• Wind farms costly and have huge opposition
• New generation of plants will cut CO_2 emissions
Opinions:
• Nuclear power the only option
• Can't rely on other nations
• Idea that UK can rely on renewables/efficiency is nonsense
• Nuclear power = "dinosaur"
• Britain can meet needs with renewables, efficiency, etc.

Article 4:
Facts:
• New plants due around 2020
• Lib Dems against nuclear
• John Hutton for nuclear

Opinions:
• Focus should be on renewables
• Lib Dems harbour "old prejudices"
• Technology could be obsolete by 2020
• New nuclear not the answer

3) Average power outputs:

Drax: 3945MW **Sizewell B:** 1181 MW **Average wind turbine:** 3MW

4) How many wind turbines or Sizewell Bs would it take to replace Drax?

Answer: 1315 wind turbines; 4 Sizewell Bs.

How much emitted CO_2 would this save?

Answer: Drax emits about 21m tons of carbon dioxide every year. A wind turbine is responsible for about 3.5 tons of carbon dioxide emissions per year, so the turbines would produce about 4600 tons a year. This is all quite difficult to calculate, though, because the costs and production of wind turbines depends a lot on the type of turbine, its location, the weather, and so on. Ignoring the carbon dioxide produced by mining uranium, using figures from the 2006 Sustainable Development Report, a nuclear power station produces about 400,000 tons of CO_2 a year.

Can you find an estimate of the energy it takes to build and decommission the facilities? How does this change the comparison?

Students should discover that a wind farm will "pay back" the energy costs of construction after about six months of use. The figure is similar for coal and nuclear plants – six to eight months in both cases. Decommissioning a wind farm is not as costly as decommissioning a coal or nuclear plant – wind turbines are made mostly from steel and copper, which is salvaged and sold (a 33-turbine wind farm contains about £1.5 million -worth of salvageable metals... selling the metal for scrap can, in many cases, pay decommissioning costs).

The cost of decommissioning a coal or nuclear plant is often included, before decommissioning, in the power bills sent to customers.

Nuclear plants are very expensive to decommission, especially because radioactive spent fuel and reactor components must be processed, buried, and guarded in special, secure facilities. In comparison, then, wind power is a lot cheaper in terms of money and energy.

Links to information can be found on the More Info page of the *I'm a Scientist* website.

5) How much CO2 would be released by coal-fired power stations generating 7.2 terawatt-hours of electricity? How many wind turbines would it take?

Answer: Depending on their source, students should discover that a coal plant emits somewhere around 1020kg CO_2 per MWh (data taken from the US EPA website). Using this figure, the stations would emit 7.344×10^9 kilos of CO_2 to generate 7.2 TWh.

2.4 million wind turbines would be needed.