3.2 and 3.4 The different responses to increasing energy demands

**Weighing up the advantages and disadvantages of contrasting energy options in terms of their technical feasibility, economics, and environmental impacts**

**Fossil fuels versus wind power or nuclear**

Onshore wind power will become competitive with traditional fossil fuels in Europe, the U.S. and Asia by 2015.

Worldwide, the technology is an average of about 10 percent above grid parity -- the level at which it’s able to compete with other technologies if all are subsidy-free and more efficient machines will help wind become competitive within two years. Renewables are moving from expensive carbon-cutting technologies to more mainstream forms of power generation. Investment in new renewable energy generating capacity in 2010 for the first time surpassed spending on new fossil fuel plants. Global wind installations rose about 10 percent to a record 44,711 megawatts last year, according to the Global Wind Energy Council. The cost for onshore wind is below $98 per megawatt-hour in Europe in 2020, a level comparable to nuclear -- without factoring the costs of decommissioning old atomic plants -- and above only hydro power and geothermal, which are “limited” in their use by geography and geology. The cost of offshore wind is around $225.80 per megawatt-hour. Offshore wind power, with its more expensive infrastructure, is still likely to be close to grid parity in Europe by 2023.

**How can meet our future energy needs with radical new approaches?**

**Emissions controls** – Kyoto Protocol adopted in 1997 aimed to reduce greenhouse gas emissions. Countries are required to achieve specific reductions in their greenhouse emissions (average of 5% against 1990 levels by 2012). The USA refused to sign. There is now in place an extension to the Protocol.

**Emissions trading** – EU emission Trading Scheme meant that heavy industrial plants have to buy permits to emit greenhouse gases over the limit they are allowed by government. Under the Kyoto Protcol carbon emissions are now tracked and traded like a commodity so that any excess reductions can be sold in the ‘carbon market’

**Green taxes** – Taxes on individuals for using air transport and pollution charges on companies. Other ideas are aimed to reduce energy consumption such as removing stamp duty on carbon neutral homes

**Offshore wind turbines** – Building offshore costs at least 50% more than on land but wind speeds are generally double those on land so they can generate more electricity.

**Carbon storage** – this involves capturing the carbon dioxide released by burning coal and burying it deep underground, but it is not proved that the carbon dioxide will actually stay underground and it is very expensive.

**Geothermal** – In the Philippines 25% of the electricity is generated from underground heat, which is free and available all day. However, the heat is often too deep to be economical.

Biofuels – algae – There are 3 main types; crops e.g. grasses, sugar, trees and algae. Algae are hard to grow but produce oil that requires less refining before it becomes a bio fuel.

**Over to you:**

1. **Find out about the London Array:**

* Create a fact-file about the project
* Weigh up the advantages and disadvantages of off-shore wind turbines in terms of technical feasibility, economics and environmental impacts

2. **Find out about the largest coal-fired power station in the world:**

* Create a fact-file about the project
* Weigh up the advantages and disadvantages of fossil fuel use in terms of technical feasibility, economics and environmental impacts

3. **Find out about the newest power station in the world:**

* Create a fact-file about the project
* Weigh up the advantages and disadvantages of nuclear energy in terms of technical feasibility, economics and environmental impacts

4. Create a presentation to the class assessing the priority that should be given to each of the different radical new approaches listed above.

**Definitions:**

**Radical energy solutions** – methods used to meet future energy needs including conservation, recycling, reliance on renewables, carbon credits and ‘green’ taxation.