Year: 10

Topic: 3.2 Generating electricity

Knowledge and Understanding to be developed:

This topic begins by looking at the advantages and disadvantages of renewable and non-renewable technologies for the generation of electrical power. It discusses the need for the National Grid as a nationwide electrical distribution system and the use of step-up and step-down transformers in the transmission of electricity from the power station to the home.
There are a number of opportunities for the development of mathematical skills in this topic. These include expressing in quantitative form the overall redistribution of energy within a system e.g. Sankey diagrams; applying the relationship between power, voltage and current to calculate the current flowing when electrical power is transmitted at different voltages. These topics afford learners the opportunity to recognise and use expressions in decimal form; to recognise expressions in standard form; to use ratios, fractions and percentages; to change the subject of an equation; to substitute numerical values into algebraic equations using appropriate units for physical quantities.

Key Terms to be learned this topic:

Non renewable	Sankey diagram
solar	tidal
National grid	energy
power	efficiency
Carbon footprint	

Learning Objectives and Outcomes: Students should be able to :

(a) the advantages and disadvantages of renewable energy technologies (e.g. hydroelectric, wind power, wave power, tidal power, waste, crops, solar and wood) for generating electricity on a national scale using secondary information
(b) the advantages and disadvantages of non-renewable energy technologies (fossil fuels and nuclear) for generating electricity
(c) the processes involved in generating electricity in a fuel based power station
(d) Sankey diagrams to show energy transfers; energy efficiency in terms of input energy and energy usefully transferred in a range of contexts including electrical power generation and transmission:
= × energy [or power] usefully transferred 100
total energy [or power] supplied % efficiency
(e) the need for the National Grid as an electricity distribution system including monitoring power use and responding to changing demand
(f) advantages and disadvantages of using different voltages of electricity at different points in the National Grid to include transmission of electricity and use in the home, selecting and using the equation:
power = voltage × current; P = VI
(g) the use of step-up and step-down transformers used in the transmission of electricity from the power station to the user in qualitative terms (they should be treated as voltage changers without any reference to how they perform this function)
(h) efficiency, reliability, carbon footprint and output to compare different types of power stations in the UK including those fuelled by fossil fuels, nuclear fuel and renewable sources of energy