Exam Papers Practice

7.1 Energy Choices & Security

Mark Schemes

Course	SL IB Environmental Systems & Societies (ESS)
Section	7. Climate Change & Energy Production
Topic	7.1 Energy Choices & Security
Difficulty	Medium

To be used by all students preparing for
SL IB Environmental Systems & Societies (ESS)
Students of other boards may also find this useful

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Indicative Content
The two solutions can be evaluated as follows: Maximum of **three** from the following: *Advantages of shale gas:* • Shale gas is free, the only cost is the extraction and shipping; [1 mark] • Most countries already have working gas-fired power stations so there is no need to build more; [1 mark] • Gas has lower carbon emissions than other fossil fuels / coal and oil; [1 mark] • Fracking will provide jobs; [1 mark] *Disadvantages of shale gas:* • Extracting shale gas involves digging underground; [1 mark] • Digging will destroy habitats; [1 mark] • Digging will spoil areas of natural beauty; [1 mark] • Shale gas may be found in areas that are already built upon; [1 mark] • Fracking may cause damage to local buildings and land near the site due to earthquakes; [1 mark] • The gas extracted from fracking will produce carbon dioxide / sulphur dioxide / greenhouse gases when burned; [1 mark] • Shale gas is methane, which is a greenhouse gas, this gas could escape into the atmosphere during the extraction process; [1 mark] Maximum of **three** from the following: *Advantages of nuclear fission:* • Nuclear power is reliable; [1 mark] • Nuclear fission does not produce carbon dioxide / greenhouse gases; [1 mark] • Large amounts of energy can be produced from small amounts of fuel; [1 mark] • Building more nuclear power stations will provide jobs; [1 mark]

Disadvantages of nuclear fission:

- Nuclear power stations produce radioactive waste; [1 mark]
- Radioactive waste is difficult and expensive to dispose of; [1 mark]
- Nuclear power stations are expensive to build; [1 mark]
- Widely perceived to be dangerous due to risks of accidents; [1 mark]

Model Answer	Commentary
Both fracking of shale gas and the need to build more nuclear power stations would provide jobs in the local communities [1 mark]. However, it is likely that the communities would not be happy with either fracking or the construction of nuclear power plants in their proximity. This is because there is some evidence that fracking causes minor earthquakes which could cause damage to buildings and land in the surrounding areas [1 mark]. Nuclear power plants are large structures that may spoil the view [1 mark] and are widely perceived to be to be dangerous in the event of an accident [1 mark]. Shale gas is a fossil fuel so burning it would increase national and global carbon emissions which contribute to global warming [1 mark]. Nuclear power does not [1 mark]. For this reason, I think that nuclear power is a better option than shale gas.	The command term 'evaluate' requires you to make an appraisal by weighing up the strengths and limitations of a particular topic or issue You do not need to know the details of how these different types of energy production work, but you do need to be able to weigh up the **pros** and **cons** of each, and you need to be able to discuss the social and economic **implications**

2

Indicative Content
Some people think that building more wind turbines is a good idea because: Any **three** from the following: • Wind power releases no pollutant gases / carbon dioxide / sulphur dioxide / greenhouse gases **OR** helps combat climate change by reducing carbon dioxide / other pollutants; [1 mark] • Energy from wind power is 'free' (once turbine/infrastructure has been built) **OR** wind doesn't have to be paid for; [1 mark] • Wind is a renewable resource **OR** wind power ensures a continuous power supply without depleting finite resources **OR** fossil fuels will eventually run out; [1 mark] • Wind farms can be built almost anywhere; [1 mark] • Wind power decreases reliance on imported energy sources, enhancing national energy security **OR** wind energy diversifies the energy mix, reducing vulnerability to supply disruptions / price fluctuations; [1 mark] • Wind energy projects create jobs in manufacturing/installation/maintenance **OR** supports local economies / fosters innovation in the renewable energy sector; [1 mark]

3

Indicative Content
Disadvantages of wind power include: Any **three** from the following: • Wind power generation depends on wind speed, which can be unpredictable; [1 mark] • Wind patterns can vary greatly, leading to fluctuations in energy production; [1 mark]

- Wind farms require significant land area, impacting local ecosystems/habitats / agriculture; [1 mark]
- Wind turbines can be considered unsightly / visually intrusive, especially when installed in large numbers / affect the aesthetics of landscapes; [1 mark]
- Wind turbines generate noise, potentially causing disturbances for nearby residents; [1 mark]
- Wind turbines can pose risks to flying wildlife, leading to fatalities / bird/bat mortalities; [1 mark]
- The setup of wind turbines involves high initial investment / infrastructure expenses; [1 mark]
- Regular (costly) maintenance/repairs are required for efficient wind turbine operation; [1 mark]
- Energy generated by (e.g. offshore) wind farms might need long-distance transmission to reach consumers; [1 mark]
- Wind power is viable only in areas with sufficient and consistent wind resources; [1 mark]

4

Indicative Content
A country should not rely completely on fossil fuels as a source of energy because: Any **four** from the following: • They will eventually run out/finite/they are not renewable **OR** they are non-renewable resources so their depletion could lead to energy scarcity; [1 mark] • Dependence on fossil fuels makes a country vulnerable to supply disruptions / price fluctuations; [1 mark] • They are expensive forms of energy/to produce/to extract/to import; [1 mark] • Transportation costs are high; [1 mark] • They pollute the air **OR** fossil fuel combustion leads to respiratory diseases / health problems due to air pollution; [1 mark] • They give off greenhouse gases/carbon dioxide/enhance global warming; [1 mark]

- They produce waste e.g. ash/slag/other residues **OR** oil/gas drilling can result in the production of drilling muds / cuttings; [1 mark]
- Relying on fossil fuels hinders the development of cleaner / more sustainable energy technologies **OR** over-reliance on fossil fuels can hinder economic growth / innovation in other sectors; [1 mark]
- Investing in alternative energy sources can create jobs / stimulate local economies; [1 mark]