



GEO.HU14 Energy Insecurity: Causes of Growing Energy Demand and Supply Issues

AQA 8035 · Calculators not allowed · about 60 minutes

Total Marks

--

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Define the term 'energy security' as used in discussions of national supply.

(Total for Question 1 is 1 mark)

- 2** State what is meant by 'energy insecurity' in the context of a country's economy.

(Total for Question 2 is 1 mark)

- 3** Give ONE reason why global energy demand has risen in recent decades, referring to population or economic change.

(Total for Question 3 is 1 mark)

- 4** Give TWO examples of economic development changes that increase energy demand in a country, for example linked to industrialisation or rising incomes.

(Total for Question 4 is 2 marks)

- 5** State TWO reasons why many countries still rely heavily on fossil fuels for energy supply.

(Total for Question 5 is 2 marks)

- 6** Give ONE physical factor and ONE political factor that can limit the exploitation of new fossil fuel reserves.

(Total for Question 6 is 2 marks)

- 7** Table 1 shows hypothetical world energy consumption by source in million tonnes of oil equivalent (Mtoe) for selected years. These figures are illustrative and not real statistics.

Source	1990	2005	2020
Coal	2500	3200	3600
Oil	3000	3400	3300
Natural gas	1800	2400	3100
Nuclear	600	700	800
Renewables	200	400	1200

- (a) Using Table 1, state which single energy source showed the largest absolute increase in consumption between 1990 and 2020. (1)
- (b) Calculate the absolute change in coal consumption between 1990 and 2020 using the table. Show your working. (2)
-
- (c) Describe the pattern of change in renewable energy consumption shown in Table 1 between 1990 and 2020. (3)
- (d) Suggest ONE reason, linked to technology or policy, that could explain the rapid rise in renewables between 2005 and 2020. (2)

(Total for Question 7 is 8 marks)

- 8** Give ONE example of an extraction technology that requires high capital investment and specialist equipment, mentioned in discussions of exploiting new fossil fuel reserves.

(Total for Question 8 is 1 mark)

- 9** Explain TWO causes of energy insecurity, using specific links to supply, demand or the cost of extraction.

(Total for Question 9 is 6 marks)

- 10** Give TWO examples of 'hostile' physical environments that make fossil fuel extraction more difficult and expensive.

(Total for Question 10 is 2 marks)

- 11** State what is meant by 'deep-water drilling' in the context of oil and gas extraction.

(Total for Question 11 is 1 mark)

- 12** Using Table 1 from Question 7, calculate the percentage change in natural gas consumption between 2005 and 2020. Give your answer to one decimal place. Show your working.

(Total for Question 12 is 2 marks)

13 Give TWO political reasons why a promising new reserve might remain untapped.

(Total for Question 13 is 2 marks)

14 Explain TWO ways in which the high cost and technical difficulty of extracting new fossil fuel reserves can contribute to higher global energy prices.

(Total for Question 14 is 5 marks)

15 Explain ONE economic reason and ONE supply-side reason why continued reliance on fossil fuels increases a country's energy insecurity. Refer to cost, supply routes or market vulnerability in your answer.

(Total for Question 15 is 6 marks)

Mark scheme · GEO.HU14 Energy Insecurity: Causes of Growing Energy Demand and Supply Issues

Question 1

- **B1** the reliable availability of energy supplies at affordable prices for a country or region, oe
- **Answer: The reliable availability of energy supplies at affordable prices for a country or region.**

Question 2

- **B1** when a country faces an unreliable or insufficient supply of energy, or when energy is unaffordable, oe
- **Answer: When a country faces an unreliable or insufficient supply of energy, or when energy is unaffordable.**

Question 3

- **B1** e.g. population growth increasing the number of energy consumers, oe
- **Answer: Population growth increasing the number of energy consumers.**

Question 4

- **B1** e.g. industrialisation, such as more factories and heavy industry, oe
- **B1** e.g. rising incomes leading to increased ownership of cars and electrical appliances, oe
- **Answer: Industrialisation, such as more factories and heavy industry; rising incomes leading to increased ownership of cars and electrical appliances.**

Question 5

- **B1** fossil fuels are currently abundant in many places and existing infrastructure is built for them, oe
- **B1** they often provide reliable base-load power and are economically cheaper to use given current markets, oe
- **Answer: Because fossil fuels are currently abundant in many places and existing infrastructure is built for them; and they provide reliable base-load power and are often cheaper given current markets.**

Question 6

- **B1** physical factor, e.g. reserves in remote or hostile environments such as deep water or Arctic regions, oe
- **B1** political factor, e.g. disputed territory or unstable government preventing investment and extraction, oe
- **Answer: Physical factor: reserves in remote or hostile environments such as deep water or Arctic regions. Political factor: disputed territory or unstable government preventing investment and extraction.**

Question 7

- (a) **B1** natural gas
- (a) **Answer: Natural gas.**
- (b) **M1** 3600 - 2500 or equivalent calculation seen, oe
- (b) **A1** 1100 Mtoe cao
- (b) **Answer: 1100 Mtoe.**
- (c) **B1** renewable consumption increased overall from 200 Mtoe in 1990 to 1200 Mtoe in 2020, oe
- (c) **B1** increase accelerated after 2005 (from 400 Mtoe in 2005 to 1200 Mtoe in 2020), oe
- (c) **B1** this shows rapid growth in renewables, particularly in the most recent period, oe
- (c) **Answer: Renewable energy consumption rose from 200 Mtoe in 1990 to 1200 Mtoe in 2020, with faster growth after 2005 (400 Mtoe to 1200 Mtoe), indicating rapid recent expansion of renewables.**
- (d) **B1** e.g. improvements and cost reductions in renewable technologies such as wind turbines and solar panels, oe
- (d) **B1** linked detail, e.g. government subsidies or renewable energy targets encouraging investment and deployment, oe
- (d) **Answer: Improvements and cost reductions in renewable technologies such as wind turbines and solar panels, often combined with government subsidies or targets that encouraged investment and deployment.**

Question 8

- **B1** e.g. deep-water drilling, fracking for shale gas, or horizontal drilling, oe
- **Answer: Deep-water drilling.**

Question 9

- **B1** cause 1 stated, e.g. rising demand due to population growth and industrialisation, oe
- **B1** linked development, e.g. more people and higher incomes increase energy use for transport, heating and manufacturing, increasing pressure on supply, oe
- **B1** cause 2 stated, e.g. difficulty or cost of exploiting new reserves, oe
- **B1** linked development, e.g. reserves in deep water or disputed areas need expensive technology or face political barriers, reducing available supply and driving prices up, oe
- **B1** additional valid linked point, e.g. over-reliance on a few fossil fuel sources or on imports increases vulnerability to price shocks and supply disruption, oe
- **B1** linked development or example, e.g. sudden export restrictions or price rises from major suppliers can quickly make energy unaffordable or scarce, oe
- **Answer: Possible answer: Rising demand from population growth and industrialisation increases pressure on supplies as more energy is needed for transport, heating and manufacturing. At the same time, many new reserves are costly or difficult to exploit, for example deep-water fields or shale requiring fracking, so supply cannot expand easily and prices rise; over-reliance on a few sources or imports also makes countries vulnerable to supply shocks and price spikes.**

Question 10

- **B1** e.g. Arctic regions with extreme cold and ice, oe
- **B1** e.g. deep offshore (deep-water) sites far from shore, oe
- **Answer: Arctic regions with extreme cold and ice; deep offshore (deep-water) sites far from shore.**

Question 11

- **B1** drilling for oil or gas from a platform in water depths significantly greater than coastal operations, often several hundred metres or more, oe
- **Answer: Drilling for oil or gas from a platform in water depths significantly greater than coastal operations, often several hundred metres or more.**

Question 12

- **M1** method seen: $(3100 - 2400) / 2400 \times 100$ or equivalent, oe
- **A1** 29.2% cao
- **Answer: 29.2%.**

Question 13

- **B1** e.g. disputed ownership or border claims over the area, oe
- **B1** e.g. sanctions, trade embargoes or unstable government discouraging foreign investment, oe
- **Answer: Disputed ownership or border claims over the area; sanctions, trade embargoes or unstable government discouraging foreign investment.**

Question 14

- **B1** point 1 stated, e.g. expensive extraction increases production costs, oe
- **B1** linked development, e.g. companies pass higher production costs to consumers through higher prices, oe
- **B1** point 2 stated, e.g. technical difficulty reduces supply growth, oe
- **B1** linked development, e.g. if supply cannot expand to meet rising demand, competition for available energy raises prices, oe
- **B1** additional linked point or example, e.g. capital-intensive projects require long lead times and risk premiums, which investors recoup via higher prices, oe
- **Answer: Expensive extraction raises production costs, which suppliers pass on to consumers so prices rise. Technical difficulty and long lead times mean supply cannot quickly expand to match demand, so competition for limited supply pushes prices up; capital-intensive projects also require risk premiums that feed into higher final prices.**

Question 15

- **B1** economic reason stated, e.g. price volatility on global fossil fuel markets, oe
- **B1** linked development, e.g. price spikes increase import bills and make energy unaffordable for households and industry, oe
- **B1** further linked point, e.g. reliance on imports ties the country to exchange rates and global market swings, increasing vulnerability, oe
- **B1** supply-side reason stated, e.g. concentration of supply on a few routes or producers, oe
- **B1** linked development, e.g. disruptions from political conflict, pipeline damage or embargoes can cut supply quickly and are hard to replace, oe
- **B1** further linked point or example, e.g. lack of domestic alternatives or slow capacity to switch increases the impact of such supply shocks, oe
- **Answer: Economic reason: global fossil fuel price volatility and sudden price spikes raise import bills and can make energy unaffordable, tying the country to exchange rate movements and market swings. Supply-side reason: dependence on a small number of producers or routes means political conflict, pipeline damage or embargoes can rapidly cut supplies that are hard to replace, and without domestic alternatives the country is highly vulnerable.**