



GEO.HU15 Impacts of Energy Insecurity and Large-Scale Strategies to Increase Supply

AQA 8035 · Calculators not allowed · about 60 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Define 'energy insecurity' in the context of a country or region's supply and demand of energy.

(Total for Question 1 is 1 mark)

- 2** State one social consequence of energy insecurity for households in the UK, naming the issue.

(Total for Question 2 is 1 mark)

- 3** Give one economic cost of energy insecurity to industry, for example in a manufacturing region.

(Total for Question 3 is 1 mark)

- 4** Describe one environmental impact of exploring for energy in an environmentally sensitive area, for example exploration for shale gas in a protected countryside area.

(Total for Question 4 is 2 marks)

- 5** Describe one way that geopolitical tensions over energy supplies can affect the UK energy market, naming an effect.

(Total for Question 5 is 2 marks)

- 6** Name the UK company and the general location associated with controversial shale gas fracking trials in the 2010s, and give the approximate first year such operations attracted national attention.

(Total for Question 6 is 2 marks)

- 7** Explain one economic benefit of continuing fossil fuel extraction such as fracking for shale gas for the UK economy.

(Total for Question 7 is 2 marks)

- 8** Explain one environmental drawback of large-scale onshore wind farms when deployed at scale in rural areas of the UK.

(Total for Question 8 is 2 marks)

- 9** Give one social or cultural objection communities sometimes raise against building large hydroelectric dams.

(Total for Question 9 is 2 marks)

- 10** The Hinkley Point C nuclear project in the UK is a named large-scale strategy to increase supply. Describe TWO benefits that supporters claim for nuclear power such as Hinkley Point C.

(Total for Question 10 is 2 marks)

- 11** Using the example of a large-scale solar farm, explain FOUR possible drawbacks to biodiversity and land use when converting agricultural land to solar arrays.

(Total for Question 11 is 4 marks)

- 12** Explain ONE way that investing in large-scale renewable energy at national scale can help to reduce geopolitical tensions over energy supply.

(Total for Question 12 is 2 marks)

- 13** Suggest TWO reasons why some communities oppose the development of new nuclear power stations in their area.

(Total for Question 13 is 3 marks)

- 14** Describe and explain TWO trade-offs policymakers must consider when deciding between large-scale fracking, nuclear power or renewables to increase national energy supply.

(Total for Question 14 is 4 marks)

- 15** Use evidence from the pack and named examples where relevant to answer this question.
Evaluate the extent to which a policy mix of nuclear power plus large-scale renewables is the best strategy for the UK to increase energy supply and improve energy security.

(Total for Question 15 is 8 marks)

Mark scheme · GEO.HU15 Impacts of Energy Insecurity and Large-Scale Strategies to Increase Supply

Question 1

- **B1** a situation where reliable, affordable energy supply is not guaranteed for households, businesses or industry, oe
- **Answer: When a country or region cannot guarantee reliable, affordable energy supplies for households, businesses or industry.**

Question 2

- **B1** fuel poverty (households unable to heat or power their homes adequately), oe
- **Answer: Fuel poverty, where households cannot afford to heat or power their homes adequately.**

Question 3

- **B1** increased production costs due to higher or volatile energy prices, leading to lower profits or job losses, oe
- **Answer: Higher or volatile energy prices that raise production costs, reducing profits and risking job losses.**

Question 4

- **B1** disturbance to habitats and wildlife, e.g. loss of vegetation and nesting sites, oe
- **B1** linked detail, e.g. heavy machinery, access tracks and noise can fragment habitat and reduce biodiversity, oe
- **Answer: Exploration can disturb habitats and wildlife, for example loss of vegetation and nesting sites; heavy machinery, access tracks and noise fragment habitat and reduce biodiversity.**

Question 5

- **B1** disruption to imported supplies, e.g. pipeline or shipping interruptions, oe
- **B1** linked consequence, e.g. this can push up wholesale prices and lead to higher consumer bills in the UK, oe
- **Answer: Geopolitical tensions can disrupt imported supplies, for example pipeline or shipping interruptions, which can push up wholesale prices and lead to higher consumer bills in the UK.**

Question 6

- **B1** Cuadrilla, oe
- **B1** near Blackpool / in Lancashire, and around 2011 (first high-profile seismic events) oe
- **Answer: Cuadrilla, near Blackpool in Lancashire; operations first attracted national attention around 2011.**

Question 7

- **B1** reduces reliance on imported fuels, oe
- **B1** linked detail, e.g. potentially lower wholesale prices and increased energy security leading to lower costs for industry and jobs in extraction areas, oe
- **Answer: It can reduce reliance on imported fuels, potentially lowering wholesale prices and increasing energy security, which can reduce costs for industry and support jobs in extraction areas.**

Question 8

- **B1** visual impact on landscapes, oe
- **B1** linked detail, e.g. can affect scenic views, tourism and local sense of place, and may lead to local opposition, oe
- **Answer: They can have a strong visual impact on landscapes, affecting scenic views, tourism and a local sense of place, which can lead to local opposition to development.**

Question 9

- **B1** displacement of communities, e.g. people forced to relocate when valleys are flooded, oe
- **B1** linked detail, e.g. loss of cultural sites, agricultural land or changes to livelihoods, oe
- **Answer: Displacement of communities, for example people forced to relocate when valleys are flooded, causing loss of cultural sites, agricultural land and changes to livelihoods.**

Question 10

- **B1** provides low-carbon baseload electricity, reducing greenhouse gas emissions compared with fossil fuels, oe
- **B1** linked benefit, e.g. long-term, reliable electricity supply that supports industry and households, oe
- **Answer: It provides low-carbon baseload electricity which helps reduce greenhouse gas emissions compared with fossil fuels, and offers a long-term reliable electricity supply that supports industry and households.**

Question 11

- **B1** loss of existing habitat or farmland, oe
- **B1** fragmentation of habitats, reducing movement of species between areas, oe
- **B1** local microclimate changes, e.g. shading, altered ground temperature or water runoff patterns affecting plants and invertebrates, oe
- **B1** possible disturbance during construction and maintenance, e.g. vehicle movement and human activity reducing wildlife presence, oe
- **Answer: Possible drawbacks include loss of existing habitat or farmland; fragmentation of habitats limiting species movement; local microclimate changes such as shading and altered runoff affecting plants and invertebrates; and disturbance during construction and maintenance from vehicles and human activity.**

Question 12

- **B1** reduces dependence on imported fuels, oe
- **B1** linked detail, e.g. by generating more domestic electricity from wind, solar or hydro, a country is less exposed to supply shocks from foreign producers or transit routes, oe
- **Answer: It reduces dependence on imported fuels; by generating more domestic electricity from wind, solar or hydro, a country is less exposed to supply shocks from foreign producers or transit routes, lowering the risk of geopolitical disruption.**

Question 13

- **B1** concern about radioactive waste and its long-term storage, oe
- **B1** fear of accidents or perceived safety risks, oe
- **B1** local disruption during construction and impact on property values or local environment, oe
- **Answer: Concerns include radioactive waste and its long-term storage, fear of accidents and perceived safety risks, and local disruption during construction with potential impacts on property values and the local environment.**

Question 14

- **B1** trade-off 1: speed and cost versus environmental impact, e.g. fracking can be quicker and cheaper to bring online but may cause local environmental damage and emissions, oe
- **B1** linked explanation for trade-off 1, e.g. policymakers must weigh short-term economic and security gains against long-term environmental harm and public opposition, oe
- **B1** trade-off 2: reliability and baseload versus safety and waste, e.g. nuclear provides reliable baseload power but raises issues of radioactive waste and high upfront costs, oe
- **B1** linked explanation for trade-off 2, e.g. policymakers balance the need for steady supply and low-carbon output with concerns about cost, safety and long-term waste management, oe
- **Answer: They must balance speed and cost against environmental impact, for example fracking may be quicker and cheaper to start but risks local environmental damage and emissions; and weigh reliability and baseload against safety and waste, for example nuclear gives steady low-carbon power but involves high upfront costs, safety concerns and long-term radioactive waste.**

Question 15

- **Level 4** (7-8): A detailed, well-balanced evaluation that uses accurate, named evidence for both nuclear and renewables (eg Hinkley Point C, UK offshore wind growth); weighs benefits for energy security, carbon reduction and reliability against drawbacks such as cost, waste, intermittency and land-use; reaches a clear, justified conclusion about the overall effectiveness of a mixed policy.
- **Level 3** (5-6): A clear evaluation that discusses advantages and disadvantages of combining nuclear and renewables with some supporting examples; a reasoned conclusion is given but the balance of evidence may be less developed.
- **Level 2** (3-4): Some relevant points about nuclear and renewables are made, with limited supporting detail or examples; a simple judgement is offered with limited justification.
- **Level 1** (1-2): One or two isolated points about strategies to increase supply are made, with little or no evaluation or supporting evidence.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Arguments supporting the mix: nuclear provides low-carbon baseload power and improves reliability while large-scale renewables such as offshore wind provide large low-carbon generation potential and reduce dependence on imports, together improving energy security and helping meet carbon targets.
 - Examples to use: Hinkley Point C as a named nuclear project; UK offshore wind farms and planned solar/wave projects as named renewable developments.
 - Costs and finance: nuclear has very high capital cost and long build times, which can strain public finances or require long-term contracts; renewables can have high upfront cost but falling unit costs and quicker deployment.
 - Intermittency and storage: renewables are intermittent and require storage, grid upgrades or flexible generation to ensure supply matches demand; nuclear is less flexible but complements intermittent sources.
 - Environmental and social drawbacks: nuclear creates radioactive waste and raises safety concerns; renewables at scale can have land-use and biodiversity impacts and local opposition; fracking, though not part of the mix here, exemplifies trade-offs between quick supply and local environmental damage.
 - Policy implementation issues: planning, public acceptance, long-term waste solutions and investment certainty are critical; a mixed strategy requires coherent policy, investment in grid and storage, and public engagement.
 - A reasoned conclusion might argue that a mixed policy is strong because it balances baseload and low-carbon variability, but it must be accompanied by investments in storage, network upgrades and clear waste management and financing plans to be the most effective approach.