

Exercise walk-through

Wind Energy ■ 6.12

eXercise

You must be able to

- describe how **wind turbines** 风力涡轮机 generate electricity
- state advantages and disadvantages
- explain intermittency and siting issues

Method — How it works

Wind turbines use moving air to spin blades connected to a generator, producing electricity. Wind is a **renewable**, low-carbon source.

Method — Advantages

- Renewable, **no CO₂** during use, no fuel cost.
- Land between turbines can still be farmed.

Method — Disadvantages

- **Intermittent** — only works when the wind blows (needs storage/backup).
- Can **harm birds and bats**; noise and visual impact.
- Best only in consistently **windy** locations (coasts, plains, ridges).

Method — A worked judgement

A wind farm on a windy coast provides clean power and lets the land below stay in use, but produces nothing on calm days and may affect local birds.

Practice 2.1 ■ 1 mark

What spins a wind turbine's blades?

Solution 2.1

Method: How it works

Worked steps

Moving air (wind) **B1**.

Practice 2.2 ■ 1 mark

State one advantage of wind energy.

Solution 2.2

Worked steps

Any one: renewable, no CO₂, no fuel cost, land still usable **B1**.

Practice 2.3 ■ 1 mark

State one disadvantage.

Solution 2.3

Worked steps

Any one: intermittent, harms birds/bats, noise/visual impact, location-limited **B1**.

Exam-style 3.1 ■ 1 mark

A disadvantage of wind power is that it is

- A** a major CO₂ source
- B** intermittent (depends on wind)
- C** nonrenewable
- D** available everywhere equally

Solution 3.1

Method: A worked judgement

- A a major CO₂ source
- B intermittent (depends on wind) 
- C nonrenewable
- D available everywhere equally

Worked steps

B — intermittent (depends on wind).

Exam-style 3.2 ■ 2 marks

A region installs a large wind farm.

- (a) State one benefit and one drawback.
- (b) Explain how the intermittency problem could be managed.

Solution 3.2

Method: A worked judgement

Worked steps

(a) Benefit: clean, renewable power / dual land use; drawback: intermittent or harms birds **B1 B1**. (b) Store surplus energy (batteries) or combine with other sources/backup for calm periods **M1 A1**.

Exam-style 3.3 ■ 2 marks

Explain why wind energy is considered renewable and low-carbon.

Solution 3.3

Method: How it works

Worked steps

Wind is continually renewed by the Sun-driven atmosphere and burns no fuel, so it emits no CO₂ during operation **M1** **A1**.