Wind and water: choosing an electricity resource

Student activity • observation and reasoning

YEAR 10 / LESSON 32 / PHYSICS ONLY

The question

How do wind and different water resources drive electricity generation?

Use process diagrams and invented output data to compare resources without confusing renewable supply with constant output.

Equipment

• Booklet, calculator, ruler and resource-diagram cards

Desk-based modelling only. No rotating fans, elevated water tanks, mains circuits or moving-water apparatus are needed.

Course coverage: Physics only: 4.18P, 4.19P. Wind, hydroelectric, tidal and wave resources.

Plan, model or apparatus sketch

Draw a labelled setup or force diagram; include the measured quantities.

Method and reasoning

Read the whole sequence before starting

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1. Draw the transfer pathway for a wind turbine and generator, starting with moving air.

2. Draw a reservoir hydroelectric pathway, starting with the gravitational store of the water. Distinguish this from tidal and wave systems.

3. Use the practice hourly powers for a fictional wind turbine: 0, 1, 2 and 1 MW. Calculate electrical energy for each one-hour interval and the four-hour total.

4. Compare these outputs with a constant 1 MW demand. Identify the hours with a shortfall and surplus; do not assume storage has no losses.

5. Compare controllability, predictability, location requirements, habitats and resource variability for wind, reservoir hydroelectric, tidal and wave generation.

6. Recommend a mixed supply for an invented coastal community. Include one constraint and identify evidence needed before a real decision.

Cleanup

- Return cards and calculators.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Invented practice data: hourly output 0, 1, 2, 1 MW over four consecutive one-hour intervals; demand is 1 MW throughout. Energy = power × time. One MW sustained for one hour supplies one MWh, not one MW per hour.

Hour	Output / MW	Energy / MWh	Surplus / shortfall
1	0		
2	1		
3	2		
4	1		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What drives a wind generator?

2. What is the initial store for reservoir hydroelectricity?

3. Calculate total practice output energy.

4. Does equal total energy guarantee supply in every hour?

5. How do tidal and wave resources differ?

6. What can storage do?