Wind Turbines

Earth & Space Science | Engineering Design Process

Engineering Challenge

Visible Elements in Photo

- Wind turbines (multiple units of varying heights) with three rotating blades each
- Tall cylindrical towers supporting the turbine structures
- Flat, open landscape (agricultural field with crop rows visible)
- Power transmission lines running horizontally across the scene
- Clear blue sky with minimal cloud cover

Reasonable Inferences

- From turbine blades rotating in open landscape: Wind is a consistent, available energy resource in this location; the blades are positioned high to capture stronger winds at elevation.
- From power transmission lines: The electricity generated must be transported and distributed to homes and communities, requiring infrastructure connections.
- From flat terrain and spacing: Large turbines require significant ground area and distance from each other to avoid wind interference and maximize energy collection.

Engineering Task

K-2 Challenge:

Design a Spinning Wind Catcher

Make a small wind spinner that can turn and light up a flashlight (or spin a pinwheel as fast as possible). You can use paper, straws, tape, and a battery. Test it in front of a fan or outside on a breezy day. Which blade shape spins the fastest?

3-5 Version

Design a Model Wind Turbine

Build a tabletop wind turbine (using a motor, paper or plastic blades, a cardboard tower, and a cup to collect small pom-poms as "energy collected"). Your turbine must:
- Stand at least 12 inches tall without tipping over
- Spin smoothly when exposed to fan wind for at least 30 seconds
- Collect at least 10 pom-poms in 2 minutes of fan exposure

Test three different blade shapes (curved, flat, angled) and measure which design collects the most "energy."

3-5 Challenge:

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Test three different blade shapes (curved, flat, angled) and measure which design collects the most "energy."

EDP Phase Targeted

Imagine / Plan

The photo clearly shows a working solution (wind turbines generating energy), so students don't need to discover the problem—they can immediately begin imagining how to recreate and test a scaled version. This phase works best because students can observe the design features (blade angle, tower height, open location) and use those observations to plan their own model.

Suggested Materials

- Paper plates or plastic cups (for blades)
- Wooden dowels or straws (for tower structure)
- Cardboard tubes or paper towel rolls (for column support)
- Small motor or hand crank (optional; for K-2, fan provides wind)
- Tape, glue, and markers
- Small lightweight objects (pom-poms, beads) for measuring energy collection
- Desk fan (to simulate wind)

Estimated Time

45–60 minutes (one session for 3-5; can be split into design and testing for K-2)

Why This Works for Teachers

This task directly addresses NGSS 3-5-ETS1-1 (Define a problem that can be solved with a given material or set of tools) and K-2-ETS1-1 (Ask questions, make observations, and gather information about a situation) by having students analyze a real renewable energy structure and prototype a miniature version using the engineering design process.