

Design a Roof: Solar vs Non-Solar

A CENVAR SOLAR SCIENCE EXPERIMENT FOR AGES 10+



Description

Students work in teams to design two roofs for the same model house: one traditional roof and one with solar panels. Using simple data on energy use and environmental impact, they build a case for which roof best serves their “client”—a family or school.

Age/Grade Level: Grade 5+ (Ages 10+)

Objectives:

Time: One 45-60 Minute Class Period plus extension for research and presentations.

- Identify benefits and tradeoffs of rooftop solar compared to a standard roof.
- Apply basic math to compare energy costs and approximate savings.
- Communicate a design recommendation using evidence.

Vocabulary

- **Solar Energy:** Energy from the sun.
- **Heat:** A form of energy that makes things warmer.
- **Melt:** To change from a solid to a liquid because of heat.
- **Reflect:** To bounce back light or heat.
- **Solar panel (PV panel):** A device that turns sunlight into electricity.
- **Kilowatt-hour (kWh):** A unit for measuring electrical energy used or produced over time.
- **Carbon emissions:** Gases released when fossil fuels are burned, contributing to climate change.

Materials

- One printed “house footprint” per team (top-down outline of a house roof)
- Colored pencils or markers
- Scissors, glue or tape
- Pre-printed “solar panel” rectangles sized to the roof drawing

- Simple data handout with:
 - Average household monthly kWh use (example value)
 - Approximate annual kWh a small rooftop solar system can generate locally
 - Approximate emissions avoided per kWh of solar energy

Safety Precautions

- Standard classroom tool safety when using scissors.

Implementation (Teacher Script)

1. Ask: “What do you notice about roofs in our town—do you see solar panels anywhere?”
2. Show a photo or graphic of a school with solar panels on the roof.
3. Explain that today students will act as designers deciding which roof design is best for a client based on energy, cost, and environmental impact.

Procedure

1. Divide students into small teams and give each team a house footprint and a set of solar panel cutouts.
2. Instruct teams to design two versions of the roof:
 - a. Roof A: Standard roof (no solar panels).
 - b. Roof B: Roof with solar panels arranged wherever they think they would work best (e.g., on the “south-facing” side of the drawing).
3. Have teams count how many panel cutouts fit on Roof B and use the data handout to estimate:
 - a. How many kWh per year the solar system might produce.
 - b. How much of the home’s electricity use that could cover.
 - c. How much carbon emissions could be avoided.
4. Ask teams to list 3–5 pros and cons for each roof design (appearance, cost, maintenance, energy independence, environmental impact).
5. Each team prepares a short pitch recommending either Roof A or Roof B for their client, using their calculations and pros/cons as evidence

Questions to Prompt Inquiry

- How did adding solar panels change the energy picture for your house?
- What tradeoffs did you see between cost, appearance, and benefits?
- How do cloudy vs sunny days impact the potential energy production?
- Would you recommend solar panels for our school roof? Why or why not?

Conclusion (Key Takeaway)

The roof of a building is valuable space that can do more than just keep out rain and keep heat in the home in the winter—it can generate clean electricity and reduce energy bills with solar panels. Designers must balance cost, performance, and appearance when choosing between solar and non-solar roofs.

Activity Extensions

- Have students redesign the roof using a “budget” and panel cost, then calculate simple payback time.
- Schedule a Meet Call with Cenvar to talk about real roof and solar design decisions and the latest solar innovations.

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