

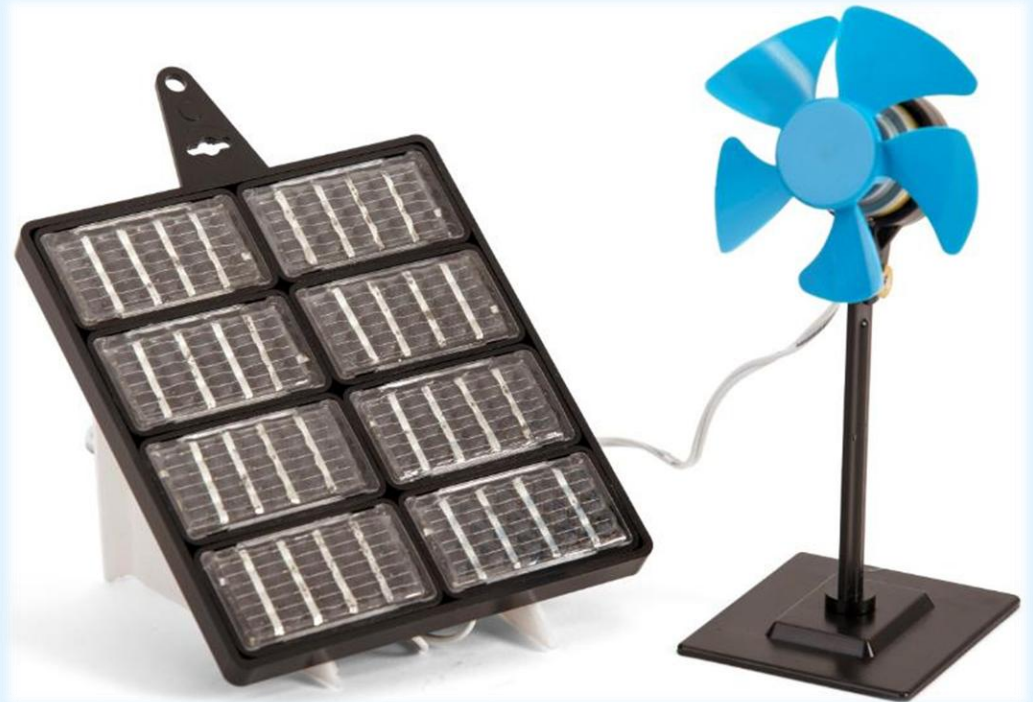
Renewable Energy – Module 1

Learn about
renewable energy

Find out how to
assemble a solar panel

Learn how to orientate
it relative to the sun

Use it to power a
pedestal fan

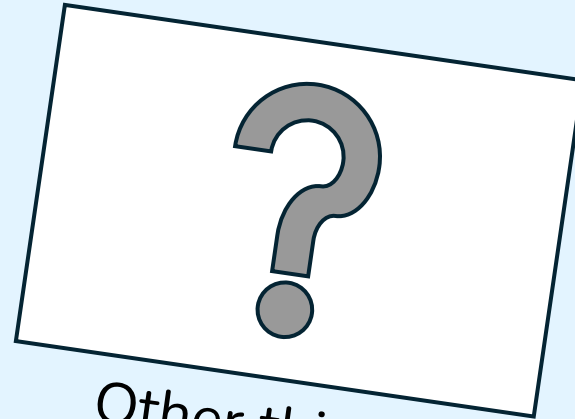


Pedestal Fan

What do we use energy for?



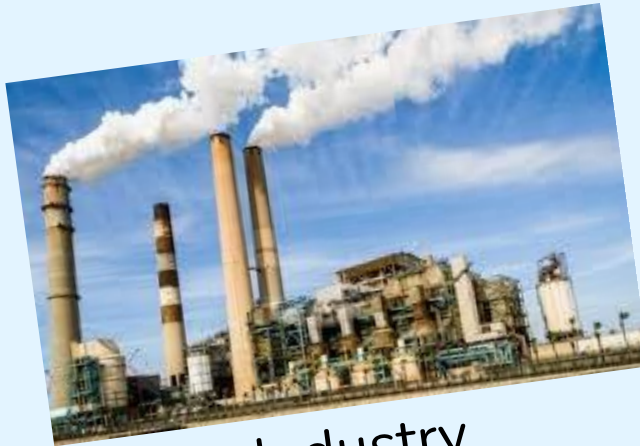
Transport



Other things



Houses (e.g. heating)



Industry



Where does our energy come from?

- Fossil fuels (mostly)
- Nuclear energy
- Renewable energy (e.g. hydroelectric, wind & solar)

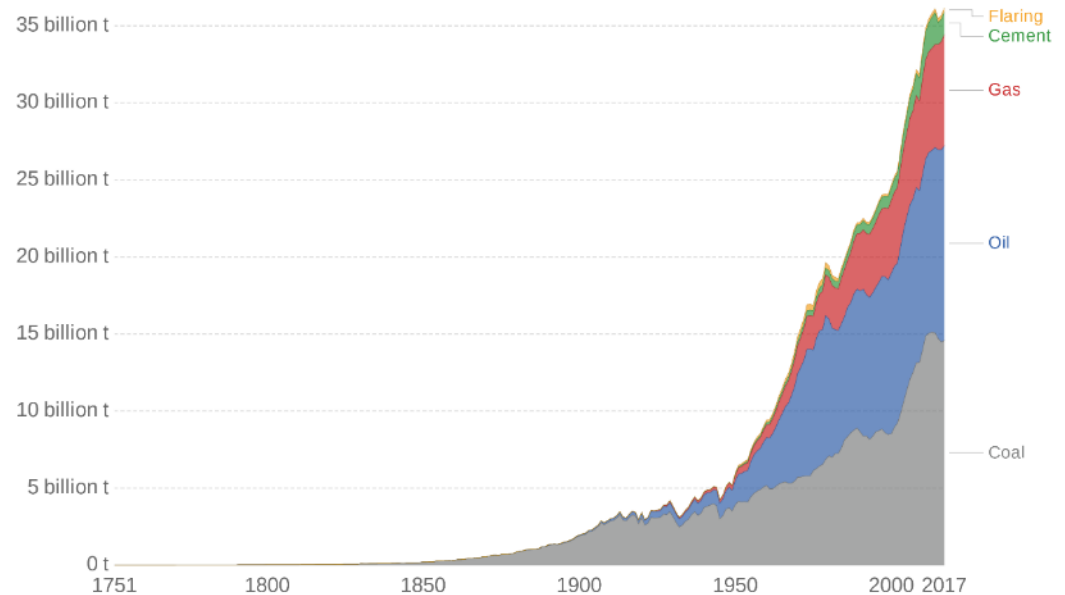


Fossil Fuels and Climate Change

- Fossil fuels include oil, coal and natural gas.
- Most of our energy at present comes from burning fossil fuels.
- This produces 'greenhouse gases' which cause climate change.

CO₂ emissions by fuel type, World

Annual carbon dioxide (CO₂) emissions from different fuel types, measured in tonnes per year.



Source: Global Carbon Project (GCP); CDIAC
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

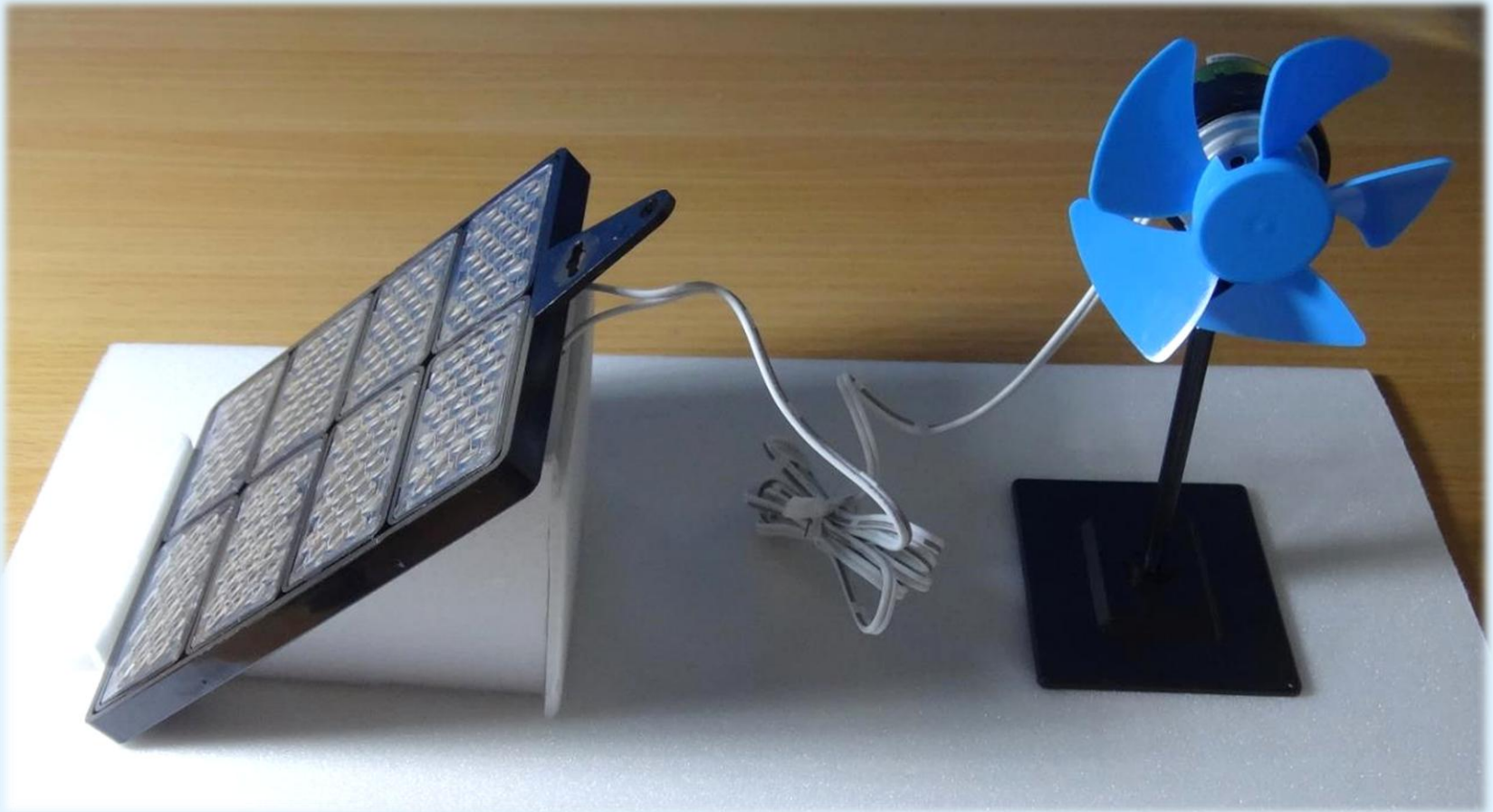


Renewable Energy



- We need to reduce our carbon emissions
- We must reduce our dependency on fossil fuels
- One of the ways we can help is to use renewable energy which does not produce greenhouse gases
- Renewable energy comes from sources that do not get used up

Make a fan powered by solar energy



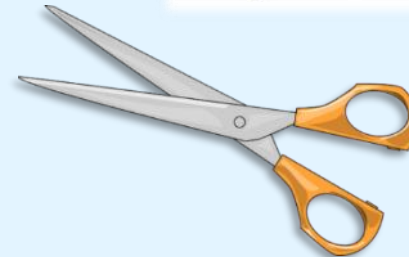
STEM Learning Objectives

- **Science:** *Electricity* (compare and give reasons for variations in how components function) and *Light* (recognise how shadows are formed).
- **Technology** – engage in an iterative process of designing and making
- **Engineering** – optimise the performance of equipment
- **Maths** – draw and measure angles using a protractor



Work Safely

Look at the tools and equipment. Can you spot any potential hazards?



Can you think of ways to reduce the risks?

Collect your materials

You will need:

- A solar renewable energy kit.
- A sheet of polystyrene foam.



Assemble your tools

You will need:

- A ruler
- A pencil
- A felt tip pen
- A protractor
- A pair of scissors
- A cool melt glue gun
- A bowl
- A sheet of card



Prepare the solar cells

1. Open the solar renewable energy kit.
2. Remove the 8 solar cells from the mounting plate.
3. Unscrew all the nuts and washers.
4. Remove the metal connecting strips.
5. Place the nuts, washers and strips in the bowl so you **don't lose them**.



Assemble the solar cell

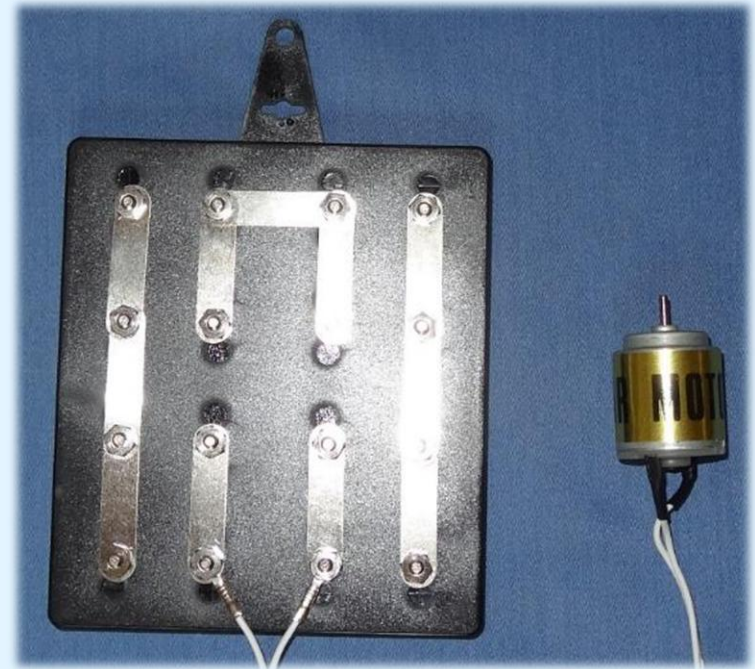
1. Lay out the solar cells in the order shown.
2. Plus (+) and minus (-) signs are moulded into the back of each cell.
3. Turn the mounting plate over and slide the small holes onto the studs.

+	-	+	-
+	-	+	-
-	+	-	+
-	+	-	+



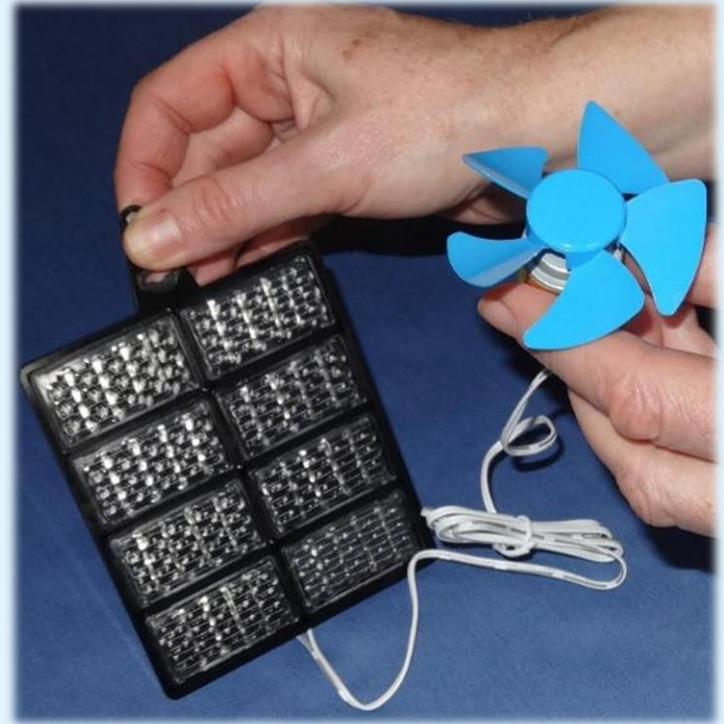
Connect up the solar panel

1. Fit the metal connecting strips.
2. Place the contacts from the solar motor onto the two studs shown.
3. Slide a washer onto each stud.
4. Spin a nut onto each stud with your fingers.
5. Nip up the nuts with the plastic spanner provided.
6. Make sure all the nuts are screwed on before you lift up the panel.



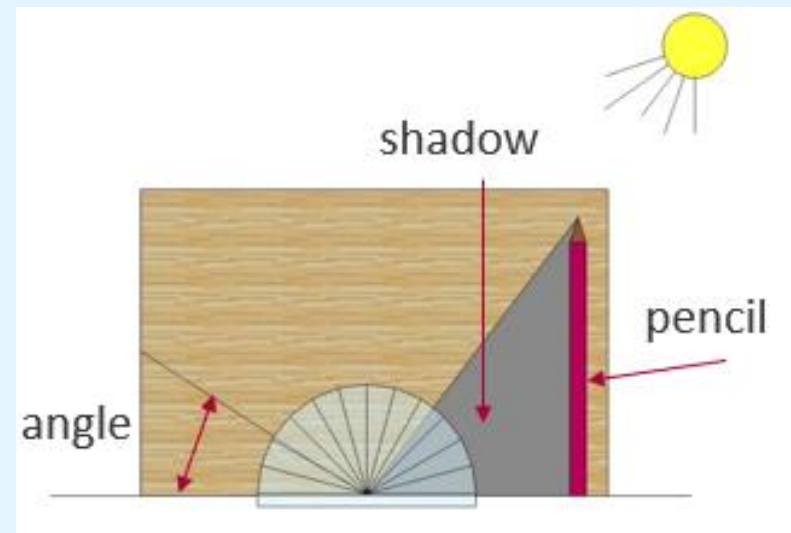
Make sure the fan works

1. Fit the propeller onto the motor shaft. Hold the solar panel facing the sun and check the propeller spins.
2. Feel whether the air is blowing away from the motor.
3. If it isn't then swap over the motor connectors on the solar panel – this will make the motor turn the other way.
4. Hold the solar panel at varying angles to the sun and try to work out whether this affects how hard the fan blows.



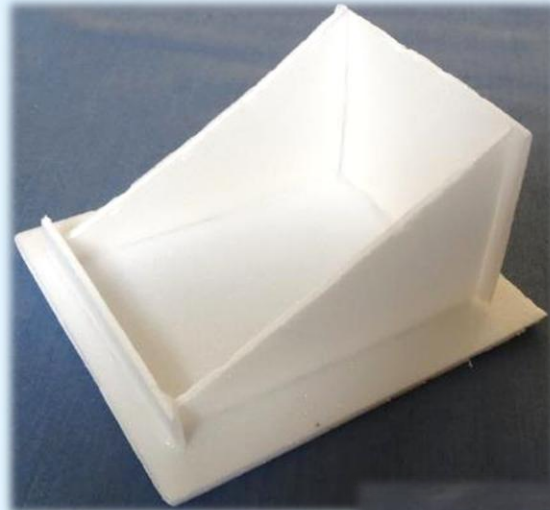
Work out at what angle to mount the solar panel.

1. The panel needs to be mounted at right angles to the sun's rays to maximise power output.
2. Take a sheet of card and hold vertically on a flat table in the sun.
3. Hold the pencil vertically as shown and mark the point on the card.
4. Mark on the card where the shadow meets the table.
5. Draw a line between the two marks.
6. Draw another line at right angles to this.
7. Measure the angle of the second line from horizontal.



Make a stand for the solar panel

1. Design and make a stand for the solar panel.
2. The panel needs to be mounted at the angle you measured in step 8.
3. You need to be able to take the panel on and off the stand.

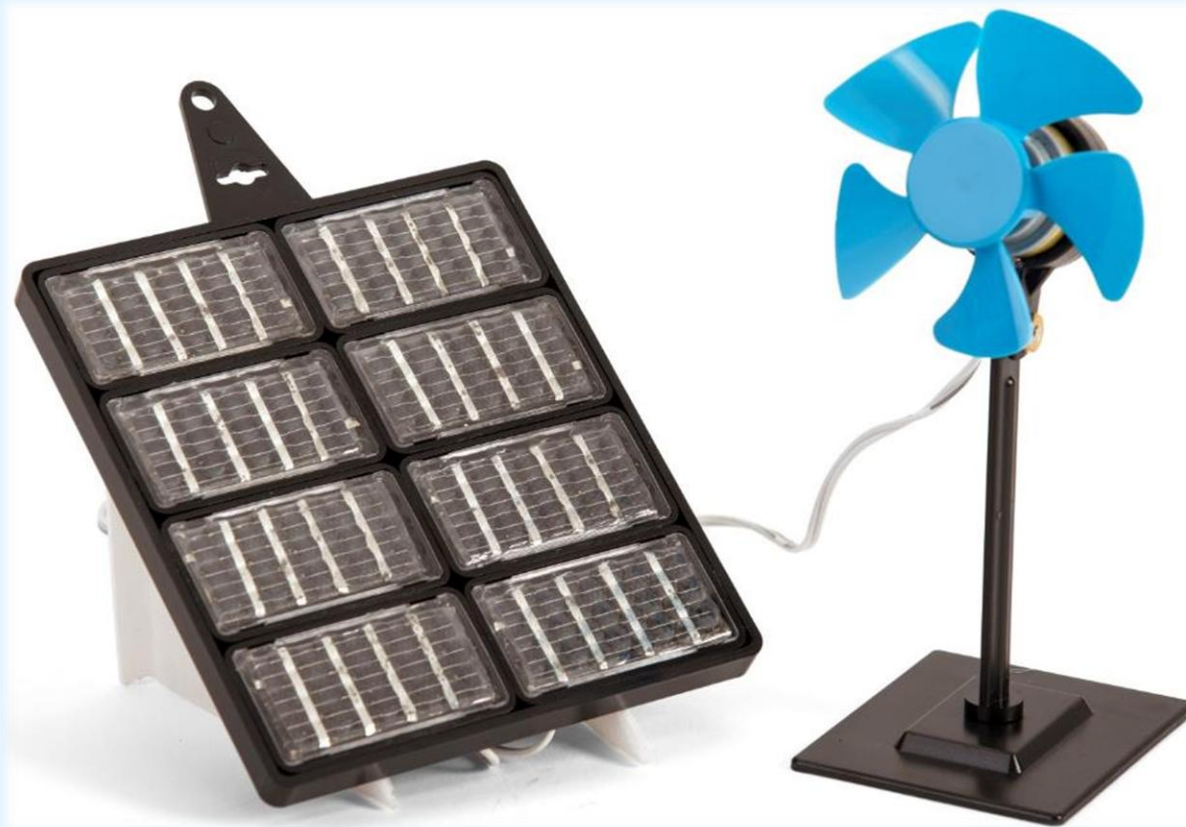


Assemble the stand for the fan

1. Push the end of the upright down into the slot in the base.
2. Twist it clockwise through 90° .
3. Take the propeller off the motor shaft.
4. Loosen the screw on the upright and push the motor in.
5. Nip up the screw and refit the propeller.



Try out your pedestal fan



What did you learn?

- Where does most of our energy come from?
- What is the problem with this?
- Name some sources of renewable energy.
- How does the orientation of the solar panel affect the fan performance?
- How are shadows formed?
- How does a solar powered electric fan work?

