Renewable Energy – Module 2

- Discover more about renewable energy
- What are variable energy sources?
- Can energy be stored?
- Make a solar powered Fairground ride

Fairground Ride

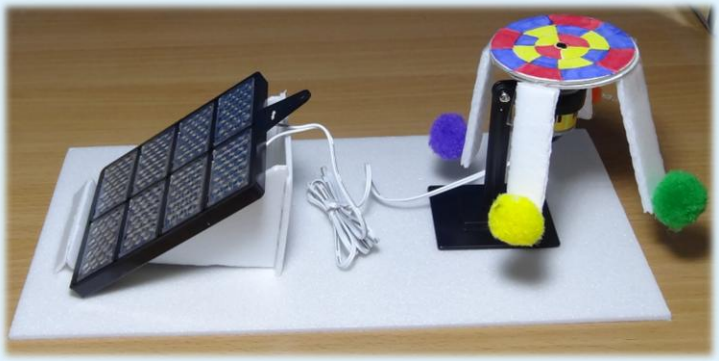
What is renewable energy?

- Most of our energy comes from burning fossil fuels which causes climate change.
- Fossil fuels are non-renewable – they get used up.
- We can use energy from clean sources such as the sun, the wind and water which do not get used up.
- These are renewable energy sources.

But what if the wind doesn't blow?

- Wind and solar power are variable resources.
- You want the wind to blow and the sun to shine.
- What about when the wind doesn't blow?
- You could use variable resources when available, reducing your fossil fuel usage.
- You could store energy, e.g. in batteries.

Make a solar powered fairground ride



STEM Learning Objectives

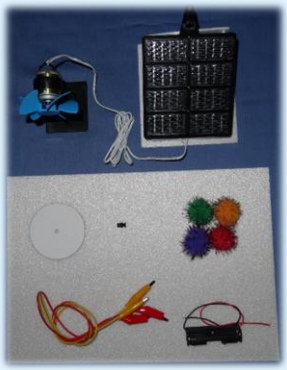
- **S**cience: *Forces* (effects of gravity and air resistance) and *Electricity* (construct a simple electrical circuit, recognise common conductors and insulators).
- **T**echnology – use a range of tools and equipment to perform practical tasks.
- **E**ngineering – design of rotating equipment.
- **M**aths – draw circles and know that diameter is twice the radius.

Don’t cut yourself or burn your fingers.
Use cool melt glue guns to avoid serious burns.
Don’t put your eye near the rotating fairground ride.
Don’t spike yourself with the compasses.
Don’t look directly at the sun as you could damage your eyes.

Collect your materials

You will need:

- A solar energy kit (pedestal fan completed in module 1)
- A sheet of polystyrene foam
- A card disc
- A motor pulley
- Four pompoms
- Two crocodile leads
- A battery holder



Assemble your tools and consumables

You will need:

- A ruler
- A sheet of card
- A pencil
- Coloured felt tip pens
- A pair of scissors
- Transparent sticky tape
- A cell (battery)
- A cool melt glue gun
- A pair of compasses

Prepare the motor

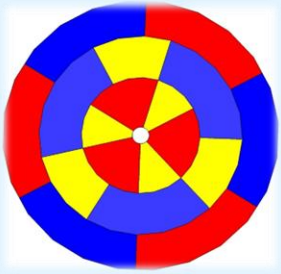
- Pull the propeller off the motor shaft.
- Replace it with the motor pulley - the nose of the pulley must face away from the motor as shown.
- Use the plastic spanner from the solar energy kit to loosen the nut slightly on the motor stand.
- Turn the motor so the shaft faces vertically upwards.
- Re-tighten the nut.

Make the base

1. Cut a base 12 cm x 25 cm from the polystyrene foam.
2. Glue the solar panel stand to one end, facing outwards.
3. Glue the motor stand to the other end. The motor should be on the side furthest away from the solar panel.

Colour in the card disc

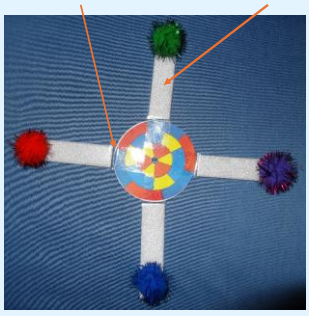
1. Hold the card disc firmly on the sheet of card.
2. Use the compasses to draw two concentric circles of 3 cm and 5 cm diameter on the card disc.
3. How do you know what radius to set the compasses at?
4. Colour the concentric rings in alternating colours.
5. When the disc spins the colours appear to mix – try to predict what colours you will see.



The radius is half the diameter.

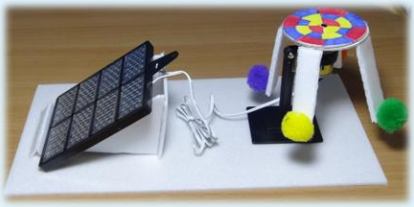
Make rotating part of fairground ride

1. Cut four strips of polystyrene foam 1.5 cm x 7 cm.
2. Glue the four pompoms (passengers) on.
3. Use transparent sticky tape to attach the strips to the disc.
4. Make sure there is a gap between the strip and disc - the sticky tape must act as a hinge so the strips can hang down when the ride is stationary and fly out when the ride is rotating.



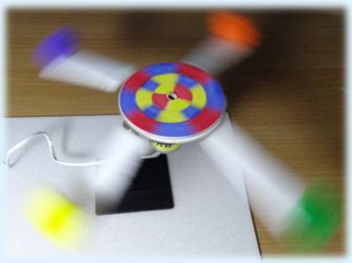
Complete the fairground ride

1. Slide the card disc onto the nose of the motor pulley.
2. If it is loose then glue it on.
3. Make sure the wires aren't in the way of the ride turning.
4. Orientate the panel so that it is facing the sun.
5. Watch what happens to the ride.



How does the ride work?

1. Watch what happens to the passengers as the ride speeds up.
2. What would happen if the strips weren't attached firmly?
3. What force pulls the passengers downwards?
4. Why do the passenger fly out to the sides?
5. What force slows them down?
6. Did you predict the colour mixtures correctly?



If the strips weren't firmly attached then they would fly off.
This would obviously be very dangerous on a real fairground ride.
Gravity pulls the passengers downwards.
As the ride rotates the passengers need to be pulled inwards to make them go round in a circle – otherwise they would continue travelling in a straight line. The faster the ride goes the more they fly out.
Air resistance slows them down.

Try controlling the ride

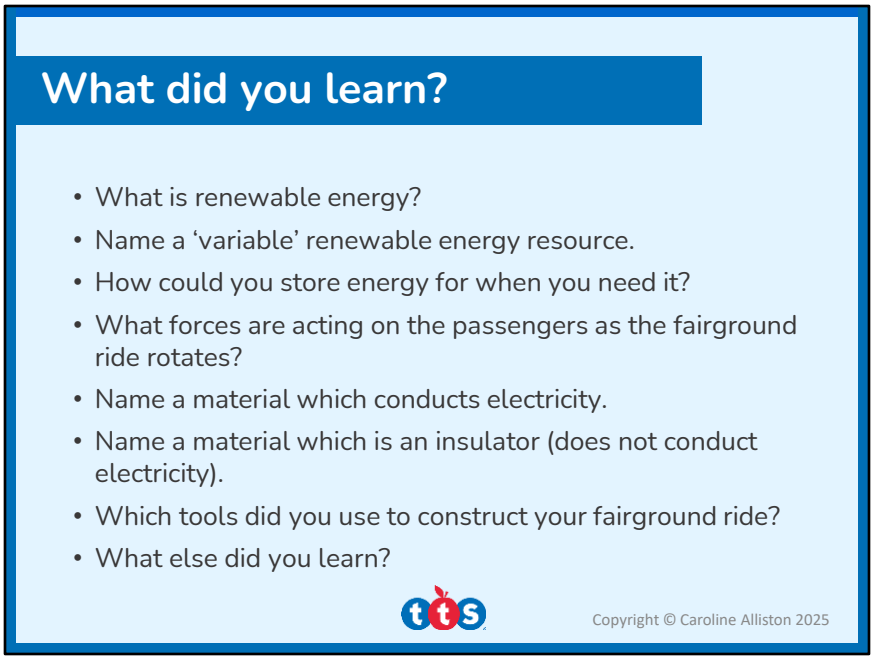
- Try slowing the ride down or stopping it by covering the solar panel with your hand.
- What proportion of the solar cells need to be covered up to prevent the ride form starting at all?

What if the sun doesn't shine?

Power your fairground ride with a battery.

- Remove the motor contacts from the solar panel.
- Fit the cell into the battery holder.
- Clip one crocodile lead from the red wire from the battery holder to one of the motor contacts.
- Why do you need to clip onto the metal end of the wire, not the plastic cover?
- Clip the other crocodile lead from the black wire to the other motor contact
- What happens if you swap the clips over?

After removing the motor contacts from the solar panel, make sure the washers and nuts are re-fitted to the panel so they don't get lost.
Make sure the metal parts of the crocodile clips don't touch or you will short circuit the battery.
You have to clip onto the metal end rather than the plastic cover because metal is a conductor of electricity and plastic is an insulator.
If you swap the clips over the ride should rotate the other way.



Renewable energy is energy from sources which do not get used up.
When the wind doesn't blow, for example, you cannot extract energy from it.
Energy is often stored in batteries. These are many other ways of storing energy as well.
Gravity acts downwards, 'centripetal' force pulls the passengers inwards so they travel round in a circle, air resistance slows them down.
Metal conducts electricity.
Plastic is an insulator (and so are lots of other materials).