



STEAMING STEM

YEAR 5 – YEAR 6

All the activities can be completed while taking a journey on Puffing Billy Railway or when you return to school.

ENERGY EXPERTS

Look around the area you are in, observe and investigate the different forms of energy you can see. Is the energy source renewable (an energy source that can be easily replenished e.g., solar, wind) or non-renewable (an energy source that cannot be easily replenished e.g. coal, petrol),

Use the chart below to record what you observed. Write down the source of the energy and place it under the right heading.

1. WHICH OF THESE FORMS OF ENERGY DID YOU OBSERVE WHILE AT PUFFING BILLY?

- Heat (thermal)
- Motion (Kinetic)
- Chemical
- Gravitational
- Light (Radiant)
- Electrical
- Nuclear

2. WRITE DOWN THE ENERGY SOURCES YOU OBSERVED:

| RENEWABLE ENERGY | NON RENEWABLE ENERGY |
|-----------------------|---|
| Eg. Wind in the trees | eg. Burning coal for the fire in the engine |

ENERGY ENGINEERS

HINT: Things don't have to be moving to have energy – there are two types of Energy - **Stored (potential) Energy and Working (kinetic) energy**. Energy is constantly shifting from potential energy to kinetic energy and back.

Kinetic energy is produced from forces caused by movement. While you are on your excursion at Puffing Billy Railway, look for where movement is creating energy. You might see people opening and closing doors, opening and closing carriages or walking around.

Where might kinetic energy be created at Puffing Billy Railway? This type of kinetic energy can be used to create electricity and could help to create more sustainable railways in the future.

Write down where Kinetic energy is created at Puffing Billy Railway.

Example: Carriage door opening and closing

COMPARE AND CONTRAST

1. On the left write a list of the needs, challenges, and uses of the railway in the past.
2. On the right write a list of the needs, challenges, and uses of the railway in the present.
3. What does the railway do now that it did in the past? What challenges does it still face? Write a list of the uses and needs of the railway that occur in both the past and present and enter them under the 'Both' heading in the middle.



RAILWAY PAST



RAILWAY PRESENT

BOTH

TRACK WHAT YOU SEE

Design Thinking is used to find multiple solutions to a big challenge.

Design thinking includes these steps:

- Empathise – understanding the problem
- Define – outlining the problem and challenges
- Ideate - designing ideas and choosing one to try
- Prototype – starting to create your design
- Test – testing your design to see if it works
- Refine - improving your idea, creating another prototype and testing again

Start designing and developing your idea for an innovative train for the railway, a bridge for the railway or a working system (e.g., creating steam, new sound system or lights for a carriage). Write down any of your ideas (ideate), designs or notes while at Puffing Billy Railway. Use these to inform the design of your prototype back at school. Remember: STEAM (Science, Technology, Engineering, Arts and Mathematics) supports design thinking. Think of all these concepts when you are developing your ideas.