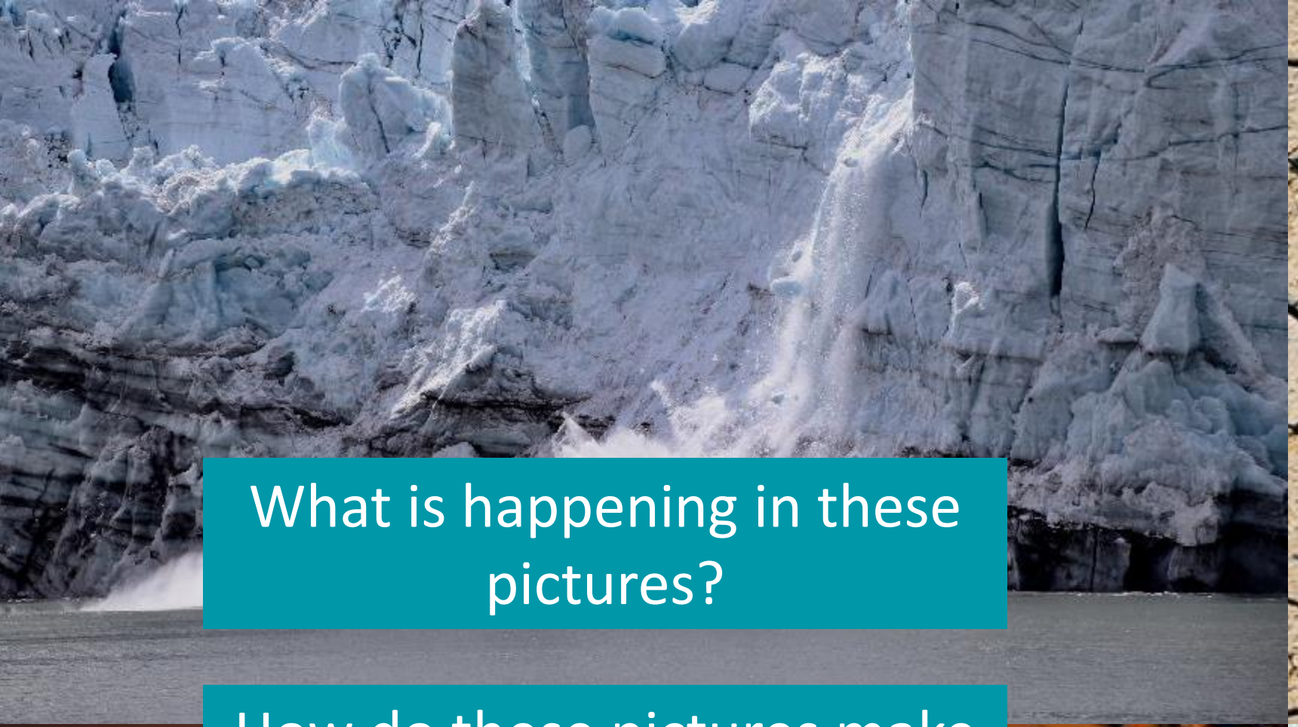
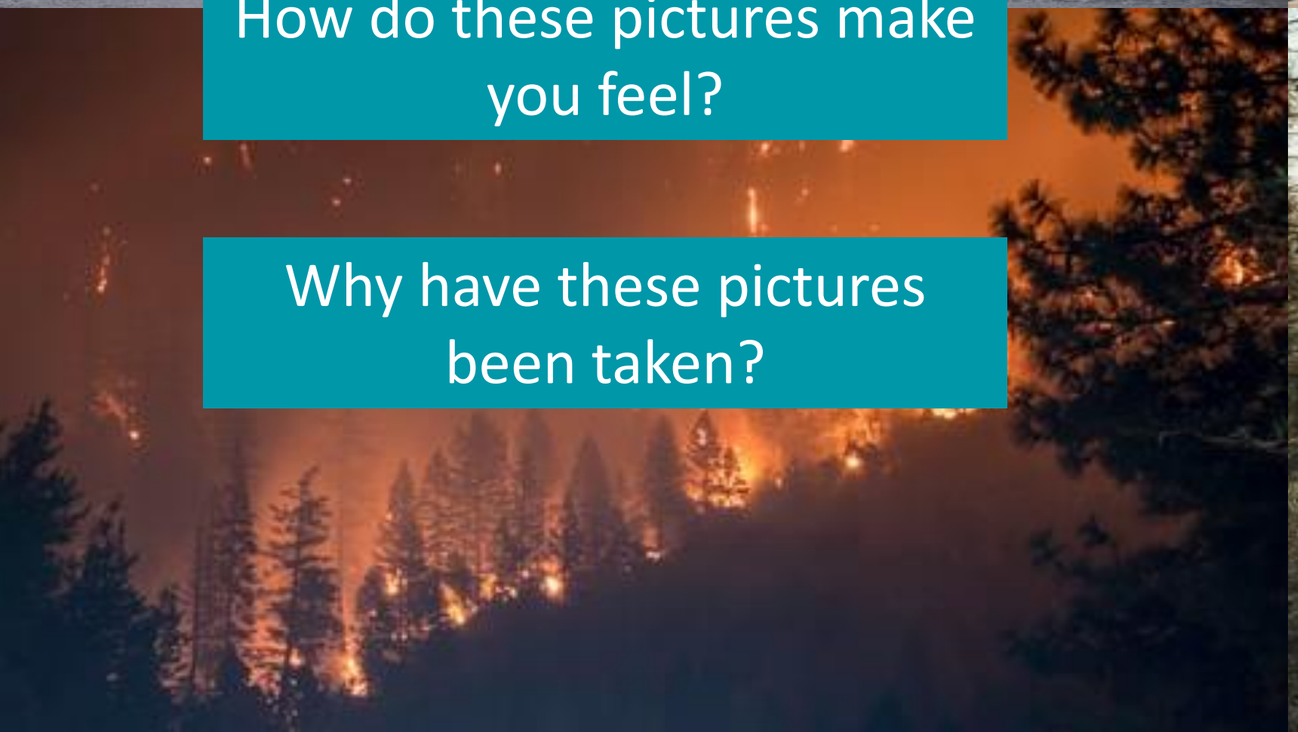


What is happening in these pictures?

How do these pictures make you feel?

Why have these pictures been taken?



STEM Education Programme
Wind Turbine Session

Name
Job role

For a better world of energy

WHO ARE SSE?

SSE VIDEO

Introducing our aims

1. To understand how and why the UK is moving towards renewable energy sources and the different methods of renewable generation.

2. To understand the mechanics of how a wind turbine generates electricity and in what environments wind turbines work most effectively.

3. To appreciate the benefits of wind generation and develop an argument in favour of wind farm development

4. Develop your essential skills

There are 8 highly transferable skills one needs to be successful in any job and to support the application of technical skills and knowledge.

Which essential skills will this session focus on?

- During this session, you will have the opportunity to apply these essential skills in particular:

The ability to find a solution to a situation or challenge

The use of imagination and the generation of new ideas

The oral transmission of information or ideas

- The Universal Framework breaks down these skills into 16 steps to help support an individual's development.

KEY DEFINITIONS

CLIMATE CHANGE

RENEWABLE ENERGY

CARBON FOOTPRINT

RENEWABLE OR NON-RENEWABLE? QUIZ

THE ANSWERS

COAL

Non-renewable

G

NUCLEAR

Non-renewable

E

Gas

Non-renewable

F

SOLAR

Renewable

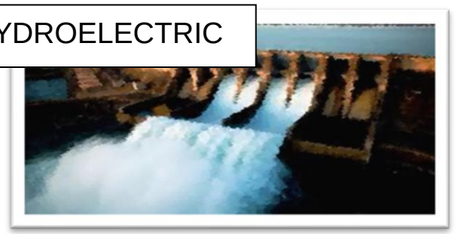
A

TIDAL

Renewable

D

HYDROELECTRIC



Renewable

C

WIND

Renewable

B

What is wind power?

- Wind is a form of renewable energy
- Wind has already been used to generate power for thousands of years
- Around 20% of the electricity we use in the UK comes from wind power
- Wind turbines often come in large groups called wind farms and be built either onshore (on the land) or offshore (out at sea)

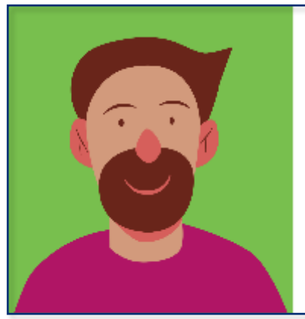
WHO WORKS WITH WIND TURBINES?

Turbine Engineers (Development Stage)

- Work with turbine manufacturers to understand what turbines are available
- Help teams to consider wind conditions, landscape and environmental constraints to make sure the turbine is as efficient as possible.

Wind Analyst/Statistician

- Work with wind data from weather masts or other equipment to ensure SSE put the best turbine on the site to meet such conditions.
- Analyse the data and suggest changes to help drive efficiency.



Consents Team

- Helps identify the best possible sites for a wind farm and advises on the design
- Works to get permission from local organisations to build the project. This team then hands over the project to the construction team.

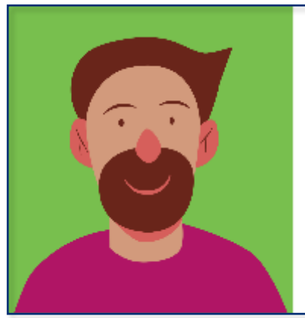
WHO WORKS WITH WIND TURBINES (CTD)?

Wind Turbine Technician

- Carry out maintenance on the wind turbines and fix any faults.
- Most of their work is done offshore and they get to work each day via CTV (Crew Transfer Vessels).

Commercial Manager

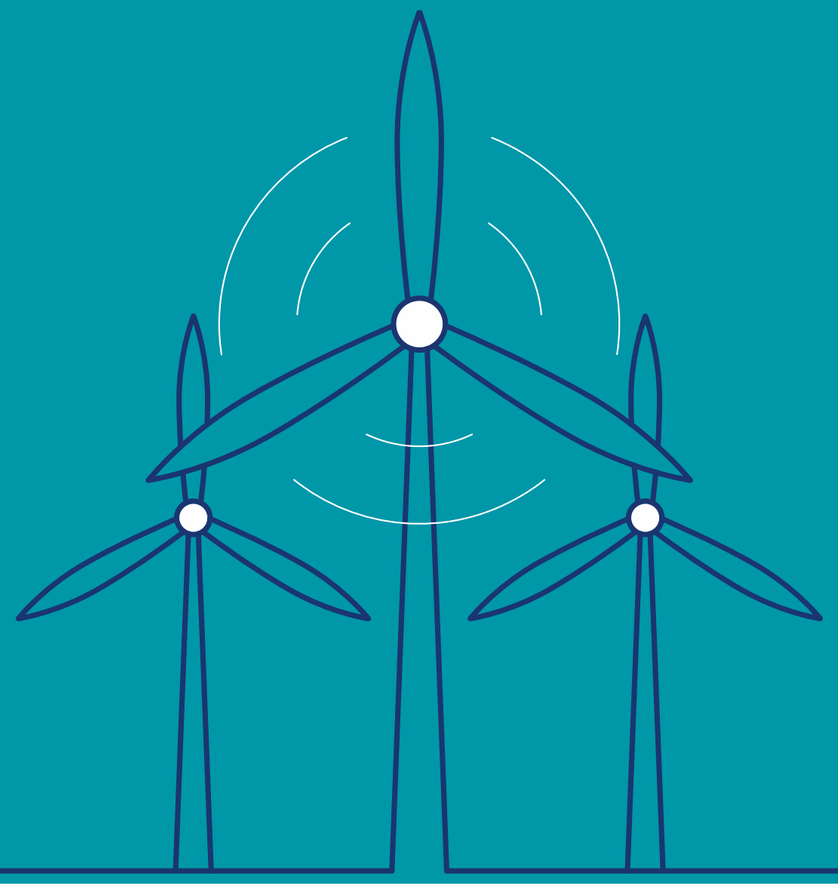
- Ensure that all works on-site happen on time and to budget.
- Speak to different departments and work out what work is highest priority, then are responsible for reporting progress and performance to the management.

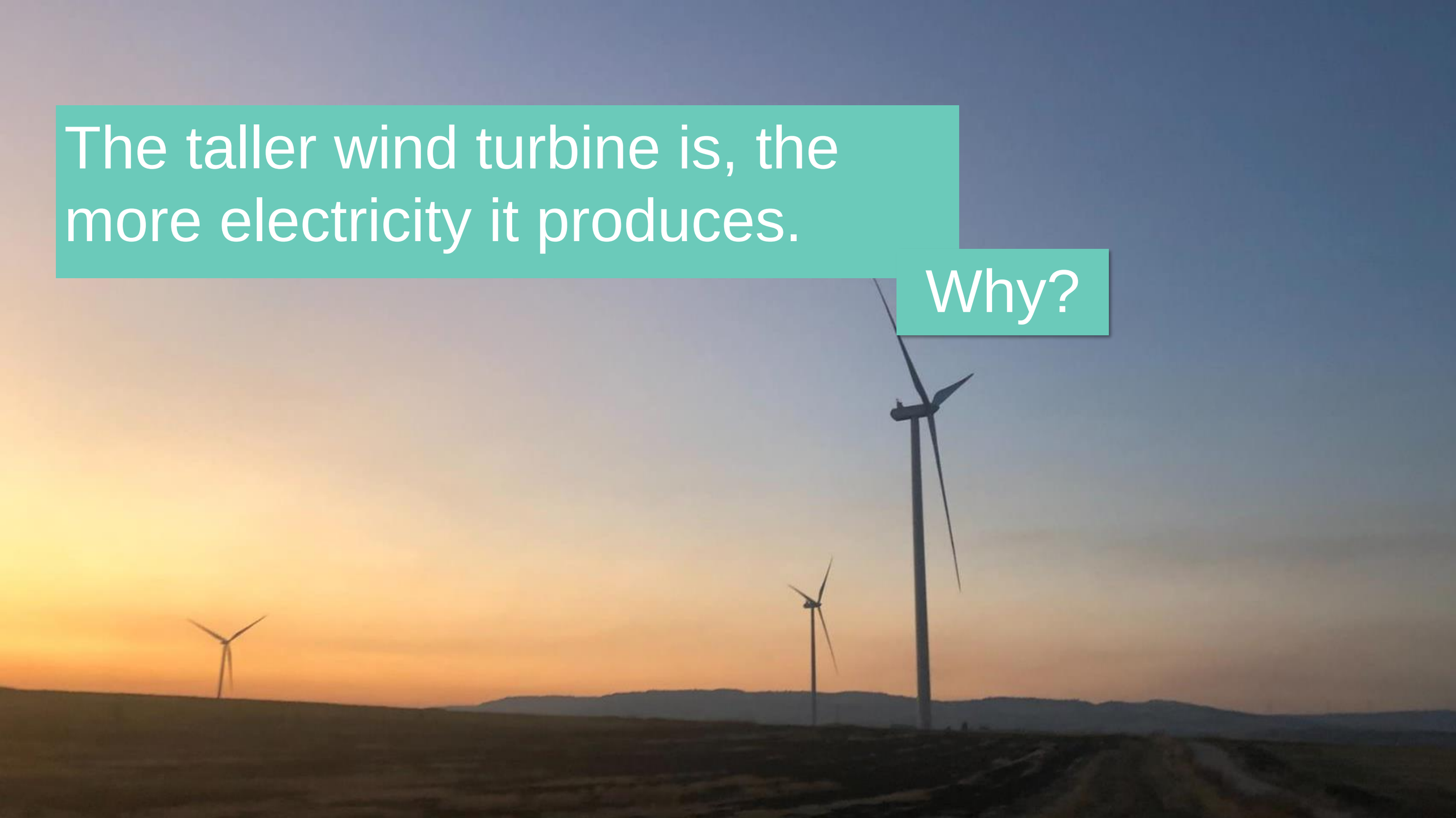


Engineer

- Monitor the wind farm by speaking to technicians and looking at reports and monitoring data
- They spend the majority of their time onshore, but go offshore when needed to help with large or complicated work.

HOW DOES A WIND TURBINE WORK?



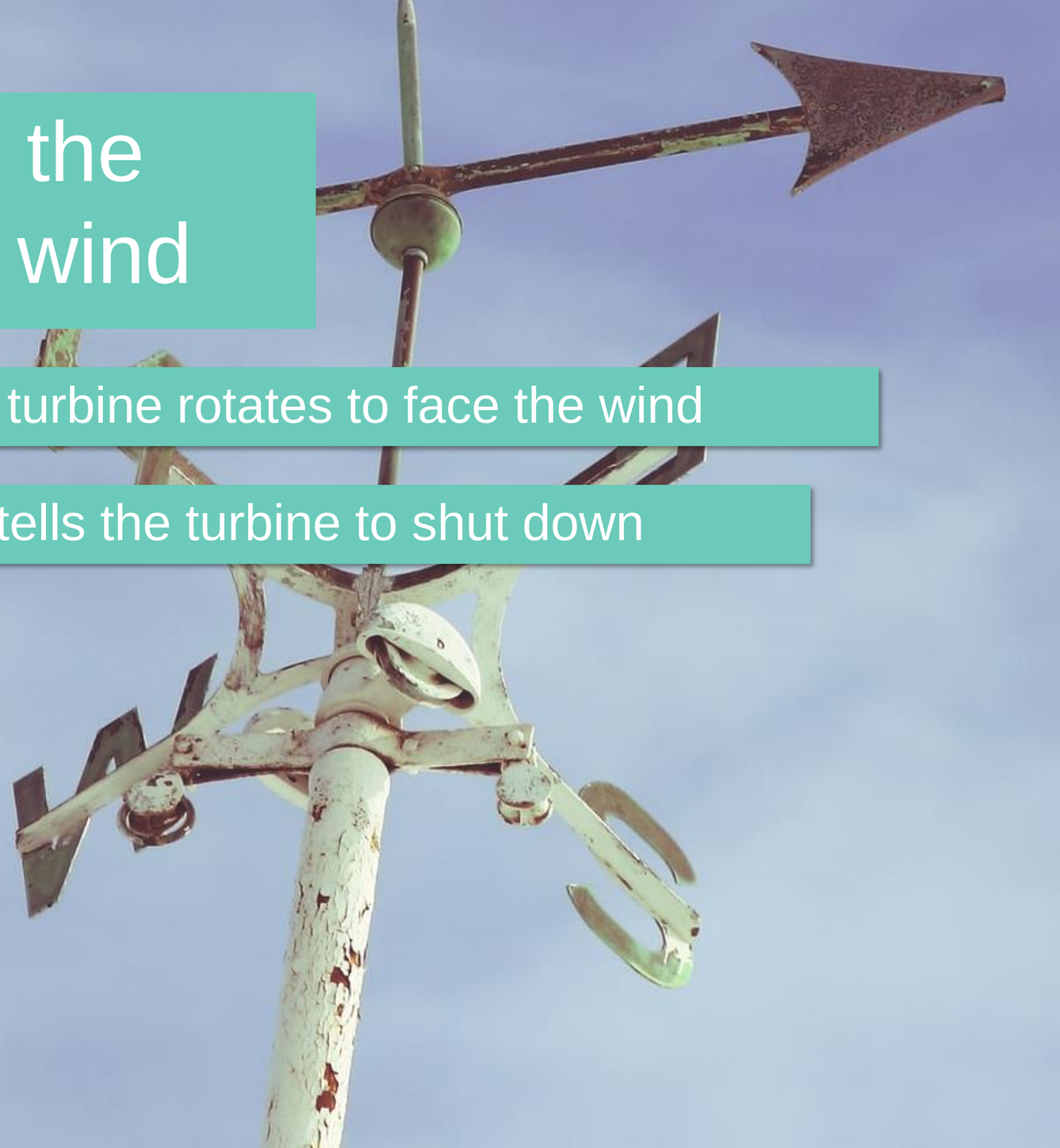

The taller wind turbine is, the more electricity it produces.
Why?

A wind turbine’s blades are made from Fibre-reinforced Polymers (a mix of glass and carbon fibre plastics)

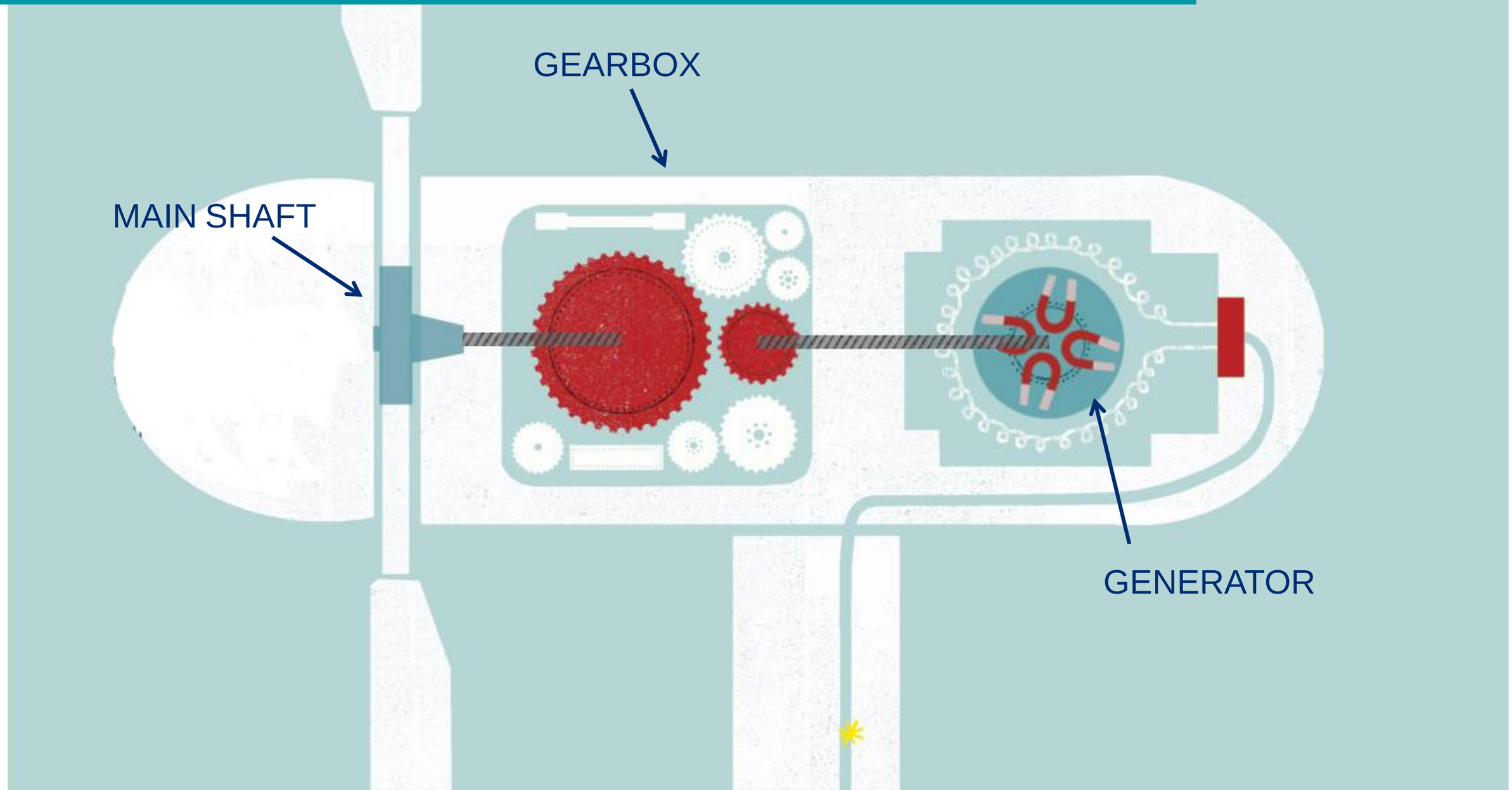
- A typical turbine used by SSE has blades about 45m long
- The blades and the central hub are known as the rotor
- A single turbo rotor weighs the same as 5 buses!

An anemometer detects the speed & direction of the wind

- When the wind direction changes, the turbine rotates to face the wind
- In very strong winds the anemometer tells the turbine to shut down



Electricity is generated in the ‘nacelle’



SSE’s Griffin wind farm in Scotland has 68 wind turbines

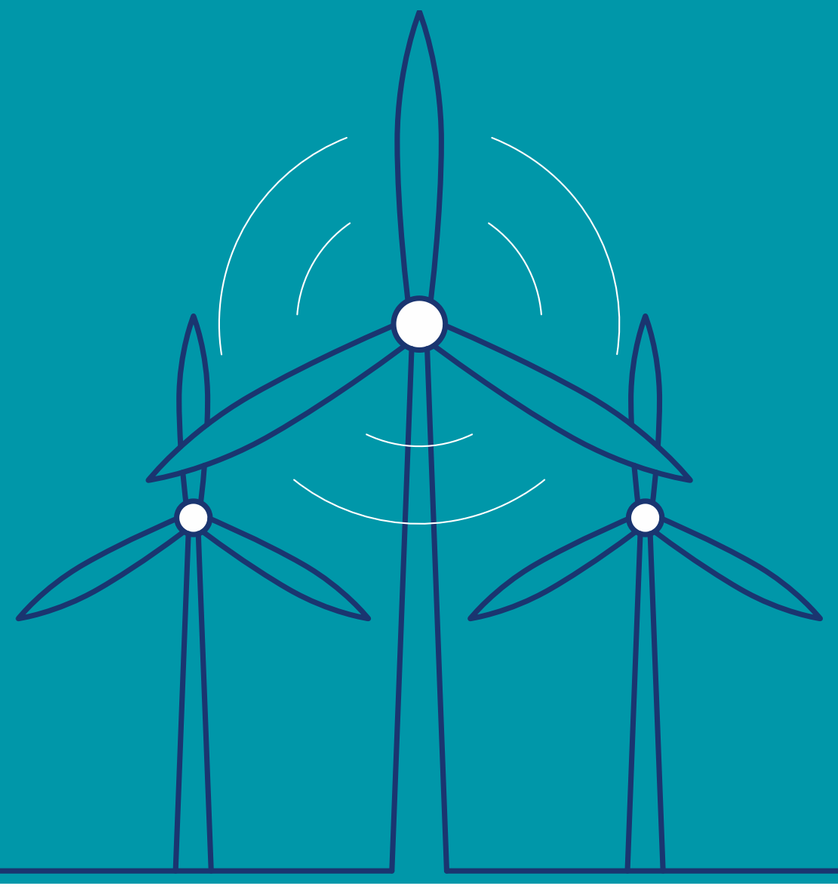
How many kettles do you think it can power?

8,000

15,000

50,000

THE BENEFITS OF WIND POWER



HOW COULD A WIND FARM HELP THESE PEOPLE?

PROBLEM SOLVING

I explore problems by thinking about the pros and cons of possible solutions

What does this mean?

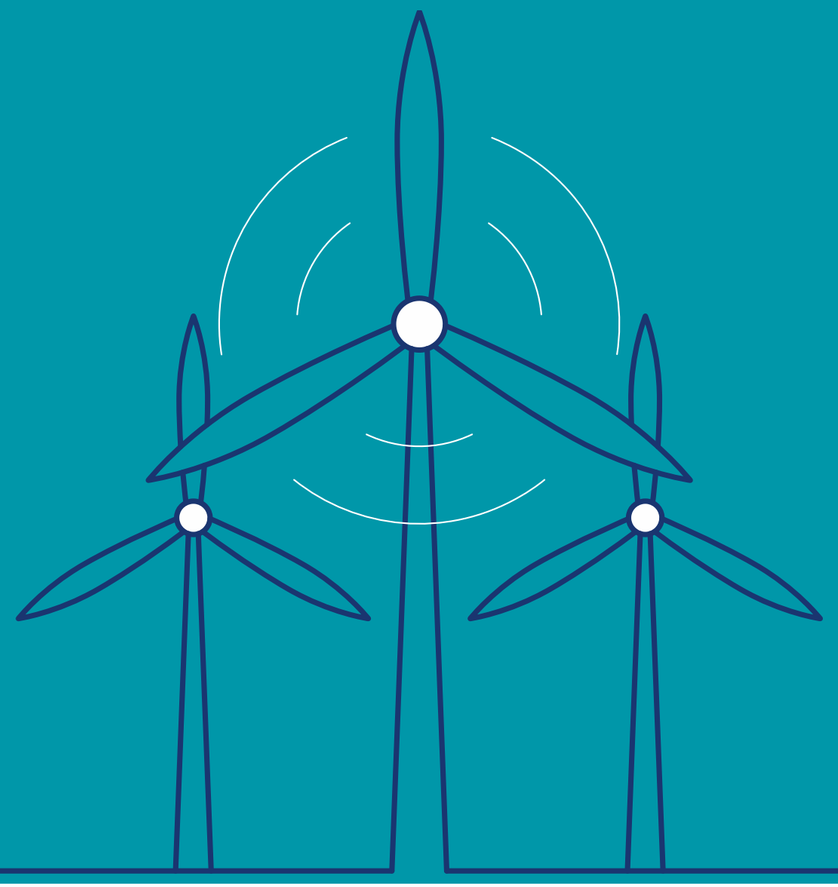
- Catriona, Wind Turbine Engineer
  - given a job on the farm

- Mr and Mrs Stewart, retired couple with limited income
  - Benefited from lower bills

- Robin, local Bus Driver
  - roads around the wind farm have improved because of the construction

- Devika, local Yoga Teacher
  - village hall where she teaches now has a new roof, new heating and double glazing

WIND TURBINE VARIABLES GAME



MAKE THE MOST EFFECTIVE WIND TURBINE

CREATIVITY

I generate ideas when given a clear brief

What does this mean?

Work in pairs to create the most effective wind turbine (that will produce as much electricity as possible).

You have some cards with images and words on them.

You need to decide on the best combination of:

- **The number of blades**
- **The geographical position of the turbine**
- **Weather conditions**

You will have 3 tries at guessing the best combination

You'll be given 3 sets of clues

YOUR CLUES

CREATIVITY

I generate ideas when given a clear brief

What does this mean?

Clue 1:

Choosing a **4 bladed turbine** will mean your turbine is heavier with a large rotor. This will require greater torque to turn blades and therefore **isn't the best choice.**

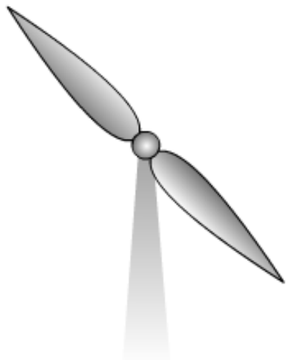
Clue 2:

It would **not be a good idea** to place turbines **on flat land with buildings between them.** This is because the building will cause the wind to become turbulent as it passes over the buildings to the turbine.

Clue 3:

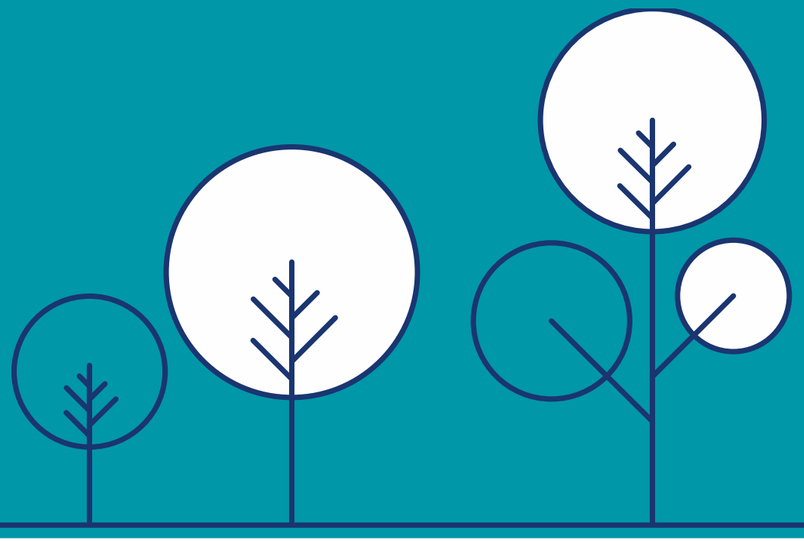
Strong winds is the ideal wind speed, allowing the turbines to reach their maximum power generating capacity.

THE BEST COMBINATION IS…



Strong Wind

TEAM ACTIVITY



SUPPORTING A NEW WIND FARM

SPEAKING

I speak engagingly by using tone, expression and gesture to engage listeners

What does this mean?

It’s time to imagine…

You’re a team of wind energy specialists who have been asked to convince a local community to vote in favour of a new wind farm that will be developed on land just outside of their town.

There’s going to be a planning meeting for local people to discuss whether the new wind farm development will go ahead or not.

Many of the people attending the meeting are against the new wind farm for the following reasons:

- They worry the farm will look ugly.
- The construction will be noisy and disruptive.
- Climate change isn’t real or doesn’t effect them.
- They worry about destroying local wildlife.

Your challenge is to convince a local community that they should vote in favour of the development.

- You have **30 minutes** to plan and prepare a presentation to give at the planning meeting.

THE ROLES

You will each take on one of the following roles:

Team Leader

This person will be responsible for keeping the team on track and writing down the order of who will speak when. They also have the additional responsibility of introducing their team of experts to the local community.

Climate Change Expert

This person is responsible for informing the locals of the threat of climate change and why its therefore important to see renewable energy as a positive addition to their local community.

Wind Turbine Expert

This person will be responsible for explaining to the locals how a wind turbine works.

THE ROLES

You will each take on one of the following roles:

Renewable Energy Business Expert

This person will be responsible for explaining to the locals how the new wind farm will positively impact their community.

A Local From The Town

This person isn’t an expert on wind energy but is a local from the town. They are in favour of the plans. It’s their job to close the presentation with some final words of persuasion.

PRESENTATIONS

Reflection

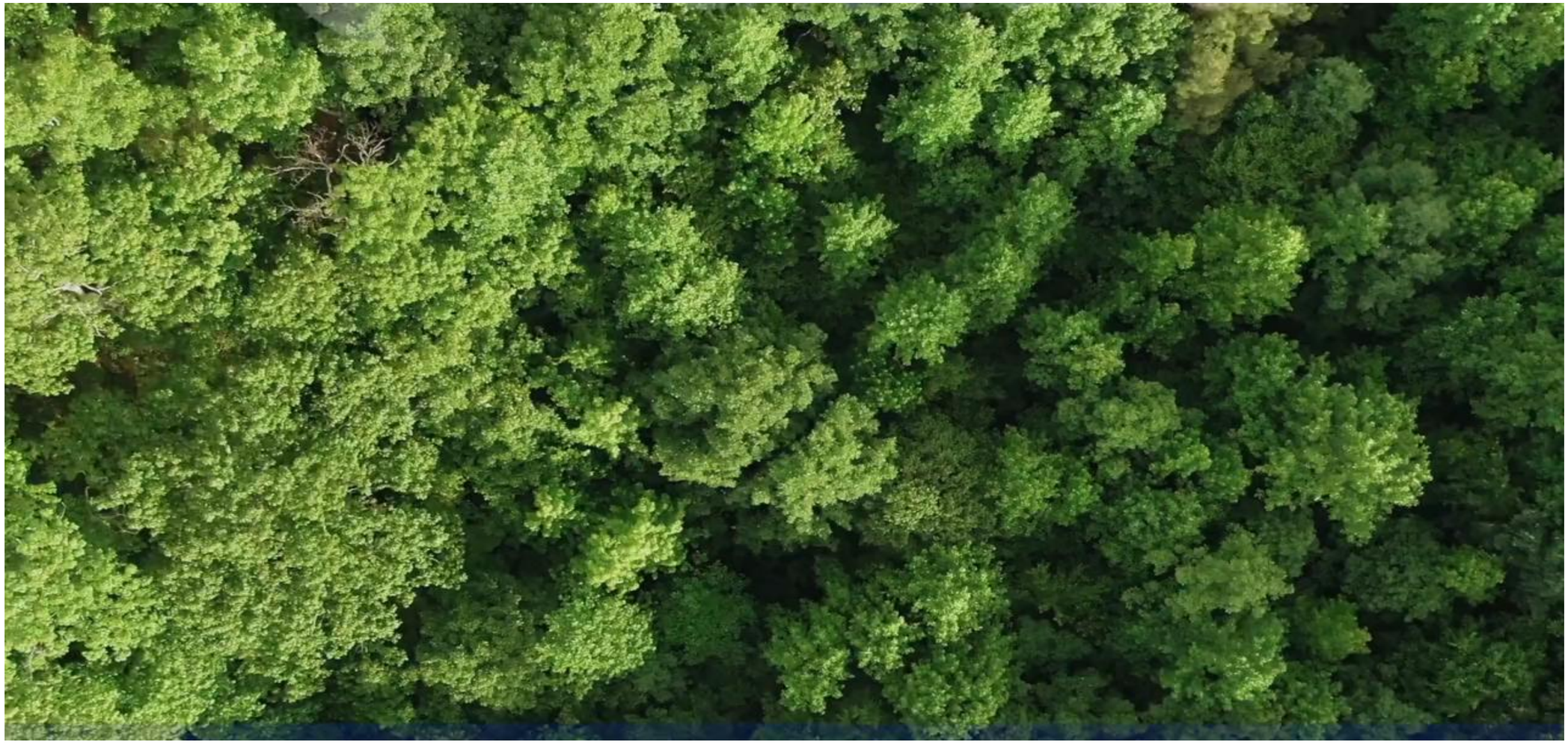
How did you demonstrate your essential skills today?

- How did you identify the pros of an idea?
- Why is it important to consider the pros and cons of something new?

- Were you able to meet a success criteria in a design brief?
- How did you generate ideas to meet the brief?

- Did you use tone, expression or gesture to make your speech engaging?
- Can you provide one, specific example of when you used tone or expression well in your presentation?

EXTENSION VIDEO



Activity	Time Allocation Guide
Climate change image	Starter activity
SSE introduction (where applicable)	5 minutes
Key Definitions	5 minutes
Sources of renewable and non-renewable power matching quiz	15 minutes
Introduction to wind turbines	5 minutes
How does a wind turbine work?	5 minutes
The benefits of wind energy	5 minutes
Wind turbine variables game	20 minutes
Team activity instructions and planning	40 minutes
Presentations	20 minutes
Plenary	3 minutes

HOST FEEDBACK LINK

Host Feedback

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