SSE School Workshops

2020

Key information

Resource type	School workshop
Duration	2 hr session To be delivered as a whole session or as 2 separate sessions
Location	Classroom/school hall
Max number of students	-
Age group	Pre-options (years 7-9 in England, S1 & S2 in Scotland)
Target number of volunteers	Minimum of 1
Facilitator	SSE volunteer or teacher
Room set up	Desks and chairs arranged facing a screen with session presentation and connection to sound. The students will be working in teams of 5, therefore it will be helpful if they're already placed and arranged in these groups.
Required materials	• Energy sources worksheet- 1 per student • Wind energy variables cards, 9X cards per pair • Paper and pens (1 set per team of 5)

Session Aims and Objectives

In this workshop, the students will gain knowledge of the various sources of renewable energy used and why investment in renewable energy is important. They will delve deeper into the topic of wind generation, understanding the mechanics and environmental factors of a wind turbine. They will then use this knowledge in a scenario-based learning exercise where they will be asked to use their knowledge of wind generation to convince a local town to vote in favour of a new wind farm. During this session, learners will use the following essential skills: Problem Solving, Creativity and Speaking

Learning Outcomes

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.
4. To develop an argument in favour of wind farm development

Essential skills outcomes

(1) Problem Solving - Explore problems by thinking about the pros and cons of possible solutions
(2) Creativity - Generate ideas when given a clear brief
(3) Speaking - Speak engagingly by using tone, expression and gesture to engage listeners

Workshop timings

2-hour session
To be delivered as a whole session or as 2 separate sessions

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

Time allocation	Activity	Description/instruction	Teacher/facilitator to check learning by	Resources
As the students arrive (Starter activity) 3 minutes to discuss	**Climate change image**	As the students arrive, they will see 4 powerful pictures that each depict the devastation caused by climate change. There will be some questions below the images that the students should reflect on as they arrive and settle into the session: • What is happening in these pictures? • How do these pictures make you feel? • Why have these pictures been taken?	Asking students to verbally contribute to the discussion and asking extension questions at the very top of the session.	**-**

5 minutes	**SSE introduction (volunteer to introduce themselves where applicable)**	The facilitator will introduce themselves to the students, communicating the following information: Name • What they do for SSE (and in brief what this means) • Their first ever job • A fun hobby they do/interesting fact about themselves The section will also include an introduction to SSE and what they do. This will be presented by using this video. **https://vimeo.com/458879568** Introduce the session aims and explain the value of focusing on essential skills as well as technical skills. Introduce the focus skills in turn along with their definitions. To help you develop these skills, there is a Framework which breaks each one down into steps to focus on in turn. Signpost / open the Framework to explore it together. Explain that each activity will have a particular essential step focus students should demonstrate.	-	https://www.skillsbuilder.org/universal-framework/listening
5 minutes	**Key Definitions**	Exploration/definition of these key phrases. Each phrase to be accompanied by an image. The facilitator will put each of these phrases to the students and will ask them to describe what each means (taking suggestions from the floor or asking students to put ideas down on mini-whiteboards if applicable to the classroom.) • **Climate Change** Extension questions: What has caused it? Why are people worried about it? What damage does it cause? • **Carbon Footprint** Extension questions: Who has a carbon footprint? How do we make it worse? Is there anything we can do to make it better? • **Renewable Energy**	Asking students to verbally contribute to the discussion and asking extension questions.	**-**

		Extension questions: Does anyone know a type of green or renewable energy? What type of energy not green or non-renewable? How does renewable energy help reduce climate change?		
15 minutes	**Sources of renewable and non-renewable power matching quiz**	The students will be asked to use a worksheet to match images of power generation types to whether they're renewable or non-renewable and a brief description of how they work. They will match the following sources: Coal Gas Nuclear Solar Tidal Hydro Wind	Teacher to go through the correct answers at the end of the exercise.	Energy sources worksheet- 1 per student
5 minutes	**Introduction to wind turbines**	The students will be Introduced to the theme for the rest of the session, **wind power using the following key points:** • Wind is a form of renewable energy • Wind has been used as an energy source for thousands of years already (who has seen a windmill before?) for grinding corn and lifting water • Around 20%-50% (fact check) of the electricity we use in the UK comes from wind power • Wind turbines often come in large groups called wind farms and can be either onshore (on the land) or offshore (out at sea) Extension question: Why might some be built on land and others at sea? Answers: Less visible, more wind, can be much bigger, more expensive offshore. Note that doubling the length of blades increases power output by 4 times – that's why better to have less bigger turbines. Offshore turbines up to 220m blade diameter – twice the length of a full size football pitch • There are lots of people involved in building and maintaining wind farms- 'let's take a quick look at some'. Students will be introduced	Asking students to verbally contribute to the discussion and asking extension questions.	**-**

		to images of 3 SSE employees who work on wind turbines. The facilitator will introduce the students to the following people: **Wind Turbine Technician** Their job is to carry out maintenance on the wind turbines, to keep it working efficiently and fix any faults they come across. Most of their work is done offshore (onshore for onshore turbines) and they get to work each day via a CTV (Crew Transfer Vessel). **Engineer** Their role is to design, improve and monitor performance of the turbines. They spend a majority of their time onshore but go offshore when needed to help with large or complicated work. **Commercial Manager** Their role is to ensure that all works on-site happen on time and to budget. They speak to different departments and work out what work is highest priority, then are responsible for reporting progress and performance to the management. They are also responsible for ensuring a wind farm makes a profit!		
5 minutes	**How does a wind turbine work?**	Teacher/facilitator to talk through the basic mechanics of a wind turbine and how they convert wind into electricity using images. Looking at an example of SSE's Griffin wind farm, the students will be asked how many kettles they think it can power per week/year? (Info taken from this resource- http://greenenergytrail.co.uk/wind.php). The students will also be shown visual images from the inside of a wind turbine.	The facilitator/teacher will ask the students questions at the end to confirm their understanding. Example, 'who can tell me what type of material the blades are made from'?	
10 minutes	**The benefits of wind energy and protecting wildlife**	The students will look at images of 4 personas of people who live close to a recently opened wind farm. These will appear on the presentation and the facilitator/teacher will talk them through each example that will be accompanied by clues. They will be asked to identify how their local wind farm has helped them.	Asking the students to put their hands up and make suggestions.	**-**

		Persona 1: Catriona, a Wind Turbine Engineer. She has benefited from being given a job on the farm. **Persona 2:** Mr and Mrs Stewart, a retired couple with limited income. They have benefited from lower bills because of wind generation. **Persona 3:** Robin Baker, a local bus driver. He has benefited from improved roads surrounding the wind farm because of the improved infrastructure in the area. **Persona 4:** Devika, a local yoga teacher. She has benefited from the village hall where she teaches having a brand-new roof, double glazing installed and new heating. * *The last example is quite tricky. The teacher/facilitator will likely have to explain that when windfarms are build, the developers must donate money to the local communities that are hosting them. Students should also be made aware that they are focussing on Step 5 of Problem Solving whilst completing this task. Ask the following prompt questions: What is meant by pros and cons?	Click 'what does this mean?' on the slide to use the Framework to aid an explanation of this focus step.	
20 minutes	**Wind turbine variables game**	The students will work in pairs to try and achieve the best power output of a wind turbine considering three key variables: **The number of blades** **The geographical position of the turbine** **Weather conditions** They will be given a set of laminated cards with images and words from which they will create what they think will be the best combination of conditions that will produce the largest power output. They will need to make a choice from: **Blades** Image of 2 blade turbine	The facilitator/teacher will reveal the most ideal combination, going through the reasons for this. Facilitator/teacher will assess which pairs have managed to get the best power output.	Wind energy variables cards. 9X cards per pair.

		Image of 3 blade turbine Image of 4 blade turbine **Geography** Image of 3 turbines on flat land surrounded by buildings Image of 3 turbines on top of hills Image of 3 turbines in the valley **Weather** 'gentle breeze' 'strong wind' 'gale force wind' They will have 3 attempts to perfect their ideal conditions and will receive a clue before round 1 and after each round which will help them to adjust their choices. **Clue 1** Choosing a 4 bladed turbine will mean your turbine is heavier with a larger rotor. This will require greater torque to turn the 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 buildings 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. Students should also be made aware that they are focussing on Step 3 of Creativity whilst completing this task. Ask the following prompt questions: What is meant by a brief? How can you create ideas to fulfil a brief?	Click 'what does this mean?' on the slide to use the Framework to aid an explanation of this focus step.	
30 minutes	**Team activity instructions and planning**	**In teams of 5**, the students will be challenged to convince a local community that they should vote in favour of the development of a new wind farm site on an expanse of land just outside of their town.	The teacher/facilitator to assist the teams in their planning, ensuring that they're using what they have already learnt in the session to prepare their responses.	Paper and pens Team roles handout

		They will need to plan and practice a convincing group presentation. They should imagine that they've been invited to come and talk at a local town meeting and that many of the attendees oppose the new development. They worry that the farm will look ugly/be noisy, the construction of the site will be disruptive, and that climate change doesn't affect them so why should they care? They are also concerned about local wildlife and how it will be affected by this development. In their teams of 5, they will be assigned (or will assign themselves) 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. **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 lives in the town and is in support of the plans for the new wind farm. It's their job to close the presentation with some final words of persuasion. The teams will have around 30 mins to plan and prepare their presentations. They will be given pens and paper to write notes or draw pictures to help them with their presentations.		

		Students should also be made aware that they are focussing on Step 3 of Creativity whilst completing this task. Ask the following prompt questions: What is meant by tone and gesture? How can tone, expression and gesture be used to make your presentation engaging?	Click 'what does this mean?' on the slide to use the Framework to aid an explanation of this focus step.	
20 minutes	**Presentations**	Each team will deliver their presentation, imagining the rest of the class are the local community. The rest of the class will be instructed to listen carefully and decide for themselves if the team have done enough to convince them.	If there is time, the facilitator/teacher can host a vote to see how many people would vote in favour of the wind farm and how many would vote against.	**-**
3 minutes	**Plenary**	Reflecting on the images seen at the start of the session. The facilitator/teacher should ask: 'Do you think it's important that companies like SSE Renewables continue to invest in renewable energy solutions such as wind?' Reflection: How did you demonstrate your essential skills today?	Teacher/facilitator will ask the students to verbally contribute and will ask them to reason why. Use reflection questions on screen to frame reflection/discussion	**-**

Extension Activity

Students to reflect on how they worked in a team. Did they enjoy it? What makes someone a good team member? How can you help someone in your team?

There is also a video included at the end introducing the team that look after a large part of SSE's wind farm fleet, it includes some good images of a wind farm and wind turbines up close.

Key words/phrases
- Climate Change
- carbon footprint
-renewable energy
-non-renewable energy
- Coal
-Nuclear
-Hydrogen
-Solar
-Tidal
-Hydro
-Carbon Capture
-Wind power
- Wind turbine
-on shore/offshore
- Power output

-Blades
- Essential skills: Problem Solving, Creativity and Speaking

Feedback links
Please ensure your host supports us with feedback on the session:
Host feedback link

Please also provide us with your feedback on the session:
Volunteer feedback link

Further Information

For more information about STEM careers, in particular Engineering careers, please visit the Institution of Engineering & Technology's education website at https://education.theiet.org. You will also find a large range of our STEM education recourses and activities available free of charge, along with competitions and funding opportunities to support your STEM education engagement.

The Universal Framework for essential skills can be found here.