Volunteer Walkthrough

JUST TRANSITION

STEM Lessons for Primary Schools in the UK and Ireland

Greenhouse Gases & Net Zero

sse | For a better world of energy

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Volunteers should be aware of the following pieces of information before delivering these lessons:

All lessons in this suite are designed to be delivered in a normal classroom setting, although facilitators could adapt them for use in an assembly.

Each lesson plan contains information about how it can be adapted to suit pupils with SEND provision.

Each lesson plan builds one essential skill step from the Skills Builder Framework for essential skills. This Framework provides a common language for defining and developing eight essential skills. You can explore the Framework here.

Lesson slide decks, worksheets and knowledge organisers for each lesson can all be found in the appendix ready for download at SSE's STEM website.

The lessons can be delivered by an in-class teacher or delivered by SSE volunteers. To contact SSE about this opportunity, please email stem@sse.com. It is suggested that if only one lesson is to be delivered, that this is the first lesson in the topic.

Please share your pupils' work on social media, tagging @SSE on Twitter or @SSEplc on Instagram and using the #STEMatSSE tag.

GREENHOUSE GASES & NET ZERO

Lesson 1

GROWING GASES

Introduce yourself as the educator.

Briefly introduce yourself and explain who SSE are and what they do.

Do Now (10 mins)

Show images showing GHGs and some of the effects GHGs are having without stating what the images are showing.

Explain to the children that they are going to discuss with a partner what the images are showing us.

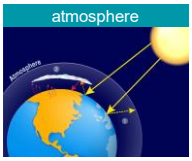
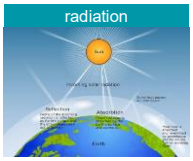
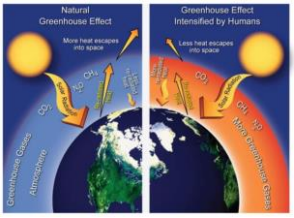
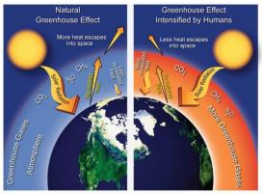
Children to create mind map of what they can see using the prompts shown

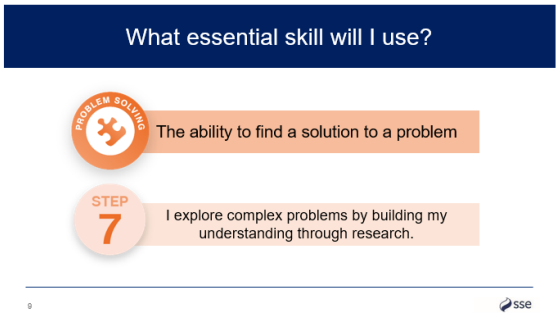
- What they see
- What they feel
- Problems
- Questions

Show the initials GHGs. What does this stand for?

Give children the opportunity to share their ideas and then click on the slide to reveal its meaning.

Ask: What are Greenhouse Gases? What impact are the GHGs having on the planet now and what might their impact be in the future?

KEY WORDS atmosphere  radiation  fossil fuels 5 sse	Explain key words used in the lesson
Introduction: what is the same and what is different?  6 sse	Show the images of the natural greenhouse effect and the greenhouse effect intensified by humans. Children to work with partner to devise an explanation of the two greenhouse effects. What is the same and what is different between the two images? Why are they different?
Introduction: fill in the blanks The [redacted] greenhouse effect involves solar radiation reaching Earth. Some of this [redacted] off Earth's surface. Some of this [redacted] heat hits the atmosphere and returns to Earth, keeping the planet warm. [redacted] of it escapes into space. Because of humans, the greenhouse effect has [redacted]. The increase in greenhouse gases means tha[redacted] heat escapes into space meaning more returns to Earth, [redacted] up our planet.  7 sse	Show the cloze procedure with key words covered up. Explain to the children that all of the words they need are shown on the diagrams given to them and they need to work out what is underneath each part. Give children time to verbally complete the statements to best describe what the images are showing. Review the responses and reveal the statements by clicking on the slide each time to reveal an answer.
Our BIG question What is net zero and why should it bother us? sse	Introduce the big question: what is net zero and why should it bother us? Explain that throughout the next three lessons, the children will be forming teams to research the impact of GHGs and also what changes can and are being made to achieve net zero.



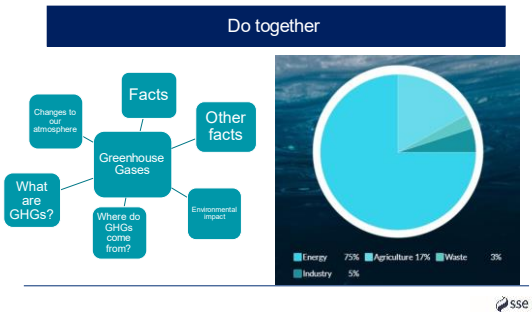
Introduce that during today's lesson, the pupils will be using their Problem Solving skills. They will be understanding the complex problem (what is net zero and why should it bother us) by building their understanding through research.

Optional: Describe how you demonstrate this skill step in your own role.

Tell the children that they are going to work in teams in order to explain the impact of GHGs on our planet. Organise the children into mixed ability teams (size of group should be between 2 and 6. Choose group size most appropriate to class).

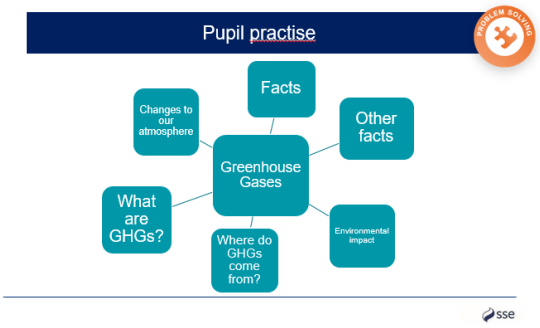
Set initial task for children to come up with 1 / 2 / 3 effects of the greenhouse effect intensified by humans using the image displayed.

Groups write down ideas onto mini whiteboards / rough paper. This will be used later in their final pieces.



Take ideas from the children and model presentation of ideas onto the mind map. This may need to be recorded separately depending on capability of the display screen.

Show the graph. Guide the children in picking key facts that can be added to the mind map and discuss with them where the best place would be to place the ideas. Record in note form in the relevant place.

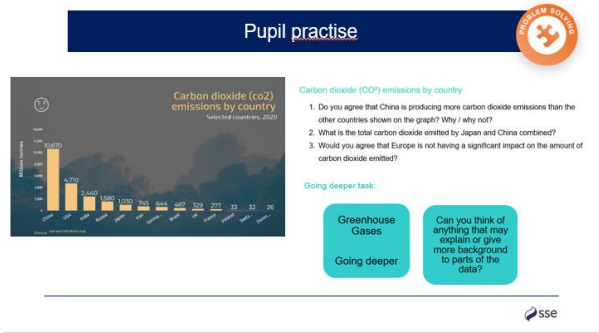


Pupil practice: (20 mins)

Explain that the children will need to work together in teams over the next 3 lessons. The facilitator may wish to organise this based on the existing seating plan.

Children form teams to tackle the problem with greenhouse gases and think about the solution. Will have considered the impact if they do get to net zero together.

Share the mind map that the children will be using to record their responses.



Give children the group resource with three additional graphs / charts. Explain to the children that they need to analyse the data and identify key facts to add to their mind maps. Show the example showing the questions and the ‘going deeper’ prompt.

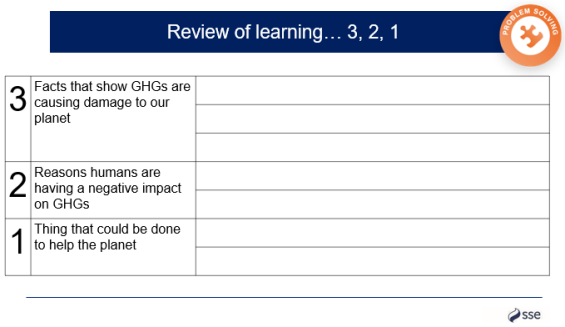
The resources scaffold the activity through questioning but children to extend further by looking for additional information which shows the negative and growing impact of the increase in GHGs.

Children add responses to the questions and further detail to their mind maps, identifying the key causes and effects of GHGs.

The questions are divided into relevant sections so the facilitator can adapt in a way that is most appropriate.

Going deeper task frames questions so children can consider their own observations across several charts / graphs. They may also go further with this and undertake further lines of enquiry e.g. energy use is 75% of global GHG emissions. Children could use safe online searches / further reading to give greater context to this.

Example question of GD task gives opportunity to involve wider knowledge i.e. China has largest population and therefore their emissions are likely to be greater.

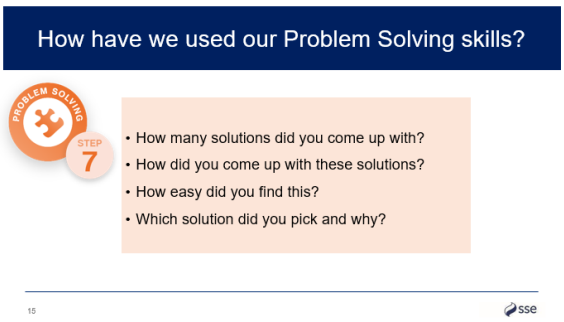


Review of learning: (10 mins)

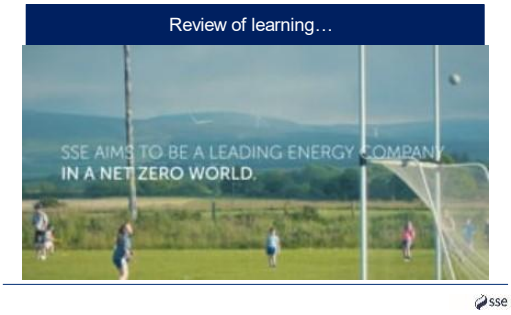
Introduce the task 3:2:1 to review the children’s learning.

Children then complete the table (orally or written) giving 3 facts that show GHGs are causing damage to our planet, 2 reasons humans are having a negative impact on GHGs and 1 thing that could be done to help the planet.

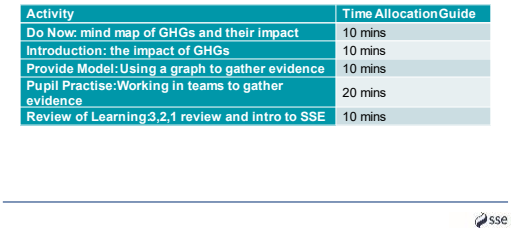
Take ideas from the children, asking them to refer to the information given and the vocabulary shown on the slide.



Use reflection questions to guide a discussion around how the children have used their Problem Solving skills during the session, in particular conducting research to understand a complex problem. Theis will help children understand and communicate the skill they have focussed on alongside their knowledge. It also provides an opportunity for the facilitator to assess the children's understanding of the focus skill step.



Finally, show the video For a better world of energy - https://vimeo.com/458879568 -This gives basic background on what SSE does. Explain that the children are going to be looking in more detail at the work of SSE in the next session.



Activity	Time Allocation Guide
Do Now: mind map of GHGs and their impact	10 mins
Introduction: the impact of GHGs	10 mins
Provide Model: Using a graph to gather evidence	10 mins
Pupil Practise: Working in teams to gather evidence	20 mins
Review of Learning: 3,2,1 review and intro to SSE	10 mins

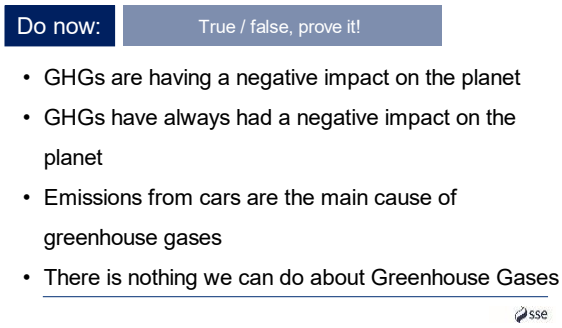
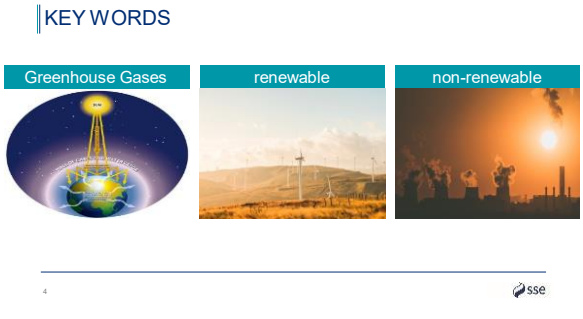
Use these timings as a guide – this can be adjusted for the session being led

Please provide feedback via QR link – encourage children to submit examples of pupil work to social media.

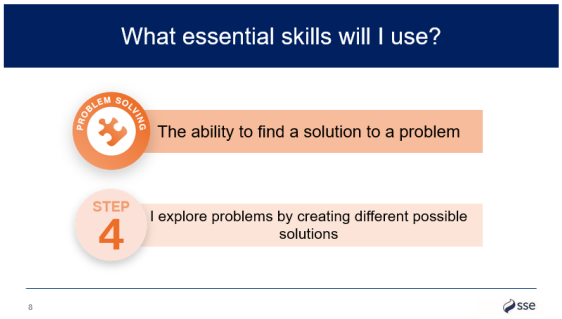
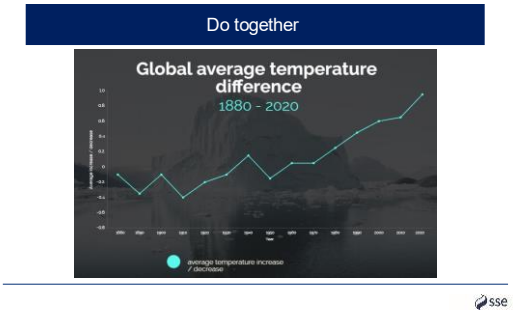
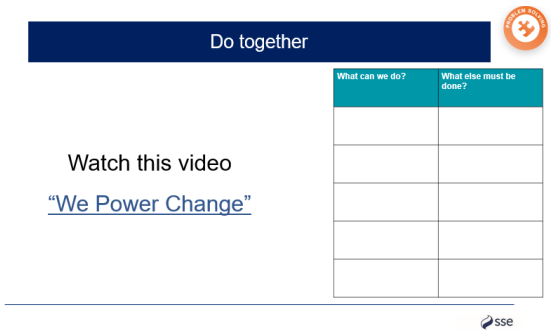
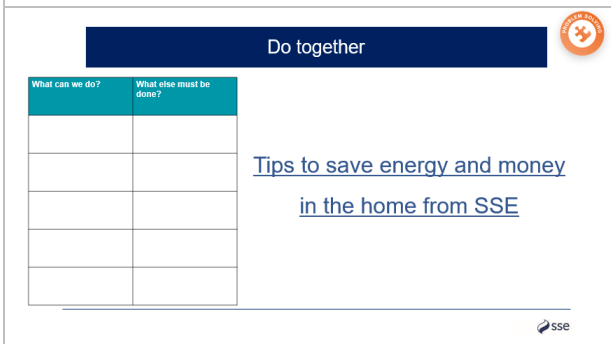
A more detailed lesson plan can be found in the SSE 'Power Changers' Primary booklet.

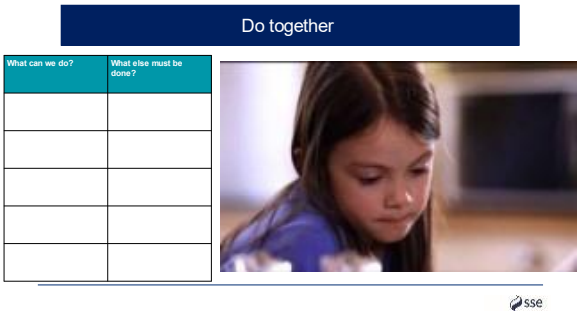
WHAT CAN WE DO?

Lesson 2

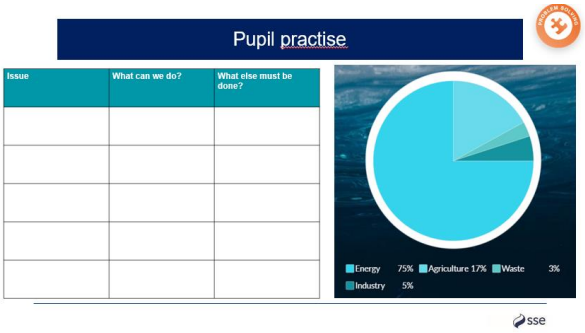
	Introduce yourself as the educator.
	Briefly introduce yourself and explain who SSE are and what they do.
	**Do Now** (5 mins) Introduce the true / false, prove it activity. Explain to the children that they are going to think back to what they have learnt so far about Greenhouse Gases. Children to take one statement at a time and discuss with their partner whether they think the statement is true or false and to give information to support their idea. Show a number of statements on the slideshow and children to talk to a partner and agree an answer.
	Introduce the key words used in the lesson and ensure children understand these. Use the lesson knowledge organiser to model finding the definitions if children are unsure.

Our BIG question What is net zero and why should it bother us? sse	Show our big question and take ideas from the children about why they think this is an important issue. Children may have an awareness of what net zero is at this stage.
Introduction: what is net zero? **What is net zero and how can we achieve it?** Net zero refers to achieving a balance between the amount of greenhouse gas emissions produced and the amount removed from the atmosphere. There are two different routes to achieving net zero, which work in tandem: reducing existing emissions and actively removing greenhouse gases. UK net zero **target** | The Institute for Government www.instituteforgovernment.org.uk/explainers/net-zero-ta... In other words… 6 sse	**Introduction** (10 mins) Read the definition of what net zero is. Explain that this is the government definition however it would be useful if we could change it into language that could be understood by everyone in our school. Tell the children that they are going to work with a partner to redefine the term 'net zero' in their own words. Ask the children to explain net zero in another way that could be understood by all. The facilitator can extend this further by adapting the number of words children can use (less than 20, less than 10, exactly 5…)
Introduction: how are SSE working to achieve net zero? 7 sse	Explain that in this lesson, the children are going to gain an understanding of the solution to the issue of GHGs. Tell the children that they are going to look into the work of SSE, an organisation who are aiming to achieve net zero. Show the video SSE: Powering future change - https://vimeo.com/554723629 - The facts and figures about SSE (e.g. investment figures and renewable output targets) are a little out of date but this video will give a nice background to what SSE is doing to power net zero. Use the questioning below to see if children understand the work of SSE and some of the ways they are working to achieve net zero.

	Explain that Problem Solving is the ability to find a solution to a problem. Explain that throughout the lesson, children will be working on Step 4 of Problem Solving: exploring problems by creating different possible solutions. Optional: Describe how you demonstrate this skill step in your own role.
	**Provide model** (10 mins) Show the graph showing the increase in GHGs and the rise in temperatures – discuss with the children where there are most significant increases. What will happen if this continues? What might the increase be in 10, 20, 30 years' time be if this is not slowed down? Children to give suggestions to the questions from the facilitator, hypothesising what would happen if nothing was done to reduce Greenhouse Gases and why aiming for net zero is so important.
	Share the pie chart 'Where do GHG emissions come from?' Examine the part of the pie chart that focuses on energy use. Use the prompts on the slide to discuss with partner what the issues are and what might be a sensible way for this to be reduced. Explain that there are things we can do individually and also actions that larger companies and governments must do to try and achieve net zero. Tell the children that SSE are a company working to support the work to achieve net zero.
	Share the 'we power change' video. - https://www.youtube.com/watch?v=6l9IEmXg2zM – This was put together in the run up to COP26 and details SSE's vision and strategy. After watching the 'we power change' video, ask the children for ideas of the sorts of things larger companies can do to help us achieve net zero. Ask the children if they can think of any ways they can help achieve net zero?



Show [Tips to save energy and money in the home from SSE - YouTube]() to give further ideas.

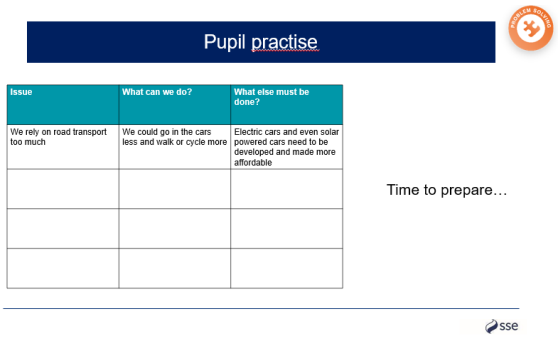


Pupil practice (15 mins)

This slide (next slide optional with completed example):

Model completion of the table based on the pie chart. Model with the example of energy use must create less GHG emissions. The example the facilitator could use is to rely on road transport less (what we can do) and make electric cars more affordable (what else must be done)

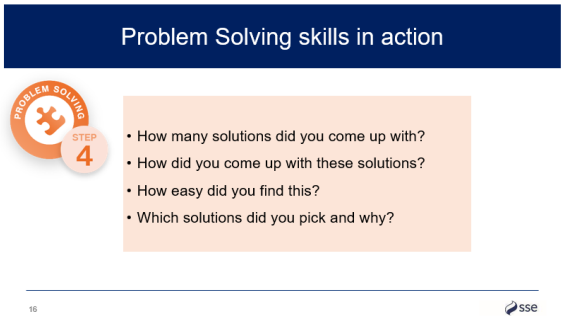
Children then given a table format with columns showing ‘issue’, ‘what can we do’ an ‘what else must be done’ in the column headings and use their ideas to complete the graphic organiser.



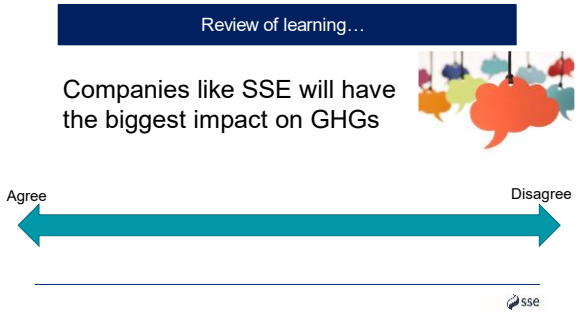
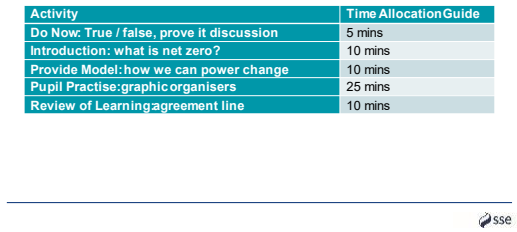
Stop the children and show the framework on the board, using the information from the example.

Then as a group, construct arguments to explain what must be done and why – referring to the facts researched in the first lesson and the information gained in this lesson.

Each pair to use the structure given to construct their argument and to make sure they do a different argument to others in their group. This should mean that groups have 3 or 4 different arguments / reasons.



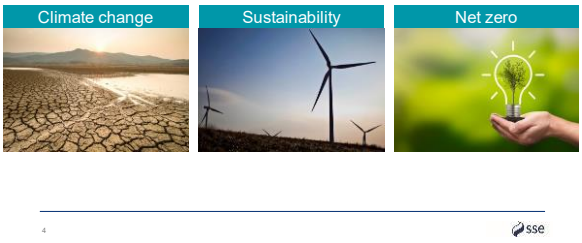
Ask the children how they used their problem-solving skills. Open a class discussion around the questions on screen. This will help children understand and communicate the skill they have built alongside their knowledge.

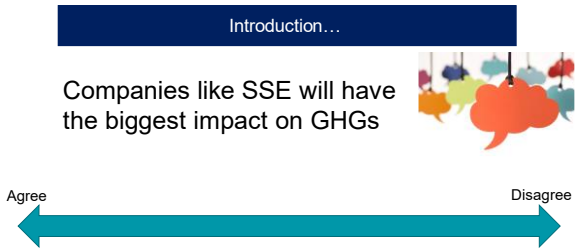
	Ask children to share examples of their arguments. Facilitator to only select 2 or 3 different ones to get a range of ideas. Introduce agreement line. Facilitator to decide whether children stand on a giant invisible agreement line in the teaching space or if children simply state where they would position their opinion. Agreement line: companies like SSE will have the biggest impact on GHGs. Children to discuss this with a partner and then decide where they would position themselves and why. At the end of the session, make sure each groups' work is collected and kept for the third session.
 Activity | Time Allocation Guide Do Now: True / false, prove it discussion | 5 mins Introduction: what is net zero? | 10 mins Provide Model: how we can power change | 10 mins Pupil Practise: graphic organisers | 25 mins Review of Learning: agreement line | 10 mins	Use these timings as a guide – this can be adjusted for the session being led
	Please provide feedback via QR link – encourage children to submit examples of pupil work to social media.

A more detailed lesson plan can be found in the SSE 'Power Changers' Primary booklet.

IMAGINE A WORLD…

Lesson 3

	Introduce yourself as the educator.
	Briefly introduce yourself and explain who SSE are and what they do.
	Do Now (5 mins) Show range of images showing the impact of GHGs. Quickly model 'If… then…' statement using an example (shown on the slide) e.g. If we don't stop burning fossil fuels like coal then there will be more damage caused to the polar ice caps. Children then to speak with their partners completing as many 'If… then…' statements as they can using the images and their existing knowledge of GHGs and net zero.
	Explain key words used in the lesson

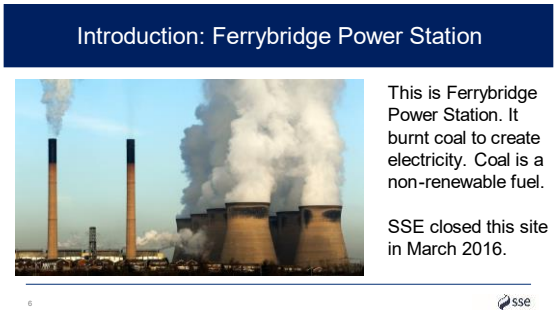


Return to the discussion prompt from the previous lesson. Ask the children where they would position themselves on the agreement line.

Children talk with partner or in small groups and then decide where they would position themselves on the agreement line: companies like SSE will have the biggest impact on GHGs

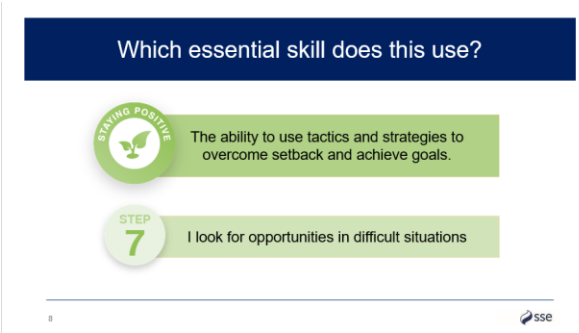
Focus around what we can do ourselves. Comparison between huge company like SSE pledging £12.5 billion and what we can do individually.

Take ideas from the children ensuring they understand that companies like SSE must take action and are doing so. They also need to show clearly that these companies need our help.



Explain that SSE are doing a lot in their commitment for net zero. Show image of Ferrybridge power station when it was in use.

Ask the children: based on what we know about SSE, what could they do to improve how energy is created?



Introduce Staying Positive as the ability to use tactics and strategies to overcome setback and achieve goals.

Ask children how SSE have demonstrated this skill with Ferrybridge.

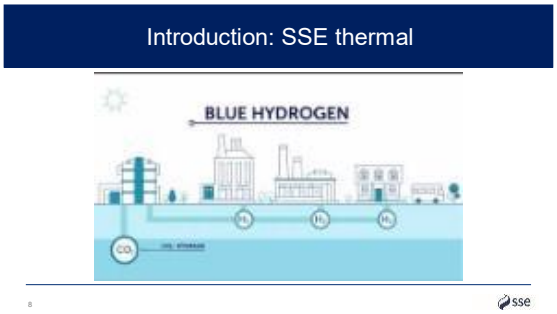
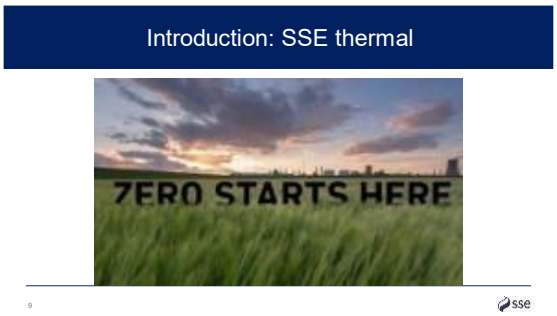
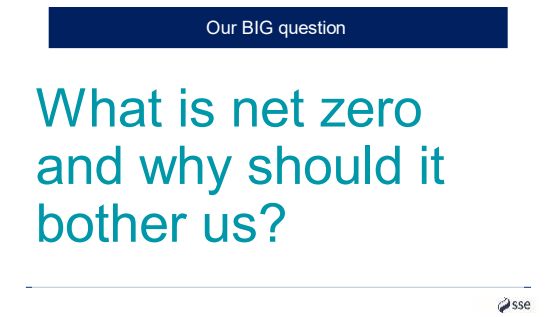
Explain that during the lesson the children will be using their Staying Positive skills by looking for opportunities in difficult situations, and using these to write poems.

Optional: Describe how you demonstrate this skill step in your own role.

Then show Ferrybridge Power Station demolition - https://vimeo.com/590566694 - Short clip showing the demolition of Ferrybridge coal-fired power station. This demonstrates that SSE has decommissioned all of its coal-fired power plants.

Discuss with the children what the film is showing and ask them why they think they are doing this.

Ask the children to consider vocabulary that could be used to describe what SSE are doing here. Examples could be demolish, reduce, fossil fuel. Record on shared display.

	SSE Thermal - where does hydrogen come from? - https://www.youtube.com/watch?v=pIqEqnS8vfU This video explains the concept of blue and green hydrogen and how hydrogen could fuel power stations in a net zero world. Tell the children that SSE are doing a number of other innovations to try and achieve net zero. Show the video and ask children to note down any vocabulary that describes what SSE are doing here. Children make notes on mini-whiteboards / rough paper showing what words / phrases can be used to describe what SSE are doing to try and achieve net zero. Examples may include: - Storage - Capture - Decarbonise - Future
	Repeat this with the video How does carbon capture and storage (CCS) work? - https://www.youtube.com/watch?v=9a7oyhsnGCM – Detailed video of how carbon capture and storage works and how it could decarbonise existing power stations. With these videos, the main learning for children is to see that SSE are showing innovation in reducing waste and using what is produced.
	Review the big question and explain that today, the children will be creating a poem to show the importance of caring about making changes to achieve net zero.

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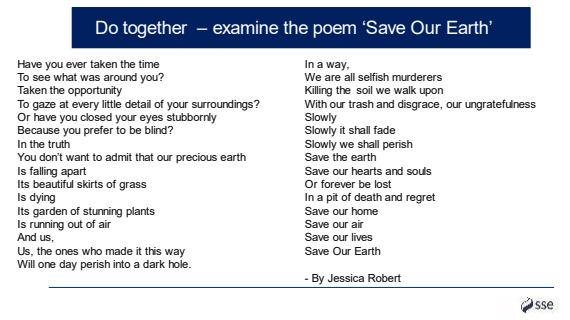

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Examine the poem on screen as a good example/model and identify the features (two verses, emotive language, speaking to the reader).

NB: facilitator to ensure there is reference to current news events where appropriate as conflict, economic difficulties etc can impact on these issues.
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Start off poem with 'Imagine a world where…'

Do a shared write with the children of the opening few lines using some of the ideas from the images showing the impact of increasing GHGs (shown on slide)

Make sure children are clear that this is not the full poem and is just a starting point for each verse.

Pupil practise (20 mins)

Children will be provided with the opening of both verses 'Imagine a world where…' and 'Wouldn't it be better if…' If confident, children can innovate these to be different however it is important that the structure is consistent.

Images to be shown on display in order to support their ideas.

Children to write a poem showing what the world would be in their eyes if we do nothing to reduce the human impact on GHGs and (in verse 2) what the world would be like if the right actions were taken today.

Important that they have their information from the previous lesson to support their writing.
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Review of learning (10 mins)

Facilitator to either:

- Ask a number of children to give a line of their poem building on verse 1 and then repeat for verse 2
- Select volunteers to read a full verse / poem

Exit ticket: Children make a pledge and write down what they will do to make a difference to achieving net zero.

Ask the children what the pledges should be from other stakeholders: governments, large companies.
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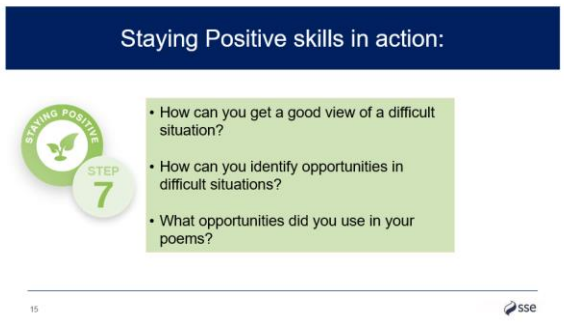
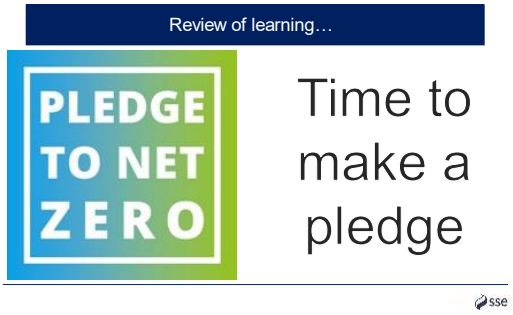
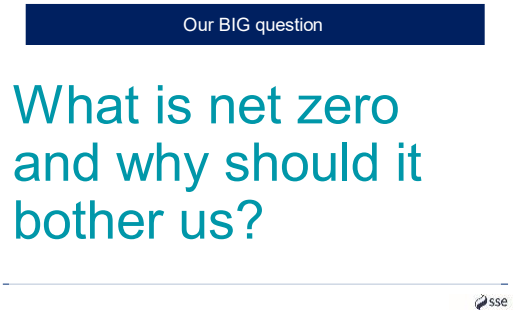
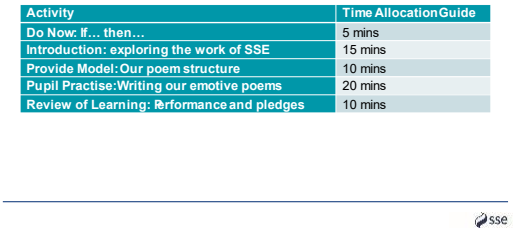
	The performance of poems will show the children's awareness of the impact of GHGs and the importance of net zero. The pledges made in the review of learning will show what they understand to be our priorities.
	Remind children that Staying Positive is the ability to use tactics and strategies to overcome setbacks and achieve goals, and this includes finding opportunities in difficult situations. Ask the reflection questions to help children understand and communicate the skill they have focussed on alongside their knowledge.
	Ask the children to make a pledge on something they will do personally to help climate change.
	Ask the children once more the big question and ensure they've understood net zero and the impact it has.
 Activity | Time Allocation Guide Do Now: If… then… | 5 mins Introduction: exploring the work of SSE | 15 mins Provide Model: Our poem structure | 10 mins Pupil Practise: Writing our emotive poems | 20 mins Review of Learning: Performance and pledges | 10 mins	Use these timings as a guide – this can be adjusted for the session being led

	Please provide feedback via QR link – encourage children to submit examples of pupil work to social media.

A more detailed lesson plan can be found in the SSE ‘Power Changers’ Primary booklet.