

- **Renewable Energy Investigations:**  
Solar and Wind Energy
- **Wind Turbine Technology:**  
Construction and Design Challenges

<p><b>Learning Objectives During this Day Course pupils should learn:</b></p>
<p><b>Workshop 3</b></p> <ul style="list-style-type: none"> <li>✓ To practise scientific enquiry skills.</li> <li>✓ To evaluate experimental materials and processes.</li> <li>✓ To investigate ways of using renewable energy.</li> <li>✓ To apply numerical and literacy skills to experiments.</li> </ul> <p><b>Workshop 4</b></p> <ul style="list-style-type: none"> <li>✓ About the properties of materials</li> <li>✓ To understand how to create rotational movements in models</li> <li>✓ To create a freestanding model with moving parts</li> <li>✓ To create a freestanding, stable structure using the principles of turbine tower construction</li> </ul>
<p><b>Pupils will also:</b></p> <ul style="list-style-type: none"> <li>✓ Learn safely including the safe use of tools and equipment</li> <li>✓ Learn about ways in which people can improve their environment including the importance of recycling</li> </ul>

<p><b>Workshop programmes</b></p> <p>All workshops begin with an introduction and end with a plenary. Teachers should enter their choices for school-based workshops on the workshop booking form. Timings vary, but as a guide, two workshops in one day is ideal. Where there are 3 classes involved then three slightly shorter workshops may be arranged. (For those who are also booking an Energy Works visit to Coldham Wind Farm, please note that any of the workshops below may be selected for the afternoon session at Coldham.)</p>
<p><b>Workshops 3a and 3b: RENEWABLE ENERGY INVESTIGATION</b></p> <p><b>3a Solar Energy</b> Using solar energy mini-kits, working in small groups pupils will investigate the generation of heat and electricity using two types of mini solar panels. They will consider how to generate the most energy by choosing suitable places to locate the panels.</p> <p><b>3b Wind Energy</b> An open investigation using model wind turbine mini-kits will look at the construction of wind turbines and give pupils working in small groups the opportunity to discover the optimum conditions for electricity generation.</p>
<p><b>Workshops 4a and 4b: WIND TURBINE TECHNOLOGY</b></p> <p><b>4a Construction Challenge</b> The importance of reduce, re-use and recycle will be discussed and materials which can be recycled will be identified. Pupils will then work individually to create a model wind turbine from recycled materials, following step-by-step verbal instructions. The model will be able to rotate about its axis (yaw) and the blades will rotate.</p> <p><b>4b Design Challenge</b> This session involves a team challenge to create a freestanding structure from sheets of newspaper. Pupils will work in groups to investigate how to increase the strength and stability of different structures before attempting the challenge of building a structure, which is freestanding, stable and as high as two sheets of newspaper. The outcomes from the challenge will be used to discuss the design principles used in the construction of turbine towers.</p>
<p><b>Workshop 5: CRITICAL THINKING &amp; PERSUASIVE WRITING</b></p> <p>Topical issues such as the installation of wind farms and climate change are explored using critical thinking techniques to develop understanding and pupils' own opinions of the issue. This can lead into persuasive writing or speaking and listening activities during the session and/or as follow up.</p>
<p><b>Note:</b> The actual programme may vary depending on number and needs of pupils and length of workshop.</p>

### Relevant extracts from CEES risk assessments

Hazard	Control measures
Use of Design & Technology equipment	<ul style="list-style-type: none"> <li>• Pupils are instructed in the safe use of equipment and are closely supervised at all times</li> </ul>
Working with tall structures	<ul style="list-style-type: none"> <li>• Instructions are given to ensure that tall structures are constructed safely</li> </ul>
Pupils' pre-existing conditions	<ul style="list-style-type: none"> <li>• School staff are required to notify the CEES teacher of any pupils with physical, medical or behavioural conditions which may affect the safe conduct of the workshop.</li> </ul>
Using scientific equipment	<ul style="list-style-type: none"> <li>• Pupils are instructed in the safe use of equipment, for example using goggles to shield eyes when using wind turbines, taking great care not to touch lamps and fans.</li> </ul>

<p><b>Adult : Pupil ratios</b></p> <p>For this workshop CEES' recommended ratio for safety is <b>1 : 15</b> excluding the CEES teacher.</p> <p>Additional adults may be needed with classes where individual pupils need 1 : 1 support.</p>
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