

CleanEnergy Notes for Teachers

The BMW CleanEnergy World Tour visited the UK in April 2002. The tour presented hydrogen technology and the hydrogen internal combustion engine to opinion formers and decision makers from politics, industry and science.

BMW is committed to developing hydrogen for the internal combustion engine as an alternative fuel while, at the same time, providing a product that is the best in manufacturing and design quality. The company believes in the importance of personal mobility while, recognising that the motor industry has responsibilities to diminish its impact on the environment.

To coincide with the visit of the CleanEnergy World Tour, the **BMW Education Programme** produced a video for 12-16 year old students, 'BMW CleanEnergy - Hydrogen Power' that describes the principles behind the production of hydrogen and its use in the fleet of BMW CleanEnergy cars.

We were delighted to hear from teachers that they found the video useful, especially as a stimulus for teaching Citizenship.

This online resource not only supports the video but also includes updated teacher information in the accompanying booklet, plus Interactive Sheets and Activity Sheets that explore a range of environmental issues in a lively and engaging way. There are also activities for use on whiteboards.

Our aim in developing the resource has been to provide support materials, closely linked to the curriculum, that can be adapted or enhanced by the teacher to match their students' needs.

We hope that teachers of Science, Environmental Studies, Geography, and PSHE/PSE/PSD Citizenship find the materials useful. We will be delighted to receive your feedback by email at **bmweduc@bmweducation.co.uk**.

BMW has a long established commitment to supporting education across the UK. The BMW Education Programme provides free, comprehensive, curricular linked and award-winning educational resources. Full details can be found at **www.bmweducation.co.uk**.

Aims

This resource aims to:

- Provide support materials for teachers of 12 -16 year olds for Science, Environmental Studies, Geography, PSHE/PSE/PSD and Citizenship, in the delivery of sustainable development issues.
- Encourage independent thought with respect to sustainable development issues associated with energy use.
- Provide opportunities to develop skills of reflection, enquiry, debate and presentation.
- Encourage young people to consider some of the social and moral dilemmas associated with environmental issues.
- Place the issues within a global and a local perspective.

At a practical level in the classroom it seeks to:

- Provide a series of activities that are realistic, linked to the curriculum and manageable for the specialist and non-specialist teacher.
- Actively engage students in their own learning through peer education, activities, presentations, teamwork, role-play and discussion.
- Enhance the resource base of the teacher.

About the resource

There is no prescribed route that needs to be followed when using the material. Teachers may wish to structure their introduction to issues and provide detailed support on the tasks, or present them as more open-ended team exercises, where groups have to find information using the materials and through other sources.

The video is intended as a stimulating introduction that clearly sets out an innovative solution to the problems associated with vehicles and petrol or diesel fuel, including the topic of climate change. It shows how other renewable energy sources could play a part in producing hydrogen, how it is stored, transported and used as fuel for vehicles.

The resource provides students with a number of **Interactive Sheets** (whiteboard and pdf resources) that are organised into four strands:

- Non-Renewable Energy
- Energy and the Environment
- Renewable Energy
- The Future

The Interactive Sheets are intended as introductory starting points, rather than being a comprehensive overview of a particular topic. It is beyond the scope of the resource to provide complete information on every topic covered.

As students will see, if they undertake further research, there are few views and ideas that are not interpreted differently by someone else!

The Interactive Sheets contain suggested web links for research to begin to look at issues more widely, plus many have diagrams, graphs or data that will inform discussions. Students will note that many of the issues described can be local, yet have global implications. This is a key issue that we hope is touched upon in their work and discussions.

Using the resource

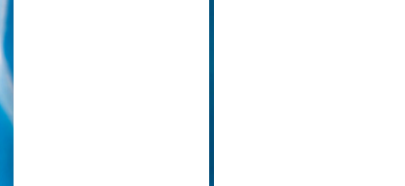
The **Activity Sheets** aim to connect local and global issues of sustainable development within contexts that will appeal to students' creative thinking. They have been designed to encourage small groups to read and discuss points from the Interactive Sheets and, if time permits, research further, using resources from within school or via the Internet. Although each follows a different pattern, all activities seek to encourage students to synthesise arguments, pool their own knowledge, form opinions, practice and make presentations to their peers.

In addition to consolidating Key Skills, this approach will enable teachers to organise the activities as a 'circus', where each presentation can then give other students an insight into the issues that have been thought about in detail.

The Activity Sheets do not prescribe which Interactive Sheets should be used as they prepare their presentation, however, teachers may wish to provide some guidance at the outset. There is no limit to the depth of information that can be researched – if time is available, and students wish to work outside lesson time, they could well find that their chosen area is far more complex than they first imagined.

Presentations can be as complex or simple as required and can provide an opportunity to demonstrate competence and imaginative use of ICT.

Students may find the video and script outline in the supporting booklet that accompanies the video presentation useful, and for some activities, they may wish to view the video again and make notes.



Summary of information and activity sheets

Interactive Sheets

Non-Renewable Energy

Fossil fuel formation	1a
Oil	1b
Natural gas	1c
Coal	1d
Nuclear power	1e

Environmental Impact

Population growth	2a
Fueling transport	2b
The Earth's climate	2c
Greenhouse effect	2d
The impact of climate change	2e
Non-renewable versus renewable energy	2f

Renewable Energy

Solar power	3ai
Solar power for electricity	3aii
Wind power	3b
Water power	3c
Hydrogen power	3d
Hydrogen combustion engines and fuel cells	3e
Geothermal energy	3f
Biofuels	3g

The Future

Sustainable development	4a
Being energy efficient	4b
Sustainable homes	4c
Transport in the future	4d
Hydrogen - Energy of the future	4e

Activities

Crisis? What crisis?	A1
Your home today – your home tomorrow	A2
Hydrogen power – communicating the benefits	A3
Solar power – can it help developing countries?	A4
Hydrogen power in the UK	A5
The town that sacked 'Non-Renewables'	A6
Personal transport – getting people to think	A7
Water World Web	A8
Nuclear free or nuclear power?	A9
Sustainable development - living for the future	A10

Useful websites

Here is a list of some useful websites that contain further information that may be of some use.

The American Solar Energy Society	www.ases.org
Biomass Energy Centre	www.biomassenergycentre.org.uk
Blue Energy International	www.bluenergy.com
BMW	www.bmw.com
BMW CleanEnergy H2Lab	www.h2-lab.com
BMW CleanEnergy	www.bmw.com/cleanenergy
BMW Group	www.bmwgroup.com
BMW Group CleanEnergy	www.bmwgroup.com/cleanenergy
The British Wind Energy Association	www.bwea.com
The Coal Authority	www.coal.gov.uk
Department for Business, Enterprise and Regulatory Reform	www.berr.gov.uk
Department for Environment, Food and Rural Affairs	www.defra.gov.uk
Department for Transport	www.dft.gov.uk
Energy Saving Trust	www.energysavingtrust.org.uk
European Automobile Manufacturers' Association	www.acea.be
The European Wind Energy Association	www.ewea.org
Hydrogen Education Foundation: H2 & you	www.h2andyou.org
Intergovernmental Panel on Climate Change	www.ipcc.ch
The International Solar Energy Society	www.ises.org
London Hydrogen Partnership	www.london.gov.uk/lhp
London Schools Hydrogen Challenge	www.lshc.co.uk
National Geographic	www.nationalgeographic.com
New Zealand Geothermal Association	www.nzgeothermal.org.nz
Oil and Gas UK	www.ukooa.co.uk
Population Reference Bureau	www.prb.org
The Recycling Consortium	www.recyclingconsortium.org.uk
Reduce, Reuse, Recycle – Your Green Guide	www.reducereuserecycle.co.uk
Sustainable Development Commission	www.sd-commission.org.uk
Sustainable Hydropower	www.sustainablehydropower.org
Sustrans	www.sustrans.org.uk
Tyndall Centre for Climate Change Research	www.tyndall.ac.uk



Useful websites continued

UK Statistics Authority	www.statistics.gov.uk
United Nations Framework Convention on Climate Change	www.unfccc.int
Wave Dragon	www.wavedragon.net
World Business Council for Sustainable Development	www.wbcsd.org
World Energy Council	www.worldenergy.org
World Meteorological Organization	www.wmo.ch
World Nuclear Association	www.world-nuclear.org

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