EDITORIAL

Einstein first explained the link between energy, matter and light exactly 100 years ago, so it is a good time to focus attention on energy and where it comes from. Some may disagree on the grounds that energy is not a topic in the primary National Curriculum for England or that it is too complex an idea for children. Our view is that *PSR* addresses many audiences, not just those concerned to meet the English statutory curriculum, and that most children can soon grasp an idea of energy, at an appropriate level. In many ways, energy is like money. It comes in many forms, you can store it in different ways and change it from one form to another, but it never gets used up; and it's only useful when you spend it. Like energy, money makes things happen, you can work out how much you need for something, and you can count it in pounds, euros, dollars or other units. Children have no problems understanding money, because they come across it often in everyday life.

The same has to be true of energy; so this issue aims to help you and your pupils meet examples from everyday life. But there is a bigger issue to consider. We all urgently need to reduce our dependence on fossil fuels: our children's generation will have to make extremely difficult choices about energy use and conservation, and so they need to be well informed. As a country, we have choices: at present, we get most of our energy from fossil fuels (oil, coal and gas) with a decreasing amount from nuclear sources, a little from wind, and a tiny amount from solar, water, biomass and the rest. But renewable sources will have to play a larger part in future. Other countries have already made different choices: France gets 75 per cent of its electricity from nuclear sources; Norway generates over 90 per cent from hydro-electric schemes; Iceland uses the geothermal power of its geysers to produce 80 per cent of its electricity; whilst China's growing industry is fuelled almost entirely by coal from 30 000 mines. So far, however, the reasons are largely economic; countries use what is cheapest and most convenient for them.

Things will have to change, because fossil fuels like oil and gas will run out, certainly during the lifetime of your pupils, perhaps as soon as 2020. Demand will exceed supply even sooner, pushing up the price until we can hardly afford our cars. The greatest oil reserves are in the most politically sensitive part of the world. Hence some countries are already switching: France, South Korea and India, for example, are moving over to (cheaper) 'bio-fuels' such as ethanol 'petrol', made from vegetable oils, maize, wheat, sugar beet or sugar cane. Italy is planning to go over to nuclear power for its electricity. California subsidises solar power for one million homes. Denmark, Portugal, Spain and Germany have invested heavily in wind power. Here in Britain we have more wind, tides and waves than anywhere in Europe, which makes the argument for these renewables almost irresistible. In the longer term, new technologies may win out, such as artificial photosynthesis, or the solar cells recently invented in Canada that are five times more efficient, using 30 per cent of the sun's energy. You can read about these and many other developments on the PlanetArk website (www.planetark.com). There is a debate to be had, and, as those most affected, your children need to be engaged in this crucial issue.

Focusing on energy

Articles in this issue deal with many of these energy sources. **Leslie Barton** of the green energy company Ecotricity provides us with an overview of the advantages and drawbacks of renewable sources of energy and how some of the systems work, particularly wind power. **Deirdre Raffan** then describes how the Centre for Alternative Technology works with children to enhance their awareness of energy conservation and describes how you can construct a model micro-hydro power station. **Joy Palmer** and **Jennifer Suggate** provide us with a timely reminder of children's perceptions in key areas related to the environment and sustainability. An important question raised here is where and how such over-arching issues are best dealt with in the primary curriculum, since they demonstrate that children do not always make connections between one scientific phenomenon such as deforestation, and other major issues such as loss of biodiversity or climate change.

Sarantos Psycharis and his colleague describe an ICT-based programme from Greece that helps primary school children to learn about solar energy, demonstrating that this approach helps children understand the concepts of energy transfer better than conventional learning from textbooks. **Malcolm Parry** continues the theme of children's conceptual learning with a response to some earlier *PSR* pieces on teaching about forces, with examples of activities using particle theory to show how we can teach about air resistance and upthrust. And the practical emphasis on teaching about forces and energy is reinforced in **Graham Lowe**'s demonstration of how to make

simple pop bottle rockets to illustrate these concepts.

On page 7 we have a new kind of item, a **puzzle picture**. As we are focusing on energy, I have taken an illustration from a Standard 7 (Y7) pupils' book from Tanzania, where biomass is widely used as a domestic fuel for heating and cooking. I hope your children will find it interesting to puzzle out what this machine does, and how cow dung can be used to cook their meal!

Beyond the theme

In the first paragraph above, I mentioned the importance of children encountering examples of energy and other concepts out of the classroom, in real-life experiences. **Helen Barraclough** and **Becky Bracey** describe several of their 'Creative Minds' projects and work packs that involve children in investigating phenomena around them, solving problems or taking on a challenge, supported by extension activities with relevant websites. **Anne Watkinson** then summarises her rationale for taking young children out of the classroom to study centres, nature reserves or even into the school environment, to learn about energy and other elusive ideas through activities as simple as a conversation with a butterfly.

Finally, having highlighted primary science in Wales in *PSR* **86**, I have focused in this issue on primary science within the Scottish curriculum. English readers will note the difference in emphasis on science and environment, raising the question, which of these should encompass the other?

Alan Peacock

PSR themes

Already published:

PSR **62** (March/April 2000): Food and farming
PSR **63** (May/June 2000): Everyday materials
PSR **64** (Sept/Oct 2000): Light and dark
PSR **65** (Nov/Dec 2000): Looking after ourselves
PSR **66** (Jan/Feb 2001): Our environment
PSR **67** (March/April 2001): ASE centenary issue
PSR **68** (May/June 2001): Assessment
PSR **69** (Sept/Oct 2001): Learning about science and scientists
PSR **70** (Nov/Dec 2001): Forces
PSR **71** (Jan/Feb 2002): Science and everyday life
PSR **72** (March/April 2002): Earth and Space
PSR **73** (May/June 2002): Celebrating Science Year
PSR **74** (Sept/Oct 2002): Words in science
PSR **75** (Nov/Dec 2002): Gardens for life
PSR **76** (Jan/Feb 2003) ICT
PSR **77** (March/April 2003): Primary science across the world
PSR **78** (May/June 2003): Early years
PSR **79** (Sept/Oct 2003): Managing primary science
PSR **80** (Nov/Dec 2003): Effective transition
PSR **81** (Jan/Feb 2004): Creativity
PSR **82** (March/April 2004): Thinking and feeling
PSR **83** (May/June 2004): Questions and dialogue
PSR **84** (Sept/Oct 2004): Recording and communication
PSR **85** (Nov/Dec 2004): Science begins at home
PSR **86** (Jan/Feb 2005): Science and citizenship
PSR **87** (March/April 2005): Energy sources

If you are interested in purchasing any back issues of *PSR* please contact Joan Hyslop at ASE on 01707 283000 to check availability. A charge of £3 a copy is made to members.

Each issue of *PSR* focuses on a theme, but also includes other articles on a range of topics, so if you have something to write about that is not on a theme or deals with a theme already covered, don't be deterred. All contributions are very welcome.

Future themes:

PSR 88 (May/June 2005): **Planning investigations**

Planning by teachers relating to parts of investigations as well as whole extended ones. Going beyond 'fair testing' to other types of investigation, including ones that are conducted outside as well as inside the classroom. Ways of helping children to plan investigations, using different frames and formats. Identifying and assessing children's progression in planning scientific investigations.

PSR 89 (Sept/Oct 2005): **Scientific reasoning**
(copy deadline 27 May 2005)

How to distinguish inductive and deductive reasoning; developing thinking and reasoning skills; 'hands-on' and 'brains-on' activities to promote reasoning; making time for making sense of evidence. How real scientists work things out. Problems to tangle with.

PSR 90 (Nov/Dec 2005): **Forensic science**
(copy deadline 22 July 2005)

Using science tests such as careful observation, microscopy, chromatography, indicators, biometrics, to determine the validity of evidence. How real forensic scientists and psychologists work. Tests you can do in your classroom.

PSR 91 (Jan/Feb 2006): **Beyond the classroom**
(copy deadline 16 September 2005)

Learning science in the environment, in school grounds, on visits and fieldwork, or at environmental centres and science centres. Making use of environmental agencies and workplaces to generate more real-world science learning.

We want to hear from you!

PSR welcomes contributions of all kinds – letters, news items, views, comment, practical ideas, reflective pieces. This is your forum for sharing problems and advice with fellow teachers.

Contributions do not have to be 'polished'. Editorial Board members are always very willing to give advice to those writing for *PSR* for the first time.

All contributions should be sent as an e-mail attachment to: **psreditor@ase.org.uk**
or posted to:
The Editor, Primary Science Review, ASE, College Lane, Hatfield, Herts AL10 9AA.
A more detailed version of these guidelines is available on the ASE website: **www.ase.org.uk** or by post from the ASE.