

*(from Great Britain: The Conservation of Our Heritage; Torrobay 1999)*

## **The Appliance of Science**

By Walt Patterson

What can you do at home about global warming? To begin with, you could buy a better deep-freeze. That may sound like a frivolous pun, but it's an entirely serious suggestion. Moreover, it illustrates an idea that's urgently important to our society and our environment.

The keynote is "energy efficiency" - getting more use out of every kilogram of coal, every litre of petrol, every cubic metre of natural gas we burn. Efficiency matters even in your home. More efficient household appliances deliver the same or even improved services while using less electricity or gas. The less fuel burned, the slower the atmospheric build-up of so-called "greenhouse gases" like carbon dioxide.

Your own deep-freeze may seem insignificant; but a remarkable seven per cent of UK electricity is used to run domestic fridges and freezers alone - and average UK freezers use well over twice as much electricity, and fridges more than four times as much, as the most efficient models already on the market. Furthermore, models under development will be more than twice as efficient as the best now available. Similar arguments apply to washing machines, clothes dryers and colour TVs.

In evidence to the House of Lords committee studying energy efficiency, Friends of the Earth say that moving to the most efficient technologies now available could reduce UK electricity use by 70 per cent. This higher efficiency would eliminate the need for any new power stations, with their intrusive impact on land-use, water and local amenities. It would also dramatically lower the amount of fuel burned in existing power stations; this would further benefit the environment, reducing the emissions that produce acid rain and the greenhouse effect, and the build-up of nuclear and other hazardous wastes.

But achieving higher efficiency is not that simple. For example, one problem you face as a responsible householder is finding out which appliances perform the best. In the US and many European countries, appliances must carry a label stating their efficiency. In the UK no such information is required; nor has the government any plans to remedy this annoying shortcoming. Indeed, despite repeated government endorsements of the importance of efficiency, their actions fail signally to match their rhetoric. The budget of the government's own Energy Efficiency Office is being cut from £26 million in 1986-87 to only £12 million in 1990-91; and the government is blocking a directive from the European Commission that would tell buyers of new homes how much they might cost to heat and light.

For some years, householders could apply for modest grants to insulate lofts - one of the most effective ways to improve domestic energy efficiency, and reduce heating bills. But the government has now withdrawn the offer of insulation grants. It has likewise withdrawn support for energy audits in industry. Although the privatisation of the UK's electricity supply offers impressive scope for boosting efficiency, the government has turned down some 30 amendments intended to incorporate efficiency measures in the Electricity Bill.

## POSITIVE DEVELOPMENTS

This official foot-dragging has undoubtedly slowed down the improvement in British energy efficiency; but progress is nevertheless being made. Major manufacturers including Bull, ICI, Pilkington, Tarmac, Thorn and more than a dozen others belong to the Association for the Conservation of Energy (ACE), a research and lobbying organisation set up to promote efficiency in the UK. ACE publications provide authoritative analysis and guidance on the measures that can be taken in homes, offices, factories, schools, hospitals and other buildings to reduce fuel and electricity bills - and environmental impact - while increasing comfort and convenience. Important developments include high-efficiency lighting; real-time computerised control to optimise heating and ventilation; improved electric motors and power trains; and heat-recovery systems.

## MANAGING ENERGY

Many industries now have "energy managers" responsible for overseeing energy use. Energy managers have their own regional and national organisations, and meet regularly to share experience and disseminate information about innovations and best practices. Homeowners can get appropriate information on insulation and the efficiency of lighting, heating and appliances from the Consumers' Association, environmental groups like Friends of the Earth and even local gas, electricity and solid-fuel showrooms. As yet, to be sure, the suppliers are at best tentative backers of efficiency. They accept it as a criterion to be used in competition with other suppliers, claiming that gas central heating is more efficient than electric, or vice versa; but the suppliers are less eager to acknowledge that improved insulation will enhance comfort at even lower cost than any supply alternative.

Every householder can take some straightforward measures to reduce bills, raise efficiency, and contribute to environmental improvement - at costs that will be repaid in a matter of months by savings on fuel. The list is familiar but worth reviewing. Plug cracks around your windows and doors; draw heavy curtains over single-glazed windows and single-panel doors after dark; insulate all lofts to a depth of at least 10 centimetres. Pack as much insulation as you can around your domestic hot-water storage tank - not just 10 or 20 centimetres but literally as much as the enclosure will hold. Many more sophisticated measures then become relevant, as detailed in brochures from the various sources mentioned above.

## SMALL IS SENSIBLE

Of course, no matter how efficient your home, office or factory, you will still require some fuel and electricity. Fortunately, within the past 15 years many innovations have increased the efficiency of energy supply while diminishing its impact on the environment. For instance, until recently UK electricity supply planners insisted that for power stations bigger always meant better. However, a

power station delivering a million kilowatts of electricity also discharges close to two million kilowatts of low-temperature heat - far too much to use in the neighbourhood. Accordingly, the huge stations of the 1960s and 1970s had to be sited away from towns and cities to get rid of this wasted energy, to say nothing of stack emissions.

Now, however, a new approach to electricity supply is emerging in the UK as it has elsewhere. The trend is now toward smaller power stations, of less than 400,000 kilowatts. They can be on stream in under five years to match demand, their output is of manageable size, and they can employ generation technology that is inherently less polluting - for instance so-called "fluidised bed combustion", which can minimise emissions of noxious sulphur and nitrogen oxides. Accordingly, instead of disfiguring wilderness areas, these smaller stations can be sited close to electricity users.

That makes it easier to use new technologies: either those which boost the efficiency of electrical output - so-called "combined cycles" (CC) - or those which produce both electricity and useful heat - so-called "combined heat and power" (CHP). A traditional power station with flue-gas clean-up has an efficiency of perhaps 36 per cent at best. A CC station by contrast can achieve an efficiency of 45 per cent or better, and a CHP station upwards of 80 per cent, while meeting equally stringent emission-control standards.

In the case of CC, increasing the efficiency of electricity generation by 25 per cent not only saves on fuel costs; it also reduces by 25 per cent the amount of "greenhouse" carbon dioxide discharged per unit of electricity generated. In the case of CHP, if local industry or residences can use the low-temperature heat from the station directly, the net gain on fuel costs and environmental impact is even more spectacular.

The proposal to privatise the UK electricity supply has triggered a wave of enthusiasm for small high-efficiency low-impact power stations in the UK. Promoters include the old Area Boards like the Midlands and East Midlands Electricity Boards; gas turbine manufacturers like Rolls-Royce and GEC; boilermakers like Foster Wheeler and Ahlstrom Pyropower; and even British Coal.

## RANGE OF OPTIONS

Which, if any, of these embryonic plans come to fruition will depend crucially not only on the details of privatisation, but also on the actual evolution of electricity demand in the UK. If UK electricity users were to recognise and adopt all the economically sensible measures to use electricity more efficiently, new power stations would be needed only to replace some of those being retired because of age and inefficiency. Ironically, this would delay the introduction of more efficient designs.

In the somewhat longer term, the range of supply options becomes wider still. A number of UK companies, including for instance Taylor Woodrow, British Aerospace and the CEGB have been pursuing research into wind-energy technology; and the UK's first wind-farm will soon be taking shape among the Welsh hills. Photovoltaics - the direct conversion of sunlight into electricity - continues to show expanding promise, as the performance of solar cells increases and their production costs decrease. Wind energy and solar energy will undoubtedly attract more attention, since they produce no noxious emissions whatever - no acid rain, no greenhouse gases, no radioactive waste.

Even so, when wind and solar energy supply technologies do become widely available, they too will do a better job if we're ready to take full advantage of them, by using their output with maximum efficiency. Now, about that new deep-freeze ...

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