

Energy efficiency means warmer homes at no extra cost

by George Henderson

Heating in British homes has undergone a quiet revolution over the past 20 years. The once ubiquitous coal fire has been largely replaced by central heating and unheated bedrooms have become the exception where they once were the rule. Perhaps surprisingly, the average home still consumes about the same amount of energy while achieving a considerably improved standard of heating.

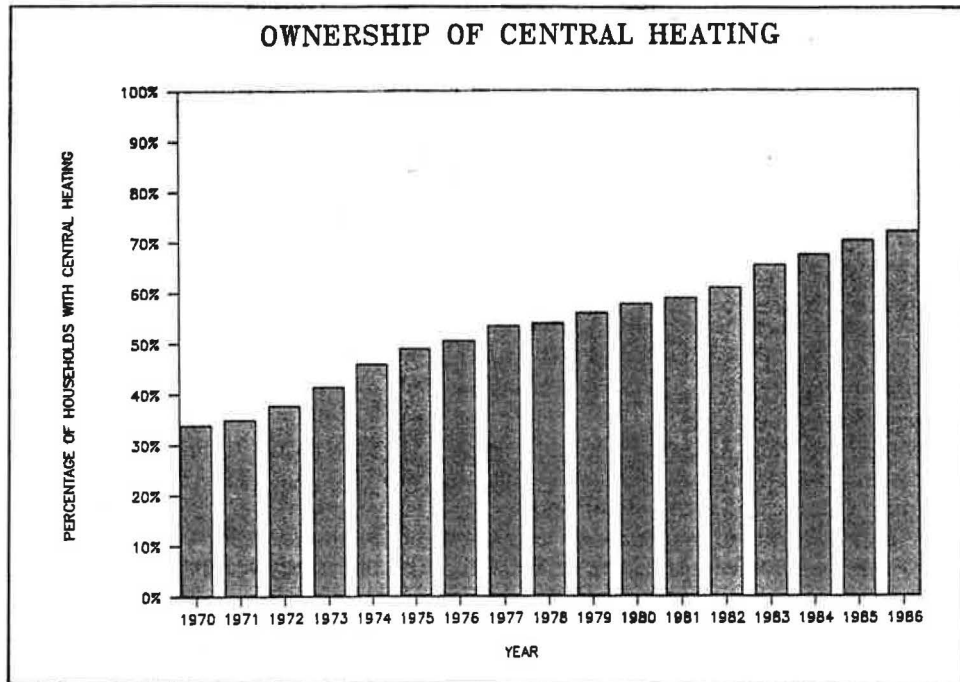


Figure 1. The growth of central heating

In 1960, central heating was mainly confined to a few larger houses and was usually coal fired. Since then, the availability of compact gas-fired boilers has been a major factor in enabling central heating to be installed in all types of dwelling. Figure 1 shows how the use of central heating has grown to its present level, now being found in over 70 per cent of British homes. Natural gas is by far the most popular domestic heating fuel, with over half of all homes having gas central heating.

CENTRAL HEATING

The installation of central heating has two important effects. Firstly, it provides a convenient means of heating the whole dwelling, leading to higher average temperatures being maintained. A BRE survey (Ref 1) of 1,000 dwellings showed those with central heating to be on average 2°C warmer than those without. Secondly, central heating often raises the efficiency with which fuel is converted into useful heat. The first effect increases the

demand for useful energy but the second allows that demand to be met without an excessive increase in the amount of fuel consumed.

Thermal insulation standards for new buildings are set by the Building Regulations. The levels were raised substantially in 1976 and 1982 and are currently under review again. As a result, new houses are far better insulated than their older counterparts and often require little more than half as much energy for space heating.

INSULATION

Nearly 90 per cent of our dwelling stock was built before the 1976 Regulations took effect and many are very poorly insulated. Consequently the greatest impact on the overall performance of the stock has to come from improvements made to existing buildings. Although it is generally much more difficult to fit insulation after rather than during building, there are many opportunities for improvements.

Loft-insulation is highly cost effective and has been installed in many millions of dwellings, over 80 per cent of eligible dwellings now having some insulation. Cavity wall insulation is also very cost-effective but has a much lower uptake and

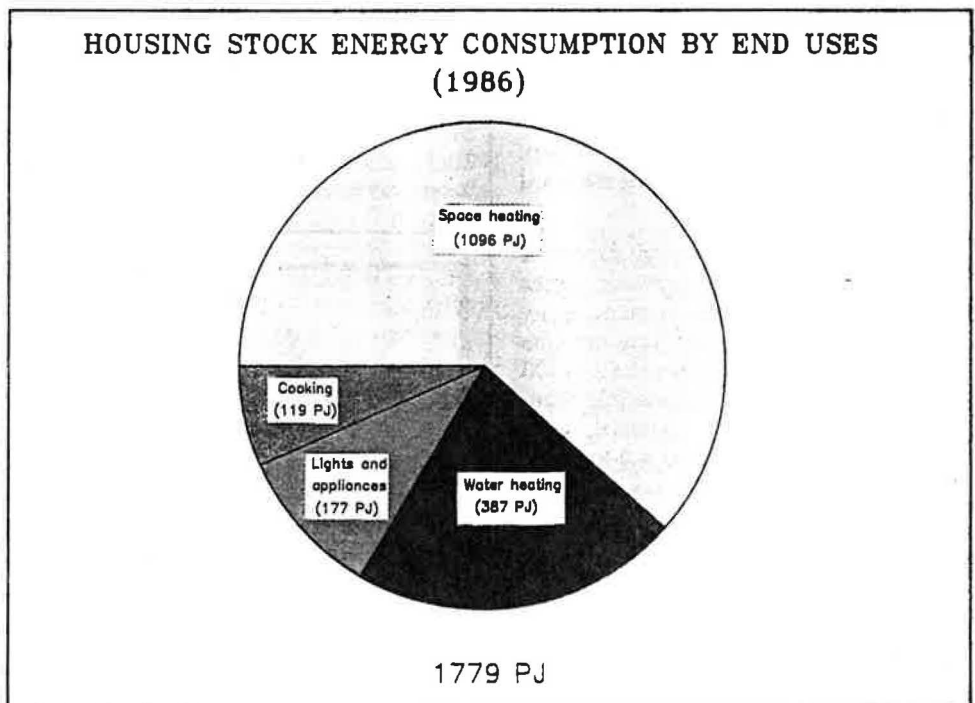


Figure 2. Breakdown between space heating and other uses.

represents a large potential for future improvement. Double glazing, while not usually cost-effective from a purely energy standpoint, is being installed in about a million dwellings a year and is a major factor in reducing heat loss. BRE has calculated (Ref 2) that the overall effect of improvements to insulation has been to reduce average dwelling heat loss by about 15 per cent since 1970.

BOILER EFFICIENCY

Modern central heating boilers are more efficient than their predecessors, needing less energy to produce the same level of heat output. This is particularly true of the new generation of condensing gas boilers which are now widely available. Typically a condensing boiler will operate with an average seasonal efficiency of 80-85 per cent compared to 65-70 per cent for a conventional boiler, resulting in about 20 per cent less gas being consumed. This reduction could be greater where the condensing boiler is replacing an old and badly controlled unit. Boiler replacements will occur in large numbers as the first generation of boilers reach the end of their useful life and offer enormous potential for energy efficiency improvements over the next decade. BRECSU, supported by the EEO, has taken a leading role in demonstrating the effectiveness of condensing boilers (Ref 3).

OTHER USES OF ENERGY

Space heating accounts for about 65 per cent of the energy used in the average dwelling but less than 50 per cent in well insulated, recently-built homes (see Figure 2). Water heating is the next largest use of energy and has also undergone considerable improvements to efficiency. Storage cylinders for hot water are now insulated in over 90 per cent of cases and this form of insulation is exceptionally cost-effective, often paying back its capital cost in a few months. Efficiency has also improved for water heating through the installation of more efficient boilers and better controls.

Lighting and appliance consumption is of particular importance because it is mostly of electricity at the full daytime tariff. Thus, although it is typically only about 10 per cent of consumption in units of energy, it usually accounts for between one third and one half of energy expenditure in individual households. This category of consumption has grown more than any other as more domestic appliances

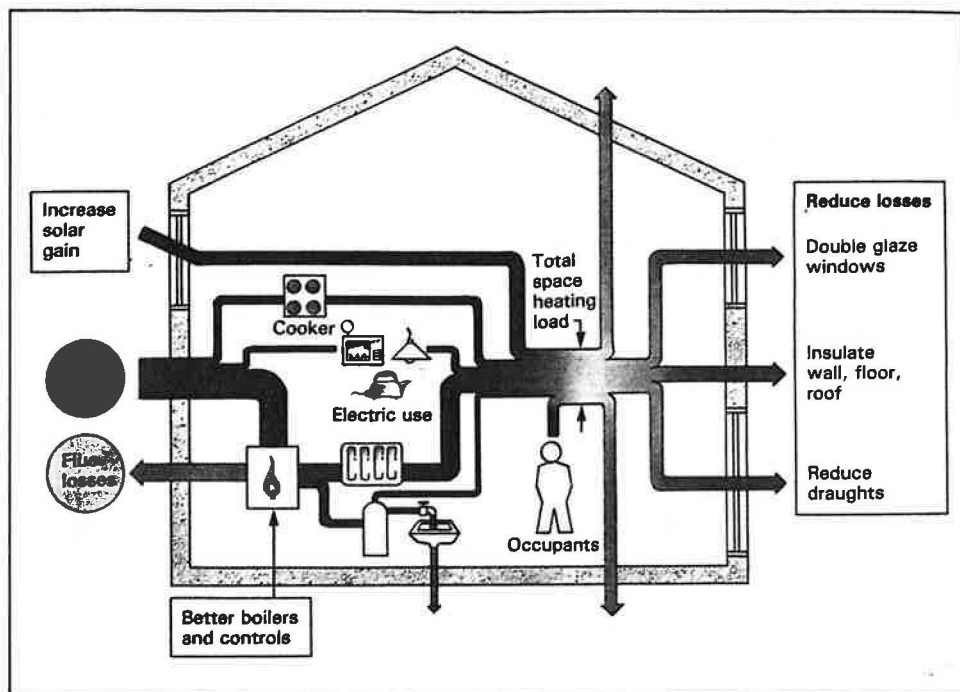


Figure 3. Energy flows in a typical dwelling

have come into use. Increased demand has been partly offset by improvements to the efficiency of the appliances themselves but the net effect has been a rise in consumption of about 3.5 per cent per year over recent years. Considerable improvements to lighting efficiency are possible through the use of compact fluorescent light fittings which are now available to replace standard tungsten bulbs and this could have a significant impact. Working in the opposite direction, however, is a growth in the use of dishwashers, which are heavy consumers of electricity. They have low market penetration in the country at present but that may be expected to rise considerably over the next few years, in line with the experience in other European countries and North America.

OVERALL EFFECT

British homes are now much better heated than before but still use about the same amount of energy, on average. This has been achieved through the installation of central heating and better insulation. Many opportunities still exist for further improvements to energy efficiency allowing heating standards to continue to rise without increased overall consumption.

The EEO has done much to raise public awareness of energy efficiency measures in housing while the BRECSU programme in particular has identified their benefits to the professions, industry and housing authorities. The EEO and BRECSU have a continuing role to play in ensuring that the benefits are widely un-

derstood, thereby accelerating the rate at which measures are applied.

Details of all BRECSU projects are available in the form of project profiles, expanded profiles (for completed projects) and reports. These can be obtained, free of charge from the BRECSU Enquiries Bureau, Building Research Establishment, Garston, Watford, Herts, WD2 7JR. Telephone 0923 664258.

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