

# Estimating energy costs and potential savings in housing



by George Henderson

The average UK household spends about £500 per year on heating, lighting and power for domestic appliances but there is a huge variation between individual household expenditures. Field trials, in which the energy use in occupied dwellings is measured, show that the physical characteristics of the dwelling and the lifestyles of the occupants are about equally important in determining energy consumption. It is clear, therefore, that realistic estimates of domestic energy consumption can only be made if both these factors are considered together. The Building Research Establishment Domestic Energy Model (BREDEM) was developed, with support from the Departments of Energy and Environment, to make such estimates and has become the most widely applied energy calculation procedure for housing in the United Kingdom.

## BREDEM

BREDEM is designed to be easy to use and to give reliable results, being based on practical experience gained through measurements made in many occupied dwellings. The approach is to identify the various uses of energy in dwellings and to estimate the annual requirement for each use. Space heating requirements are calculated taking account of the physical details of the dwelling and its heating system, internal and external temperatures and the living patterns of its occupants. Other energy uses are estimated from average consumptions derived from surveys and appropriate to the composition and activities of the household. The performance of BREDEM has been extensively tested by comparing its predictions with measured consumption data from a large number of dwellings.

An obvious use of BREDEM is for estimating energy requirements in particular dwellings or groups of dwellings. This is of value to those wishing to know the likely running cost of a property before buying, and to housing associations and local authorities, who want to know



*Energy Efficient Housing Refurbishment. Many older houses can have their energy performance upgraded when they are re-furbished.*

whether their tenants can afford to heat their homes. It is also valuable to policy makers who need to estimate the impact of possible policy options on national energy needs.

The other main use of BREDEM, however, is for investment appraisal of energy efficiency measures which requires estimates of the savings resulting when the measures are applied. This can be in the design of new housing, rehabilitation of existing housing or for retro-fitting of specific measures. Having estimated the likely savings, standard investment appraisal techniques can be used.

## Important applications of BREDEM

### (a) Building Regulations

The Building Regulations for England and Wales and their counterparts for Scotland and Northern Ireland are currently being revised. The parts that deal with the conservation of fuel and power are based on cost-effectiveness of the measures set out in the Approved Documents, and, hence to justify the levels set.

### (b) EEO Monergy Campaign

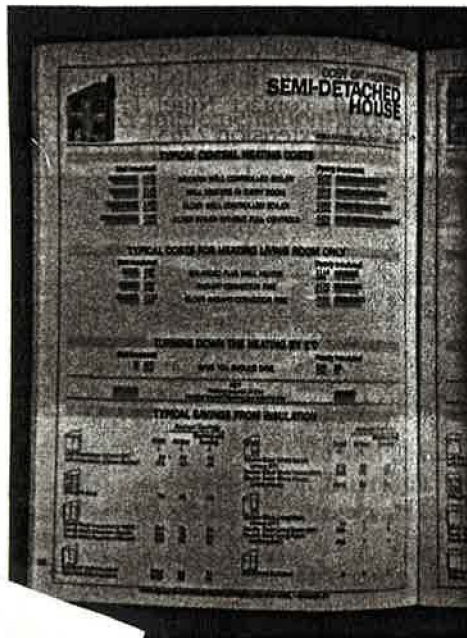
The 'Monergy' campaign and other EEO initiatives in the domestic sector

have been based on BREDEM. Examples include the 'Monergy Guides', which show estimated running costs for a range of typical houses and heating systems, and 'Monergy News', which gives simple guidance on how to install a range of energy efficiency measures.

### (c) Energy Auditing and Advice

A home energy audit is an analysis of energy use in a particular dwelling which identifies how energy is used at present and how energy efficiency can be improved. The best known example is the 'Energy Matters' scheme which was operated by Channel 4 television and the Open University. This offered viewers the opportunity to complete a questionnaire about their own dwellings and have it analysed by the Open University. A computer program based on BREDEM was used to produce a report recommending appropriate measures.

Some home energy audits can be complex and therefore costly. BREDEM offers the basis for a simplified approach which has been successfully developed and has resulted in an energy advice system that can be used by members of the public. Using a low cost personal computer, the



*Some of the information given by the Monergy Guides.*

system requires only simple information that the average householder is likely to know about his own home but gives advice which is tailored to the particular situation he has described.

**(d) Commercial Energy Analysis Software**

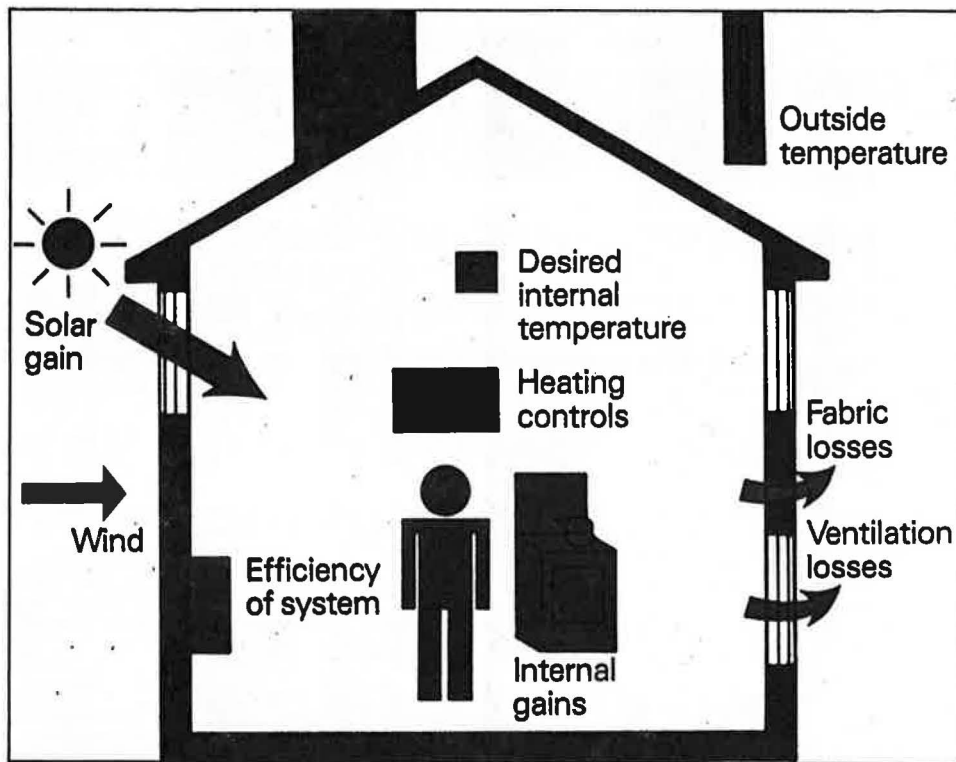
BRE has encouraged commercial exploitation of BREDEM through licensing agreements with suppliers of software. 'Energy Auditor', 'Energy Designer', 'Energy Targeter' and 'Energy Assessor' are currently available from private sector organisations. Other licensing agreements are currently under negotiation. Local Authorities use 'Energy Targeter' to assess options in energy efficient housing refurbishment.

**(e) Codes and Standards**

BREDEM has been included by the British Standards Institution as the calculation procedure for its Code of Practice (BS 8211) on 'Energy Efficient Refurbishment of housing' and associated hand book which are to be issued in July. The procedure is to be made available in hand-held and desk-top computer versions as well as in work-sheet form which can be used without a computer. BREDEM is also an important foundation to the development of a draft Eurocode on the 'Rational Use of Energy in buildings' and to a draft ISO standard.

**(f) Energy Labels**

Energy labels for housing express the overall energy costs of the dwelling in terms of a simple rating and enable the prospective purchaser to make better in-



*Energy flows in a typical dwelling.*

formed decisions on which property to buy. The Milton Keynes Energy Cost Index is the best example of such a label in the UK. The Index, which is based on BREDEM was originally applied only in the Milton Keynes's Energy Park development but is soon to be extended to all new development in Milton Keynes. The possibility of devising a scheme based on BREDEM for use throughout the United Kingdom is currently being investigated.

The Department sponsors are keen to see BREDEM and subsidiary products used more widely in the drive for energy efficiency in housing. Anyone interested in finding out more about the computer programs and BREDEM should contact Margaret Gidman in the Energy Economics and Statistics Section, Building Research Establishment, Garston, Watford, Herts. WD2 7JR, telephone 0923-894040 ext 4514/4517.

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**SEMINARS & COURSES**

**International Symposium on Engineering and Economic Aspects of Energy Saving in Protected Cultivation**  
4-8 September, Cambridge. Details: Dr. B.J. Bailey, Institute of Engineering Research, Wrest Park, Silsoe, Bedford MK45 4HS. Tel: (44 525) 6000.


**Energy Management, Short Course**  
19-23 September, Portsmouth Polytechnic. Details: Dr. M.R.I. Purvis, Dept. of Mechanical Engineering, Anglesea Road, Portsmouth, Hants PO1 3DJ. Tel: (0705) 827681 Ext. 227/130.

**Sixth Energy Projects Conference, "The Challenge of Change"**  
5-8 September, University of Nottingham. Details: Neighbourhood Energy Action, Tel: 091 261 5677. (Please note that all bookings should be made by 30 June.)

**North West Energy Efficiency Exhibition and Conference**  
13 September, Park Hall Conference Centre, Charnock Richard, Lancashire. Conference details from Paul Newman on 061 838 5334; exhibition details from David Nicholson on 0695 75471.

**SHORT COURSES**

The Energy Conservation and Solar Centre is running a series of one day courses during the summer at its London headquarters. *Giving Heating Advice* will be the *Combating Condensation* is on 7 July. *Living on 16 June and 2 August, and Low E* 18 August. Details are available from Ar 380 1002.



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