ENCOURAGING ENERGY EFFICIENCY IN BUILDING BY THE COST-EFFECTIVE DELIVERY OF PROJECT SPECIFIC ADVICE - THE UK ENERGY DESIGN ADVICE SCHEME

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ABSTRACT

This paper describes the way in which an advice service, funded by the UK Government has assisted designers and building owners to achieve energy efficient design solutions by encouraging the use of proven, low-energy technology. The scheme forms a link between the research community and construction industry professionals, enabling the effective dissemination of results and giving added value to research funding bodies and to building procurers. Case studies are presented to illustrate the ways in which timely, appropriate advice can result in significant savings in building energy consumption.

KEYWORDS

Advice; energy policy; efficiency; energy conservation; building design; information dissemination.

INTRODUCTION

Following the Rio Earth Summit in 1992 the UK Government made commitments which included the intention to return atmospheric emissions of CO_2 to 1990 levels by the year 2000. More recently, prior to Kyoto, an ambitious target of a 20% reduction on 1990 levels was announced.

The use of buildings accounts for almost half the UK's delivered energy consumption and associated CO_2 emissions. Therefore the construction industry is being encouraged to adopt techniques to minimise energy use. The Building Regulations define statutory performance standards for the conservation of energy. However, designers can often overlook the fact that these are minimum requirements, especially when under pressure to save time and reduce capital costs. Advice and good example can increase the effectiveness of legislation and the Energy Design Advice Scheme, or EDAS, was established to provide such advice to help realise the energy saving potential in the built environment.

THE OPERATION OF THE ENERGY DESIGN ADVICE SCHEME

The aim of the EDAS, is to improve the energy and environmental performance of the UK building stock by encouraging the adoption of proven and economic low energy technology in the design of new and refurbishment projects. In many cases capital costs can also be reduced if the relevant decisions can be made

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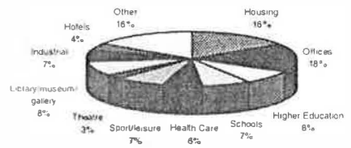
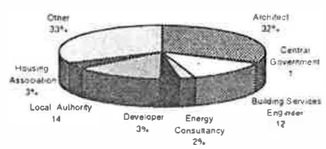
at an early stage in the design process. All new and refurbishment projects with a floor area greater than 500m² are eligible for a one day, free consultation. The advice given is based on proven low energy design techniques and encourages reduction in demand and the appropriate use of renewable and other energy sources. Many designers have a basic understanding of low energy strategies but need reassurance that they are employing current, best practice techniques. EDAS advice is tailored to offer the appropriate solution for each project and improve the design team's knowledge for the future.

The Scheme operates from four regional centres and can respond to enquiries from building designers, procurers and managers. The figures below illustrate the different disciplines represented by EDAS customers and the range of building types with which we have been involved.

Building Types



Customer Organisations



The advice given will consider orientation and passive solar configurations, fenestration and fabric, heating and cooling by passive and mechanical means and renewable energy and water conservation techniques. Following an initial assessment by EDAS staff, in which the potential energy savings are estimated using data from the Energy Efficiency Best Practice Programme, published by the Department of Environment, Transport and the Regions, a report will identify areas which would benefit from additional research by external consultants. This could include more detailed calculations or computer modelling and when considered appropriate, financial subsidies have been made available. In all cases the integration of fabric and services and the importance of the holistic view is emphasised. This approach, from the outset, can avoid costly changes late in the design process or the use of inappropriate engineering solutions.

DISSEMINATION OF INFORMATION

The need for improved links between researchers and designers is recognised and the dissemination of the results of research is an important part of the service that EDAS provides. The regional centres are located within University Schools of Architecture, to maintain commercial independence, and are staffed by environmental scientists and architects. Free, impartial and expert advice can remove misconceptions and acquaint the designer with the up-to-date, cost effective information, that is relevant to the project in hand. EDAS works closely with the energy conservation unit at the Building Research Establishment, BRECSU, and the DTI energy technology support unit, ETSU, who have responsibility for research into renewable energy technologies in the UK. The Scheme is a major disseminator of publications produced by these groups and by the International Energy Agency and the European Union. The enquiries received by the regional centres can provide feedback to these groups on the implementation of the research that they have funded and may also indicate where new or additional research may be needed.

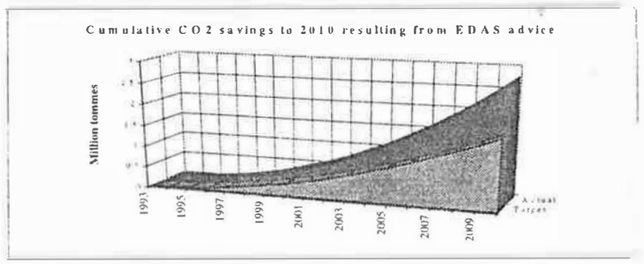
THE EFFECTIVENESS OF EDAS

Since its launch in 1993, which followed a pilot study undertaken in Scotland, EDAS has supported over 1,200 projects and has identified annual energy savings in excess of £17 million. This equates to a reduction in CO_2 emissions of over 350,000 tonnes which will continue every year of the buildings' life. These savings

exclude any benefits that will accrue from the replication of the advice received. Nor do they take into account the referrals made to other sources of help and the general information given to enquirers, numbering approximately 3,000 to date, who do not fulfil the consultation criteria.

The targets set by the scheme sponsors, have been met in terms of numbers of enquiries, seminars and published papers. The scheme's performance has been monitored independently (Eclipse Research Consultants) and an analysis of its activities indicates a successful market penetration when compared with operating costs. It has been calculated that approximately 2.5% of building contracts, worth over £800m per year, that have commenced during the scheme's operation have received EDAS advice during the design process. The total cost of this nation-wide service is less than £1.5 million per year.

The predicted energy savings resulting directly from the advice given to date and projected to the year 2007 amounts to £159m. This does not take into account savings which should occur from replication or indirectly from information given in general enquiries or at seminars. For every £1 spent in providing the EDAS, £22.70 has been identified in the cost of energy saved. Similar savings can be seen in atmospheric carbon dioxide emissions.



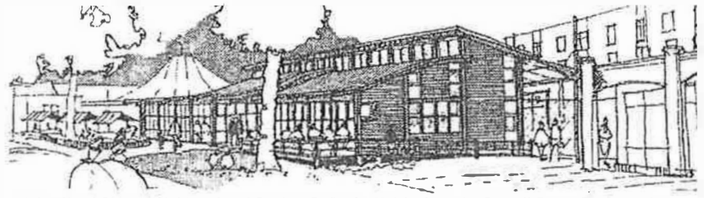
Case Studies

The CBSO Centre: A permanent rehearsal hall and practice studios for the City of Birmingham Symphony Orchestra and a home for education and community work. This new, three storey facility features a south facing elevation with ventilated, glazed facade to assist cooling and air movement in the summer and to take advantage of solar gain in the winter. Other low energy techniques employed are natural ventilation by stack effect, night cooling of the structure and the use of daylight in all parts of the centre. EDAS was invited to contribute to the development of the energy strategy for the building and was able to pay 50% of the consultants' fees for a computer simulation exercise to optimise the low energy concepts within the design. The results indicate that a comfortable working environment can be achieved with considerable energy savings of up to £8,000 (£2.92/m^2) per yr.

5 Brindleyplace: New offices for British Telecom in Birmingham. This building is part of the UK's largest city centre, mixed use development. The developer requires a good return for his investment while providing high levels of comfort for the occupants. The design team responded by the use of energy efficient systems and a cohesive design. Energy consumption has been reduced by the use of automatically controlled solar shading and a ventilated facade to the atrium on the south-east side of the building, and by reducing the steam requirement for humidification. This should achieve an annual saving of 1.2 million kWh, equivalent to over £80,000 (£7.02/m^2) per year.

Robin Hood Chase Neighbourhood Centre: A self-build development, initiated by a local residents' group, to provide accommodation for community activities within a demonstrably environmentally benign, building.

Fabric and services are integrated to ensure that the fabric provides as much internal climate control as possible. Robust, passive solutions for ventilation, cooling and heating minimise energy use and avoid high maintenance and servicing costs. A turf covered roof helps to stabilise internal temperatures and clean rubble from the site forms an under-floor thermal store through which incoming air is drawn to provide passive cooling. Gas fired condensing boilers reduce heating fuel use, and catalytic, gas fired radiant heaters respond quickly in intermittently used areas. Rain water is collected for wc flushing and landscape watering. Future plans include the use of solar power and wind generation to reduce the use of fossil fuels. An EDAS grant contributed to the consultants' fees and the resulting, annual energy savings are approximately 50,000 kWh, equivalent to 15 tonnes of CO_2, and savings to the community of £1,600 (£2.50/m^2) per yr.



Robin Hood Chase Neighbourhood Centre, St Ann's, Nottingham, by Carnell Green Partnership.

Riccall Community Sports Hall: Another community project for which low running costs are of great importance. Without a mains gas supply to the site, minimising the demand for energy and the generation of power from renewable sources were major considerations. There once stood a windmill on the adjacent site, suggesting that wind energy will be a cost effective source of power for electric under-floor heating. Photovoltaics will be used for small power loads and solar collectors for domestic hot water. The building is not yet completed but savings of up to £9,500 (£5.00/m2) per year are expected.

Bromsgrove School - Art, Design and Technology Building: This new teaching block is designed to demonstrate the school's commitment to lessening its environmental impact and low energy design. Passive solar design techniques are employed together with an integrated PV array to supply IT equipment and small power loads. A grant from the Scolar programme will help to fund capital costs and energy consumption should be reduced by over £2.00/m^2/yr compared with typical school usage.

Conclusions

By disseminating free and independent advice to building designers, procurers and managers EDAS has encouraged the implementation of energy saving strategies which will result in significant savings in building energy use and reductions in harmful atmospheric emissions.

The cost of implementing the Scheme is relatively small and shows a good return to the UK Government in terms of the energy saved. The informal day to day operation, with an emphasis on personal contact and individual response has proved popular. This format could be replicated easily throughout the European Community and beyond to increase the exchange and spread of information and the potential for further Global reductions in CO_2 emissions.