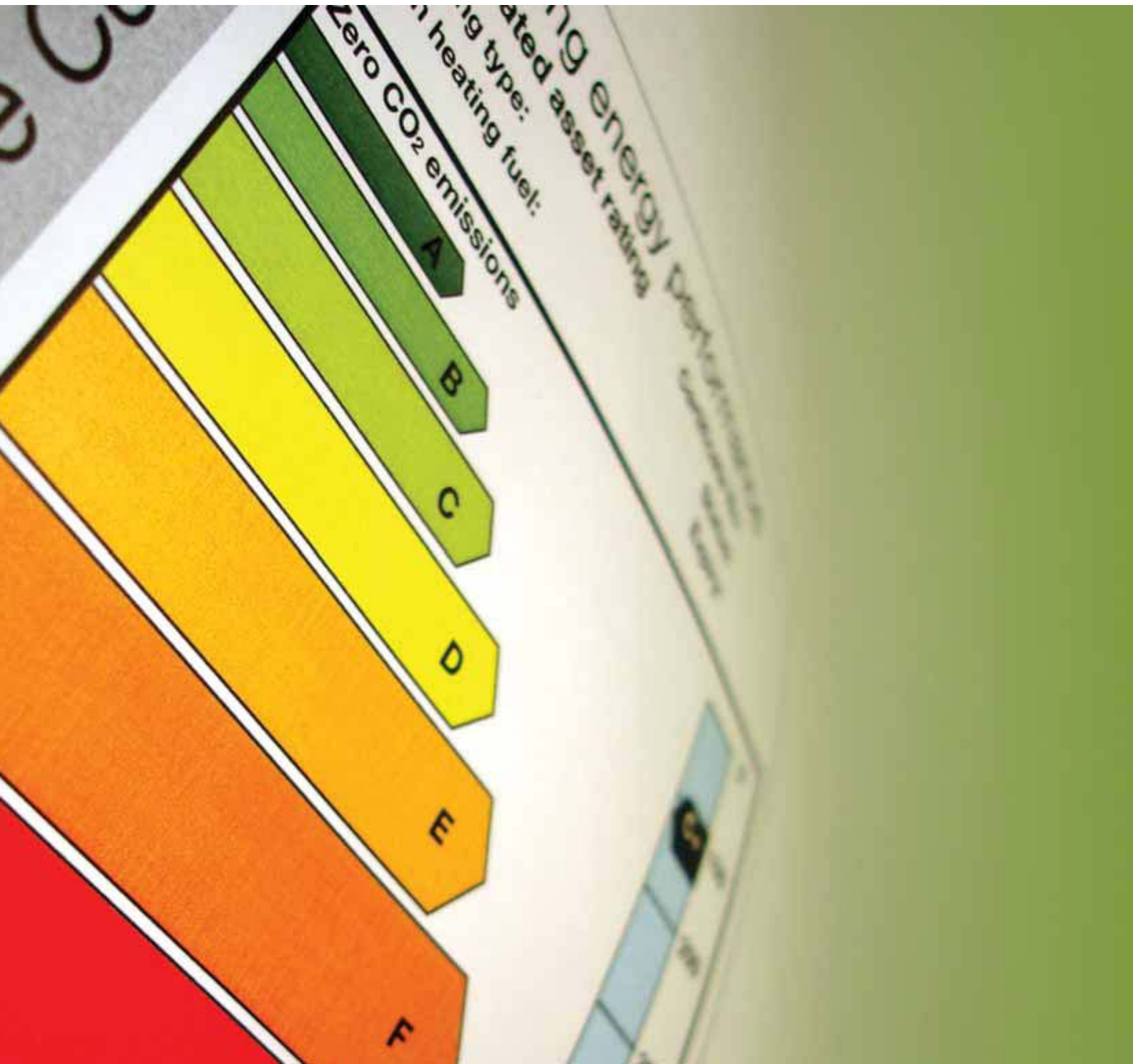


# Energy performance in theatres

To comply with new government legislation all new non-domestic buildings will be required to assess their energy efficiency and obtain Energy Performance Certificates. *David Richards and Mel Allwood of Arup provide a useful guide*





The Government has pledged that the UK will cut carbon emissions by 60% by 2050. To meet this ambitious target it is introducing new legislation focusing on tackling the key causes. Non-domestic building stock in the UK is responsible for around 20% of all carbon emissions, so it is a prime candidate for action. And this, of course, includes theatres and performance buildings.

Theatre building operators will need to meet the government's new legislation with regard to energy performance, which is being phased in throughout 2008. Part of this legislation includes Energy Performance Certificates and their close cousins Display Energy Certificates. Both certificates are intended to enable consistent, clear comparisons of a building's energy performance. Prospective tenants, purchasers, funders, investors and visitors can assess the energy or emissions rating of individual buildings. The Government hopes that this increased visibility will place pressure on building operators to improve their energy performance, as their behaviour will be open to public scrutiny and bench-marked against the rest of the industry.

Anyone who has bought white goods in the past few years will be familiar with energy labelling that allows consumers to make informed choices based on comparing the relative energy performance of goods. Energy Performance Certificates and Display Energy Certificates will work along similar lines, comparing theatre buildings on an A to G scale. Carbon-neutral theatres will be A rated, while a G rating will be the poorest level.

The certificate is accompanied by a report setting out recommendations for

improvement and the likely timescales over which costs would be recouped from savings in energy bills.

#### Energy Performance Certificates

Energy Performance Certificates (EPC) will be required whenever a building is constructed, sold, or rented. For new theatres a certificate of completion will not be issued without an EPC.

The table below highlights the programme for phasing in Energy Performance Certificates during 2008.

Key Dates	Action Required
6 April 2008	Properties over 10,000m <sup>2</sup> now require an EPC
1 July 2008	Buildings over 2,500m <sup>2</sup> will require an EPC
1 October 2008	All remaining non-commercial buildings will require an EPC

The purpose of the Energy Performance Certificate is to give the new occupier information about the energy efficiency of the property. This could affect the value of the building. In the case of theatres, the certificate may become a key issue for private or public funders. Over time, it is expected that this will provide an incentive for anyone responsible for a building to improve its energy efficiency. Two useful bench-marking ratings are listed on the certificate:

- one that shows the rating your building would achieve if it was newly built to the latest building regulations;
- the other gives the average rating of similar buildings across the country.

Each type of certificate is accompanied

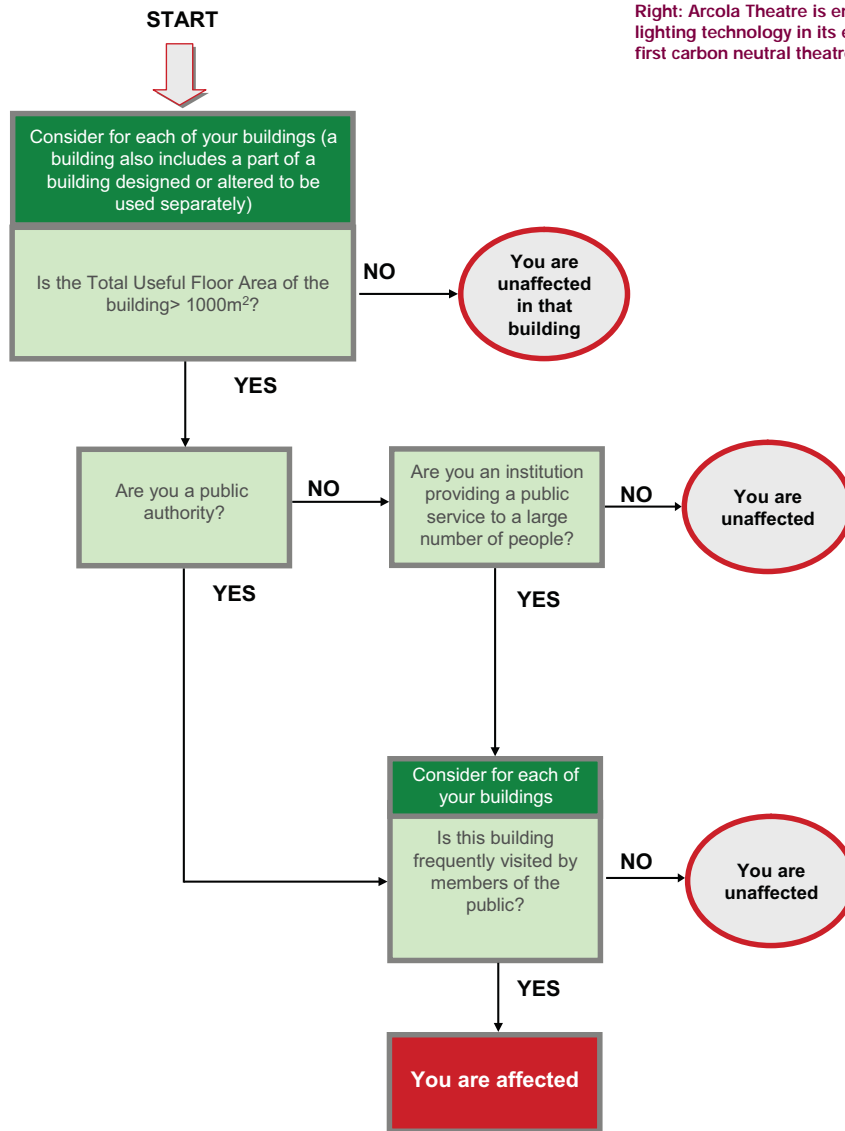
by a short report listing recommendations for improvement. Examples of the type of upgrades identified might include alterations to the theatre's building fabric, such as installing insulation, double glazing, or shading glazed areas from direct sunlight. Energy-hungry systems, such as air-conditioning and boilers are likely to be highlighted frequently.

Where theatres are occupied intermittently, it is likely that the report will highlight significant gains that can be achieved by smart building management, such as ensuring that timings and levels on air-conditioning units are set appropriately. Where there are step changes in occupancy levels (for example, rehearsals during the day and then performances with large audiences in the evening), proposals may include installing variable speed air-conditioning systems, so that power output can be matched to the actual cooling demand.

Another area of significant energy use – and with the potential for cost-effective investment – is likely to be lighting. For office, storage and transitional areas, simple measures such as installing compact fluorescent light bulbs during routine maintenance will pay back in the short-term. Light sensors maybe fitted to ensure that lights switch themselves off in daylight hours.

The more sophisticated lighting systems used for auditoria can also be upgraded for more energy-efficient alternatives. Technologies are now available that can replace show-load and daytime systems, and reduce the amount of time for which they need to be operational. However, these changes should be assessed on a case-by-case

Right: Arcola Theatre is embracing the latest LED lighting technology in its effort to become the world's first carbon neutral theatre



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basis and may require substantial investment, both in new equipment and in ensuring system reliability is maintained during performances.

### Display Energy Certificates

Display Energy Certificates will be required from 1 October 2008 for buildings over 1000m<sup>2</sup> that are occupied in whole or in part by public authorities, and by institutions providing public services to a large number of persons and therefore frequently visited by those persons. The certificate must be displayed where visitors can see it.

There is confusion about the definition of 'providing public services' and 'large number of persons' but given many theatres have significant public funding streams, are owned by public authorities, and have a strong membership base, it is likely that some or all theatre buildings will be affected. The ultimate decision will need to be made by each operator.

Display Energy Certificates are derived from actual meter readings in the property, and so provide an indication

of actual carbon dioxide emissions performance over the previous 12 months. The operational readings for the previous two years are also shown as a simple bar chart, so that visitors can track overall performance. The certificates also act as a bench-mark, as an average rating for similar theatre buildings will be shown, though how this comparative information will be gathered has yet to be established.

### How is the assessment carried out?

The assessments for both certificates can only be carried out by trained assessors, who use Department for Communities and Local Government authorised software packages that model each theatre building. A range of building data is analysed. For Display Energy Certificates, one model is created. Energy Performance Certificates are more complex, so a range of different building models are used.

Both types of certificate require data about the location of the building, its shape and occupancy level. The building

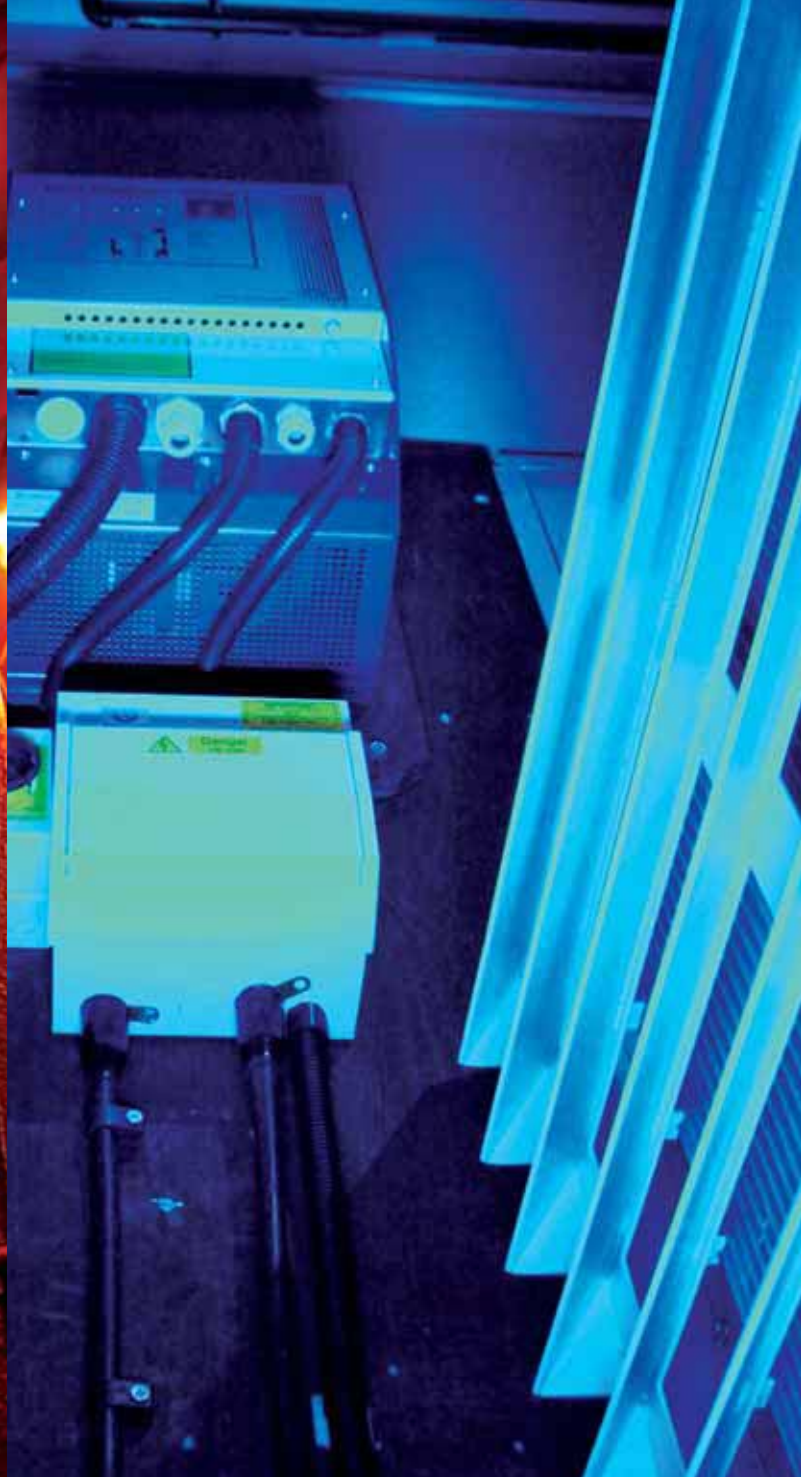
location allows for fair comparisons between different parts of the country. For example, a theatre on the south coast will require less heating energy than an identical case situated further north. Occupancy levels give an indication of heating and cooling requirements.

If a theatre has not previously been given a certificate, a site visit will usually be necessary. Subsequent assessments may be carried out on the basis of meter readings and other current information.

Since Display Energy Certificates are based on actual energy consumption, the assessor will need access to all records for the period. Theatre operators will need to ensure that records are kept up to date.

### What can you do to improve the performance rating of your theatre?

Both types of certificate are accompanied by an advisory report, which is valid for seven years. In many ways, this is the most important part of the process, as the report will contain a number of recommendations for cost-effective improvements.



The report may be tailored by the assessor to take into account the constraints posed by older or listed theatres, where elements such as the building fabric or the façade may be strictly governed or may make changes financially prohibitive.

In the report, the recommendations are broken down as follows, based on the expected time to recoup the initial investment:

- short term - less than 3 years
- medium term - 3 to 7 years
- long term - 7 years+

They are also rated in terms of the likely impact of improvements. This can be particularly useful in identifying cost savings

for theatre building operations. For example, simply fitting timers to boilers so that they only operate when the building is being occupied may be a more effective and less disruptive way to reduce emissions than a complete boiler replacement.

It is important to note that the report gives suggestions. Since each building and their circumstances are different, further investigation will always be needed to obtain actual estimates of the costs and benefits of making specific modifications.

#### The Future

The Government is leading the drive for energy efficiency in buildings. Theatre operators and owners are facing increasing levels of legislation, which with

the right implementation may allow them to reduce their energy running costs. More importantly, it may allow operators to position their buildings as environmental leaders in the theatre world.

*David Richards is a mechanical engineer and building services team leader at Arup. He has worked on a wide range of projects and has developed a keen interest in passive design and low energy use in the control of the internal environment. Mel Allwood is an Environmental Technologist at Arup specialising in energy and water related issues. She has contributed to recent work on Energy Performance Certificates and climate change.*