Asset Value Implications of Low Energy Offices

Phase 2 Report

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EXECUTIVE SUMMARY

This report presents the results of Phase 2 of the project "Asset Value Implications of Low Energy Offices" and will form the basis for the project's main outcome – to present a compelling business case for investment in low energy offices to investment analysts (Phase 3) and property valuation professionals as part of the RICS' "Lifelong Learning" series of seminars (Phase 4). The report covers a set of Key Issues, identified in Phase 1 of the project in conjunction with its Steering Group as needing to be addressed in order to be able to make this case. The Key Issues are:

- Improved rental income (addressed in Sections 1 and 2)
- Technical energy issues (addressed in Section 1)
- Risk premium for future valuation (addressed in Section 3)

Section 1 on "Technical Issues and Rental Data" deals with matters pertaining to 'low energy' offices. Due to the absence of an official definition of a 'low energy' office Section 1, therefore, presents a formalised methodology for quantitatively defining what is meant by a 'low energy' office, based on real building data and a DETR Best Practice Programme classification. A proposed comparative investigation of 'low energy' offices and 'standard' comparisons is undertaken, using valuation data from the Investment Property Databank (IPD). The initial premise for this section is that under current valuation methodologies, energy efficiency is not incorporated in valuation assessment procedures. Unfortunately the analysis ultimately failed due to a lack of valuation data as well as a lack of real energy use data yielded from office occupiers. Despite this setback, the process allowed for a number of useful and pertinent conclusions to arise concerning the generation and centralisation of energy use data. Furthermore, the possible implications of the forthcoming Energy Performance in Buildings Directive (EPBD) on the issues of energy use data generation and the identification of 'low energy' buildings are discussed.

Section 2 on "Tenant Demand" investigates both existing and empirical evidence supporting the notion that tenants can drive and are driving the demand for low energy offices. It is proposed that three of the existing top ten criteria in the procurement of new office space – "other occupational costs", "opportunity to promote branding and identity" and "inclusive package of real estate, fit out and services" – can be positively met by a low energy office. Furthermore, an investigation of FTSE100 companies' CSR and environmental reports reveals a substantial interest in commercial building (offices included) energy use in that 32 companies measure their own building energy consumption, 13 are working towards improvement with accredited energy efficiency best practice status or have implemented recognised low building energy standards, nine state that they have staff building energy awareness training and three are explicitly concerned about the building energy consumption of their stakeholders. An empirical survey investigating 26 British corporations' attitudes to the European Energy Performance of Buildings Directive (EPBD) finds the majority of respondents marginally likely to respond proactively to the Directive, in particular with respect to the energy certification and labelling provisions. Finally, a modelling exercise is carried out which suggests that the carbon savings from low energy offices could both be brought forward by around seven years and could be greater if tenant demand were to be stimulated only marginally before the onset of the Directive.

In order to illustrate potential trajectories for low energy offices, Section 3 – "Scenarios for Office Investment Decisions" – assesses the implications of three Chatham House "Open Horizons" global economic scenarios to 2020 for six factors which affect the demand for offices generally, and low energy offices in particular. These six factors are the economy / the level of employment, the location of employment, the energy (policy) context, business commitment to sustainable development, the importance of business reputation and stakeholder awareness. The consequences of the resultant trends are then further assessed in terms of the relative importance of the top ten office space procurement criteria reviewed in Section 2. It is found that under each of the scenarios, low energy offices may be desirable to different degrees and different reasons,

and that the three office procurement criteria that can be met by low energy offices become more important over time.

The findings and conclusions to be taken forward to Phases 3 and 4 of the project, organised by the Key Issues, are:

On improved rental income:

- CSR considerations of tenants and investors are currently a weak driver of the procurement of low energy offices. There is, however, a fairly high level of awareness of building energy use amongst the UK's largest corporations.
- There is a slightly stronger supply opportunity due to the impetus generated by the EPBD for improving building energy efficiency. Those large corporate tenants with strong CSR drivers are more likely to take action to improve their leasehold properties. Developers are being driven to supply more energy efficient buildings through the stricter regime of the revised building regulations.
- Considering tenants' potentially central role in the take-up of low energy offices, they are likely to be responsive to the market 'pull' that would be generated by property investment and valuation professionals taking low energy into account.
- It did not prove possible to demonstrate empirically that 'low energy' offices are currently effectively undervalued by valuation professionals. A methodology was developed to investigate this issue but it was ultimately unsuccessful due primarily to a lack of valuation data from IPD and also because of the difficulty of obtaining real energy use data from office owners / tenants.

On technical energy issues:

- There is currently no standardised or widely-used method of quantitatively assessing what constitutes a 'low energy' building. This project presents a potential methodology for achieving this, based on a Good Practice Programme methodology. However, the certification process of the EPBD will institute a very practicable 'at a glance' method of determining if a building is indeed 'low energy' or not.
- There is no centralised registry of building energy use / energy efficiency data. The forthcoming implementation of the EPBD will generate a significant amount of such data, and there is a strong case to be made for its compilation. Various potential organisations which might take a lead on this already exist – possibly the ODPM, the Office of National Statistics (ONS) or the IPD.

On risk premium for future valuation

- In all the scenarios being taken forward there is a reasonably strong case for low energy offices being a good investment compared with standard offices as energy use within offices is likely to be an issue. This holds even when the prognosis for property investment as a whole is poor; low energy offices are likely to be a less bad investment than standard in that scenario.
- All three scenarios being taken forward also illustrate how the three office procurement criteria low energy offices can help meet – "other occupational costs", "opportunity to promote branding and identity" and "inclusive package of real estate, fit out and services" – are set to become more important.

The next steps for the project "Asset Value Implications of Low Energy Offices" are to use the evidence and findings of Phase 2 and use them to make a compelling business case in Phases 3 and 4 – in terms of improved rental income and future market value – for investment in and improved market valuation of low energy offices.

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AAS	actual activity schedule
ACE	Association for the Conservation of Energy
AR	asset rating
BPF	British Property Federation
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CCGT	combined cycle gas turbine
CHP	combined heat and power
CIBSE	Chartered Institution of Building Services Engineers
CO_2	carbon dioxide
CSR	corporate social responsibility
Defra	Department of Environment, Food and Rural Affairs
DERA	Defence Evaluation and Research Agency
DETR	Department of Environment, Transport and the Regions
DIAG	Directive Implementation Advisory Group
DTI	Department of Trade and Industry
EC	European Community
ECFSU	European Commission Forward Studies Unit
ECON 19	Energy Consumption Guide 19 “Energy use in offices”
EPBD	Energy Performance of Buildings Directive
EST	Energy Saving Trust
EU	European Union
EUI	Energy Use Index
FES	Future Energy Solutions
FGD	flue-gas desulphurisation
FTSE	Financial Times Stock Exchange
GDP	gross domestic product
IPD	Investment Property Databank
NGO	non-governmental organisation
NO_X	nitrous oxides
PIU	Performance and Innovation Unit
PMSU	Prime Minister’s Strategy Unit
PV	photovoltaics
NHS	National Health Service
ODPM	Office of the Deputy Prime Minister
ONS	Office of National Statistics
OR	operational rating
R&D	research and development
RICS	Royal Institution of Chartered Surveyors
RIIA	Royal Institute of International Affairs
SAS	standard activity schedule
SRI	socially responsible investment
TFA	treated floor area
UKCIP	United Kingdom Climate Impacts Programme
VAV	variable air volume
WMD	weapons of mass destruction

INTRODUCTION

Developments in building and corporate governance such as the EU Energy Performance of Buildings Directive (EPBD), Corporate Social Responsibility (CSR) and Socially Responsible Investment (SRI) are raising the profile of energy efficiency in commercial buildings. Legislation to transpose the EPBD should increase the demand for energy efficient offices among tenants and so there is a potential for CO_2 emissions associated with commercial buildings to be reduced. However, this legislative market 'push' is not being matched by a corresponding market 'pull'.

This report is the first public output of the research project "*Asset Value Implications of Low Energy Offices*". The project runs from October 2003 to April 2005, and **the aim is to address the problem of market 'pull', posed by the failure on the part of property investors and their advisers to recognise the investment benefits of an energy efficient office, by presenting a compelling business case – in terms of improved rental income and future market value – for investment in and improved market valuation of low energy offices**. The target audience are investment analysts and property valuation professionals, and dissemination is through co-operation with a DTI-funded project led by Kingston University with the Royal Institution of Chartered Surveyors (RICS). The project is funded by the Carbon Trust, Pilkington Energy Efficiency Trust and BP plc, together with in-kind contributions from our Steering Group comprising representatives of Drivers Jonas, Jones Lang LaSalle, BP, Kingston University, RICS, Universities Superannuation Scheme, Impetus Consulting and the Carbon Trust.

Whilst the full rationale for the project and its objectives are available on our website www.ukace.org/research/offices, the objectives and work phases to fulfil the project's aim are outlined in the table below. Each of the objectives has a corresponding work phase. This document is the report on Phase 2.

Objectives	Work phases
Objective 1: Establish the gap between current information on low energy buildings and their market valuation and that required by stakeholders.	**Phase 1**: Defining the key issues investment managers and their advisers require to incorporate energy issues in office property evaluation.
Objective 2: Develop a model to demonstrate the valuation of low energy buildings.	**Phase 2**: Researching and evaluating the market value of energy efficiency, and longer term investment issues due to legislative push towards a low carbon economy and to mitigate climate change effects.
Objective 3: Share this model with others involved with improving the take-up of sustainable property by investors and occupiers.	**Phase 3**: Developing a package of dissemination materials and a dissemination plan. This includes collaborative working with other agencies to incorporate our findings into their work.
Objective 4: Disseminate a compelling business case for the positive valuation of low energy property to chartered surveyors, property investment analysts and asset managers.	**Phase 4**: Delivering the results and outputs from the project through a series of seminars organised by RICS with Kingston University together with other dissemination.

The current status of the project and how the work phases relate to one another are illustrated in the diagram below. The box on Phase 2 further illustrates which sections in this report cover the different Key Issues.

Phase 1 – Defining Key Issues (complete)

Key Issues identified:

- Improved rental income:
  - Tenant characteristics and drivers on rental income / turnover
  - Rental data
- Technical energy issues
  - Energy certification and labelling
- Risk premium for future valuation

The first phase of this project researched the issues to be addressed in understanding what drives valuation of commercial property and what is needed to be known before a business case for including low energy issues in valuation can be made. The Key Issues were identified through interviews and discussions with key stakeholders.

Phase 2 – Researching and evaluating Key Issues in order to make the business case (completed with this report)

Potentially improved rental income:

- tenant characteristics and drivers on rental income / turnover (**Section 2,** "Tenant Demand")
- rental data (**Section 1**, "Technical Issues and Rental Data")

Technical energy issues:

- Energy certification and labelling (**Section 1**, "Technical Issues and Rental Data", and **Appendix 1**, "The EPBD")

Risk premium for future valuation:

- **Section 3** ("Scenarios for Office Investment Decisions")

The aim of this – the second phase – is to construct the argument for valuation professionals to incorporate energy indicators into their market valuation of properties, by addressing each of the key issues listed above. If we are successful in constructing the argument, this report will provide the main output from the project, forming the basis for reports and articles, plus the presentations to the RICS members in their "Lifelong Learning" seminars in the new year (Phases 3 and 4).

Phase 3 – Developing a package of dissemination materials and a dissemination plan

This includes collaborative working with other agencies to incorporate our findings into their work.

Phase 4 – Delivering the results and outputs from the project through a series of seminars

"Lifelong Learning" seminars organised by RICS with Kingston University together with other dissemination.

Why is energy use important in a valuation? Section 1 – *Technical Issues and Rental Data* – addresses the question via the Key Issue of "Improved rental income – rental data". It also tackles the Key Issue of "Energy certification and labelling" in order to construct an easily understandable concept of what a 'low energy' office is. We propose that 'low energy' offices are a better investment because they have the potential to provide greater overall rental income and a higher future value than other offices.

Section 2 on *Tenant Demand* suggests rental income is further enhanced through our hypothesis that occupiers will demand low energy offices for various reasons. In addressing the Key Issue of "Improved rental income – tenant characteristics and drivers on rental income / turnover", Section 2 posits that this demand translates into rental premiums, reduced void periods and 'better' (i.e. lower risk) tenants.

Finally, we propose that the risks to future value and principally the risk of obsolescence – i.e. the Key Issue of "Risk premium for future valuation" – can be estimated using established scenarios that include the issues of security of energy supply, of government and societal responses to climate change and carbon dioxide emissions, together with wider socio-economic conditions. Section 3 – *Scenarios for Office Investment Decisions* – reports on the analysis of the implications of a set of Royal Institute of International Affairs scenarios on the future market for offices, in particular for low energy offices.

Overall, Phase 2 can be viewed as *constructing* the argument for taking low energy issues, i.e. the Key Issues, into account in property investment and valuation. Consequently, Phases 3 and 4 must be regarded as *making* the argument or *making* the business case to the target audience in order to create the desired market 'pull' for low energy offices.

It is expected that valuation practice will eventually take account of the Key Issues once they become supported by statistics linking energy data with rental income and price data. However taking into account current average lease times and the requirement of the EPBD only to energy-certify existing buildings upon a change of lease, this is not likely to happen for a considerable time. Investors and developers would be working in a distorted market if actual demand for low energy offices were not recognised through the valuation process before then.

During the development of this project, the implementation of the Energy Performance of Buildings Directive has come to prominence, with actors in the energy and property fields discussing the details of the implementation through fora including the Directive Implementation Advisory Group (DIAG). The researchers have used the opportunity to canvass opinion on the effects of this Directive and to use its implementation as a benchmark for improvement.

As a result, we have found that our project has become closely linked with the Directive's progress, although we believe that the business case could be made regardless. In effect, the business case to be made in Phases 3 and 4 will use the progress of the Directive to further strengthen the argument and advocate early adoption of the Directive's requirements.

The timing of this Phase 2 report is deliberately chosen to enable the findings to date to be in the public domain whilst the consultation period for the EPBD implementation plans is open. Much work is still needed to achieve the overall project aims, and comments and criticism from informed stakeholders is welcome.

1 – TECHNICAL ISSUES AND RENTAL DATA

The initial premise for this section is that we anticipated finding little or no difference between the rental value growth, market valuation and void periods of identified low energy offices and similar standard offices. This outcome would indicate that energy efficiency is not a significant determining factor under current property valuation methodologies. If this were not the case and the results of the comparison showed that valuers attached *more* value to low energy offices, then we would essentially have no case here to prove. If we found the opposite, i.e. that valuers actively discriminate against low energy buildings and attach *lower* value to them than they do to standard buildings, then we would have found evidence of a problem associated with energy efficient buildings that is even worse than anticipated.

Another potential outcome is that we are not able to arrive at any conclusions owing to a lack of data availability. Due to issues such as data confidentiality from various sources, as well as the disparate and dispersed nature of data sources, this has been a real possibility of this phase of the research.

1.1 – Section aims and objectives

In this section we aim to establish:

- How it can be determined if an office is of 'high' or 'low' energy use relative to comps;
- Whether low energy office buildings command the same, higher, or lower rental values than geographically and structurally comparable standard offices.

In pursuit of these aims, our Section Objectives are:

- Section Objective 1: To identify examples of low energy offices and obtain energy use and structural data;
- Section Objective 2: To obtain rental value growth, market valuation and void period data;
- Section Objective 3: To analyse data samples and draw conclusions.

1.2 – Proposed methodology for analysing low energy and standard office buildings

Figure 1 presents a schematic diagram which illustrates the sequence of steps proposed to fulfil our Section Objectives.

The first step towards investigating the premise that low energy office buildings are not currently valued higher than 'standard' comps was to identify a number of potential 'low energy' office buildings. These were then confirmed quantitatively as low energy offices according to a formalised methodology. This section deals specifically with this process.

At the present time there is no widely-used method for assessing, classifying or certifying 'low energy' office buildings. This situation will be substantially addressed with the introduction of the EU's Energy Performance of Buildings Directive (EPBD), which is due to come into force by the 4th January 2006 (see Appendix 1). One of the principal objectives of the Asset Value project is that our findings will encourage valuers and property portfolio managers to pre-empt the imposition of this legislation and recognise in advance the potential benefits of low energy offices.

A number of methodologies have been developed to classify offices in general, and these are a good starting point for the identification of generic low energy offices. Prominent UK examples include:

- **ECON 19…** (Energy Consumption Guide 19 "Energy use in offices", produced under the auspices of what was then the DETR) produced by the Best Practice Programme in 2000. This presents a 4-type generic office classification system and provides figures for determining 'typical' levels of energy use (in kW / m^2 of treated floor area (TFA) per year) and 'best practice' levels of energy use. Classifications vary by size, internal structure (open plan / cellular), and the presence of air conditioning or natural ventilation.

- **Office OSCAR…** Produced yearly by Jones Lang LaSalle. The database for Office OSCAR 2003 contains 267 properties, separated between air conditioned and non air conditioned buildings. These are then further divided by size and by location across six areas: City of London, West End of London, Greater London, South, North and Scotland.

- **Investment Property Databank (IPD)…** The definitive source of property valuation information in the UK. The IPD offers a range of rental and valuation information, and distinguishes between 'standard offices' in Central London, Rest of London, South East and Rest of UK, and 'office parks'.

As is apparent from the description of the three prominent office classification systems above, only the ECON 19 methodology proffers 'best practice' energy consumption figures which might be used to identify low energy buildings. The IPD databank was a crucial source of valuation information for this phase of the project in particular, and was relied upon to provide comparative valuation figures for low energy and standard offices in pursuance of Section Objective 2.

The first step towards identifying low energy building examples was to search through a number of Best Practice Programme Leaflets, which present case studies of specific low energy buildings. Other sources also exploited include contacts from ACE's Governing Council, and a review of the CSR (corporate social responsibility), environmental or annual reports of FTSE 100 companies (in coordination with section 2.1). In total this search yielded 26 potential 'low energy' buildings:

1 Bridewell Street	(Ernst and Young)
100 Park Village East	(Policy Studies Institute)
Beaufort Court	(Renewable Energy Systems)
Bedfont Lakes	(IBM UK)
Body Shop Headquarters	(The Body Shop plc)
BRE Low Energy Office (LEO)	(Buildings Research Establishment)
BT Brentwood	(British Telecomm plc)
Carlton Park	(Alliance and Leicester)
DTI Headquarters	(Department of Trade and Industry)
Edinburgh Gate Building	(Pearson Education)
Elizabeth Fry Building	(University of East Anglia)
The Helicon Building	(Oracle)
Heslington Hall	(University of York)
The Jeffreys Building	(Azuro UK Ltd)
Number One Leeds City Office Park	(O_2, Energis, KPMG)
NFU Mutual and Avon Group Head Office	(NFU Mutual and Avon Group)
Norwich Union Moorside	(Norwich Union)
Posford House	(Posford Haskoning)
Quadrant House	(Reed Business Information)
Refuge House	(Refuge Unit Trust Managers)
Regis House	(Sun Microsystems)
Solid State Logic Ltd	(Solid State Logic Ltd.)
Stockley Park	(Stockley Park Consortium Ltd.)
Walton Hall	(The Open University)

Watling House (Bryan Cave, CREST Co, Mellon Bank)
Zenith House (Zenith Insurance Management Ltd.)

At this point, these buildings were regarded only as *potential* low energy offices; it had not yet been verified quantitatively that they could indeed be classified as 'low energy', though an element of self-selection was exploited (i.e. inclusion as case studies in Best Practice Programme leaflets, or claims by company CSR reports or contacts). If specific properties subsequently appeared on the IPD databank, then efforts were made to confirm that they were 'low energy' buildings with a higher degree of certainty and on a more formalised and quantitative basis. The procedure for this was to obtain figures for office energy consumption from the property occupiers or owners themselves (by telephone or email), with the intention of comparing these consumption figures (Energy Use Index, or EUI, in $kW/m^2/year$), with a table of generic office 'standard' and 'best practice' EUI figures (combined electricity and gas) presented in the ECON 19 Guide once case study buildings had been allocated a 'type':

Table 1: Annual delivered energy consumption (EUI) of 'good practice' and 'typical' offices[1]

Office Type	**Type 1** Naturally Ventilated Cellular		**Type 2** Naturally Ventilated Open-Plan		**Type 3** Air-Conditioned Standard		**Type 4** Air-Conditioned Prestige	
	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical
EUI ($kWh/m^2/year$)	112	205	133	236	225	404	348	568

Questions have been raised over the continuing validity of the ECON 19 benchmark comps and respective EUI figures; some commentators have suggested that the four generic office types in the ECON 19 methodology no longer accurately represent the current office building stock in the UK. However, the EU's SAVE funded UK-led EUROPROSPER project (charged with improving the energy performance of existing buildings, specifically in the office sector, across the EU by the process of energy audit, benchmarking and certification) has chosen to integrate the ECON 19 office classification system (amongst other methodologies, including BREEAM) into their proposed office building energy efficiency assessment method. This lends the ECON 19 methodology a continuing credibility sufficient for the purposes of this phase of the Asset Value project. It is also judged to be a sufficiently simple methodology which lends itself well to the context of this project where data availability is a potential problem.

[1] Adapted from Energy Consumption Guide 19 (2000) *Energy Use in Offices*, Best Practice Programme, DETR, p. 20

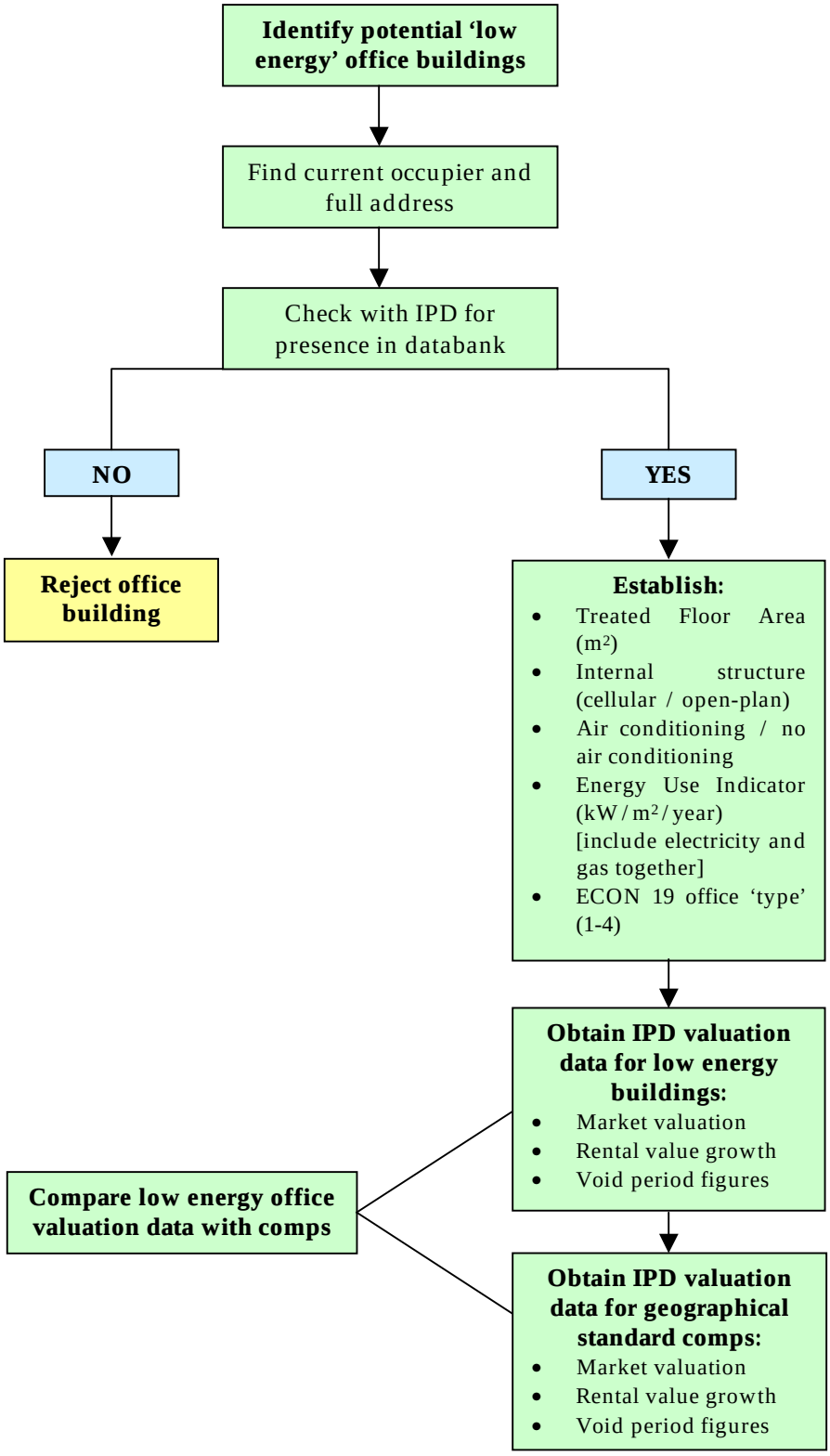

Figure 1: Proposed schematic for the comparison of valuation data for low energy buildings and standard comps

Further information was sought from the 'low energy' office property occupiers, which together was intended to enable specific properties to be assigned to an ECON 19 office 'type' (see Table 1). This included:

- Treated Floor Area (TFA, in m²)
- Internal structure (predominantly open-plan / predominantly cellular)
- Air conditioning (yes / no)

It is acknowledged that these indicators are too broad to construct a highly accurate picture of an office property; for example, the use of the term 'predominantly' when describing internal structure or the lack of options related to air conditioning systems such as mechanical ventilation or chilled beams will all have a varying impact upon office EUIs. However, for the purposes of this project, it was more practical to choose the simple approach even if it did not yield total accuracy.

This outcome fulfils Section Objective 1. The remainder of this section focuses on Section Objectives 2 and 3.

The next step in the proposed methodology was to obtain key valuation data from IPD. For the purposes of comparing identified 'low energy' buildings with 'standard buildings', the IPD would be asked to provide identical valuation data for other buildings located in the same geographical areas as the low energy properties in an attempt to minimise the influence of location on valuation figures.

The key data obtained from IPD from the point of view of Section Objective 2 were[2]:

- Property market valuation figures
- Rental value growth figures
- Void period figures

The two datasets, low energy offices and standard offices, could then be compared on the basis of the above information, and conclusions drawn as to whether low energy offices are currently valued by the property profession any differently from comparable standard offices or not, addressing Section Objective 3.

1.3 – Section outcomes

Finding potential low energy buildings, the first step of the methodology, was not a problem. However, the next step of the process entailed checking whether or not IPD had information on the identified properties, and it became apparent that there would be significant problems in continuing along this path. Of the 26 potential low energy properties identified, IPD had collated data on only 7 of them. Furthermore, because of confidentiality agreements with the owners of properties listed in their databank, they were only able to release valuation information which was composed of average figures for groups of four properties selected from a specified geographical area. With Stockley Park counting as four properties alone by merit of the number of businesses located at this business park, the total yield of information would have been just two sets of averaged valuation figures. This was not considered to be a sufficient base for rigorous analysis, and the process of comparing low energy office valuation data with standard office valuation data was regrettably abandoned at this point.

The issue of contacting office property owners with regards to providing the information necessary for office classification also proved a difficult task, especially concerning EUI data.

Unfortunately, the proposed methodology for testing the principle assertion of this section, i.e. that valuers do not currently account for the benefits arising from low energy offices, was ultimately unsuccessful.

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[2] Property market valuation figures as defined by RICS e.g. in *Calculation of Worth, An Information Paper*, Royal Institution of Chartered Surveyors, 1997 ; rental income growth as %age growth per annum in rents yielded from a specific office property; void periods pertain to periods between tenancies when a property lies empty

1.4 – Summary and conclusions

The section outcomes were undeniably disappointing, The key spoiler, the lack of rental value information in the IPD databank for identified potential low energy offices, was always a risk, but nevertheless it was important to try to develop the methodology to fruition. In addition, attempts to obtain EUI information from property owners proved difficult and time intensive.

This section also addressed the issue of defining what is meant by the term 'low energy office', as well as presenting a prospective method of determining quantitatively whether an office building falls into this classification (see section 1.2). The method depends upon actual energy consumption figures for a specific building as well as the ECON 19 best practice EUI figures. It is acknowledged that this method has its shortcomings, but it was judged to be sufficiently simple and practical for the purposes of this project. However this approach will effectively be succeeded by the introduction of the EPBD, which will generate a significant amount of intrinsic and operational energy use ratings, as well as providing a more robust method of determining exactly what is meant by a 'low energy office'[3].

Despite the unsuccessful outcome of the methodology outlined in this section, there are important and pertinent observations that can be made. It is clear that there is, in the UK, a lack of aggregated energy consumption data for office properties, and this was the central cause for the failure of the methodology in this section. Whilst individual office owners frequently measure and manage their own energy use, the lack of national-scale compiled data hinders any national effort to manage energy use in this sector.

This situation could conceivably change after the implementation of the EPBD. Office owners must ensure that their properties are assessed and certified in compliance with Article 7 of the Directive. This will generate large amounts of standardised but dispersed energy use data which could then be used to inform the policy-making process. It would, however, require the creation of some kind of centralised 'registry' whose task would be to compile certification information. Various potential organisations already exist – possibly the ODPM, the Office of National Statistics (ONS) or indeed the IPD.

[3] If, as proposed by the ODPM, buildings are to be rated on a scale from A to G, then it is conceivable in our view that a 'low energy office' is rated A or B, assuming that the current 'standard office' would be given an E rating.

2 – TENANT DEMAND

As we explain in the introduction, one of the key issues that will increase demand for low energy offices for investors is increased rental income. There are two aspects to this; higher rents and lower void rates (i.e. fewer or shorter non-earning periods). In the absence of real data on existing offices, we need to examine the hypothesis that tenants will increasingly demand low energy offices, with the consequence that where there is a shortage in such properties, given equivalency in location attributes, low energy offices will let quicker, and with the possibility of increased rental premiums (although most stakeholders specifically do not want low energy offices at a higher price!).

First we look at what drives tenant demand, and then at the issue of low energy offices. We take the opportunity of the introduction of certification under the EPBD to explore the demand for such offices with a small survey of stakeholders. Finally in this section we consider what effect tenant demand might have on improving the supply of low energy offices.

2.1 – Existing evidence

There were three strands to our investigation of existing evidence of tenant demand for low energy offices. First, the classification of drivers of tenant demand; second, the investigation of the hypothesis that low energy offices are more likely to attract what might be considered as 'desirable' tenants, and finally the production of a snapshot of corporate interest in low energy offices. The second of these lines of research was abandoned due to the anecdotal nature and lack of evidence found to support the 'desirable tenants' hypothesis. Nevertheless, there follows a report on all three areas of research into tenant demand for low energy offices.

Drivers of tenant demand

The overall level of tenant demand (*how much* tenants want) for office space is usually driven by the general economic trend. Subject to this constraint the overall level of demand is further affected by the relative economic importance of the commercial sector as well as the significance of the office as the location of work.

Table 2: Most important office procurement criteria (Gibson, 2000)

Rank	Criterion	Explanation
1.	Location	Physical location of the office building
2.	Direct property costs	Rents and rates, constituting approximately half of total occupancy costs
3.	Flexible contracts / ability to vacate or exit	Time horizons for business activity are usually between one and three years – consequently, tenants tend to prefer (the option of) shorter leases – and are willing to pay more – to ensure they are not at odds with business planning.
4.	***Other occupational costs***	This includes all forms of running costs, including the cost of energy
5.	Length of commitment	Generally the shorter, the better; though large lettings always tend to command longer lease lengths
6.	Expansion / contraction capabilities	An increasingly important demand closely related to lease flexibility
7.	Efficiency of layout	Minimisation of the opportunity cost
8.	Speed of occupation	Need for speed – businesses are faced with increasingly short periods of time available to move into new office space
9.	***Opportunity to promote branding and identity***	So-called 'prestige' offices are the obvious example; a low energy office can also conceivably grant this opportunity
10.	***Inclusive package of real estate, fit out and services***	Building energy management services may well be part of a desirable inclusive package

The type of office demanded (*what* tenants want), subject to constraints on knowledge and information availability, is driven by the type of business and business priorities. Table 2 above lists businesses' ten most important criteria for selecting office space according to empirical research by Virginia Gibson of Reading University's Centre for Real Estate Research[4]. The research was conducted in 2000, so the ranking and the criteria may have changed, but it should nonetheless provide an indication of what tenants want and consider important. Of particular relevance to tenant demand for low energy offices are criteria 4, 9 and 10. Low energy offices affect these criteria and the how important these criteria are to business can in turn affect the demand for low energy offices.

Section 3 - which analyses scenarios for future (low energy) office demand – returns to the subject in assessing the implications of the scenarios for the relative importance of the office procurement criteria in Table 2.

Desirable tenants

Evidence to support this hypothesis was purely anecdotal, but it is a potential argument in favour of investment in low energy offices and remains worthy of further research. The idea is that a low energy or sustainable building could attract 'enlightened' or 'good' tenants – such as companies that are strongly committed to CSR – who in turn attract more good tenants. This could conceivably lead to asset value appreciation somewhere down the line and investigation of this link may be of interest at a later point in the development of the market for low energy offices. On a slightly different note, one commentator was considering a risk appraisal method for the purpose of screening out 'bad' tenants; the notion behind this was to create a positive tenant culture and a more innate willingness for tenants to know and enquire about their energy consumption.

Corporate interest in low energy offices

An assessment of corporate interest in low energy offices was carried out based on the contents of CSR or environmental reports of FTSE100 companies[5] where such reports were available. In order to gauge corporate interest, the relevant reports were checked for mentions of building energy use as well as the presence of any example low energy offices[6].

Of the 100 corporate websites investigated, 87 companies had CSR or environmental reports, either in pdf or web-page format. The majority of them (71) reported on the year 2003, although a handful covered more than one year. Forty-two companies mention building energy use[7] in one way or another. Thirty-two of these measure their own building energy consumption, 13 are working towards improvement with accredited energy efficiency best practice status or have implemented recognised low building energy standards, nine state that they have staff building energy awareness training and three are explicitly concerned about the building energy consumption of their stakeholders.

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[4] The survey and the contents of Table 2 overwhelmingly represent the views of large organisations with significant office portfolios in sectors which are office space intensive; this would suggest that most respondents *fully* occupy at least some of their buildings. The views of smaller companies that *part*-occupy office buildings are likely to be different, but not accounted for here.

[5] www.londonstockexchange.com, June 2004

[6] Appendix 2 presents the results in this sub-section in tabular form.

[7] Industrial buildings have not been included in this assessment. "Buildings" here are taken to mean offices, retail warehouses and outlets, hotels, restaurants and other leisure facilities. The assumption is that a company concerned about (say) hotel energy use are likely to be concerned about office energy use too.

In addition the assessment of corporate interest has yielded 13 companies citing at least one low energy building[8] in their UK portfolios.

There appears to be considerable corporate interest in low energy offices amongst large firms. A high proportion of FTSE100 companies are concerned about building energy consumption; the important unanswered question that remains is the relative importance this concern takes on when procuring office space.

2.2 – Empirical evidence

In this sub-section, we incorporate the results of a survey carried out by Zoe Kaplan, an MSc student at Imperial College London working for ACE, that forms part of her thesis (Kaplan 2004). The survey of 19 stakeholders, most of which were from FTSE100 companies, plus a small sample of investment funds, addresses their awareness of and reactions to the provisions of the Energy Performance of Buildings Directive (EPBD) and its current proposals for translation into English law.

The aim is to assess views of stakeholders on certification and labelling under the EPBD, focusing on end-users of commercial offices and retail premises. The survey sample may have had a degree of self-selection bias, i.e. a number of contacts were made and the individuals were invited to take part. The targets were those involved in making decisions relating to property procurement and energy services, so mainly property managers, energy or environment managers, or facilities managers[9]. There was a strong bias towards financial services (eight respondents) and retail (four), banks and retailers responding as both retail space and office users. The views of investors and suppliers were provided by two of the largest property fund managers, two leading SRI companies and two major quoted property companies.

The questions asked fell into three categories:

- **Awareness**
  - What is the current level of awareness of the EPBD?

- **Certification and labelling**
  - Will certification and labelling lead to an increase in the demand for energy efficient buildings?
  - Will certification and labelling lead to reductions in energy consumption in existing buildings?

- **Drivers**
  - Where improvements in energy efficiency are predicted, which factors are driving change?

Additional areas were explored in the interviews but are not directly relevant to this report.

Awareness

Asked **"**What is the awareness amongst stakeholders in your company of the EPBD?", end-users were reported to have a general rather than detailed awareness of the EPBD; the responses are shown in Figure 2. Most of these were broadly aware of the demands of the Directive, although not clear on what it means in practice.

[8] Where possible, these were added to the list of example buildings in section 1.

[9] Respondents were asked to second-guess the views of their board – however, this does not necessarily reflect the opinions of the board.

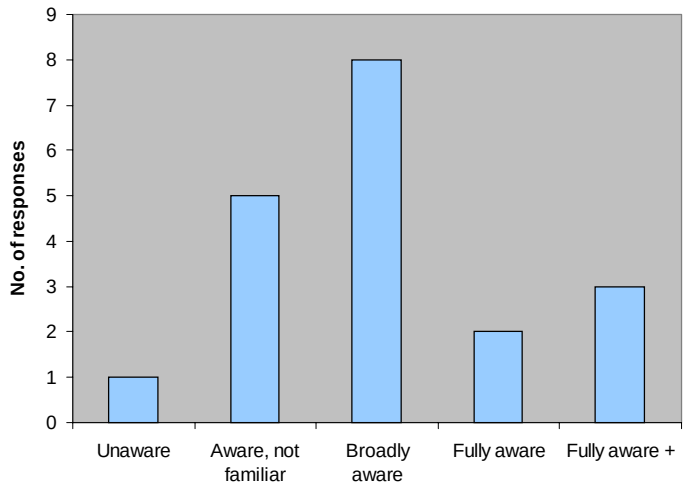

Figure 2: Awareness of Energy Performance of Buildings Directive

Certification

Q1 asked "When certificates are available will you acquire more energy efficient buildings?", most companies and investors predicted a marginal or greater effect. "Marginal" was the mid-point of the available responses to this question.

- End-Users
    - 32% of office end-users responded marginal and 47% likely or higher
    - 40% of retail end-users responded marginal and 40% likely or higher
- Investors
    - Most surveyed predicted a marginal and one a greater tendency to acquire energy efficient buildings
- A stamp duty concession of 0.5%
    - Would further drive uptake of energy efficient buildings
    - 42% end-users predict a marginal and 37% a greater effect
    - All property investors predict a marginal or greater effect

Comments made by participants include:

- Other business needs would prevail, for example location, fitness for purpose
- More likely to see a positive effect for offices than retail, as there is more flexibility on location
- Setting criteria for new buildings is simpler than for existing buildings
- Level of ratings could be used as a negotiating tool by lessees when agreeing rentals
- Non-supermarket retailer: the fit-out of retail outlets provides the opportunity to improve the energy rating, irrespective of the initial asset rating
- Supermarket retailer: high energy efficient offices are driven by planning requirements
- Offices: would expect some users to raise their requirements, whereas for the retail sector would expect it to have a marginal effect (views of two of four investors consulted)

Note: These are comments made by individuals and small numbers of participants and should not be construed as representing the majority view.

Q2 Asked "If certificates were available would you reduce energy consumption in **existing** buildings?" 72% of end-users of offices and 90% of retail users said there would be a marginal effect or greater, as shown in Figure 3.

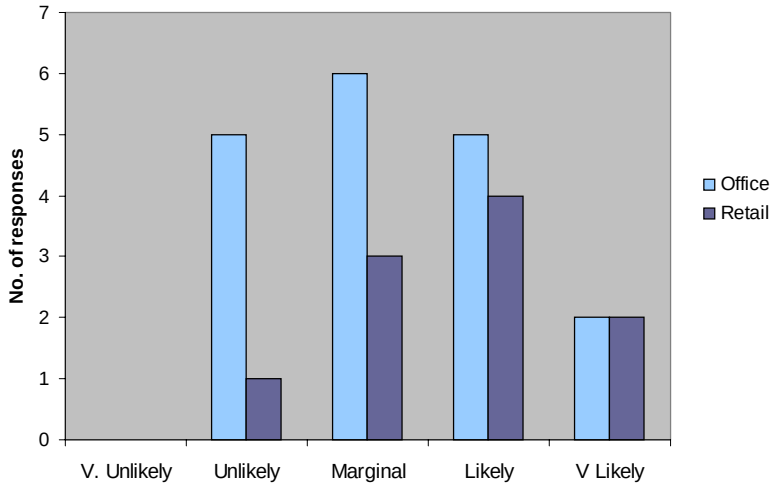

Figure 3: Likelihood of reducing energy consumption in existing buildings

Building/lease turnover is low (5-10%) due to lease lengths, so certification will take time as it is only required by the Directive in the case of major refurbishment and / or change of building occupier[10].

Comments made by participants include:

- More major measures would be incorporated into planned refurbishment programmes, not triggered by energy efficiency alone. (Applies to retailers in particular, as stores have to be closed.)
- Depends on lease expiry date
- "As a retailer we move around a lot. We would be concerned about the impact of a poor rating on the ability to sub-let void space and thus on its disposal value"
- Already addressing the issue; ratings won't add anything as we already know which are our poor performing branches
- Ratings would act as a lever for change

Q3 Asked "If your board was made aware of a poor rating (F or G), how would they react?" the level of concern was generally modest or low as shown in Figure 4.

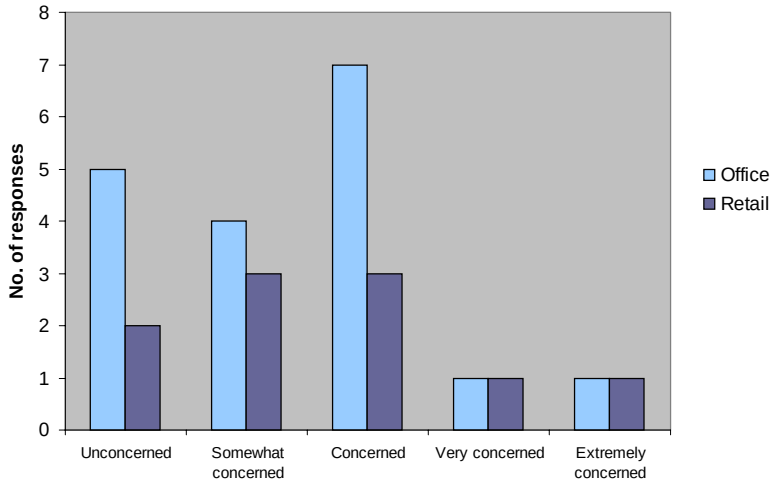

Figure 4: Reaction of Board to low energy ratings

A number of participants felt that there would be significantly more concern about poor ratings of prestige buildings, for example head office buildings or flagship stores, than standard buildings.

[10] See Appendix 1 for detail on the EPBD.

The view generally was that the main focus would be on the average rating of their portfolio, as compared to their peers. The fact that a few properties were rated poorly would not necessarily be a cause for concern; there is already a general awareness of the poor performers.

Public display of certificates (energy labelling)

At present it has not yet been decided what the requirements will be concerning the display of certificates in a public place. Energy labels have been designed as part of the implementation process. In this survey it was suggested that energy labelling might be introduced and the reactions of the stakeholders sought on that basis.

In general, the perception amongst the end-users surveyed is that energy labelling will stimulate competition between them due to reputation with institutional and other stakeholders, rather than the general public. Although it is targeted at all stakeholders, some are more important in terms of the influence sought/provided. In offices, the concern is about all visitors but in particular institutional and corporate visitors, whereas in retail, labelling is seen as a useful tool in raising awareness in branches and stores. The assertion is that the general public do not read labels, so this is not a driver. However labelling leads to information being in the public domain and therefore available to other interested groups, including NGOs. End-users show concern about ratings being available, e.g. on websites, and the risk of comparison with their peers. This last observation is an issue for particular groups who have the intention of competing with their peers on average ratings for their portfolio of buildings. The level of interest was most marked in the financial services sector; a number of retailers also showed an inclination to watch their peers on ratings, particularly on larger stores.

Q1 Asked "How would a requirement to *display* an energy certificate impact your choice of property?" an increased number of office users (84%) predicted some effect, when compared with certification alone (79%), as shown in Figure 5. For retail there was little change over certification alone.

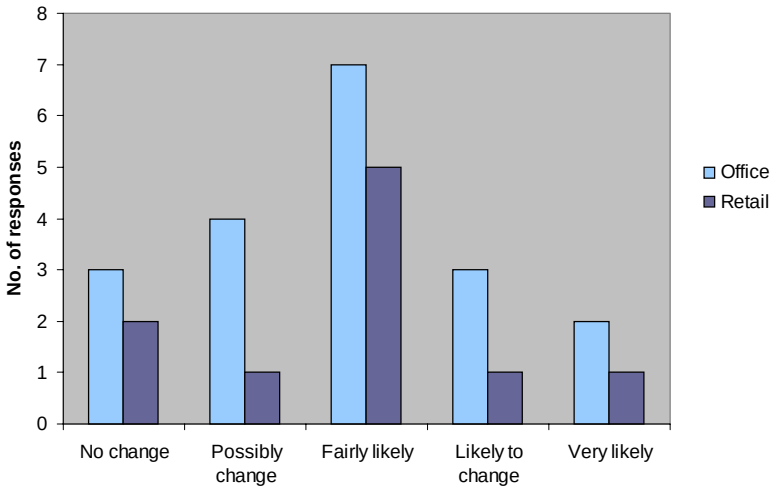

Figure 5: Response to the influence of labelling on choice of property

Comments in response to this question endorsed the issue of selectivity in the reasoning behind these responses:

- "If there were to be an effect it would driven by our concern about CSR image with institutional investors; our customers are not interested"
- "For a high profile building yes, but not for low cost premises"

Q2 Asked "Why does public display affect building choice?" responses show that reputation is the principal driver, as indicated by the relative weight attributed to the following factors:

- **Improved awareness:** Poor energy performance becomes visible, leading to action by management
- **Reputation:** Concern about reputation with customers and other third parties
- **CSR reporting:** Desire to report ratings positively as an indicator of good CSR

In this leading group, awareness of performance was already considered to be good (but could be assisted by ratings); reputation was the main driver. All but one of the participants who predicted that there would be an influence, attributed reputation as a driver. Over 80% predicted that they would also wish to report ratings positively as an indicator of good CSR.

Q3 Asked "Would public display lead to improved energy efficiency in *existing* buildings?" 90% of both office and retail users predicted they would possibly change energy management practices or be more likely to do so. Seventy-four percent of office users and 80% of retail users predicted it would be fairly likely or greater. The results are shown in Figure 6.

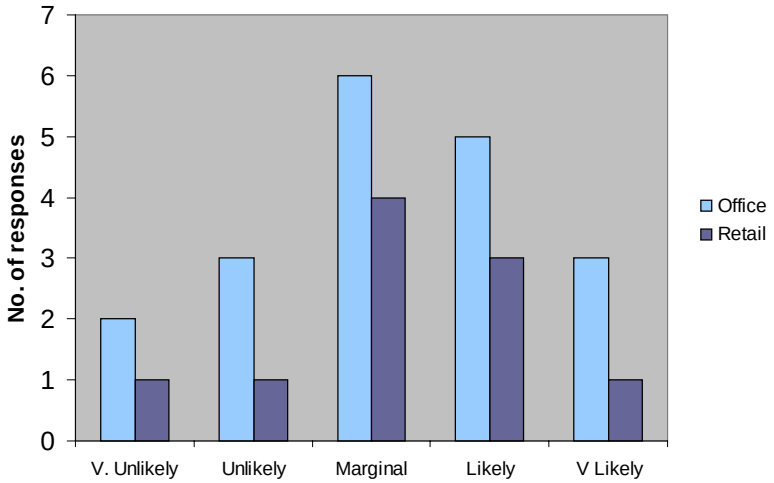

Figure 6: Would public energy labelling lead to change in existing buildings?

The results suggest that the impact of public display is greater for existing buildings than it is on choice of buildings when acquiring buildings. For both categories there appears to be an incremental impact over certification alone, in particular for offices where the level at which some effect is predicted rises from 72% to 90%.

Q4 Asked "Would you be an early adopter of the public display of certificates?", the majority of office users (72%) predicted a marginal likelihood or greater, but with an interesting difference between offices and retail, which at 60% was markedly lower as shown in Figure 7. This was possibly due to their concern about the cost of implementation, reflecting the large numbers of branches or retail outlets.

The drivers for early adoption were the desire to be seen to be ahead of the game in their sector and also to be able to test the system before going live, to avoid any surprises at that time. The investor group were particularly positive in their responses.

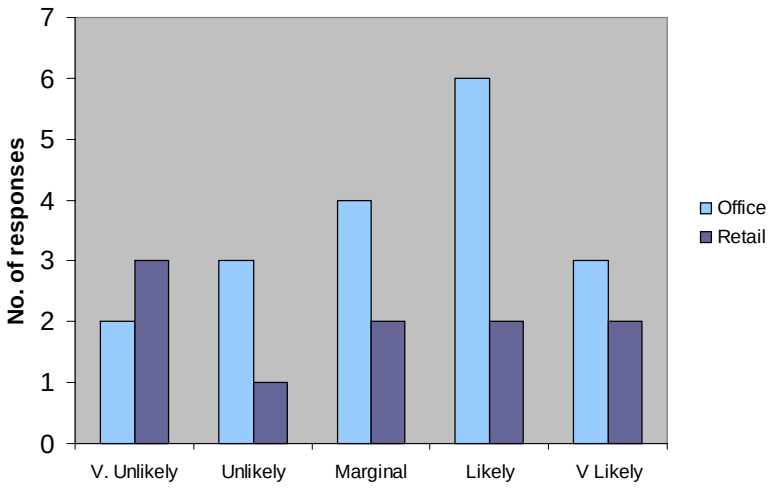

Figure 7: Likely to be an early adopter of energy labelling

Reporting

As we have seen in the previous sub-section, CSR and environmental reports are one of the few publicly available sources dealing with corporate energy use at present. Asked "Would energy ratings be incorporated into your environmental management system?" 17 end-users and five investors confirmed they would. It is seen as a useful tool for highlighting the issue internally as well as external benchmarking, although there were some qualifying comments about the need for the rating system to be seen as robust and for its active promotion to ensure there is strong awareness of the scheme. However, as certificates are initially only likely to be provided for newly constructed, acquired or rented buildings, this limits their usefulness in reporting. It will take time for existing buildings to be rated, unless public certification is required, which would then filter through the reported figures. One of the SRI analysts indicated they would use it in assessment, as it will impact brand image if publicly available. It was also thought to be a useful tool that will be successful if it is widely acknowledged and accepted with perceived minimum standards (as for white goods).

Summary of results

For a leading group of office users:

- **Awareness** – majority say broadly aware or lower
- **Demand** - users predict certification will influence choice when acquiring offices (32% marginal, 47% greater)
- **Existing offices** - if certification is available, users predict reduction in consumption (33% marginal, 39% greater)
- **Financial incentive** - could drive increased demand
- **Labelling** – some further impact on demand, particularly in relation to existing buildings
- **Drivers** – reputation with institutional investors; competition between peers; raised internal awareness; financial incentives

For this leading group of end-users there is evidence that certification and labelling have the potential to influence decision making, the main driver being reputation. The extent to which this leading group can pull the wider market has not been investigated. The timing of the implementation of certification and labelling under the EPBD will impact the rate of change in the market; given the low rate of turnover of building stock the effects of inaction could be long-lived.

2.3 – The effect of certification and tenant demand on office CO_2 emissions

One of the results of this research into the views of tenants on certification under the Energy Performance of Buildings Directive (EPBD), combined with the interest in energy saving through CSR reporting, is to provide some estimate of how much energy saving might be applied as a result of the EPBD's implementation.

As an illustration, a model has been designed that considers the effect of a percentage of lease renewals improving the energy efficiency of the property, to produce a cumulative carbon emissions reduction chart. The model starts by taking the total number of offices at 2000 and the average carbon emissions from those offices (both figures taken from references in previous ACE reports; see Wade, Pett & Ramsay 2003). It then assumes that the total number of buildings is divided into those on a 25 year lease, a 15 year lease and a 10 year lease, and that there is a flat distribution of lease renewals, i.e. for 25 year leases, 1 in 25 are renewed in year 1, the same in year 2, right up to year 25. This allows for assumptions to be made on the number of lease renewals per year, which in turn gives an implication for the number of energy certificates that will be issued each year. From our work, we are assuming that a percentage of these lease renewals will lead to energy improvement work to be carried out before the new lease is granted[11]. We have assumed that without additional incentive, the energy improvements will be to the level that is currently cost-effective, i.e. approximately 20% carbon emission reduction.

There are some issues we have introduced to refine the model.

- First, we have assumed that because the trend is towards shorter lease terms, a percentage of lease renewals will be a shorter term than previously. Both the current distribution of 25, 15 and 10 year leases, and the percentage of each changing to shorter terms can be varied.
- Second, a percentage of energy refurbishments could be to best practice, leading to a 40% reduction in carbon emissions.
- Third, we have assumed that the standards of the EPBD a reviewed in ten years and the review promotes a move to this higher level of emission reduction
- Finally, we have assumed that this project promotes a gradual take up of energy refurbishments at the higher level at an earlier stage than would otherwise be achieved under the EPBD alone, due to the awareness of investors that low energy offices are a better long-term investment.

As a result of this modelling, we produce the graphs shown in Figure 8. The lowest line shows the cumulative carbon saving made by a basic implementation of the EPBD. There is no incentive for taking up additional measures.

In the second line, the review 'kicks in' a higher quality refurbishment so that the effect of the Directive leads to a greater carbon reduction, but the speed at which it takes place is no faster than before.

The third, upper line, shows the effect of promoting the value of low energy offices through valuation and the market transformation that occurs. Naturally because the carbon is saved earlier, there is a greater cumulative effect over the same time.

[11] Not included in the model, break clauses are becoming a more regular feature of lease contracts and are likely to be exercised more often (see BPF & IPD, 2003). The effect of this would be to increase the rate of energy refurbishment and resultant carbon savings illustrated in Figure 8.

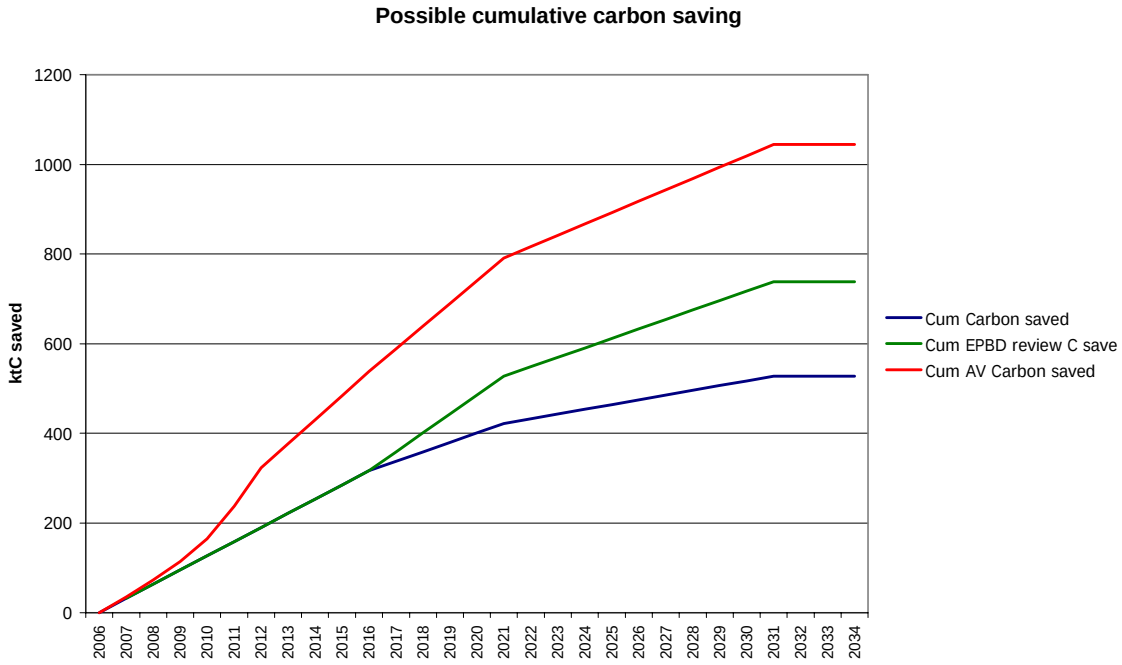

Figure 8: Three options for carbon saving for low energy offices

As an illustration, this has value, but further work is needed to refine it. For example, no allowance has been made for the larger volume of owner-occupied offices than leasehold. We can make assumptions on this, for example through data on ownership of offices as summarised in Pett & Ramsay 2003, and we can make assumptions on turnover from feedback from our steering group, e.g. average length of property holding at seven years. There has been little research undertaken by us to establish the 'correct' distribution of lease lengths, although the rate of lease shortening is believed to be accelerating[12]. There is no allowance for construction and demolition, which might be 2% of all property per annum, based on estimated office floor space increase of just under 1% per year 2000-2005 (Pout 2002) and assuming renewal at the same rate. Finally, no account has been taken of the future property market, which as we will see in the next section, could change radically in the futures described.

Consequently we believe that as an illustration of the reason for the project, i.e. to accelerate the effect of the EPBD by raising awareness amongst the investment community, the reasoning is sound but the CO_2 savings arbitrary.

2.4 – Summary and conclusions

In summary, the main findings from this section are that:

- Three of the existing top ten criteria in the procurement of new office space – "other occupational costs", "opportunity to promote branding and identity" and "inclusive package of real estate, fit out and services" – can be positively met by a low energy office.
- FTSE100 companies' CSR and environmental reports reveal a substantial awareness and some interest in commercial building (offices included) energy use.
- The empirical survey finds the majority of respondents marginally likely to respond proactively to the Directive, in particular with respect to the energy certification and labelling provisions.

[12] See BPF & IPD "*Annual Lease Review*" (2003) for data on lease length distribution and rate of lease shortening.

- The modelling exercise carried out suggests that the carbon savings from low energy offices could both be brought forward by around seven years and could be greater if tenant demand were to be stimulated only marginally before the onset of the Directive.

There are two main conclusions to be drawn from this section; first, tenants can drive and are driving demand for low energy offices in a wide range of ways and for different reasons. Second, modelling the take-up of low energy offices highlights how a market 'pull' on the demand (the overriding aim of this project) – above both the 'business as usual' level as well as above the level of demand for low energy offices that the EPBD alone might additionally incentivise – could enable projected carbon savings to be realised sooner. Altogether, this suggests that tenants would indeed be responsive to the market 'pull' created by property investment and valuation professionals taking into low energy into account.

3 – SCENARIOS FOR OFFICE INVESTMENT DECISIONS

This section of the Asset Value project has been designed to address the key issue of "risk premium". The risks considered in this project are regulatory, economic, social and environmental risks associated with office markets and valuation. The scenarios chosen have been assessed in terms of relevant risk factors that will affect offices.

The method chosen for this approach was to identify robust scenarios developed by other actors – ones that illustrate a range of futures – in order to put into context the attractiveness of (investment in / occupation of) a low energy office compared with the current standard.

This section first outlines the importance of scenarios in business planning and the choice of scenarios used in the Asset Value project before going on to assess the chosen scenarios in terms of the risk factors.

3.1 – Scenarios and their purpose in business planning

Scenarios are commonly used by organisations and governments in order to consider how to develop strategies or policies that will place them at a strategic advantage. The technique is to develop a set of descriptions of possible conditions in which the organisation will be an actor and (most usefully) to test whether current or proposed strategies will place them at an advantage or disadvantage in those possible futures. There is no suggestion that these scenarios predict the future; they merely describe or illustrate possibilities that might logically ensue from a given set of trends.

The Asset Value project does not propose to develop scenarios for the property market. Global real estate scenarios already exist, but in this project, we have chosen one of a number of sets of relevant business scenarios and added or overlain additional energy features in order to illustrate the potential benefits to investors choosing low energy offices in the UK now, rather than in the future. The test was whether low energy offices would be a better risk in the circumstances or not.

3.2 – Selection of scenarios

Following a review of a wide range of existing scenario sets, the Chatham House "Open Horizons 2020 Scenarios" were chosen. They were deemed to provide a sufficiently broad yet plausible global economic and social outlook whilst maintaining a firm eye on the UK. Furthermore, the Chatham House scenarios stem from the highly regarded Royal Institution of International Affairs and have been internationally peer-reviewed. Appendix 3 contains details of the other scenario sets considered for the project.

In the Chatham House scenarios, it is assumed that the world faces two major sequential hurdles or challenges to 2020. The first of these is the economic challenge, and the second is the challenge dealing with the resultant complex risks. The "Atlantic Storm" scenario does not manage the first hurdle – economic success – whereas "Market Quickstep" does, but unable to deal directly with complexity, leaves the management of information to the "invisible hand" of the market economy. "Wise Counsels" succeeds in strategically managing complexity and risk achieve desired outcomes.

The Chatham House scenarios do not make any specific reference to energy policy or context. In order to be able to illustrate the likely energy context, a set of five UK energy policy futures to 2020 developed by the Cabinet Office's Performance and Innovation Unit[13] for the Energy Review (PIU 2002) were reviewed by the Project Team. The objective was to identify the best fitting energy

[13] See Appendix 3 for descriptions of the Performance and Innovation Unit's energy futures.

context(s) for each Chatham House scenario. "Wise Counsels" and "Market Quickstep" were found to have two plausible variations in their energy policy context respectively. This amounted to five separate investigations of the demand for low energy offices, listed in Table 3 below.

Table 3: scenarios used

Chatham House scenario		Energy policy context
"Atlantic Storm"		*"Provincial enterprise"*
"Market Quickstep"	I	*"Business as Usual"*
	II	*"World Markets"*
"Wise Counsels"	I	*"Global Sustainability"*
	II	*"Local Stewardship"*

In discussions with the Asset Value project's steering group, it was agreed to carry forward only one variation per Chatham House scenario for the purposes of dissemination (project Phases 3 and 4); the main criterion for the three choices was plausibility in the likely view of our main target audience of property valuation professionals. The ones that are greyed out in Table 3 have nonetheless been included in this report to illustrate other conceivable outcomes for the (low energy) office market.

Each scenario was assessed in terms of six broad factors with a bearing on the demand for (low energy) offices. The approach taken was a think-tank session within the research team to consider the implications of each scenario, including their variations, on the six factors. They were:

- economy / the level of employment
- the location of employment
- energy context
- business commitment to sustainable development
- the importance of business reputation
- society's awareness and the relative importance placed upon the issues

In addition, the question of the tendency towards either existing stock refurbishment or new construction was investigated. Though strictly speaking independent of the demand for (low energy) offices, the question nevertheless can shed some light on potential future debates surrounding embodied energy.

Naturally, there was a large degree of speculation involved in assessing the above. However it must be stressed that the narrative texts of the following five sub-sections serve only to illustrate the application of each scenario to the above factors. Each illustration is followed by a table summarising the key trends for each factor, as well as the likely outcome of the refurbishment / new build question.

3.3 – Description and assessment of the scenarios

Atlantic Storm

The global economy is driven largely by the United States. The UK, building on its historical ties with the US and having a younger demographic profile than the rest of Europe, does relatively well economically. Employment is higher in the UK than elsewhere in Europe, but low compared to other scenarios: particularly as this is a situation in which productivity continues to increase but output does not keep pace. US competition is too strong for the UK's financial sector. There is a major reduction in office use and consequently office space. The property market generally is stagnant to recessive. Due to concerns about the security of energy supply, energy prices are high – so low energy offices are more attractive, but in the context of very low demand for office space generally. Energy-related legislation has not developed significantly, but energy policy is now more focused on national self-sufficiency – hence the use of subsidised coal and nuclear power.

Neither businesses nor their stakeholders are committed to sustainable development in an economic landscape dominated by short-term priorities. Businesses have no need to be concerned about their reputations in this regard.

Table 4: Atlantic Storm and six factors

	What happens…	*…and its impact on (low energy) office market*
Economy / employment level	Generally low as economy is very slow to recover from global recession	Contraction in financial and business services sector, resulting in swaths of unused office space
Employment location	No shift in emphasis on office-working…	…but less working (including in offices) generally
Energy context	Defined by security of supply, self-sufficiency concerns and high cost of production	Low energy offices are relatively attractive, but the scale of demand is insignificant
Business commitment to SD	Is very low as not considered a priority	Interest in low energy offices is only in terms of cost-savings / productivity benefits
Importance of business rep.	Reputation is based on short-term economic success	No bearing on demand for low energy offices
Societal awareness	Sustainable development is of little interest because of economic priorities	No stakeholder pressure for low energy office take-up
Refurb / new build?	Emphasis on refurbishment (if at all) due to scarce capital	

Market Quickstep I

The global economy fares quite well, markets generally determine when and where investment takes place and regulation is limited to ensuring market participants have and provide the necessary information to maximise the gains from trade; employment is generally high. Workers need to be flexible and adaptable in terms of the skills required of them and their location of employment. The importance of adaptability necessitates that the economy remains stitched together in real time by a myriad of agents, in particular from the service and business support sectors. There is no paradigm shift towards more working from home, however. Traditional office hubs and clusters remain desirable for making business, but these are likely to represent a much closer fit to the activities of their oft-changing occupiers. There are no radical changes to the current trajectory of energy policy and legislation; despite the increasing cost of carbon, there is a growing dependence on natural gas because of a lack of investment in renewables. Most businesses are concerned about their reputation in terms of corporate social responsibility. Any serious action undertaken by businesses is voluntary, however; there are no statutory requirements on business to go beyond minimum sustainability standards. The stakeholders of business are usually well-informed about sustainability issues and are able to sporadically exert effective pressure on under-performing businesses to change their behaviour; responding adequately can prove decisive to business success in an environment where competitive differentiation normally lies in the detail. There is no real consensus on the relative importance of the three pillars of sustainable development; the debate on and tension between the three is ongoing.

Table 5: Market Quickstep I and six factors

	What happens…	*…and its impact on (low energy) office market*
Economy / employment level	Generally high in this market-driven economy	Great expansion of service and business support sectors drives up demand for office space
Employment location	Small change in proportion of employed working from home…	…greatly outweighed by aforementioned increase in demand for (more efficiently used) office space

Energy context	Energy policy emphasises voluntary reductions in carbon emissions	Small incentive due to increasing cost of carbon, but does not otherwise encourage the occupation of low energy offices
Business commitment to SD	Some businesses are defined by this commitment	Genuine interest in low energy office portfolios from a few high-profile trans-nationals
Importance of business rep.	Businesses with direct links to end-user want to be 'seen to be green'	For some firms in the service sector, this may imply occupying a 'showy' low energy office
Societal awareness	Many stakeholders sufficiently informed to exert pressure on business	Pressure brought to bear too broad to result in low energy office portfolios
Refurb / new build?	Both, depending on business office requirements	

Market Quickstep II

The situation is much the same as in scenario B, the main difference being that there are little or no barriers to trade. The regulatory maintenance of market information flows is even more effective. There is a slightly greater requirement on the flexibility of workers as well as companies, and an indirect result is that there are comparatively more people working from home at any given time. Prestigious locations are not as important as access to good transport and communications infrastructure. Employment levels are slightly higher. Energy markets are fully liberalised, which minimises the cost of energy production – markets generally are characterised by changing interdependencies shaped by highly liquid capital. Low energy is not a priority concern. Statutory requirements on businesses to adhere to sustainability are minimal, but businesses do tend to make a greater effort than in scenario B in this respect because brand identity and reputation play an even more important role in competition. Low energy offices are associated primarily with prestige, and highly knowledgeable stakeholders reward businesses who are both at the cutting edge of corporate social responsibility and economic performance.

Table 6: Market Quickstep II and six factors

	What happens…	*…and its impact on (low energy) office market*
Economy / employment level	Quite high in this market-driven economy	Great expansion of service and business support sectors places pressure on supply of office space
Employment location	Substantial change in proportion of employed working from home…	…slightly outweighed by aforementioned increase in demand for office space (as still preferred)
Energy context	Defined by competition, low to no taxation, ease of switching supplier, and a low relative price of fossil fuels	Cost of energy virtually irrelevant to business; committed and image-conscious businesses purchase green energy
Business commitment to SD	Commitment to sustainability defined by need to remain competitive	Interest in low energy office portfolios from most high-profile trans-nationals
Importance of business rep.	Good reputation is the core business value; regulatory compliance is widespread	Most businesses are willing to pay a small premium for a low energy office
Societal awareness	Stakeholders are well-informed and can form vocal and effective groups around any given issue	This has a bearing on general CSR performance, but not on the take-up of low energy offices in particular
Refurb / new build?	Emphasis firmly on new build, but also comprehensive refurbishment of prestige existing stock	

Wise Counsels I

In this scenario, society has managed to create a prosperous global economy as in "Market Quickstep", but has in addition succeeded in creating effective institutions that can manage or empower the management of the complexity of a highly dynamic, interdependent and interconnected world. Though the location of employment is ultimately flexible due to the wide diffusion of high bandwidth communication services, face-to-face meetings are considered important. The boundaries between living and working space become blurred, and offices are characterised by their ability to match occupiers' highly specialised requirements. Energy policy and legislation is driven by the need to mitigate human-induced climate change and places a balanced and integrated emphasis on renewable energy and energy efficiency, with the latter becoming a key factor in smoothing the former's transition to cost-effectiveness. Minimum sustainability standards are set at a higher level than in the other scenarios, but the means by which these can be met are completely flexible. The most competitive businesses are aware of, and can and do reap the benefits of going beyond these standards. Business transparency and accountability are self-perpetuating, businesses being an integral component of their wider stakeholder networks.

Table 7: Wise Counsels I and six factors

	What happens…	*…and its impact on (low energy) office market*
Economy / employment level	Employment levels are high, characterised by lifelong learning translated into high worker adaptability	Information and knowledge sectors are the underpinning economic force, demanding work space flexible to accommodate highly differentiated and shifting business needs
Employment location	Multiple places of work, coupled with a blurring of the line between work and living space	Less overall office-working, but a blurring also of the distinction between low energy offices and low energy homes
Energy context	Sustainable production and consumption of energy is the energy policy priority; security of supply does not pose a problem due to the stability of international cooperation	Regulation demands high building energy efficiency standards
Business commitment to SD	Businesses are highly committed to sustainability and CSR because it makes good business sense	All aspects of operations are under constant performance improvement review; energy management is a core concern in all business activities
Importance of business rep.	Reputation is important, but secondary to transparency and accountability; stakeholders not impressed by superficial efforts (i.e. will dig deep)	A newly defined generation of 'prestige' offices (e.g. small / efficient / low energy) are in high demand, not in order to bolster reputation, rather to define identity and achieve differentiation
Societal awareness	Stakeholders systematically identify CSR shortcomings before they pose a significant problem to the business concerned	The depth of business-stakeholder dialogue is such that low energy offices are a firm part of a wider CSR approach
Refurb / new build?	Life cycle assessments carried out to determine whether or not to refurbish or build new	

Wise Counsels II

This scenario describes a fairly radical departure from our historical trajectory compared to the other four scenarios described. It thus requires some additional explanation to flesh out its plausibility. This is provided in the box below and is followed by the assessment of the scenario in terms of the six factors.

Box 1: Rationale for Wise Counsels II

Under "Market Quickstep", it is conceivable that an elite few would desire and attain a 'deep green' lifestyle. Under "Atlantic Storm" it is possible that some societies would lead similar lives, albeit involuntarily and as a result of poverty. An alternative trajectory or paradigm shift which the "Wise Counsels" framework of complexity / risk management could enable however, is the achievement of a 'deep green' lifestyle desired and attained by the masses.

This scenario is best understood in terms of the post-materialism hypotheses or reflexive modernisation. Here society is responding to a set of circumstances that were more extreme that those leading to "Wise Counsels I". Many reaped the material benefits of the initial global economic growth but, in addition to the unforeseen dissatisfaction this brought in attaining 'higher order' human needs, there were also dire consequences for the poor, and for society as a whole as crime, drug dependency and other social ills proliferated.

Society's consequent 'reflex' can be seen as opposite in direction to the earlier forces of material individualism. Consequently community, spiritualism and socialism manifest in local stewardship. These social choices are processed using access to the global knowledge network provided for under "Wise Counsels", but are ultimately negotiated through highly devolved governance structures at the local level.

Local level investment choices are augmented by the (human-made) capital surpluses left over from the preceding economic boom. Rather than investing further in economically attractive ventures however, these resources are sunk back into social capital and the natural environment. This is reflected in the low GDP growth rate (an indicator since superseded by sustainability indices which are suggesting a higher rate, albeit different kind, of growth). Additionally, given that there is an aging population due to advances in medicine (and possibly large inward migration), there has been a shift in the production function to put greater emphasis on paying people rather than (a relative minority) receiving rents on capital.

What does all this mean in terms of the property market and energy efficient offices? Given access to the knowledge network, society would take care to maximise the utility of the existing office stock to *society and the environment* (but under a 'limits to growth' framework). We therefore would not expect a collapse in the demand for office buildings per se, but a managed reconfiguration of the life-work dynamic and as a consequence, changes in the built environment. Consistent with the conservation philosophy, zoning and planning laws would be adapted to reduce reliance on fossil fuel and travel, and the adoption of mixed-use buildings and, in the city context, a transformation into truly 'living' environments. Again due to the emphasis on conservation, energy efficiency would be an integral feature of this society. Whilst we would not expect the same radical technological innovation as likely under Wise Counsels I, due to the relative lack of capital, there is a strong likelihood that social and low-tech innovation could result in similar outcomes. Thus energy efficiency is systemic and consequently would affect office space as it would all other buildings and processes. This would be driven in part by price, as more local forms of energy production, at least in the earlier stages, would not benefit from the scale economies available under other scenarios.

Table 8: Wise Counsels II and six factors

	What happens…	*…and its impact on (low energy) office market*
Economy / employment level	Economies of scale in a traditional sense are no longer a desirable objective	Contraction of metropolitan office hubs
Employment location	Businesses focus on supplying goods and services locally; location is generally close to home, if not in the home itself	More dispersed, small scale offices
Energy context	Local energy self-sufficiency is a major driver leading to renewable micro-generation; this cements the importance of energy efficiency	Virtually all offices are low energy, both in terms of energy use and energy embodiment (i.e. reused construction materials)
Business commit-ment to SD	Adopted paradigm makes uncommitted businesses a rare exception	Occupation of low energy offices is nearly a foregone conclusion
Importance of business rep.	Reputation builds on the extent of business commitment to SD	Marginal impact; e.g. the extent to which an office's reused construction materials are sourced locally
Societal awareness	Economy, environment and society are strongly integrated; there is no 'external' stakeholder pressure	Supply and occupation of low energy offices is nearly a foregone conclusion
Refurb / new build?	A clear emphasis on refurbishment, followed by reduction of new office space requirements, reuse and recycling of existing office stock's materials	

3.4 – Scenario comparison and conclusions

Table 9 tabulates the three scenarios, including variations, against the six factors. A "1" in the table indicates where that factor (say "importance of business reputation" under "Market Quickstep II") has the greatest effect in increasing the demand for low energy offices compared to the other scenarios. What this table illustrates is that the different scenarios affect different factors in various ways; "Atlantic Storm" aside, there is no way of saying which scenario has the greatest or smallest effect on the demand for low energy offices.

Table 9: Relative importance of key factors driving the demand for low energy offices

	Atlantic Storm	**Market Quickstep**		**Wise Counsels**	
		I	*II*	*I*	*II*
Employment level	5	3	1	2	4
Employment location	5	1	2	3	4
Energy context	5	3	4	2	1
Business commitment to SD	5	4	3	1	2
Importance of business rep.	5	2	1	3	4
Societal awareness	5	4	3	1	2

In addition, implications of the scenarios on the demand for low energy offices can be compared on a more detailed level; in particular by assessing how they may alter the relative importance of *what* tenants want. Table 10 features the same ten office procurement criteria as Table 2, section 2.1. Here they have been tabulated against the scenarios. The changes in *relative* importance of the criteria as a result of each scenario have been denoted by a scale ranging from a double-minus ("**—**"; relatively less important) to a double-plus ("**++**"). No attempt was made at reconfiguring the ranking of the criteria; this would have been too speculative.

Table 10: Change in importance of office procurement criteria

	Atlantic Storm	Market Quickstep		Wise Counsels	
		I	*II*	*I*	*II*
Location	-	o	-	-	o
Cost of property (rent, rates)	+	o	o	o	-
Ability to vacate / exit	+	+	++	+	-
Other occupational costs	++	o	o	+	++
Length of commitment	++	o	+	o	-
Expansion / contraction capabilities	+	+	++	+	--
Efficiency of layout	o	+	++	++	+
Speed of occupation	-	o	++	+	-
Opportunity to promote branding and identity	-	+	++	+	--
Inclusive package of real estate, fit out and services	o	+	+	++	o

The criteria in bold italics – as already described in section 2.1 – are criteria which low energy offices have the potential to fulfil directly. Low energy offices can of course meet the other seven criteria, but only indirectly, i.e. not as a direct result of their low energy features. It can be seen, comparing the three scenarios being taken forward for dissemination purposes (i.e. those not greyed out), that the relevant criteria[14] are mostly going to become relatively more important in each.

[14] "Other occupational costs", "opportunity to promote branding and identity" and "inclusive package of real estate, fit out and services".

OVERALL CONCLUSIONS AND NEXT STEPS

Conclusions

The Key Issues identified through discussion with stakeholders in Phase 1 of the project have now been analysed in this stage, Phase 2, of the project. The main findings and conclusions from the three sections on "Technical Issues and Rental Data", "Tenant Demand" and "Scenarios for Office Investment Decisions" have been reorganised according to the Key Issues (below) and will be carried forward into Phases 3 and 4.

Improved rental income

Tenant characteristics and drivers on rental income / turnover

- CSR considerations of tenants and investors are currently a weak driver of the procurement of low energy offices. There is, however, a fairly high level of awareness of building energy use amongst the UK's largest corporations.
- There is a slightly stronger supply opportunity due to the impetus generated by the EPBD for improving building energy efficiency. Those large corporate tenants with strong CSR drivers are more likely to take action to improve their leasehold properties. Developers are being driven to supply more energy efficient buildings through the stricter regime of the revised building regulations.
- Considering tenants' potentially central role in the take-up of low energy offices, they are likely to be responsive to the market 'pull' that would be generated by property investment and valuation professionals taking low energy into account.

Rental data

- Real rental data was to be used to explore an initial premise that energy efficiency is not a significant determining factor under current valuation methodologies. We anticipated finding little or no difference between the rental growth, market valuation and void periods of identified 'low energy' offices and 'standard' comparative offices. This would confirm that 'low energy' buildings are effectively undervalued. A proposed methodology ultimately failed to reach a conclusion.
- The proposed methodology failed primarily due to a lack of data from IPD. Three criteria were to be used to explore the initial premise; these were: property market valuation figures, rental value growth figures, and void period figures. Other problems included the difficulty in obtaining real energy use figures from office owners / tenants. Several of the information gaps will, however, be addressed by the forthcoming EPBD, namely the lack of real energy use data.

Technical energy issues

- There is currently no standardised or widely-used method of quantitatively assessing what constitutes a 'low energy' building. This project presents a potential methodology for achieving this, based on a Good Practice Programme methodology. However, the certification process of the EPBD will institute a very practicable 'at a glance' method of determining if a building is indeed 'low energy' or not.
- There is no centralised registry of building energy use / energy efficiency data. The forthcoming implementation of the EPBD will generate a significant amount of such data, and there is a strong case to be made for its compilation. Various potential organisations which might take a lead on this already exist – possibly the ODPM, the Office of National Statistics (ONS) or the IPD.

Risk premium for future valuation

- In most of the scenarios we examined – in particular in the three to be taken forward to the next phases – there is a reasonably strong case for low energy offices being a good investment

compared with standard offices as, in all but one scenario, energy use within offices is likely to be an issue. This holds even when the prognosis for property investment as a whole is poor; low energy offices are likely to be a less bad investment in that scenario that standard.

- All three scenarios being taken forward also illustrate how the three office procurement criteria low energy offices can help meet – 'other occupational costs', 'opportunity to promote branding and identity' and 'inclusive package of real estate, fit out and services' – are set to become more important.

Next steps

The next steps for the project "Asset Value Implications of Low Energy Offices" are to use the evidence and findings of Phase 2 and use them to make a compelling business case in Phases 3 and 4 – in terms of improved rental income and future market value – for investment in and improved market valuation of low energy offices. This will be carried out in discussion with the Steering Group, and in particular in conjunction with Kingston University and RICS with respect to Phase 4 of the project.

Do we have a compelling business case? We believe we have the makings of one if coupled with the Energy Performance of Buildings Directive. We know of other projects attempting to make a case for increased valuation of buildings for other reasons such as good design. At this stage we are very interested in their findings as we see them facing many of the same problems as ourselves.

There has been a long standing view that building standards will only increase if legislation pushes them to be increased. The current consultation on new Approved Document Part L (Energy efficiency) raises the question of fairness. Paragraph 59 says that procurers fear that by continuing to raise the standards of new buildings, market distortion results, as the cost of providing new buildings inevitably increases: "Procurers are then faced with a market where the costs of one sector (new construction) has had its costs increase relative the existing stock, but with no *clear* signal about the benefits accruing from the better standards provided' (emphasis added). (ODPM 2004)

Our view is that our work here, if we can prove a sufficient case, provides the clear signal about the benefits accruing in the market from the higher standards. This will provide a major impetus for the remaining phases of the project.

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APPENDIX 1 – THE ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE

Introduction

Directive 2002/91/EC – the Energy Performance of Buildings Directive (EPBD) – of the European Parliament and Council, came into force on the 4th January 2003. It is intended to raise public and professional awareness of energy use in buildings and subsequently to increase investment and training levels in energy efficiency measures. These can be either 'passive' in nature (i.e. through building design and improvement) or 'active' (i.e. through user behaviour).

The EPBD is intended to help deliver the EU's Kyoto Protocol greenhouse gas emissions reduction targets. Buildings in the EU use over 40% of Europe's energy and create over 40% of its CO_2 emissions. According to the European Climate Change Programme, the EPBD could deliver up to 45 million tonnes of CO_2 reduction by 2010, a significant contribution to the total of 330 million tonnes reduction to which the EU has committed[15].

This paper will focus on two related aspects of the EPBD, both of which are encapsulated in **Article 7: Energy performance certificates**. Certification of all buildings according to their assessed energy efficiencies, and the display of these certificates in a "prominent place" in the case of "public use" buildings with useful floor areas over 1000m^2 (labelling), are viewed as key tenets of the Directive and central to its chances for delivering its goals. However, the wording of the EPBD allows significant scope for interpretation by the individual EU member nations, which must implement legislation by the 4th of January 2006.

Building energy efficiency certification (and, indeed, labelling) is currently not a requirement in the majority of EU countries[16]. Voluntary schemes do exist in some, but overall it is fair to say that - at the present time - the practice is underdeveloped and is in need of further research and design. Failure to do so could result in ineffectual certification and labelling, and, ultimately, a missed opportunity to deliver substantial CO_2 reductions.

Certification

Article 7 of the EPBD states that whenever a building is constructed, sold or rented out, a certificate detailing its energy performance must be made available to the owner, or by the owner, to the prospective buyer or tenant. Furthermore, no certificates may be older than 10 years. In order to facilitate comparisons between buildings, the energy performance certificate must include reference values such as current legal standards and benchmarks. For all nations in the EU, the establishment of meaningful benchmark profiles will therefore become a priority. This is discussed in greater detail below.

Certification in the UK has existed on a voluntary basis for a number of years in the form of the BREEAM (Building Research Establishment Environmental Assessment Method) system. To date, some 400 major office buildings have been assessed using this method[17]. The BREEAM system covers numerous environmental aspects of a building's use, including water pollution, transport, ecological impacts and so on. With the introduction of the EPBD a dedicated method for assessing energy efficiency must be developed, which must be carried out by independent and accredited experts.

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[15] CIBSE (2003) Briefing 6 "*The Energy Performance of Buildings Directive – A summary of its objectives and contents.*"

[16] See section on "European member states' progress towards certification implementation" below.

[17] http://www.scottwilson.com/services/breeam/about.html

The UK lead for the implementation of the EPBD is taken by the ODPM, which has responsibility for designing and implementing certification and labelling. This task will be done in conjunction with existing legislation. To this end, Part L of the Buildings Regulations for England and Wales (which sets obligatory standards for building energy performance) is currently being reviewed. The other task in this area is to develop the rating system required by the EPBD's certification stipulation which will allow for energy efficiency comparisons between buildings.

A further rationale behind the rating system is that it will help connect the energy performance of buildings with their asset value: a low rating will reflect badly upon the asset in the minds of landlords or tenants and will possibly drive the value of the property or the rental income down, just as a high rating will drive the market value or rental income up. This process is potentially aided by the requirement in large, 'public use' buildings for the certificate to be prominently displayed, making the energy performance of the building immediately obvious and comparable, and thus placing greater pressure on the building's owners to ensure it has a good rating in keeping with the spirit of CSR.

Office profiling

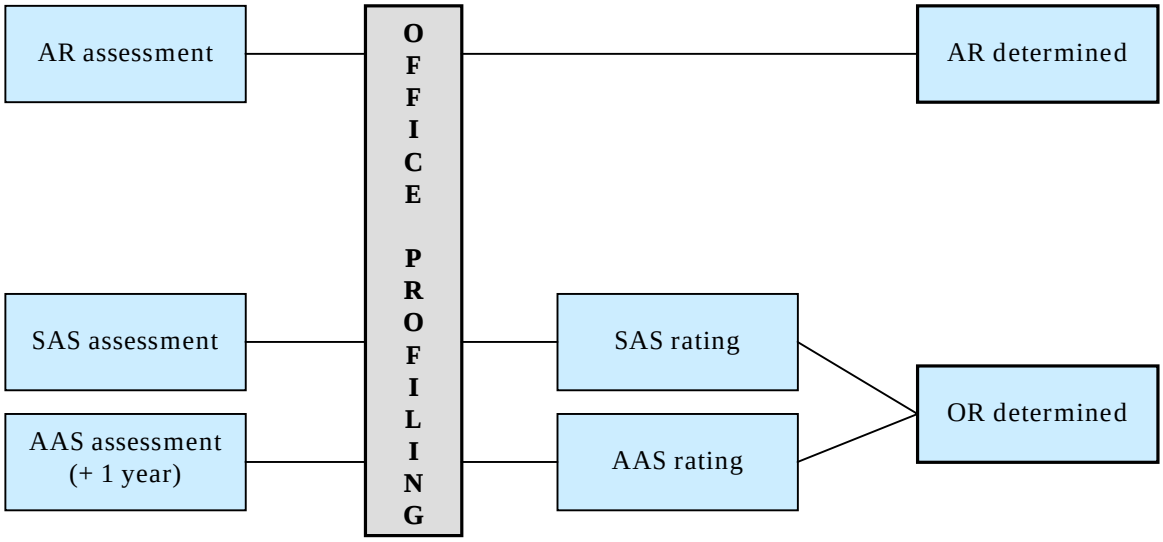
The process of certification is widely regarded as encompassing two distinct measures: a largely passive measure of energy use known as the "Asset Rating" (AR), and a largely active measure known as the "Operational Rating" (OR). Under the provisions of the EPBD both will be assessed and allocated an independent grade or 'rating', in much the same way as many consumer goods such as refrigerators already are, so that comparisons can readily be made.

The assessment of the AR requires predominantly observable information: this includes 'passive' elements of energy performance such as the extent of insulation, double glazing, the presence or not of an air conditioning system, and so on. Established methods for assessing such 'intrinsic' aspects of a building's energy performance (such as that prescribed under Part L of the Buildings Regulations) are likely to be deployed, with possible additions such as tests for airtightness.

Information gathered from the assessment must then be compared to the rest of the building stock in order for it to be allocated a performance rating (e.g. A-G).

The Operational Rating describes the in-use performance of the building. Although it is influenced by the Asset Rating, it encompasses behavioural aspects such as the number of hours worked by employees per week, the number of computers used and so on. The OR is determined by two different measures. Firstly, energy use can be accurately measured by means of electricity and gas metering and other survey exercises, and these results are known as the Actual Activity Schedule (AAS). However, because buildings must be designated an OR by the time the user (be it the landlord or a tenant) moves in (i.e. before sufficient time has passed that an AAS can be measured), it becomes necessary to assign an estimated, standardised OR for the relevant specific building type. This second measure is referred to as the Standard Activity Schedule (SAS). The difference between the preliminary SAS and the subsequent AAS (probably carried out after one year of occupancy so seasonal variations can be measured) can then be used to determine how effectively a building's occupants are using energy compared to an averaged figure for other similar building types, and a corresponding grade to the AR (e.g. A-G) allocated.

It is apparent that in the determination of both the AR and the OR of an office building, there is a need for the use of building 'profiles'. For AR determination they are necessary to provide a comparison with other like buildings as opposed to an absolute value. For OR determination they are needed to provide the preliminary SAS as well as to grade the subsequent AAS:



Provisional Asset Rating and Operational Rating determination process.

Attempts have already been made to construct generic office types, and the ODPM should seek to evaluate these before deciding upon the exact system to adopt. Perhaps the most notable profiling scheme developed in the UK is presented in the DETR's "Energy Consumption Guide 19: Energy use in offices" (often referred to as "ECON 19"). The methodology presented in this guide envisaged four office building types (see also the graphic[18] below):

1. Naturally ventilated cellular…
A simple building, often (but not always) relatively small and sometimes in converted residential accommodation. Typical size ranges from 100m^2 to 300m^2. The domestic approach, with individual windows, lower illuminance levels, local light switches and heating controls helps to match the operation with the needs of occupants and tends to reduce electricity consumption in particular. Catering often consists of the odd sink, refrigerator and kettle.

2. Naturally ventilated open-plan…
Largely open-plan but with some cellular offices and special areas. Typical size ranges from 500m^2 to 4000m^2. This type is often purpose built, sometimes in converted industrial space. Illuminance levels, lighting power densities and hours of use are often higher than in cellular offices. There is more office equipment, vending machines etc, and more routine use of this equipment. Lights and shared equipment tend to be switched in larger groups, and to stay on for longer because it is more difficult to match supply and demand.

3. Air-conditioned, standard…
Largely purpose-built and often speculatively developed. Typical size ranges from 2000m^2 to 8000m^2. This type is similar in occupancy and planning to Type 2, but usually with a deeper floor plan, and tinted or shaded windows which reduce daylight still further. These buildings can often be more intensively used. The benchmarks are based on variable air volume (VAV) air-conditioning with-cooled water chillers; other systems often have similar overall consumption but a different composition of end-use.

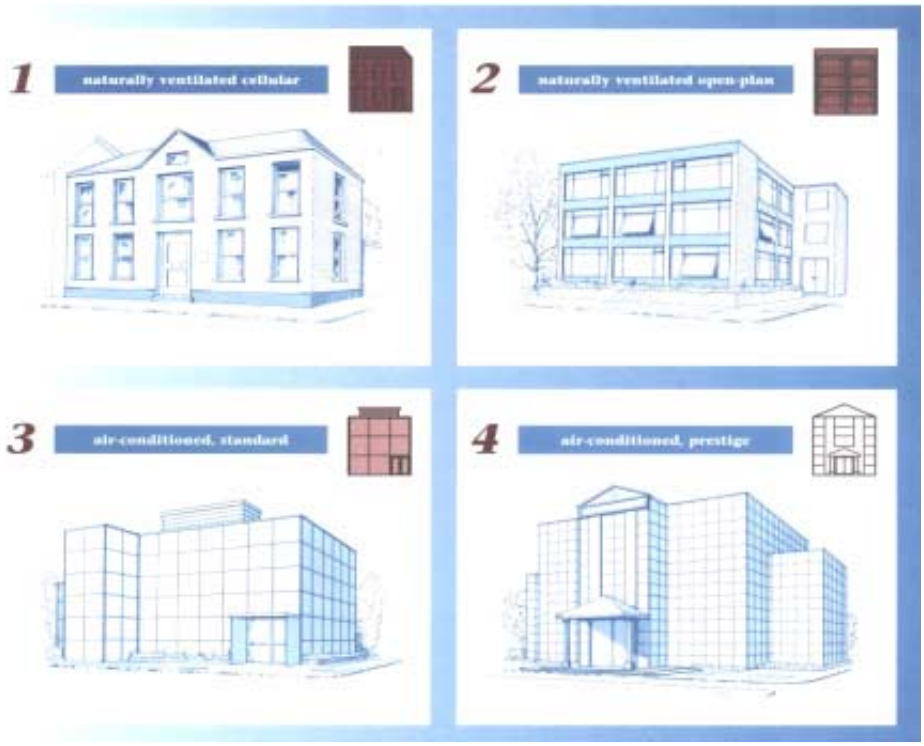
4. Air-conditioned, prestige…
A national or regional head office, or technical or administrative centre. Typical size ranges from 4000m^2 to 20,000m^2. This type is purpose-built or refurbished to high standards. Plant running hours are often longer to suit the diverse occupancy. These buildings include catering kitchens

[18] DETR (2000) *Energy Consumption Guide 19 - Energy use in offices*, p. 7

(serving hot lunches for about half the staff); air-conditioned rooms for mainframe computers and communications equipment; and sometimes extensive storage, parking and leisure facilities.

ECON 19 suggests "good practice" and "typical" annual cost benchmarks for each office type, presented in the form of £/m² of treated floor area (TFA). These are intended to provide users with a rough and ready guide to the energy efficiency of their building. Possible outcomes are described relative to these benchmarks (e.g. "below typical", "good practice" etc.). The generation of benchmarks in this way is discussed further in the section on performance benchmarks below.

It is apparent that this system of classification alone is not sufficiently rigorous for the purposes of meeting the requirements of Article 7 of the EPBD regarding a certification process that affords comparison between buildings through the allocation of ratings. It also does not incorporate the work of qualified and/or accredited experts in an independent certification process, as stipulated in Article 10. However, this generic office type profiling exercise remains useful in the context of the EPBD certification process, though there may be a need to expand upon the presented classification system.



Other attempts to develop generic office building profiles have been undertaken in the UK. Perhaps most notable is the "Office Oscar" consultation produced annually by Jones Lang LaSalle, which is aimed at highlighting trends in service charge costs across the office sector[19]. Now in its twentieth edition, Office Oscar uses a different classification system to ECON 19's, and which takes into account other variables such as geographic location (City; West End; Greater London; South; North; Scotland) and size range (<9,999m²; 10,000–24,999m²; 25,000–39,999m²; 40,000–99,999m²; ≥ 100,000m²). Office Oscar also differentiates between air conditioned or non-air conditioned buildings in much the same way as the ECON 19 classification.

Another classification system is used by the Investment Property Databank (IPD)[20], which compiles independent market indices and portfolio benchmarks to the investment industry. The IPD office survey methodology does differentiate broadly between geographical locations (central

[19] See www.oscar.joneslanglasalle.co.uk/office/index.html.
[20] See www.ipdindex.co.uk/index.asp.

London; rest of London; South East; Rest of UK) but thereafter the classification system is based on office use (standard offices; office parks).

Decisions over certification (and labelling) implementation methodologies are ultimately the responsibility of the ODPM, which is at time of writing receiving advice from consultants Faber Maunsell[21]. The ECON 19 methodology is certainly a good place to start, but there is a significant amount of work still to be done. Office building profiling is an important part of this process, as is the formulation of performance benchmarks.

Performance benchmarks

The formulation of office building energy performance benchmarks must go hand-in-hand with the construct of building profiles. Each building profile will have a different AR and OR scale from the other profiles because of the limitations (or advantages) inherent to that particular office type. In other words, the performance rating of, for example, (borrowing from the ECON 19 profiling system) a naturally ventilated cellular office, is only comparable to other buildings in this same class; it is *not* comparable to, say, an air conditioned prestige office. The variation in office types necessitates distinction between performance benchmark scales.

This can only be achieved through a surveying process of offices belonging to the various profiles. Article 2 (Definitions) of the EPBD provides a list of non-specific criteria for the assessment of the energy performance of buildings; these include the assessment of, inter alia, heating, hot water heating, cooling, ventilation and light. In the Directive's preamble, however, it is stated that the specifics of energy performance assessment are left up to the member states, though they are required to apply the method uniformly. It should also be noted that the general criteria provided by the EPBD relate to intrinsic AR values and do not readily apply to the OR of an office building. Together, these two factors mean that member states are required firstly to decide upon a standardised methodology for assessing the energy performance of all buildings, and secondly to carry out scoping exercises into 'best practice' (and indeed, 'worst practice', and points in between) for each individual office building profile with the aim of translating these into a grading system for AR and OR.

Labelling

Energy performance labelling is essentially the public display of a building's AR and OR and is intended to help achieve the realisation of energy efficiency targets at a number of levels. Firstly, labelling will allow for the easy comparison of the performance of different buildings by an easy scale (perhaps an A-G rating like that used in the white goods market). Secondly, and more fundamentally, it is hoped that this in turn will provide a stimulus for owners of buildings with a poor AR and OR to take matters into their hands and improve their building's performance. In owner-occupied buildings the stimulus is likely to originate from the owner's dedication to CSR issues, and in leased property it will originate from the owner's desire to maximise the asset value of the building by demonstrating its high performance to potential tenants, which in turn will raise revenue and reduce void periods.

Labelling might be viewed as the final stage of the certification process, but it is only applicable to some office buildings. The EPBD requires "…all buildings with a total useful floor area over 1000 m^2 occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons an energy certificate, not older than 10 years, is placed in a prominent place clearly visible to the public" (Article 7.3).

[21] See '*Methodologies in support of the Energy Performance of Buildings Directive: The UK approach to implementation for buildings other than dwellings*', found at www.odpm.gov.uk.

There is evidently considerable scope for interpretation in this text, most importantly concerning the exact definition of the phrase "providing public services". There has been concern expressed about the possibility that the ODPM will go down the 'minimalist route', applying the Directive to 'public sector buildings' rather than to all buildings used by the public[22]. Advocates of energy efficiency will undoubtedly resist this possibility and push for a wide interpretation which encompasses leisure facilities, libraries etc.

This contention is likely to provide the main debate in the matter of labelling. The process itself is not technically complicated when the AR and OR values of a property have been established. The question of which buildings should fall under the labelling remit of the EPBD will surely be taken up by a number of stakeholder groups and it is ultimately for the ODPM to decide where the boundaries lie. It is a crucial task because labelling is widely seen as a requisite for market transformation which is, ultimately, the whole point of the exercise.

European member states' progress towards certification implementation

The implementation of the EPBD is now of pressing importance to all EU member states. The timetable of the Directive is such that parties are required to implement the legislation by the 4th January 2006[23]. Member states will, where possible, attempt to build upon their own previous experience with certification and labelling and adapt existing legislation. However, currently the practices are almost uniformly undeveloped.

The following table presents a summary of progress in member states towards Articles 7 and 7.3. It shows the current state-of-play, and plans for implementation of, these Articles. Note that the information presented under 'Article 7' relates to all buildings, and the information under 'Article 7.3' pertains to 'public services' buildings with a total useful floor area of 1000m^2 or over, but it *does not* pertain to offices specifically.

Country	Article 7: Certification of energy performance in buildings	Article 7.3: Display of certificates (labelling)
AUSTRIA Current	Certification covers meeting the energy performance requirements. Upper Austria and Styria have introduced further certification which will need to be adapted.	No requirements, but examples exist.
Plans for implementation	End 2004 – Design of certificates to be based on Upper Austria and Styrian experiences and adapted to cover non-residential use and A/C.	OIB will set out the requirements and exceptions.
BELGIUM Current	No.	No.
Plans for implementation	?	?
DENMARK Current	Mandatory since 1997 for both new and existing buildings. Mandatory when small buildings or owner occupied flats are sold. Certification of large buildings every 1-3 years. 2 separate labelling schemes exist (for buildings less than 1500m^2 and all others).	Energy label and energy plan is made available for all public buildings.

[22] For example, see BRE's Energy Division Managing Director David Strong's comments to the 2004 NHER Conference (which can be found at www.nher.co.uk/j5.shtml).

[23] Member states do have a temporary 'get out clause', however. If they believe that there are insufficient qualified or accredited experts to implement fully the provisions of Articles 7, 8 and 9, they may delay these Articles for up to three further years. If they wish to cause this delay, governments must justify this to the Commission together with a schedule detailing when they do plan to fully implement the Directive.

Country	Article 7: Certification of energy performance in buildings	Article 7.3: Display of certificates (labelling)
Plans for implementation	2003 – work underway to develop new certificates using consultants. Oct 04 – propose new law to promote energy and water savings in buildings. Late 04 / early 05 – passed by parliament, early 05 – new executive orders issued, 1st Jan 06 – implemented.	See left.
FINLAND Current	None	None
Plans for implementation	Dec 03 – project launched to cover whole certification procedure. New laws may be needed.	To be developed in 2004.
FRANCE Current	Revised regulation since 2001.	No.
Plans for implementation	Work on existing houses is almost finished.	?
GERMANY Current	New buildings – certification is required. Existing buildings – certificate required only with large renovation changes to the building. Number of voluntary schemes in place which are mostly for housing.	Not mandatory
Plans for implementation	Field test to be carried out to compare the existing certification schemes. Legal basis will need to be extended to introduce energy certificates for existing buildings being sold or rented.	Law will need to be extended.
GREECE Current	Joint-ministerial Decision includes measures and procedures on energy certification following energy auditing for new and existing buildings.	?
Plans for implementation	?	?
IRELAND Current	Compliance can be shown through the Heat Energy Rating (HER) to show that the energy required for space and water heating does not exceed a certain value, which depends on the shape of the building.	No.
Plans for implementation	New legislation required.	New legislation required.
ITALY Current	Certification already included in Article 30 of Law 10/1991 and in 1997/8 – a demand to implement was given to the regions. Voluntary certification in some regions. Energy audits have been carried out since 1991 for public buildings being renovated (mainly schools). There are two models: ERS (Energy Restyling) and ECU (Energy Check-Up) and both use a cost-benefit analysis.	Not required, but there are some examples.
Plans for implementation	?	New legislation is needed, taking into account of voluntary experiences.
LUXEMBOURG Current	?	?
Plans for implementation	?	?
NETHERLANDS Current	New: already required by the building code. Existing: Quality control scheme which certifies the process of assessment. Energy labelling also developed.	No, but some examples exist.

Country	Article 7: Certification of energy performance in buildings	Article 7.3: Display of certificates (labelling)
Plans for implementation	?	?
PORTUGAL Current	No.	No.
Plans for implementation	?	?
SPAIN Current	?	?
Plans for implementation	Will use CALENER as a method for certification.	?
SWEDEN Current	No.	No.
Plans for implementation	?	?
UNITED KINGDOM Current	England and Wales, N. Ireland – SAP Rating is produced for new dwellings. No mandatory certification for other buildings, except in England and Wales. For buildings over 1000m2, an estimate of the annual energy usage is required.	England and Wales – temporary notices are posted on new dwellings.
Plans for implementation	England and Wales – May introduce legislation in 2004 requiring a certificate for all marketed houses for sale. Will include SAP ratings (actual and benchmark) and list of energy performance improvement works.	New provisions will be needed.
CZECH REPUBLIC Current	Energy label is not mandatory for new buildings, but it can be used as proof of compliance.	No.
Plans for implementation	Working group established. Draft amendment is being prepared for 2004/05. Spring 2004 – 6-month PHARE project will be launched, gathering information on the implementation of the EC Directives on energy efficiency.	See left.
CYPRUS Current	No.	No.
Plans for implementation	New legislation is required.	New legislation is required.
LITHUANIA Current	No.	No.
Plans for implementation	June 2003 – established a group of experts to implement the Directive.	See left.
MALTA Current	None.	None.
Plans for implementation	Bill will make it mandatory for owners of new or altered buildings to have a certificate of conformance with the building regulations. Certificate of conformance issued by architect and civil and mechanical engineers who are responsible for the building.	2004/05 – subsidiary legislation introduced in phases.
POLAND Current	?	?
Plans for implementation	?	?

Country	Article 7: Certification of energy performance in buildings	Article 7.3: Display of certificates (labelling)
SLOVAKIA	Not in legal codes.	No, but some examples exist.
Current		
Plans for implementation	End-2005 – Research completed on the requirements for implementation. New code on the energy performance of buildings may be introduced which would implement the entire directive.	See left.
SLOVENIA	Pilot scheme of energy certification of buildings (based on SAVE Directive 93/76/EEC).	No.
Current		
Plans for implementation	Regulation being prepared on the basis of the Building Act adopted in Dec 2002.	See left.

It is apparent that certification is currently a requirement in few countries, and in those where it is mandatory, only certain building types are covered by the legislation. Labelling (or the display of certificates) is currently required in even fewer nation states, and again not all buildings are covered by the requirement. All nations have yet to develop (or in some cases, adapt) certification and labelling methodologies in order to fulfil the obligations of the EPBD.

APPENDIX 2 – SURVEY OF FTSE100 COMPANIES

Company	Business	Report	Year	Building energy use	Example building	Measure building energy use	Wider building EE concerns	Accredita-tion	Staff training
3i	financial services								
Abbey National	financial services	x	2002	x		x	x		
Alliance & Leicester	financial services	x	2003	x	x	x		x	
Alliance Unichem	retail								
Allied Domecq	beverages and gastronomy	x	?						
AMVESCAP	financial services								
Anglo-American	mining and natural resources	x	2003						
Antofagasta	mining and natural resources	x	2003						
Associated British Foods	food, ingredients and retail								
AstraZeneca	pharmaceutical	x	2003	x		x			
CGNU (now AVIVA)	insurance	x	2004	x	x	x		x	x
BAA	aviation	x	2003	x					
BAE Systems	defence	x	2003	x		x		x	
Barclays	financial services	x	2003	x	x	x		x	x
BG	energy	x	2003						
BHP Billiton	natural resources	x	2003						
BOC	chemicals	x	2003						
Boots	retail	x	2003	x	x	x			
BP	oil	x	2003						
Bradford & Bingley	financial services	x	2003	x	x	x			
BA	aviation	x	2003						
BAT	tobacco	x	2003						
British Land	property	x	2003	x	x	x			
BSkyB	media	x	2003	x	x	x			
BT	telecommunications	x	2003	x		x			
Bunzl	support services	x	?						
Cable & Wireless	telecommunications	x	2002						
Cadbury Schweppes	confectionary and beverages	x	2004	x		x			x
Capita	support services	x	2003						
Carnival	leisure								
Centrica	energy	x	2003	x					x
Compass Group	catering	x	2003						
Daily Mail General Trust	media	x	2003						
DIAGEO	beverages and gastronomy	x	2002						
Dixons Group	retail	x	2003						
EMAP	marketing	x	?						
Enterprise Inns	gastronomy								
Exel	support services	x	2003						
Friends Provident	financial services	x	2003						
Gallaher Group	tobacco								
GlaxoSmithKline	pharmaceuticals	x	2002						
GUS	retail and business services	x	2003	x					
Hanson	construction materials	x	2003	x		x	x	x	
Hays	recruitment and HR services	x	2002						
HBOS	financial services	x	2003	x					
Hilton Group	leisure	x	2002	x		x			x
HSBC	financial services	x	2003	x					
ICI	chemicals	x	2003						
Imperial Tobacco	tobacco	x	2003						
Intercontinental Hotels Group	leisure and beverages	x	2003						
ITV	media	x	2003						

Company	Business	Report	Year	Building energy use	Example building	Measure building energy use	Wider building EE concerns	Accredita -tion	Staff training
Matthey	chemicals	x	2004		x				
Kingfisher	retail	x	2003						
Land Securities	property	x	2002	x	x	x			
Legal & General	financial services	x	2003						
Liberty International	property	x	2003	x	x	x		x	
Lloyds	financial services	x	2003	x		x		x	
Man Group	financial services	x	2004	x	x	x		x	
Marks & Spencer	retail	x	2004	x				x	
mmO2	telecommunications	x	2004	x		x			
Morrisons	retail								
National Grid Transco	energy	x	2004						
Next	retail	x	2004	x		x			
Northern Rock	financial services	x	2003	x	x	x	x	x	x
Old Mutual	financial services	x	2003	x		x		x	
Pearson	publishing	x	2003	x		x			
Prudential (PruPIM)	property	x	2002	x	x	x		x	
Reckitt Benckiser	domestic products	x	2002						
Reed Elsevier	publishing	x	2002						
Rentokil	hygiene and security	x	2003	x					
Reuters	information	x	2003						
Rexam	support services								
Rio Tinto	mining and natural resources	x	2003						
Rolls-Royce	engineering	x	2003	x		x			
Royal & Sun Alliance	insurance	x	2003						
Royal Bank of Scotland	financial services	x	2001	x		x			
SAB Miller	beverages	x	2003						
Sage	business support								
J. Sainsbury	retail	x	2003	x					
Schroders	property	x	2003	x		x			
Scottish Newcastle	beverages	x	2003						
Scottish & Southern Energy	energy	x	2004						
Scottish Power	energy	x	2003						
Severn Trent	energy	x	2003						
Shell / Royal Dutch	oil	x	2003						
Shire Pharmaceuticals Group	pharmaceuticals	x	2003						
Smith & Nephew	healthcare	x	2002						
Smiths Group	engineering	x	2003	x					x
Standard & Chartered	financial services	x	2003						
Tesco	retail	x	2004						
Tomkins	engineering								
Unilever	consumer goods	x	2003	x					x
United Utilities	utilities	x	2003	x	x	x			
Vodafone	telecommunications	x	2003	x		x			
Whitbread	gastronomy	x	2003	x		x			x
William Hill	gambling								
Wolseley	construction materials								
WPP Group	media	x	2001	x		x			
Xstrata	mining and natural resources	x	2003						
Yell Group	media	x	2003	x		x		x	

APPENDIX 3 – CHOICE OF SCENARIOS FOR ASSESSMENT

A review of available scenarios brought a large number to our attention, most of which were already five years old. Despite this drawback, it was apparent that there was considerable interest from the EC and the UK Government at that time, so many of the projects had been carried out by respected organisations using reliable methodologies. The Centre for Future Studies[24] lists a number of scenarios focused on various key issues, of which four papers provide interest; however these are not clearly attributed to an author or publisher, so whilst interesting, provide additional food for thought rather than a basis for research.

The Prime Minister's Strategy Unit (PMSU, formerly the Performance and Innovation Unit – PIU) has policy strategy and innovation at its heart, and is charged with ensuring that government departments have a realistic and coherent approach to options for the future. In order to carry out this duty they have produced a report, "The future and how to think about it" (to 2050)[25], which provides a range of trend data to support the reasoning behind the key drivers for change identified. These are: demographics, science and technology, environment, attitudes and values, economic globalisation and political institutions.

The PMSU study suggests we can be relatively sure of:

- population growth in other countries
- stabilised population growth, but ageing in the UK & Europe
- more people with higher education
- at least 3% growth in global economies but continued gap between rich and poor
- world more interconnected both economically and culturally
- huge expansion in information; greater proportion of economic output based on information and knowledge
- technological innovation continues at present rate or faster
- effective political power more dispersed
- human nature will remain basically the same

The main dimensions of uncertainty they suggest are the degree to which the alternative views are achieved:

- a creative networked society vs. individually atomised society
- sustainable development vs. environmental degradation
- inclusive world development vs. global inequality
- network monopolies vs. vigorous competition
- public acceptance of globalisation vs. widespread public opposition
- effective global institutions vs. ineffective ones
- information overload vs. information society.

They also list some 'shocks': life changing events. These include: major financial market crash; new deadly disease; use of WMD; economy-changing technology, rapid shift in fertility rates and major environmental disaster.

Within the scope of the Asset Value project, we have not been concerned with the 'shocks' as these will affect both property and energy more radically than we can surmise. Furthermore, we were also concerned with a slightly shorter time horizon; our understanding was that we should be thinking of futures for around 2020. Property professionals are well aware of the changes in the

[24] www.futurestudies.co.uk
[25] http://www.number-10.gov.uk/su/future/future.shtml

market place that can occur, based on the events of the 1990s. Our purpose then, was to identify options for the office environment of the future, examine the possible impact that would have on demand for offices and in particular for the energy consumption of offices, and consider what drivers might be present in those futures for investment decisions.

The table on the next few pages was taken from DERA 2001 "Strategic Future Thinking: Meta-analysis of published material on drivers and trends"[26]. Two scenario sets were omitted from the table, one because the methodology was suspect and the other because it was developed for US defence purposes and was unhelpful in the context of the Asset Value project. Of the remainder, we found the Chatham House scenarios gave an accessible picture within the period of interest (2020) and that the methodology was robust. ECFSU[27] was accessible and Euro-centric, but a little old – drivers for 2010 is a little short, but given some of the assumptions made have already passed, it could have been considered a possible for 2015. The Madingley Scenarios were developed to test strategies for the NHS, which was interesting. They were also short and accessible. "Which World?" gave access to some global thinking in our key areas "for the 21st Century" and seemed to have a time base of 2050. It would have required some work to develop the descriptions into something useful for our project. The others were either difficult to find or just appeared less attractive.

Scenario names and characteristics		
	Chatham House Open Horizons 2020 Scenarios	
	Wise counsels	Knowledge economy; individualistic differentiation or developing within self-defining communities
	Atlantic storm	Low economic growth; defunct NATO; global elite of nations; distinctions between economic classes, ethnicity and nationality
	Market Quickstep	'invisible hand'; sub-regional areas differentiate, developing strengths and excluding weaknesses
	CIA Global Trends 2015	
	Inclusive globalisation	Technical development utilised to deal with problems of developing world; robust global economic growth; effective national and international governance; public private partnerships shrink the role of the state; minority of the world does not benefit
	Pernicious globalisation	Elites thrive as result of globalisation, majority fail to do so; migration becomes source of tension; technologies fail to address the problems; national and international governance is weak; increasing internal conflict; growing gap between developed and developing
	Regional Competition	Sharp regional identities; uneven distribution of technologies; internal conflicts
	Post-polar world	Increased economic and political pressure in Europe; domestic US view; rise of Japan and China alerting fears of possible conflict between them
	ECFSU 2010 Drivers	
	Triumphant Markets	Growing world trade (free trade); increasing social and regional inequalities
	The Hundred Flowers	Decline in administrations; public dissatisfaction; political fragmentation; ominous international situation
	Shared Responsibilities	Discontent among general public; civil society on the rise
	Creative Societies	Public pressure with regards to social questions
	Turbulent Neighbourhoods	Globalisation fails to deliver; tensions on EU's doorstep; China/Japan jockey for position in Asia

[26] http://www.number-10.gov.uk/su/meta.pdf
[27] http://europa.eu.int/comm/cdp/scenario/scenarios_en.pdf

	Insight	
	Web of Nations	High globalisation; high public involvement in politics; international institutions function; marginalisation of less developed world
	Subsidiarity with Interdependency	Globalisation accelerated; populations engaged in political process; strong regional groupings
	Fragmented	Side effects of globalisation: international institutions are weak; cynical public
	Blocs	Retarded globalisation due to isolationism and barriers; public engaged in politics; strong alliances
	Madingley Scenarios	
	Find my way	Empowered individuals; global community; institutions subject to mistrust; unlimited information; haves and have-nots
	Trust their guidance	Re-vamped institutions; limited individual choice; strong national governments; information cautious
	Shell Global Scenarios 1998-2020	
	The New Game	New global institutions; organisations adapt to globalisation, liberalisation etc; new rules of play for businesses
	People Power	Increased wealth, education, choice; diversity and volatility; fragmented political parties; institutions challenged by speed of change;
	UNU Millennium Project	
	Cybertopia	Internet and technologies increase globalisation
	The Rich Get Richer	Bigger divide between rich and poor
	A Passive Mean World	Unemployment and underemployment rife due to population increases
	Trading places	Asian governments politically and economically dominate over US/Europe
	Which World?	
	Fortress World	Economic boom, increasing gap between rich and poor; upsurge in violence and organised crime; collapse of Africa
	Market World	Economic boom
	Transformed World	Importance of public opinion; internet giving the public increased voice

Possible futures of energy policy also needed to be considered. As current energy scenarios incorporate issues of climate change, we did not need to re-examine climate change scenarios such as those provided by UKCIP. The two established scenarios we considered were the PIU Energy scenarios to 2020[28] (used in the development of the PIU's Energy Review which informed the Energy White Paper), and the FES/Imperial College Low Carbon Futures scenarios[29] also used in the Energy White Paper (DTI 2003). Although the GDP used in the "Global Sustainability" option of the latter differed slightly, it was clear (and confirmed – pers. comm. M. Leach) that the FES/Imperial College set were derived from the former. Consequently we decided to use the PIU energy futures to complement the key features of the Chatham House scenarios selected above.

World Markets (WM)
The core value is consumerist. This has the highest rate of UK GDP growth (3% pa) and the lowest fuel prices. Economic growth is rapid in this scenario and electricity demand grows most rapidly. The main drivers for technology development are cost, power quality and efficiency. Environmental drivers are not strong and the adoption of energy efficiency improvements is slow. Security of supply concerns are addressed through expanded gas and electricity interconnection, increasing decentralisation of power generation, with effective world trade rules, liberalisation of gas and power on the continent and good trading relations ameliorating geopolitical concerns about gas dependence. The high level of economic growth and limited environmental concern lead demand for road transport to grow rapidly. Air travel growth is particularly strong. The renewables obligation is frozen at 10%. This is comfortably met by on and offshore wind and eligible wastes. Nuclear power and coal are unable to compete with CCGT and the contribution of both runs down as stations come to the end of their lives.

[28] http://www.strategy.gov.uk/files/pdf/PIUe.pdf
[29] http://www.dti.gov.uk/energy/whitepaper/phase2.pdf

Provincial Enterprise (PE)

The core value is individualist. UK GDP growth is assumed to be 1.5% and fossil fuel prices are high. Energy efficiency is limited due to lower capital availability and the low priority attached to environmental concern. There is very little investment in new public transport infrastructure, so despite lower growth, car and goods vehicle use continues to grow. Security of supply is the main driver in this low-growth, low-innovation scenario. Concerns about excessive dependency on imported gas in a volatile world dominated by national interests ensure that both nuclear and coal stations are replaced. Environmental concerns are limited to issues of local and national amenity. The electricity supply mix reflects a 'quota' system for coal, nuclear and gas. The contribution from renewables is frozen at the 10% level achieved around 2010 as scarce capital is invested in replacement and refurbishment of coal and nuclear stations. Nuclear stations are large plants built on existing sites based on 'evolutionary' designs such as the Westinghouse AP series, coal stations are super-critical pulverised coal designs of UK origin. All new coal stations are fitted with FGD and low-NO_x emission control.

Global Sustainability (GS)

The core value is sustainable development. GDP growth is assumed to be 2% pa. Strong international agreements on carbon abatement lead to high priority being given to both energy efficiency improvements and the rapid development and deployment of renewables and CHP. International commitments 'beyond Kyoto' are comfortably met and the UK becomes a net exporter of carbon permits. Geopolitical concerns relating to security of supply are not a major concern in this world of strong international co-operation. Major investment in public transport infrastructure and changes to public attitudes result in slower growth in road transport use and more rapid innovation in transport technology. Renewable generation expands to 30% of total electricity supply. The largest single area of growth is offshore wind, followed by energy crops and biomass wastes, then onshore wind. Wave and tidal stream begin to make a contribution around 2015 and there is a small contribution from micro-hydro. Existing large hydro stations are refurbished as required and their contribution remains at 2000 levels. Nuclear and coal stations continue to the end of their lifetimes and are not replaced. After 2010 new CCGT stations are fitted with CO_2 capture and sequestration technologies.

Local Stewardship (LS)

The core value is conservation and this has the lowest GDP growth rate of 1% pa. Over-riding priority is given to maximising utilisation of local resources with minimal environmental impacts. Consequently energy efficiency measures are given a high priority. A 'think global act local' environmental policy driver reduces import dependency. Very significant changes in attitudes to mobility stabilise the level of private road transport and increase the uses of trains and buses. Renewable generation expands to 20% of electricity supply. Onshore wind makes the largest single contribution as community owned turbines and plants become ubiquitous. Capital constraints and the increased focus on localised resources limit the contribution of offshore wind. Lack of investment in international R&D reduces the development of PV, wave and tidal. Solar water heating and micro-hydro are deployed to their maximum potential and biomass fired CHP is more widely used in rural areas. Nuclear power stations are not replaced as they are decommissioned but some coal fired stations are replaced or re-powered, with CO_2 capture and sequestration.

Business as Usual (BAU)

The assumed GDP growth rate is 2.25% p.a. In this scenario there is no overriding policy driver, instead the tensions between social, economic and environmental concerns continues. Transport trends continue with car use rising, but at a declining rate. Goods vehicle use grows more rapidly than car use. It is assumed that markets determine investment and that this leads to a growing dependence on gas, particularly in electricity generation where renewables do not progress beyond the 10% target reached shortly after 2010. The scenario is based upon the projections of the Inter-Departmental Analysts Group on Low Carbon Options, which take account of the existing Climate Change Programme.