

# Valuing low energy offices: the essential step for the success of the Energy Performance of Buildings Directive

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## Abstract

Energy use in offices is a long way from being a hot topic for managers. Spending on refreshments in meetings is often higher than energy bills. So which stakeholders *are* interested? Previous research suggests that investors hold the key, provided that property valuation takes account of energy performance.

Under present valuation methodologies, energy efficiency of offices is rarely taken into account. Those properties that might be categorised as ‘low energy’ are undervalued; the market for them is stagnant. This research argues the property investment benefits of low energy offices, namely the prospect of both increased rental return and increased future investment worth. Despite difficulties gathering empirical valuation data the work reaches important conclusions regarding data availability, energy assessment and market stimulation.

The Energy Performance in Buildings Directive is a strong driver. Its stipulations should address key data availability issues as well as making investment in low energy buildings desirable. It should also stimulate remedial action to upgrade existing portfolios through certification. However, the research shows that unless valuation professionals appreciate the importance of low energy offices, the likelihood of the EPBD having any impact in a reasonable time is small.

This paper highlights the current inability to demonstrate the investment benefits of low energy offices under current practices, and emphasises the reduced risk for owners that ensure their properties comply with energy efficiency best practice. The question remains: without stronger legislation or higher energy prices, will energy use in commercial buildings ever become more important than the cost of tea and biscuits?

## Introduction

Why is it so difficult to reduce the energy used by commercial buildings? Whether newly built or refurbished, the attention given to energy use in buildings is minimal; this goes against the trend in nearly every other technology where development of new products are nearly always more energy efficient. Why this might be the case could be due to many things; candidates are the desire for prestige buildings which seem, by definition, to require air conditioning, and the difficulty of retrofitting energy efficient solutions. Blame can also be directed at the common practice of over-specifying both heating and cooling systems as office buildings are built without a specific user in mind (Wade *et al* 2002). These buildings, in particular, are designed to a standard generally referred to as “investment quality”, meaning that they are of a standard which should make them attractive to institutional investors, usually because they should be easy to let to suitable tenants. What constitutes a low energy office, given a widely variable office typology, is not easily defined. However, the last UK guidelines – arguably in need of an update not least because office typology is no longer as relevant – nevertheless provide an idea of the magnitude of

**Table 1. Annual energy consumption of 'good practice' and 'typical' offices (DETR 2000)**

Office Type	Type 1		Type 2		Type 3		Type 4	
	Naturally Ventilated Cellular		Naturally Ventilated Open-Plan		Air-Conditioned Standard		Air-Conditioned Prestige	
	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical
consumption kWh/m <sup>2</sup> /year	112	205	133	236	225	404	348	568

difference between 'good practice' and 'typical' offices, as shown in Table 1.

One problem is that among business costs energy use is a very small percentage, even though for some companies, the actual bill is a large amount in absolute terms. Total energy use in a central London office is typically 8 Euro per m<sup>2</sup> per year compared with rental costs of 484–645 Euro per m<sup>2</sup> per year (EiBI 2004, metric translation). Very few organisations use whole life costing to evaluate energy efficiency improvements, and the actual cost of energy in use can be low compared with the project management costs of improvement, possibly regardless of whether whole life costing is applied.

Where does the power lie in the specification of energy consumption standards? Previous research indicates that no single sector is to blame, but that investors, developers and architects, occupiers and valuation professionals could in conjunction move the market towards demanding more energy efficient property (Pett & Ramsay 2003).

What needs to happen for this move to take place? One suggestion – and the main angle for investigation in this paper – is that if investors found energy efficient properties desirable, then they would be built and/or existing properties refurbished. The objective of this paper is to construct a comprehensive argument for investment in energy efficient commercial property in light of the relative insignificance of energy costs in accounting terms. It describes research that took place in 2004 to identify the drivers for investment in energy efficient commercial property. First, we consider the issues of importance to investors, and examine the evidence available to investors and professionals who set property prices (valuation surveyors). Second, having discovered that the implementation of the Energy Performance in Buildings Directive is crucial to the argument, we assess the likely impact of the Directive on the market by evaluating the results of a small survey of energy and property professionals, and ask whether the link between energy certification and energy improvement in commercial property has been truly understood. Third and finally, we illustrate the potential future importance of and potential for low energy in the UK office market by examining a verified set of alternative economic scenarios and possible carbon emissions reductions. We suggest that the energy professional has to learn much more about the property business if she is to be successful in driving down energy use in buildings. Consequently, we start by discussing the importance to investors of the commercial property market.

## Price, Valuation and Calculation of Worth

The commercial property market is a global one; investors needing to find places to park their capital to make it 'work' for them have the world to choose from. This means that countries, and particularly cities, are in a competitive market to draw in investment capital from a wide range of sources. The property market in the UK is dominated by London (which has 22% of UK offices by number, 26% of the floor-space and represents 48% of the rateable value; calculated from ODPM 2004a and JLL 2001), but London competes for investment not with other parts of the UK so much as with Paris, Frankfurt, New York, Hong Kong, Singapore, Tokyo and increasingly Rio de Janeiro, Mumbai and Kuala Lumpur (DTZ 2004). The people and organisations investing are generally in one of three categories; corporate investors such as the world's major companies needing places to 'store' their profits, institutional investors, particularly insurance companies, pension funds and fund management companies who operate on behalf of smaller investors, and finally individual private investors (those who figure on the world's 'rich lists'). What they have in common is the desire for a good return on investment (ROI). There needs to be a reasonable income stream, from rents etc, and preferably, the prospect of a good resale value when they come to dispose of the property. Property is generally considered a fairly low risk investment; it is not as volatile as stocks and shares (the equity market), and consequently is an important part of an investment portfolio. It is particularly important to pension fund managers and to insurance companies, who need to have a fairly predictable income over a long term; property investment allows them a considerable benefit in confidence that they can meet their future liabilities.

How do they decide what sort of property to invest in? There has to be an initial assessment of what they wish to achieve from their investment. This means that they can then determine the particular characteristics of any property that they might wish to invest in and therefore what it might be worth to them. This 'calculation of worth' is something that is known to the investor and is particular to his or her own strategy (RICS 1997). It is not known how many investors include the energy performance of a building as an element of worth to them in their calculation. It is understood that some companies who are constructing their own prestige office – such as the low energy, architecturally prestigious headquarters of International Netherlands Group in Amsterdam – place additional worth on energy performance because it makes a statement about their company; it displays something about their reputation. In a survey of envi-

ronmental and sustainability reports of the top one hundred companies listed on the London Stock Exchange (FTSE100), 32 measure their building energy use and 13 cite a low energy building in their portfolio, often their head office (Pett *et al* 2004). A low energy building would cost less to run, but most investors do not see the immediate benefits; for them, it is an issue faced mainly by their tenants or by owner-occupiers. Investors are looking for return on their investment. How do they find it?

The property market has properties that are for sale. They may be bought by an individual investor, or more likely by a consortium. The ‘price’ that is paid for the property may not be the price that is advertised. This advertised price is known as the ‘valuation’, and the valuation process, where an independent assessor determines the market value of a property (a market price, not necessarily the final agreed price), is the key to this paper. The valuation process is described by valuation professionals themselves as “partly an art and partly a mathematical process” (Millington 2000:107), meaning that there is a subjective element to valuation. Furthermore, very different methodologies<sup>1</sup> are employed for each individual valuation depending on the property (e.g. how frequently it has been transacted), the data available about it, its location and the property market, and the purpose of the valuation – for example whether the valuation is intended for sale, purchase, insurance, the balance sheet, (re)development and more. The important questions are: Who sets the value on a property? What do they know about its energy performance? How does this affect the value?

### Identifying the effect of energy efficiency on valuation

In the UK and Europe, valuation surveyors are bound by professional standards cited in the UK by the Royal Institution of Chartered Surveyors (“Red Book”, RICS 2003) and in Europe by The European Group Of Valuation Agents TEGOVA. RICS also promotes an international standard (“Blue Book”). In the USA the methodology used is more likely to be mathematical; in Europe a method comparing properties with a standard is more likely to be used (Preston, pers. comm. 2004<sup>2</sup>). Energy use or energy efficiency simply does not appear in these standards, or in models for valuation. For investors concerned with the impacts of climate change on buildings, this is an omission that needs rectifying (Russell, pers. comm. 2004<sup>2</sup>).

The main issues that are taken into account when determining whether a building is of ‘investment quality’ are location, condition, design, size and quality of the floorspace, amenities and service, adaptability to different tenants’ requirements, and transport communications (Millington, op cit). Some elements of these may be affected by energy issues, including design, amenities and (often negatively) adaptability. The problem with adaptability is that with current technology there is usually a trade-off between holisti-

cally calibrated low building energy systems and subdivision of space into energetically independent offices or meeting rooms. Nevertheless, there are a number of important areas where energy issues can positively affect the ‘investment quality’ of a building. In the top ten office procurement criteria according to Gibson (2000)<sup>3</sup>, there are three – ranked fourth, ninth and tenth – which can be considered to be enhanced in a low energy office. First is “other occupational costs”, which includes energy costs. Second is the “opportunity to promote branding and identity” – achievable mainly for occupiers conscious of their environmental and sustainability impacts. Third and final is an “inclusive package of real estate, fit out and services”; in a low energy office, active building energy management is likely to be an integral part of lease agreements. Should any of these three criteria increase in importance, then there exists already a lever for low energy to be reflected in the valuation of an office building.

What actual evidence is there on the valuation of low energy properties? An attempt was made to answer this question by examining published case studies and buildings cited in other publications (including environmental reports) in the UK. Valuation data is held for many, but not all, properties in the Investment Property Databank (IPD). This enables property professionals to access anonymous data on and research into various aspects of the property market, including trends in prices, rentals, void rates and turnover. However there is no central record of energy performance of buildings. Working with IPD, the authors attempted to match the candidate low energy offices with valuation data. The aim was to compare low energy offices in cohorts based on location or type, with their peers, to see whether they were valued more highly, the same, or even lower, as there was some thought that low energy offices with ‘new’ technology might be seen as more risky.

The outcome of this work was highly disappointing as no conclusions could be reached. Of the 40 properties we identified, only eight had records in the IPD, and only four could be grouped into a sufficiently meaningful group (a single location near to London Heathrow airport). With so few data on valuation, we did not press on with the task of identifying their energy performance.

So energy efficiency is not currently considered in valuation, and energy performance data is not currently recorded. What might affect these barriers?

### The drivers for improvement of energy efficiency due to the EPBD

The most imminent driver is the requirement of the Energy Performance of Buildings Directive (EPBD) for energy performance certificates. For the first time, commercial buildings will be required to have a standard energy assessment and a certificate that allows comparison of performance between properties. Some actors believe the existence of certificates, and more importantly their public display, will

1. Methodologies include *comparative, contractor's, residual, profits, investment, discounted cash flow* and *mortgage* For further information about these see Millington (2000).

2. See “Acknowledgements”.

3. The top three criteria are location, rent and lease flexibility.

cause organisations to seek improvements in order to retain their reputation, especially those who already have a high environmental or sustainable development profile (see for example Strong 2005).

To what extent is this true? In order to test this assumption a survey was carried out to assess the effect managers perceived certification and public display (labelling) would have on their energy efficiency refurbishment decisions (Pett *et al* 2004, Kaplan 2004). The survey of 28 stakeholders, most of which were from FTSE100 companies, including a small sample of investment funds, addresses their awareness of and responses to the provisions of the Energy Performance of Buildings Directive (EPBD) and the proposals current in July 2004 for translation into English law<sup>4</sup>.

The aim was 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 was self-selecting, i.e. a number of contacts were made and the individuals were invited to take part. The target group were managers involved in property procurement and energy services, so mainly property managers, energy or environment managers, or facilities managers. There was a strong bias towards financial services (eight respondents) and retail (four); banks and retailers responding as both retail and office users. The views of investors and suppliers, referred to as the 'direct investor group', were provided by two fund managers, two socially responsible investment<sup>5</sup> (SRI) analysts and two property companies.

The questions asked fell into three groups: assessing the current level of awareness of the EPBD; whether certification and labelling would lead to an increase in the demand for energy efficient buildings and reductions in energy consumption in existing buildings, and finally, where improvements in energy efficiency were predicted, the factors driving change.

The majority were broadly aware of the EPBD. Contextual questions revealed that energy efficiency is currently a low priority when acquiring buildings, for 25% of the end-user group it is not considered at all.

Once certificates are available under the EPBD, end-users predicted that 47% of office users and 40% of retail users are likely to seek to acquire more energy efficient buildings; a further 32% of office users and 40% of retail users predict a marginal likelihood. The lower response for retail is attributed to the higher priority attached to location. In discussion, a number of participants expressed the view that other business needs would prevail. The view of direct investors was that the effect of the Directive's requirement for energy certification would be low, in particular in relation to retail. Representatives of both groups thought that there would be a greater impact on new developments than existing buildings. Public display of certificates slightly increased the demand for energy efficient buildings over certification alone<sup>6</sup>.

With regard to energy consumption, responses to contextual questions showed that energy efficiency is a higher priority for running existing buildings than in acquiring

buildings. 39% of office users and 60% of retail users predicted that certification is likely to motivate them to seek improvements in energy performance; a further 33% of office users and 30% of retail predict a marginal effect. A distinction was made between minor changes and refurbishment measures; the latter were viewed as disruptive to business. The direct investor group predicted less of an effect for offices and none for retail; again they were responding in a wider context. The public display of certificates was also predicted to have a greater impact on the management of existing buildings than on the choice of new buildings. Ninety per cent of both end-user categories predicted a possible or likely effect. It was noted that a financial incentive to increase energy efficiency on refurbishment would drive increased demand.

In general, the drivers for companies were: reputation with institutional investors; competition between peers; raised internal awareness and financial incentives. Whether public display will apply to commercial end-users in the UK is yet to be determined. If it is not required, certificates will only be issued when buildings change hands. As this applies to only a small proportion of buildings each year (5-10%), the effect on existing buildings is likely to be limited in the early years. Key drivers were associated with investment value, either directly or indirectly. If a link between energy performance and value were proven to exist, then certification and labelling would assume some significance. Two of the participants expressed concern about the risk that tenants may demand better energy ratings in the future and that ratings could come to be seen as a proxy for quality.

The results suggest that, amongst this leading group, certification and public display will lead to a small improvement in energy efficiency in buildings and increase the likelihood of energy performance featuring as a criterion.

Many interesting points were raised in discussion during the interviews; in particular, whether energy certification would result in increased rental income. Some stakeholders have been concerned that their interest in various environmental sustainability issues when procuring property was increasing the rental premium being asked (St Lawrence, pers. comm.). The responses to the survey interviews suggest that certification will present potential tenants with the information required for a negotiation over rental, so that a poor energy certificate (obviously implying increased expenditure required on fuel bills) runs the risk of reduced rental terms. This risk that poor energy performers might actually reduce their return on investment, especially against that forecast, is an important finding.

### Will the EPBD promote change in energy efficiency?: The market diffusion curve for certificates

As indicated above, any change driven by certification is only likely to take place at the rate at which certification

4. In the UK, energy is covered by UK legislation and building standards are a devolved issue, hence the relevant proposals for the survey of mainly London based companies was English law

5. SRI involves investment according to stated ethical criteria, and is entirely self-regulating.

6. A five percentage point increase; in other words approximately 85% of office users and retail users marginally likely to likely to acquire more energy efficient buildings.

spreads, which is induced by the two key trigger events of purchase and lease renewal.

Data for the commercial sector are, as previously stated, scarce and unreliable, although the views of property professionals consulted compare fairly closely. In view of this, rather than making specific claims on the rate of certificate diffusion, a model was devised so that various parameters could be input and varied to identify the rate of market diffusion (ACE 2005). The parameters considered are: the percentage of commercial property with lease lengths of five, ten, 15 and 25 years respectively, with the balance of 100% to be owner-occupied; the percentage of renewals that will switch to a shorter lease in each band, the rate of new construction and the rate of demolition (fixed in the first five years to give the current net increase of 2% per year). Starting from the total number of commercial offices buildings according to Government Statistics (ODPM *op cit*), a picture can be built up, as shown in Figure .

In this parameter set, it can be seen that 80% of commercial offices have certificates by around 2010, and 100% certification is achieved in 2021.

It is important to reiterate that Figure 1 only shows the rate at which buildings are energy-certified – the first time where owner-occupiers and landlords have evidence of the energy performance of their property. It does not follow that energy efficiency improvements will be made. Only if owners are convinced of the value of good energy performance will they make the effort to improve their property before the first official certificate is issued, as the most appropriate time to make improvements is at the time of a refurbishment, which often coincides with changes of lease. The im-

pact on new build is continuous – the energy performance of new construction will be promoted through the Building Regulations.

Therefore, the recognition that good energy performance provides a tangible business (and investor) benefit is crucial because it will most likely strengthen the intended effect of energy certificates: to provide continual impetus to improve energy performance beyond the minimum requirements.

### Scenario analysis: potential future demand for low energy offices

#### METHOD

In order to begin to build an argument for valuation professionals and investors to incorporate low energy considerations into their business practices, it is necessary to gain an idea of the potential effects in the longer term on return on investment in and future value of low energy offices. Pett *et al* (2004) approached this task by examining the concept of ‘risk premium’ or future value. This meant identifying the issues which can make low energy offices a better or worse investment risk than the ‘standard’ office, taking into consideration regulatory, economic, social and environmental risks associated with office markets and valuation. The effects on six broad factors, listed below, affecting the market for low energy offices were assessed through the development of alternative futures based on the internationally peer-reviewed Royal Institution of International Affairs’ “Open Horizons: Three Scenarios for 2020” (RIIA 1998) and the Cabinet Office Performance and Innovation Unit’s

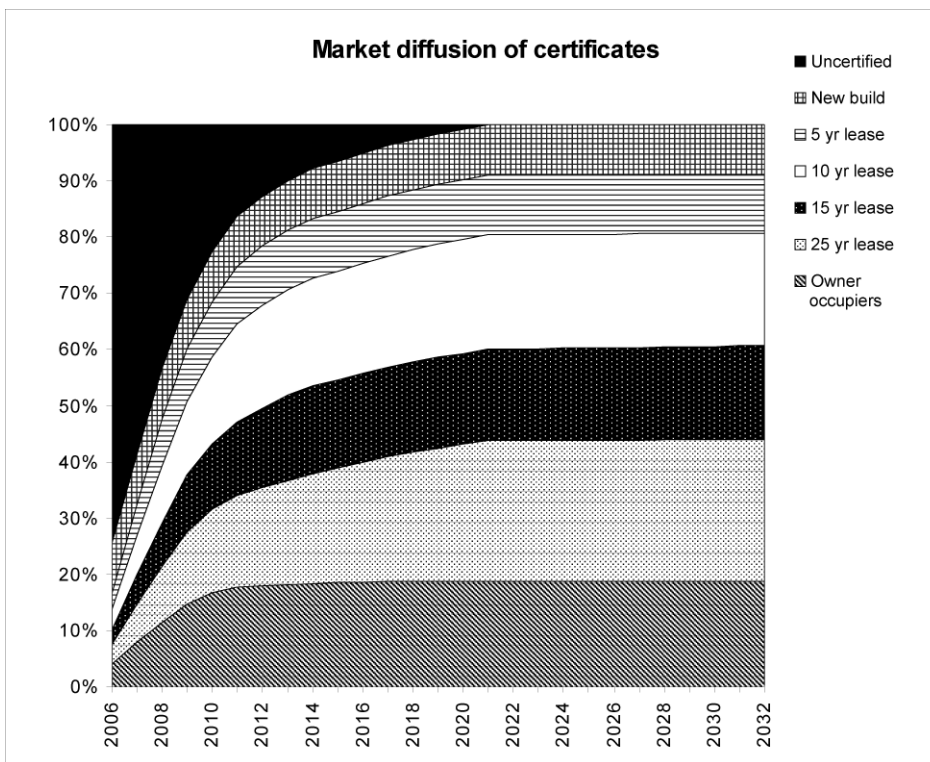


Figure 1. Market Diffusion of Certificates for parameter set A. Parameter set A: new build 10%, demolition 8%, 25 year leases 30%, 15, 10 year leases, owner-occupied each 20%, five year leases 10%.

“Energy Scenarios to 2020” (PIU 2001), developed to inform the UK’s energy policy white paper. The six factors assessed 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 importance placed upon the issues

The three RIIA scenarios were integrated with the most plausible and fitting PIU energy scenarios to flesh out the energy policy detail, as illustrated in Table 2.

In the RIIA 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. In “Wise Counsels”, society has gone one step further and succeeds in strategically managing complexity and risk, achieving desired outcomes.

It must be stressed that the narrative texts of the following three 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 of the six factors.

## 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,

**Table 2. Scenarios developed and taken forward.**

RIIA scenario	Energy policy context
“Atlantic Storm”	“Provincial Enterprise”
“Market Quickstep”	“World Markets”
“Wise Counsels”	“Global Sustainability”

**Table 3. 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

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.

### Market Quickstep

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 levels are high. Employees and employers need to be flexible and adaptable in terms of the skills required of them and their location of work. 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. Traditional office hubs and clusters remain the most desirable places for making business, but these are likely to represent a much closer fit to the activities of their oft-changing occupiers. Furthermore, the prestige of where such hubs and clusters are located is less important than access to good transport and communications infrastructure. There are no radical changes to the current trajectory of energy policy and legislation; energy markets are fully liberalised, which minimises the cost of energy – so low energy is not a priority concern for this reason. Most businesses are concerned about their reputation in terms of corporate social responsibility. Any serious action undertaken by businesses is voluntary, however; there are little to no statutory requirements on business to go beyond minimum sustainability standards. Nevertheless, because of the rapidly growing importance of brand identity and especially reputation in competition,

many businesses do make considerable sustainability efforts. The stakeholders of business are usually well-informed about sustainability issues and are often able to 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. In this context, 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.

**Wise Counsels**

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.

**SUMMARY**

The common thread through each of the scenarios assessed is that low energy offices are likely to become more important, but via different pathways. In “Atlantic Storm” they become more important because of concerns over energy security and self-sufficiency, but reduced growth in the office sector may mean that demand for low energy offices is likely the lowest in this scenario. In “Market Quickstep”, the main factor increasing the importance of low energy offices is

**Table 4. Market Quickstep 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

**Table 5. Wise Counsels 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

**Table 6. Relative importance of key factors driving the demand for low energy offices.**

	Atlantic Storm	Market Quickstep	Wise Counsels
Economy / employment level	3	1	2
Employment location	3	1	2
Energy context	3	2	1
Business commitment to SD	3	2	1
Importance of business reputation	3	1	2
Societal awareness	3	2	1

business reputation, driven primarily by a civil society can effectively exert pressure on businesses to be accountable for their actions. Finally, in “Wise Counsels” the underlying most important factor is a consensus on the need to act to mitigate climate change that includes the business sector.

More formally, Table 6 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”) 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.

With reference to the top ten office procurement criteria (Gibson 2000) cited earlier, each scenario presents a set of circumstances that will change their relative importance. In particular, the three criteria affected by a low energy office, i.e.

- other occupational costs,
- the opportunity to promote branding and identity
- and inclusive package of real estate, fit out and services,

are affected in different ways by each scenario. Under “Atlantic Storm”, office procurement criterion 1 is likely to increase in importance relative to the others in the top ten, but criteria 2 and 3 would most likely diminish in relative significance. On the other hand, the opportunity to promote branding and identity may make the biggest rankings jump under “Market Quickstep” whereas inclusive packages could become the most significant of the three under a “Wise Counsels” type scenario. In summary, a multitude of arguments can be made in favour of low energy offices being a better risk. In lieu of the relationships of the various stakeholders involved in commercial property, especially investors and valuation professionals, it is important to ensure that each stakeholder group can perceive and understand the benefits to them of a low energy office, necessitating that the arguments in favour are tailored to each group’s interests.

### **Need for promotion of potential benefits to valuation professionals and investors; the business argument**

This paper focuses in particular on investors and valuation professionals; investors because they hold the resources, and

valuation professionals because they relay information about the commercial property market to investors. In order to maximise the potential for increased take-up of low energy commercial buildings likely to be triggered by the Energy Performance of Buildings Directive coming into force, it is of central importance that investors and valuation professionals understand the benefits of low energy offices in their terms. It is nevertheless important that the other stakeholder groups, such as occupiers, facilities managers, developers, property agents and policy makers can simultaneously grasp the merits of low energy offices so that sustained change in the commercial property market can be achieved. But it is the investors and valuation professionals that can generate some real leverage to transform the market for low energy offices.

Investors stand to gain a considerable first mover advantage, both by reducing the amount of energy inefficient property in their portfolios before they become less attractive to other investors, and by building a low energy portfolio before low energy characteristics become recognised in the valuation process. Exposure to property investment risks associated with energy security uncertainty and climate change and resulting tightening of carbon emissions legislation and increases in insurance premiums can be reduced through investment in low energy offices. Furthermore, low energy offices may attract increasingly prestigious tenants, tenants aware of their impacts and legislative commitments, thus contributing to reducing void rates as well as justifying higher rental returns compared to ‘standard’ offices.

Valuation professionals need to be able to convey to investors the signals that the Energy Performance of Buildings Directive and an increasing number of highly regarded and energy conscious companies are sending to the market for commercial property. Competence, accuracy and the setting of standards and benchmarks are the pillars of the valuation profession, and given the imminent requirement of building owners to produce an energy certificates, there is already a simple tool waiting in the wings for valuation professionals to incorporate energy considerations into their practice. This need not necessarily be in monetary terms, but at a minimum energy certificates must be brought to investors’ attentions because of the possible implications for return on investment and future value.

So why should these audiences take note of the energy performance of buildings?

- 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.
- 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 will be increased demand for low energy offices; 32 of the top 100 UK companies measure their building energy use, and at least thirteen have a low energy office in their portfolio. Furthermore, if investors’ strategies include ethical, environmental or sustainable development criteria, they should consider whether the energy performance of their property portfolios undermines or supports these.

### Possible impact on carbon emissions from commercial buildings

If investors, valuation professionals and others become convinced of the value of low energy property, and so every opportunity is taken to make commercial buildings more

energy efficient, what will the impact be on carbon savings, and how quickly will they accrue?

The model used in Figure 1 can be extended and developed to take account of decisions made at lease break points. As with parameter choice for the market diffusion curve, so can a number of options be presented for energy efficiency improvements. The carbon saving model therefore offers the user the opportunity to test hypotheses with varying rates of take-up of improvements and degrees of improvement over the ‘average’ office emissions.

The model in Figure 2 shows the carbon saving based on the same rate of certification applied in the market diffusion model. Three types of user specification for improvement are applied: ‘Minimalist’ take up is assumed to be the regulatory minimum, which is carried out only after the first performance certificate is issued. Refurbishment is assumed to take place at the next certification date, and energy performance improved to the level required by the Building Regulations. ‘Enlightened’ and ‘Leading Edge’ improvements are carried out at every refurbishment by those convinced of the value of good energy performance. The percentages of each take-up attitude can be inserted to see how the carbon saving is affected.

The percentage improvement for each approach in 2006 is estimated from the consultation document on the Building Regulations (OPDM 2004b) and previous ACE work (Wade *et al* 2002); 4% for the Minimalist approach, 30% energy efficiency improvement for the Enlightened, representing all appropriate cost-effective technologies, and 48% for the Leading Edge best practice plus demonstration approach. Later (five year review period) percentage improve-

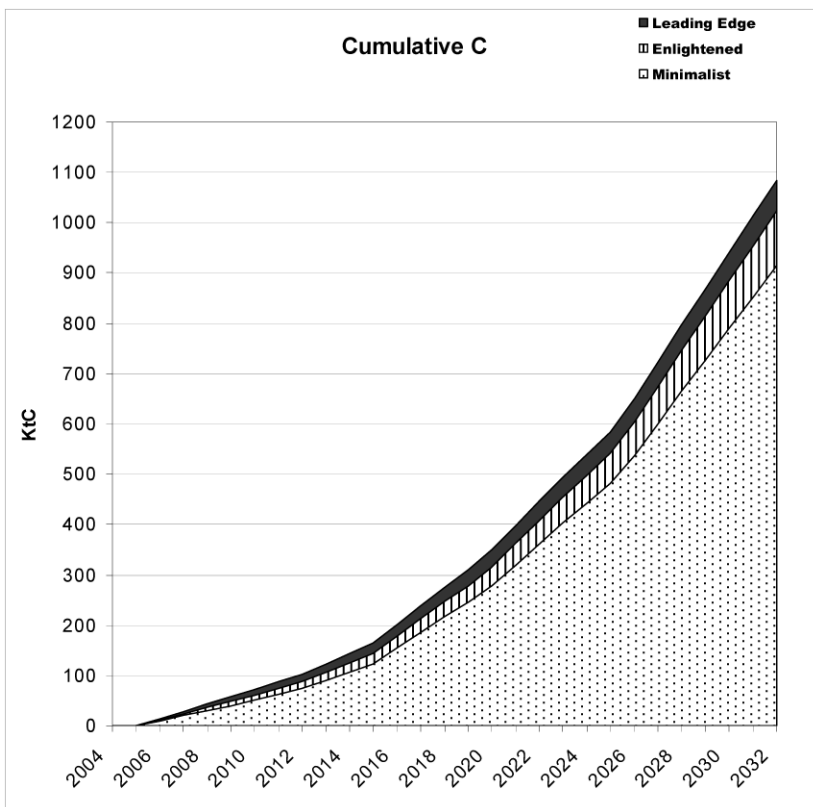
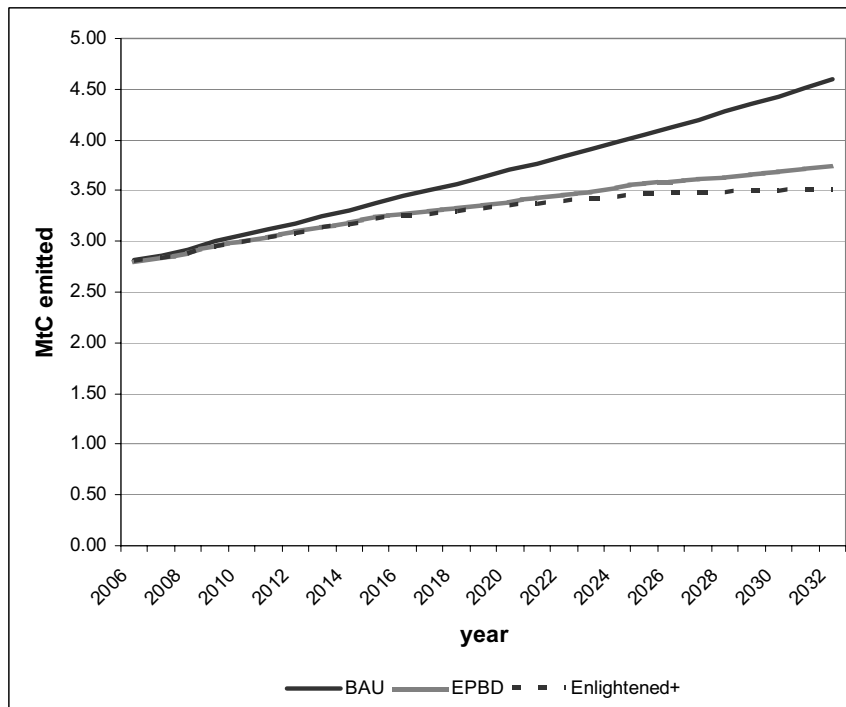


Figure 2. Cumulative carbon saving from energy improvements as specified in the model.



**Figure 3:** Emissions from offices – enlightened practice compared with business as usual (BAU).

ments can be tested by the user (ACE 2005). The total carbon saving from Enlightened and Leading Edge improvements could be ascribed to energy, property, investment and building professionals' work to promote awareness of the value of good energy performance in commercial offices.

This example takes a cautious view that 1% of investors/owners are Leading Edge and 10% are Enlightened, but even this may be too much. It identifies how little saving is made until at least 2016, when by our estimation using the information in the scenarios, more attention is paid to office energy use as the benefits become clearer. On second and subsequent certification, substantial improvements may be made.

The overall effect on emissions can be compared with a 'business as usual' approach as shown in Figure 3.

In this graph, the bold line shows the emissions that would continue to be made if no change was made to existing property and if new buildings had the same emissions as the average at the start of the period. The shaded line (EPBD) shows the reduction due to the minimum implementation of the Directive through Building Regulations for both new build and refurbishment. The dotted line shows the improvements made for the stated scenario. The graph shows that by 2026, in this scenario, emissions would have increased by 50%. In contrast, the effect of the EPBD is to limit this rise to +28%, and at this level of take up by enlightened investors, emissions increase may be limited to 21%.

There are many uncertainties in this model, and a number of different scenarios can be explored to allow greater adap-

tation to the property professionals' expectation of market behaviour. However it should illustrate to energy professionals the nature of the timescales involved in dealing with change to commercial property infrastructure, and that change will occur only if the market takes up the challenge presented.

## Conclusions

Due to the cost of energy forming only a small proportion of the overall costs of running a business (in London frequently just 1-2% of rent alone<sup>7</sup>) in the commercial sector, energy savings alone do not generate sufficient interest in the take-up of low energy offices. However, low energy offices can achieve more than just save energy, for investors and occupiers alike. They can promote a positive corporate image and attract correspondingly good tenants, they can be a low risk component of a sustainable investment strategy, prepare for and pre-empt toughening energy use and climate change legislation and even help minimise the risk of disruptions to energy supply. On current trends, all of these benefits are likely to heighten in importance, enhancing the potential for improved return on investment and increased future value.

The problem is that at present, unless already aware and highly committed, investors and occupiers have no means by which they can differentiate between a low energy and a 'standard' office. Low energy simply does not show up on the valuation radar. The Energy Performance of Buildings Directive will initiate an opportunity for change by introducing the requirement for energy certification, but energy

7. EiBI, *op. cit.*

certificates run the risk of becoming merely another bureaucratic process, another piece of paper unable to affect behaviour.

Given the anticipated rapid diffusion of energy certificates and the increasing frequency of opportunities for achieving energy and carbon emissions savings due to the increasing rate at which occupants move to a new property, there is simply too much potential to leave untapped. It is absolutely critical that valuation professionals exploit their position and the introduction of energy certificates to convey low energy information to the market place and investors' decision-making processes, both to reflect the market that is beginning to emerge, and to help foster it. Maybe then there will be more tea and biscuits for everyone.

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Building energy performance benchmarking increases awareness and enables stakeholders to make better informed decisions for designing, operating, and renovating sustainable buildings. In the era of nearly zero energy buildings, the more. Building energy performance benchmarking increases awareness and enables stakeholders to make better informed decisions for designing, operating, and renovating sustainable buildings. ABSTRACT This paper presents the development and evaluation of the Belgrade Domestic Energy Model (BEDEM) for predicting the energy consumption and carbon dioxide (CO<sub>2</sub>) emissions of the existing housing stock. The distribution of energy more. PDF | GRAPHICAL ABSTRACT Highlights i. Low energy system implemented for a Passive House located in a zone with a temperate climate. ii. The system | Find, read and cite all the research you need on ResearchGate. This paper is focused on the performance of the building in terms of energy demand for a passive house simulated using EnergyPlus software. The simulation results were compared. Energy levels considered when defining energy performance of a building. Elements taken into account for energy performance calculation. The use of energy in buildings represents a large share of the total end use of energy. In the United Nations Economic Commission for Europe (UNECE) region, buildings are responsible for approximately one third of total energy consumption and account for almost 40 percent of CO<sub>2</sub> emissions from combustion. Existing building energy standards in the UNECE region vary from voluntary guidelines to mandatory requirements, which may apply to one or many building types. To boost energy performance of buildings, the EU has established a legislative framework that includes the Energy Performance of Buildings Directive 2010/31/EU (EPBD) and the Energy Efficiency Directive 2012/27/EU. Together, the directives promote policies that will help achieve a highly energy efficient and decarbonised building stock by 2050. In particular, the Directive amending the Energy Performance of Buildings Directive (2018/844/EU) introduces new elements and sends a strong political signal on the EU's commitment to modernise the buildings sector in light of technological improvements and increase building renovations. The Commission has introduced a renovation wave of public and private buildings, as part of the European Green Deal.