

Review of the regional Town Planning requirement for on-site renewable energy generation and its impact on new commercial developments in Central London.

by

Manon Stockhammer

This thesis is submitted in partial fulfilment of the requirements for the degree of Master of Science in Built Environment from the University of London.

Bartlett School of Graduate Studies
University College London
September 2008

UMI Number: U594134

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.

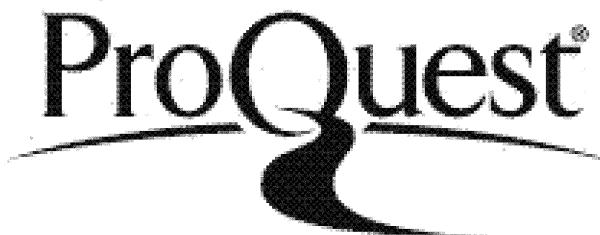


UMI U594134

Published by ProQuest LLC 2013. Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code.



ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Abstract

This thesis reviews the regional town planning policy requirements to provide on-site renewable energy generation, aimed at reducing carbon emissions, and assesses their impact on commercial developments in Central London.

A critical review of the current policies and regulations, of different renewable energy technologies available, and of the characteristics of sustainable building design also form the base of the thesis. Interviews were conducted with property professionals and questionnaires were issued to understand how different occupational groups, involved in the design process of office buildings, deal with and judge the requirement for on-site renewable energy generation.

The findings from these interviews and questionnaires indicate that the concept of carbon reduction is widely supported and understood, but the individual regional policies with different requirements were considered to be inconsistent and at times perplexing. In addition, concern was raised in regards to the prescriptive nature of the policies and the constraints faced by office developments in dense urban locations like Central London.

This thesis ends with recommendations to make existing policies less prescriptive and to extend the legal framework for carbon reductions nationwide by amending current Building Regulations. It is contended that aside from such legislative measures, developers, tenants and other stakeholders in the urban realm should be better informed and educated as part of the paradigm shift needed as to what constitutes an exemplar office building.

Keywords: *on-site renewable energy generation, non-domestic building, carbon emission reduction, Merton Rule*

Thesis word count: 9925

Table of Content

1. Introduction	4
1.1 Content and Aim of the Research	4
1.2 Methodology and Scope	5
2. Literature Review	5
2.1 Legislation, standards and policies in England	5
2.1.1 Overview	5
2.1.2 Critical Appraisal of Regional Policies	11
2.2 Renewable Energy Technologies	16
2.3 Sustainable Design of Commercial Buildings	21
3. Procedure of Data Gathering	25
3.1 Scope and Aim of Data Gathering	25
3.2 Analysis of Primary Data and Results	27
4. Summary and Conclusions	39
5. Recommendations	41
6. Reference literature	43
7. Appendices	
I. Extract of Reviewed Policies	
II. Renewable Energy Technologies	
III. Interviews & Completed Questionnaires	

Table of Figures

Figure 1	Calculation of carbon dioxide savings	9
Figure 2	CO ₂ saving in relation to energy efficiency measures	13
Figure 3	Growth in electrical generation from renewable sources since 1990	16
Figure 4	Breakdown of CO ₂ savings for scenario 5	18
Figure 5	Breakdown of capital costs for scenario 5	18
Figure 6	Fully glazed office buildings in Central London	22
Figure 7	Numbers of proposed installations by renewable technology	32
Figure 8	'Circle of Blame' in the property industry	40

1. Introduction

1.1 Content and Aim of the Research

In the last 10 years awareness of climate change has increased exponentially and governments are highly committed to taking actions to combat carbon emissions which are seen as a major threat to ecosystems and future generations (Stern, 2008). The Kyoto Treaty ensured commitment from Governments worldwide in the battle against climate change including the European Union which set a target reduction for CO₂ emissions of 22% by 2010. As part of this agreement the UK Central Government has set a target of 10% of all energy to be generated with renewable energy sources by 2010, and this target will increase to 20% by 2020. As a result various policies have been introduced to reduce carbon emissions and one area of particular concern is the built environment, which is responsible for 20% of greenhouse gas emissions worldwide (Stern, 2008). In London commercial buildings are responsible for approximately 30% of the overall energy demand and carbon emissions, and residential buildings for approximately 45% (GLA, 2004).

This thesis critically reviews current regional town planning policies, the London Plan and the so-called Merton Rule, both of which have embraced the use of on-site renewable energy technologies in order to reduce new developments' carbon emissions. A report published by the British Council for Offices criticised any Merton-style policy as being too prescriptive in the way the required carbon reduction has to be achieved and highlights potential problems in relation to commercial offices in dense urban locations like Central London (Foreman Roberts, 2007). These and other concerns regarding the viability and feasibility of the policy requirements are echoed across the building industry (UK Green Building Council, 2007).

The research aim of this thesis is to understand the potential implications of the requirement to integrate renewable energy technology in new commercial developments and to devise recommendations to either improve existing policies or to introduce other measures which will reduce carbon emissions from commercial developments.

1.2 Methodology and Scope

The increased uptake of renewable energy generation is a complex process involving change in multiple areas simultaneously. It affects policies and other legislative frameworks, the economy, cultural values in general as well as the lifestyles and behaviour of the individual (van der Berg & Bruinsma, 2008). Hence it is beneficial to explore the topic of the thesis in a holistic manner. The literature review evaluates policies, regulations and standards as well as available renewable energy technologies for the built environment and sustainable building design measures. In order to gain an understanding how regional town planning policies and their impact are perceived by different stakeholders within the construction industry a postal questionnaire was issued to 50 companies and the findings are analysed in the third chapter of the thesis. In addition the author carried out semi-formal interviews with professionals with different expertise and background providing a deeper understanding of the issues. Summary and conclusions are contained in chapter four and recommendations can be found in chapter five.

2. Literature Review

2.1. Legislation, Standards and Policies in England

2.1.1 Overview

This chapter provides an overview of different measures taken by the Government to influence the uptake of renewable energy applications in the UK.

According to Stern three different policy elements are needed to respond to the threat of climate change. One area is pricing of carbon through tax, trading or regulations, another area is action to remove barriers to energy saving and energy efficiency which includes educating and informing the public, and policies to support innovation and deployment of low carbon technologies (Stern, 2008). Indeed Central Government uses various approaches to promote carbon emission reductions from the built environment: through Building Regulations, town planning policies, energy policies and fiscal incentives.

The legislative framework is also influenced by and interacts with international agreements and treaties, European Union policies and law, as well as UK legislation. Local authorities develop their own policies based on strategies and frameworks from Central Government.

Points (A) – (D) below provide a summary of the different drivers promoting sustainable construction and renewable energy technologies in England.

A. International drivers:

Kyoto Protocol (1997)

In 1997 an international agreement called the Kyoto Protocol was made between industrialised countries to cut the emission of greenhouse gases responsible for climate change. The target for the UK Government is to reduce greenhouse gas emissions by 12.5% below the base year (1990) levels by 2008 – 2012 ("United Nations Framework Convention on Climate Change").

B. European drivers:

Energy Performance of Buildings Directive (EPBD)

The European Parliament published the Energy Performance of Buildings Directive in 2003 to assist in achieving the targets set out in the Kyoto Protocol by reducing energy consumption in the built environment. It has implications not only for the owner or developer of all building types, but also for the operator. The directive requires all member states to measure the energy demand in buildings by introducing agreed measurements of relative energy performance and carry out regular inspections and re-evaluations of buildings. Further it requires higher standards for upgrading larger buildings and improves the standards for all new buildings (Cheshire et al. 2007).

C. National drivers:

Planning Policy Statements

PPS 1 states that 'sustainable development is the core principle underpinning planning' and a supplement to PPS 1 was published in December 2007 addressing climate change. It supports the use of sustainable energy sources and encourages local authorities to set a renewable energy target for new developments.

In addition PPS 22 sets out the strategy for renewable energy. Clause 8 and clause 18 both refer directly to the inclusion of a requirement for new developments to generate a certain percentage of energy demand through on-site renewable energy ("Communities and Local Government").

Climate Change Bill

According to the Department for Environment Food and Rural Affairs (DEFRA) the Climate Change Bill sets a precedent worldwide by 'introducing a long term legally binding framework to tackle the dangers of climate change'. One of the key provisions will be to put the UK targets for reducing CO₂ emissions into statute thereby committing to a reduction of 60% by 2050, and at least 26% by 2020 against the baseline year (1990) levels ("Department for Environment Food and Rural Affairs").

Energy White Paper

The first energy white paper 'Our Energy Future – Creating a Low Carbon Economy' published by DTI in 2003 sets out a target of 10% of all electricity to be generated from renewable sources by 2010, increasing to 20% by 2020.

The current energy white paper 'Meeting the Energy Challenge' was published in 2007 and has four main goals which are summarised by the Department for Business Enterprise & Regulatory Reform as follows ("BERR Department for Business Enterprise & Regulatory Reform"):

- ◆ to put ourselves on a path to cutting CO₂ emissions by some 60% by about 2050, with real progress by 2020;
- ◆ to maintain the reliability of energy supplies;
- ◆ to promote competitive markets in the UK and beyond;
- ◆ to ensure that every home is adequately and affordably heated.

Building Regulations

In addition to planning policies all new developments are legally required to comply with current national Building Regulations. Part L of the Building Regulations, more specifically Part L2, refers to the consumption of fuel and power for non-dwellings and thus addresses energy efficiency and sustainability of a development, regulating for example solar gain, air-tightness and the regulated energy needed for heating, cooling and lighting.

The document specifies the maximum allowable annual CO₂ emission and provides the minimum requirement of energy savings, which is normally used as the baseline for the energy assessment required for the planning policies. The updated version which came into force 2006 is designed to reduce the regulated carbon emissions in new buildings by 20 – 25% when compared with buildings complying with the 2002 edition (Cheshire, Attenborough & Grant 2007). However it should be noted that the Building Regulation energy assessment considers only a proportion of the total energy consumption of a building, the regulated energy, and disregards any energy used by the occupier of the building (UK Green Building Council, 2007). Energy used by lifts, escalators, external lighting and computer suites are excluded from current Part L calculations (Foreman Roberts, 2007). This issue should be addressed especially as occupier behaviour plays an important role in the efficient energy use of any building.

Energy Performance of Buildings (Certificates & Inspections)

Introduced to fulfil the requirements of the European Energy Performance of Buildings Directive (EPBD) in the UK it prescribes energy performance certificates (EPC) on construction, sale or rental of a property, as well as plant inspection requirements (Cheshire et al. 2007). For public buildings the regulations also require Display Energy Certificates.

The fact that currently only public buildings require a Display Energy Certificate (DPC) has been criticised because well-designed buildings which achieve a good rating under the EPC might be operated in a way that consumes much more energy than anticipated due to occupier behaviour and this would be highlighted in a DPC (Stocks, 2008). This has been echoed by the UK Green Building Council (2007) stating that DPCs should be introduced for all non-domestic buildings to enable a comparison between design targets and achieved energy consumption, which would assist designing future buildings through lessons learned.

D. Regional drivers:

The London Plan

In February 2004 the Greater London Authority (GLA) issued the London Plan which described a strategy for all London-level planning issues together with Supplementary Planning Guidance documents (SPGs). One of the key topics in the London Plan relates to greenhouse gas emissions and thus focuses on the use

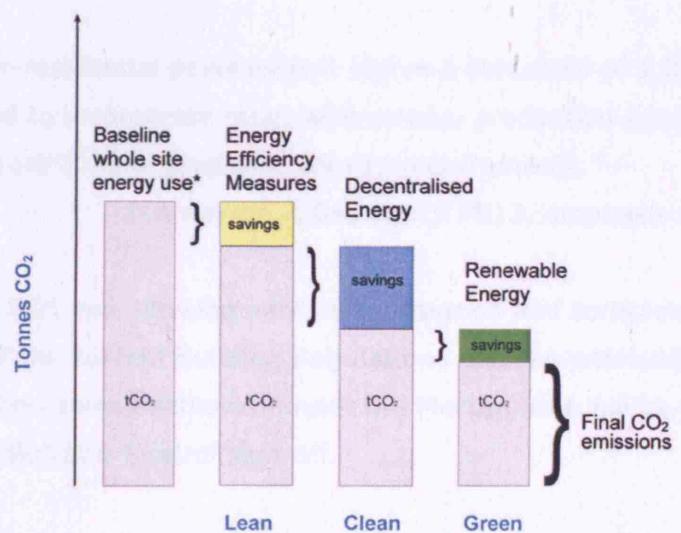
of energy, energy efficiency and implementation of renewable energy. In addition to the London Plan a further document was published, the Mayor's Energy Strategy. The overarching objectives of the Energy Strategy were identified as follows (GLA, 2004):

- ◆ reduce London's contribution to global climate change
- ◆ help eradicate fuel poverty
- ◆ contribute to London's economy by delivering sustainable energy and improving London's housing and building stock.

In order to reduce London's impact on climate change the strategy focuses on reducing London's CO₂ emissions based on objectives identified in PPS 22 (Renewable Energy). The Energy Strategy established an 'energy hierarchy' with three main principles as follows:

- ◆ use less energy = Be Lean
- ◆ use renewable energy = Be Green
- ◆ supply energy efficiently = Be Clean

Calculation of energy/carbon dioxide savings (not final)



note *calculated using current Building Regulations (at time of publication 2006) plus the CO₂ emissions associated with other energy uses not covered by Building Regulations.

** including district heating and cooling.

source GLA, adapted from the London Climate Change Agency

Diagram: GLA, The London Plan - consolidated with alterations since 2004 (2008)
www.london.gov.uk/thelondonplan

Figure 1: Calculation of carbon dioxide savings, London Plan (GLA, 2008)

The Energy Strategy also includes a specific target for energy generated by renewable sources, which was initially set at 10% of all consumed energy. However, in the draft 'Further Alterations to the London Plan' this target has been set to 20% together with other measurements aimed at ensuring new developments contribute less to climate change ("LONDON").

The Renewable Toolkit was published by the GLA in September 2004 offering guidance to developers and town planners in assessing the possibility of the different renewable energy technologies for new developments.

The Merton Rule

In October 2003 the council of Merton, a borough in South-West London, was the first local authority to include a policy in its Unitary Development Plan (UDP) that required all new non-residential developments over a certain threshold to install and use on-site renewable energy applications. According to Merton Council the main driver behind this was a local initiative to assist the UK in meeting the Kyoto commitment of CO₂ reduction, as well as the need to address fuel poverty within the borough and the aim to make businesses in Merton more competitive by lowering their fuel bills. In order for the policy to have an impact and be adhered to Merton council felt that it needed to be prescriptive and the wording of the policy reflects this:

"All new non-residential development above a threshold of 1,000 sqm will be **expected** to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements."

(LA Merton, UDP/ Policy PE13, emphasis added)

The policy requires that new developments are designed and constructed beyond the requirements of the current Building Regulations and the enforcement note states that any carbon saving achieved under the Merton Rule will be above the saving required for Building Control sign-off.

Following formal acceptance of the policy Merton council promoted the policy nationwide and established an online presence dedicated to the Merton Rule (<http://www.themertonrule.org>) to inform the public and other local authorities. However uptake by other authorities was slow until the publication of the revised PPS 22 (Renewable Energy) supporting the inclusion of such policies at local planning level. This was further strengthened by a statement from the Minister

for Housing and Planning in June 2006, which stated that 'Government expect all planning authorities to include policies in their development plans that require a percentage of the energy in new developments to come from on-site renewables' ("The Merton Rule.org – Best Practice in Low Carbon Planning", 2004).

Currently 12 out of the 32 London boroughs have fully adopted a Merton Rule-style policy in their local development strategies, and a further 8 boroughs are actively considering it in draft.

This chapter outlined the different policies and regulations in regards to CO₂ emission reduction and renewable energy. The following section provides a critical review of the two regional drivers for on-site renewable energy applications.

2.1.2 Critical Appraisal of Regional Policies

The London Plan

According to Hammer (Droege, 2008, pp. 143-172) in the last decade cities have become more interested in energy policymaking and the use of renewable energy at city level. One of the reasons for this is the growing awareness of urban sustainability issues in the context of climate change, energy price fluctuations which affect the local economy, the need for energy security and the impact of emissions on the air quality in the city. According to GLA sources, in 1999 the final energy demand of London was as high as the overall demand of Ireland and close to the overall demand of Portugal (GLA, 2004).

Resulting from the high energy use and the requirement from the Government to develop strategic plans for London, Ken Livingstone as Mayor of London decided to develop an energy strategy in 2001, which was interlinked with other strategic plans for London, addressing for example land use and transport (Droege, 2008, pp. 143-172).

The GLA has only restricted areas where it has sufficient power to overrule local authorities, one of them being Planning. Planning applications of a certain size and of 'strategic importance' require approval from the Mayor as well as from the local authority, and the Mayor's Energy Strategy requires all new developments

which have been referred to him, to reduce carbon emissions by at least 10% through on-site renewable energy sources. Although large scale planning applications play an important role in the reduction of CO₂ emissions they are only a minority of all planning applications submitted in London. As a response the Renewable Toolkit was developed, which aims to educate local authority planners about the benefits of renewable energy, energy conservation and sustainable building design, with the aim that educated planners will assess planning applications not only against local policies, but against the objectives of the Energy Strategy as well (Droege, 2008, pp. 143-172).

A study conducted by the London South Bank University and the Energy Centre for Sustainable Communities assessed the implication of the introduction of the Energy Strategy by reviewing planning applications received by the GLA between May 2004 and January 2006. The results show that the average carbon reduction anticipated through renewable energy was 9.3% and that 37% of the submitted designs claim to achieve more than the required 10% saving (Droege, 2008, pp. 143-172). As no data is available for the installed applications and their capacity, no judgement can be made as to whether the suggested savings have been achieved. The study makes no reference to the different building uses, such as residential, offices or mixed-use, which would be an important factor in regards to the carbon saving achieved with renewable energy and would enable to assess the viability for different renewable technologies for the various building uses and their differing energy demands.

However after the first year of implementation of the London Plan and Energy Strategy almost no renewable energy technologies were specified. This changed towards the middle of 2005 with a sharp increase in renewable applications and it has been argued that once planning officers became more experienced in applying the policy, the enforcement became stricter. The report also found that the submitted applications exceeded the required CO₂ savings through energy efficiency measures and the reason for this seems to be that developers and design teams have understood that a reduction in energy demand leads to a reduction in energy generated with renewable energy sources. In addition energy efficiency measures are easier to incorporate into the design and are generally more viable.

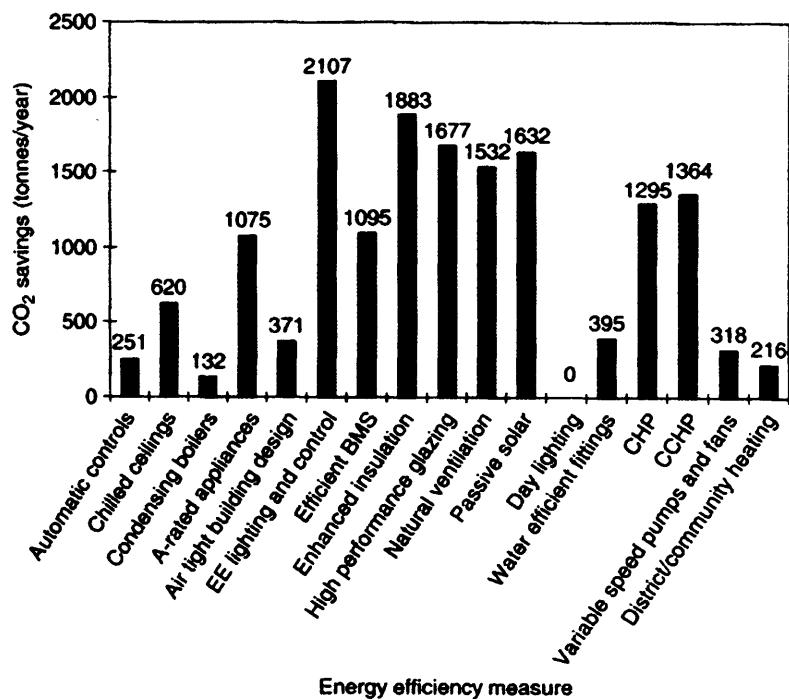


Figure 2: CO₂ savings in relation to energy efficiency measure
(Droege, 2008, pp.143-172)

The report draws a positive conclusion indicating that developers are responding positively and are engaging energy consultants or services consultants earlier in the design process to fulfil the planning requirement for an energy strategy statement, and both planners and design teams have adapted to the new requirements, developing the necessary skills and knowledge. However, it has been noted that further development is required in regards to the baseline figures used in the Renewable Toolkit and more knowledge about the compatibility of the different technologies is needed, as well as post-occupancy data and assessments to ensure the 'theoretical' carbon savings are achieved in reality (Droege 2008, pp. 143-172). In addition the sample spread of the study can be considered as too small and subsequently a further assessment of submitted planning applications is needed to understand which specific buildings types achieve the targets, in relation to building use, size and location.

In the alteration of the London Plan in 2007 it was proposed to raise the existing target from 10% to 20%, which caused strong opposition from property developers claiming that 10% is unlikely to be achieved for office developments and that currently 7% would be more common. This notion was supported by Peter Rogers, chairman of Stanhope and founder of UK Green Building Council, who stated that 'Renewables tend to work outside London, but not in'

(Rossiter, 2007). Nevertheless the increased target of 20% came into force in February 2008 and the updated London Plan states that 'boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in CO₂ emissions of 20% from on-site renewable energy generation (which can include sources of decentralised renewable energy) unless it can be demonstrated that such provision is not feasible [...]’ (Policy 4A.7 - GLA, 2008).

The target has changed and it now applies to all developments but the revised policy contains two caveats, which weakens it slightly: firstly the reference to decentralised renewable energy, and secondly the phrase 'unless [...] such provision is not feasible'.

The original version of the London Plan in 2004 calculated the energy delivered to the building via renewables (in kWh or MWh), whereas it has now been changed to comply with the calculation model used in the Building Regulations, which refers to CO₂ savings (Droege 2008, pp. 143-172). It is not stated whether the increased target of 20% is really more stringent than the 10% calculated based on the superseded method.

The Merton Rule

Since its introduction the Merton Rule has been the subject of much debate. Research by the UK Green Building Council (2007) states that those in favour of the Merton Rule argue that it is an important driver for the design of high-performance buildings as in their opinion design teams will try to achieve a large reduction in energy demand in order to reduce the quantity of renewables needed to achieve the required percentage. In addition the policy is seen to be crucial in supporting the micro-renewable energy market in the UK indirect through the private sector, which is also one point critics raise. Opponents of the Merton Rule argue that the focus on renewable energy generation, especially on-site, is misplaced and that in actual fact it leads to less carbon emission savings. It has also been said that the 'competition' between local authorities has led to an increase in percentage targets without first reviewing and investigating the feasibility, viability and practicality of doing so, thereby alienating developers and increasing opposition to the policy (UK Green Building Council, 2007).

It is generally acknowledged that the Merton Rule gave a long overdue boost to the renewable technology market in the UK, but it has also been said that more flexibility is needed to allow the experts, the designers, to find the most cost-

effective solutions for carbon saving in a holistic way. According to Sullivan *et al* (2006) planning policies should prescribe the level of carbon saving required but not how it is achieved. Otherwise there seems to be the danger that renewable technologies will be installed to satisfy planning requirements, but not necessarily used after installation (Davies & Mark, 2008).

On a more theoretical level the UK Green Building Council (2007) observed that local policy initiatives often foster innovation and act as testing ground for national policy, thereby influencing policy development from top-down and also bottom-up. However, this can lead to the creation of what can be called a 'policy-patchwork' with different targets or guidelines leading to confusion within the industry. A good example is the Merton Rule as some councils expressed their target reduction in terms of percentage of energy (kWh) and others in terms of percentage of CO₂ (kg). The property industry and the market need security and reassurance about future demands to enable investment and preparation in a timely manner (UK Green Building Council, 2007).

This chapter assessed regional planning policies in London which promote the uptake of renewable energy generation for new developments.

The Merton Rule was developed 'bottom-up' by the local authority in Merton as they felt that current legislation was not sufficient to promote energy saving measures and renewable energy technology in planning terms. In addition the GLA developed an Energy Strategy for London which also promotes the use of renewable energy generation based on key elements from the Merton Rule, but only affects major planning applications referable to the GLA.

The policies had a positive effect on the uptake of renewable energy technologies and led to increased energy saving measures for new buildings, but have been criticised as being too prescriptive and inflexible.

Both policies set a fixed percentage target which is imperative for all new developments but fails to take into account the distinct energy loads and demands of different building types. Developers and design teams have acquired the necessary skills to respond to the new policies, and the energy strategy of a building is now assessed early in the design process. However, more work is needed from the policy makers to update obsolete data currently used to calculate energy demands for buildings in accordance with the policies, and in addition post-occupancy data is required to ensure that the predicted energy usage at planning stage is achieved once the building is occupied.

The following chapter reviews the practicality of incorporating renewable energy technologies into office buildings in dense urban locations as this has been identified as a barrier to uptake.

2.2 Renewable Energy Technologies

In March 2007 the Government published the draft Climate Change Bill which outlines a framework for a transition to a Low Carbon Economy. A Low Carbon Economy is an economy with a minimal output of greenhouse gases, especially CO₂ and with less dependency and use of fossil fuels.

The UK aims to achieve this through an energy mix of nuclear power, fossil fuel plant with carbon capture and renewable energy, mainly large-scale but also micro-generation, as those can be deployed faster (Droege 2008, pp. 451-474).

In addition to the legislative drivers for renewable energy which were discussed in the previous chapter of this report, the UK also promotes renewable energy through cost grants or market-based instruments, Climate Change Levy and the Renewables Obligation. It has been pointed out that this has not led to a sufficient uptake in renewable energy generation (Droege 2008, pp. 451-474).

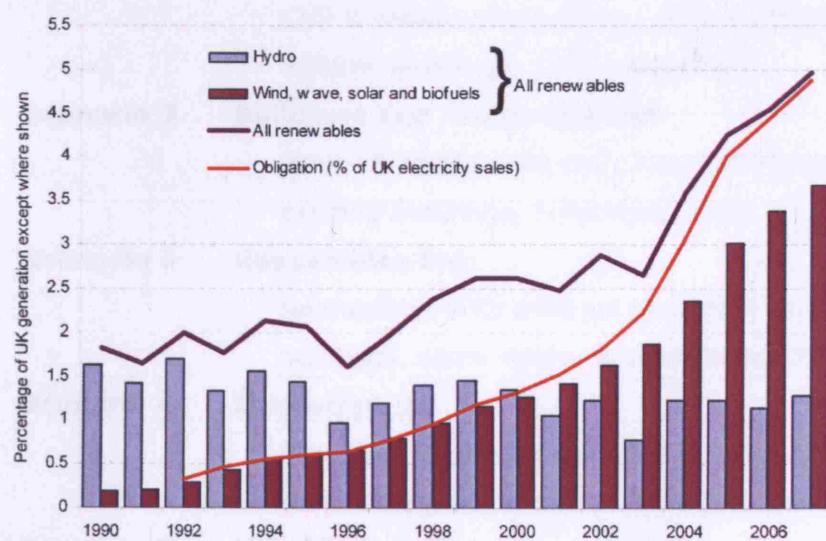


Figure 3: Growth in electrical generation from renewable sources since 1990 (BERR, 2008)

In comparison European countries which introduced a feed-in tariff, such as Germany, Austria and Spain, have seen increased deployment of renewable energy, mainly wind and photovoltaic technology, by the private sector ("Wikipedia The free encyclopaedia"). Under this system the energy suppliers are legally obliged to purchase the electricity at predetermined rates and are allowed to recover the money from the end users and it has been noted that in Austria this led to yearly cost increase of around £17 (Broe & Worthington, 2008). The feed-in tariff also ensures that it is in the interest of the owner or operator to maintain and service the installation to guarantee the system delivers the maximum energy possible, and thereby creating revenue. This is not achieved through the Merton Rule or the Energy Strategy of the London Plan. A summary and brief description of the different renewable energy technologies suitable for use in the UK is provided in appendix II.

In order to assess which renewable technologies and other energy saving measures should be employed to meet the CO₂ reduction targets the 'London Carbon Scenarios to 2026' study was conducted for the London Energy Partnership (Droege, 2008, pp. 451-474). The study modelled five different scenarios and examined those in regards to capital cost, operation and maintenance cost and heat or electricity generated or saved. The different scenarios are summarised here:

- ◆ **Scenario 1 Large Combined Heat & Power plant (CHP) led**
CHP & community heating, minimal insulation to existing buildings, 10% renewables
- ◆ **Scenario 2 Buildings and micro-CHP led**
Micro- & small-scale CHP, minimal insulation to existing buildings, 10% renewables
- ◆ **Scenario 3 Renewables led**
Renewables with minimal insulation to existing buildings, some micro- & small-scale CHP
- ◆ **Scenario 4 Insulation led**
Maximum insulation to buildings with 10% renewables, some micro- & small-scale CHP
- ◆ **Scenario 5 Hybrid scenario**
Less large CHP than scenario 1, but with more renewables and energy efficiency measures

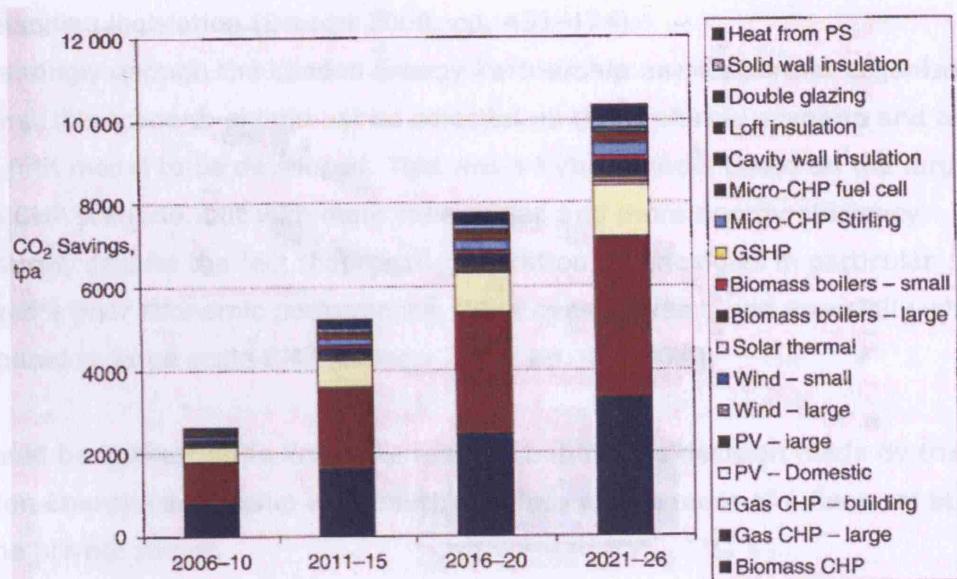


Figure 4: Breakdown of CO₂ savings for scenario 5

(Droege, 2008, pp. 451-474)

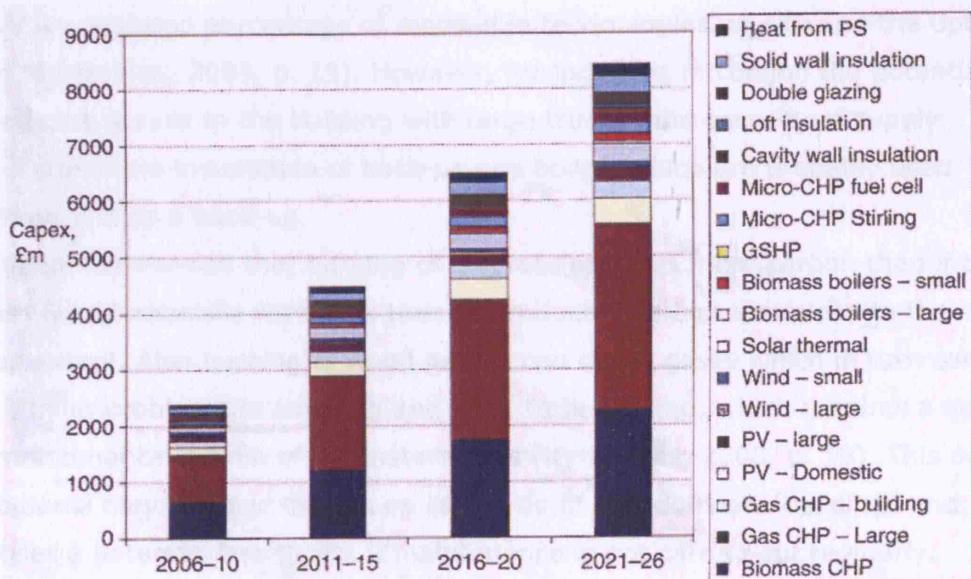


Figure 5: Breakdown of capital costs for scenario 5

(Droege, 2008, pp. 451-474)

The outcome of the study showed that all scenarios would require a substantial amount of energy generated with Combined Heat and Power plant (CHP) to achieve the target. Indeed the best economic solution according to the model is the scenario with CHP and community heating for all new build, district heating

widely implemented across London and 10% requirement of renewable energy as per planning legislation (Droege 2008, pp. 451-474).

Interestingly enough the London Energy Partnership and its partner organisations felt that this scenario should not be selected as the preferred scenario and asked for a fifth model to be developed. This was a hybrid model based on the large scale CHP scenario, but with more renewables and more energy efficiency measures, despite the fact that micro-generation technologies in particular showed a poor economic performance, even over 20 years and especially when compared to large scale CHP (Droege 2008, pp. 451-474).

It would be interesting to know the reasons behind the decision made by the London Energy Partnership as the fifth scenario places more of a financial burden on the private sector.

According to the UK Green Building Council (2007) the implementation of renewable energy generation is far more challenging from a technical and operational aspect for non-domestic buildings than for domestic. Currently the installation of a biomass boiler is seen as the cheapest and most efficient way to achieve the required percentage of renewable technologies on-site and the uptake is high (Kyriakides, 2008, p. 19). However, for locations in London the potential problems are access to the building with large trucks, and security of supply which leads to the installation of back-up gas boiler, which are probably used more than just as a back-up.

In addition it is claimed that burning of biomass releases more carbon than if the biomass would naturally rot away, thus not reducing carbon emissions to the claimed extent. Also burning of wood pellets can cause gases which in turn can cause similar problems to smoking and need to be filtered, which requires a very good maintenance regime of the installations (Kyriakides, 2008, p. 19). This adds an additional maintenance burden on landlords of non-domestic buildings and also poses a potential health risk if maintenance is not carried out regularly.

At the beginning of this thesis is a review of current renewable energy policies in the UK and other European countries and it is concluded that the UK has failed to sufficiently increase the percentage of energy generated through renewable sources. Incentives like cost grants and other market-based instruments did not lead to an enhanced uptake through the private sector, especially when compared with the feed-in tariff system employed in many European countries which has been very successful.

The Energy Strategy incorporated in the London Plan and the Merton Rule aim to extend the use of renewable energy applications integrated in new developments and thus assists in raising the amount of energy generated through renewable technologies as required to fulfil the commitments of the Government under the Kyoto treaty. However, it is argued that the integration of renewable energy technologies into buildings is challenging from a practical and technical point of view.

Central London is characterised by a very dense urban grain which leads to space restrictions for the installation of wind turbines, PV cells and solar thermal panels on the roof or on facades. Insufficient wind speed in inner city locations prevents the use of micro-wind turbines, and potential archaeological remains could hinder the application of ground source heat pumps.

It is noted that office buildings have a high demand for electricity and for cooling whereas renewable energy technologies are more viable when generating heat.

The 'London Carbon Scenarios to 2026' study concluded that large-scale Combined Heat Power (CHP) and community heating systems together with energy efficiency measures and a 10% renewable energy requirement would be the best economic option to achieve the required carbon saving for London by 2026. The report favoured CHP and community heating and not renewable energy micro-generation due to the poor economic performance of micro-generation when assessing the cost of the system in relation to the energy produced.

However according to the study the London Energy Partnership, which is advising the GLA in regards to carbon saving measures, has rejected the preferred model in favour of a model which increases the amount of renewable energy applications and energy efficiency measures and is likely to occur a higher cost.

This chapter argues that renewable energy technologies are better suited to buildings with a different energy demand than office buildings, such as residential or mixed-use developments. In addition renewable energy applications require certain building and location characteristics to achieve a good performance which is often not feasible in Central London.

In order to assess the topic of this thesis in a holistic manner the next chapter reviews energy saving measures through building design.

2.3 Sustainable Design of Commercial Buildings

Sustainable development was defined by the Brundtland Commission in 1987 as development that 'meets the needs of the present without compromising the ability of future generations to meet their needs'. As a part of this concept sustainable building design aims to reduce the overall impact of the built environment by increasing the efficiency with which buildings are using energy, water and materials, whilst at the same time reducing waste and pollution. The most important measure is passive solar design, which considers building orientation, thermal mass and ventilation.

According to Buttera (Droege, 2008, pp. 329-364) low energy building design can be maximised if it also considers urban design in addition to building design, as this increases the potential energy saving through building orientation and density. Researches shows that buildings constructed along the north-south axis require more energy for heating and cooling and that buildings developed too close to each other have insufficient natural daylight and thus require more artificial lighting, which in turn can increase internal heat gain and necessitate more cooling (Droege, 2008, pp.329 - 364). According to the Department for Trade and Industry in 2005 commercial buildings were responsible for 12% of the annual CO₂ emissions in the UK (Turrent, 2007). For most of the time offices do not require heating as electrical fittings, such as computers and monitors produce enough heat. Most of the energy demand for offices is therefore due to cooling requirements.

Careful consideration of the building orientation and shape, together with the internal configuration enables cross ventilation and improves the natural daylight to the internal areas and at the same time reduces solar gain (Turrent, 2007). However, in dense urban locations the footprint of a site generally equals the building footprint and the surrounding buildings affect the shape, height and orientation of a new development. In addition, efficient space planning which suits the building form as well as the requirements of an occupier, such as a dealer floor, is often not compatible with the ideal dimensions for cross ventilation or side ventilation (UK Green Building Council, 2007). Noise, dust and security issues might further prevent the utilisation of natural ventilation for buildings located in city centres.

The need for air conditioning in offices can also be reduced through the use of thermal massing, high level of insulation and air-tightness and the possibility of night time cooling (Turrent, 2007).

Facade design is another important element in passive design, as the position and size of windows and the use of external shading devices affect solar gain. In London and other world cities the current architectural style for commercial buildings favours fully glazed buildings. But those buildings require special glazing to reduce solar gain in summer and to reduce cold drafts in winter (Droege, 2008, pp. 451-474).



Figure 6: Fully glazed office buildings in Central London

Part L2 of the Building Regulations states that a glazing ratio of 40% should be used as good practice design for commercial buildings, but there is little evidence that it is adhered to and a glazing ratio of 60% seems to be more common (UK Green Building Council, 2007). Besides, the positive effect of fully glazed office buildings with views to the outside and natural daylight to the internal space is generally undone through the use of blinds to stop glare onto monitors, or for privacy reasons. Nevertheless designers should always consider passive design first and foremost to reduce CO₂ emissions as any potential saving is larger than with renewable technologies (Fisher, 2007, p. 22).

High density of office occupation, both in terms of the number of people within a building and the length of working hours, increases the energy demand for heating, cooling and lighting and is often higher than anticipated at design stage.

But this would result in a positive overall effect when calculating carbon emissions per person as the building is used more efficiently (UK Green Building Council, 2007). For developers the overall building efficiency is key to the property value and therefore the focus has always been on maximising the 'let-able' floor area, the net-to-gross ratio, for example by minimising the thickness of the external façade construction. Requirements for higher thermal massing or high performance façade constructions could thus lead to a loss in internal floor area, and studies show that this could result to around 5% area loss for a typical deep plan office building in Central London (UK Green Building Council, 2007).

Together with the continuing long-term trend of construction cost increasing faster than the general economy the profitability of commercial office buildings, especially speculative, will remain under pressure. In addition to the effect of the credit crunch with more available office space and falling rental values, the increased cost for low carbon requirements will potentially affect levels of rent and the commercial property cycle (UK Green Building Council, 2007).

It has been said that a paradigm shift in the market is needed, especially concerning the speculative office market. According to a property trend survey conducted by GVA Grimley in 2006 occupiers are starting to recognise the benefits of sustainable buildings with lower utility bills, improved staff productivity and satisfaction and are prepared to pay 'marginally more' in rent (Turrent, 2007). However, a recent survey conducted by Knight Frank stated that the current economic pressure has changed the priorities of occupiers looking for new office space. According to the survey the key factors are now rental cost, followed by retention of key staff and then lease flexibility. Energy efficiency dropped to the bottom of the list at rank 10 (Knight Frank, 2008, pp. 1-3).

This chapter evaluated sustainable design for office buildings as a measure to increase energy efficiency. It is noted that the form and configuration of a floor plan, the amount of glazing and thermal mass of a building can play an important part in reducing the overall energy consumption. This is achieved through the use of natural ventilation, solar shading and the use of building mass for night time cooling. But it is argued that in dense urban locations like Central London it is not always possible to optimise the building orientation and form, and that noise, dust and security issues prevent the use of natural ventilation and the utilisation of open-able windows.

In addition the current architectural style of fully glazed office buildings amplifies this problem and a paradigm shift is needed to more solidity in façade design.

It is argued that the drive for higher building efficiency has led to minimal building envelope thicknesses and that the requirement for energy efficiency will have an adverse effect and increases the envelope thickness, thus losing valuable floor area for the developer. Together with the current economic pressures of rising construction cost and uncertainty in the market, speculative commercial office development will struggle to remain profitable.

Furthermore a recent survey among Central London office occupiers shows that due to the current economic situation energy efficiency is now the least important factor when looking for office space and the rental value is most important. This survey result is contradicting a survey carried out in 2006 which concluded that occupiers are recognising the benefits of energy efficient buildings and it reflects the impact of current economic pressures on occupiers.

The next chapter reviews the results from questionnaires and interviews against the findings of the previous chapters, which assessed regional policies, difficulties in incorporating renewable energy technologies on-site and alternative energy saving measures through building design.

3. Procedure of Data Gathering

3.1 Scope and Aim of Data Gathering

This section explains the process of gathering data through postal questionnaires and semi-formal interviews with property professionals. The aim was to collate views of different stakeholders in the commercial office market in regards to the renewable energy planning requirement. The questionnaire addressed four main areas of interest, namely the regional planning policies, technical issues in relation to renewable energy technologies and passive design, potential barriers for successful implementation of the policies and also the impact on the building value.

Questionnaires were posted to 20 companies working in the construction industry and also to 30 individuals known to the author and working as architects, planning consultants, cost consultants or services consultants. Despite following up the questionnaires issue with phone calls the response rate was relatively low as only 20 completed questionnaires were received. Unfortunately no response was received from developers.

The first part of the questionnaire dealt with general information about the profession of the respondent and position, the amount of office developments they were involved with, whether renewable energy technologies were used and the size of those developments in terms of area and building height. This information allows one to analyse the data in regards to the professional background of the respondent and to review the answers against the scale of the projects the respondents were involved with.

The second part asked respondents to rank different energy saving measures and renewable energy technology according to the frequency they were integrated in the respondents' projects. The data were then assessed against data collected for a study assessing the implication of the introduction of the Energy Strategy (Droege, 2008, pp. 143-172).

The third part of the questionnaire asked open-ended questions in regards to barriers to the uptake of renewable energy in the built environment and local

planning policies. This section enabled respondents to express their own opinion and to raise issues the author may not have considered.

The last section of the questionnaire asked respondents to judge attitudinal statements in regards to the thesis topic using a Likert scale.

To improve the depth and quality of information the author also conducted semi-formal interviews with highly experienced property professionals from different backgrounds. Interviews are contained in appendix III and were conducted with:

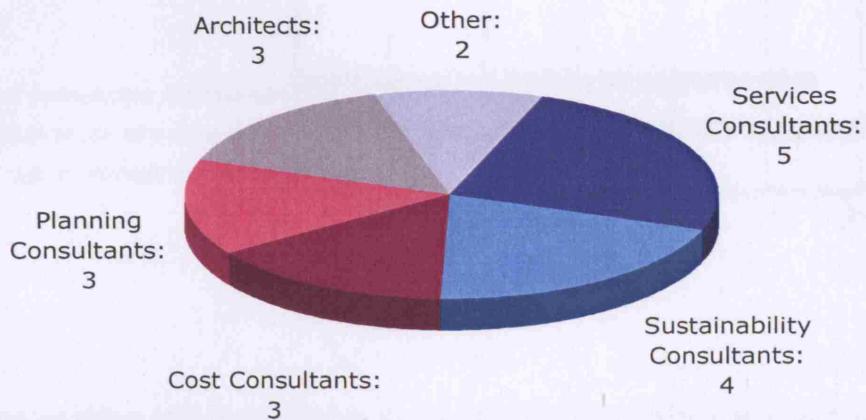
- ◆ Peter Fisher, Associate, **Bennetts Associates**
- ◆ Eoin Hickey, Director, **Building Services Design**
- ◆ Michael De Silva, Associate, **Davis Langdon** (Sustainability team)
- ◆ Marie Sebba, Sustainability Engineer and Tom Spurrier, Renewable Energy Engineer, **Ramboll Whitbybird** (Sustainability team)
- ◆ Peter Shaw, Principal Director, **RHWL Architects**
- ◆ Peter Thursfield, Director of City office agency and James Crawford, Head of City Investment, **Savills**

3.2 Analysis of Primary Data and Results

The initial questions assessed the background of the respondents to ensure that an adequate sample had been selected. The chart below shows the area of occupation of the respondents.

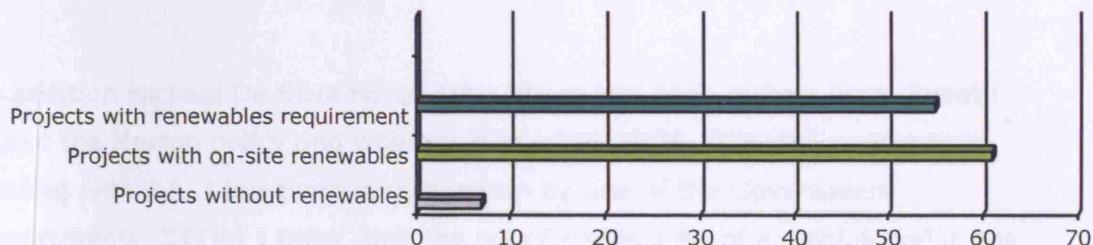
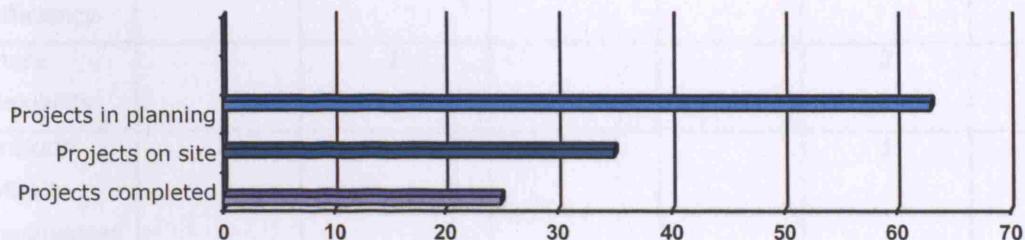
It shows a relatively even split between the different design team members with a slightly better response rate for services consultants.

Currently services consultants seem to be responding faster to the challenge of low carbon design with many developing extra skills, such as Low Carbon Consultants.



The majority of office developments that the respondents were involved with have a building area of 50,000 to 150,000 sq ft and are 6 to 12 storeys high. As the results show that over 50% of the respondents worked on buildings with similar size the remaining answers to the questionnaire can be compared with each other.

The two charts below show the number of projects in the different construction stages, and the number of projects incorporating renewable energy technology, on which the respondents were involved. It can be said that the respondents have sufficient experience to be able to answer the questionnaire with the required expertise.



The following analysis will deviate from the order of the questionnaire and assess the findings in context to each other, grouped into four main areas as set out earlier.

A. Acceptance of regional policies

The respondents were asked an open-ended question enquiring which changes should be made to current planning policies in order to increase the amount of carbon saving for new office developments.

The results show that across the board all respondents feel that more emphasis should be placed on energy saving measures, improving the energy efficiency of a building and the building fabric, and that currently the focus is misplaced on renewable energy technologies. Further suggestions are to allow the use of renewables off-site or the contribution to a communal fund for renewable energy developments.

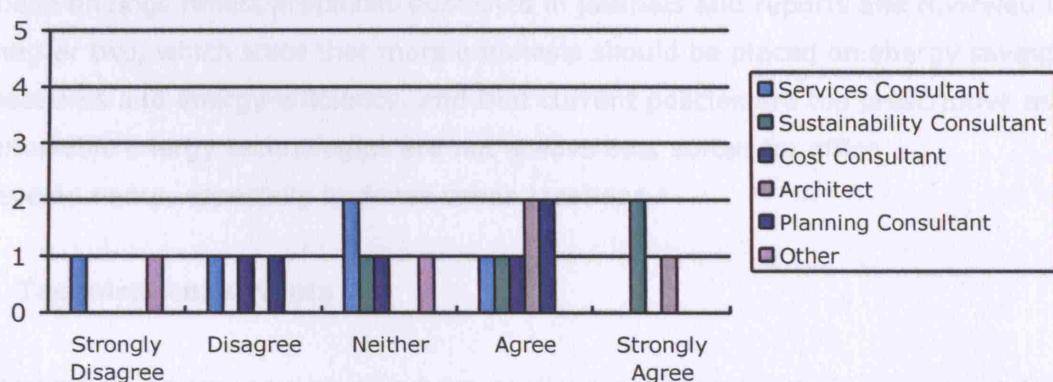
	Services Consultant	Sustainability Consultant	Cost Consultant	Architect	Planning Consultant	Other
More energy saving & efficiency	4	2	1		2	2
More flexibility		1			2	
Include off-site renewables	1		1		1	
No changes	1		1	3		

In addition Michael De Silva noted that: 'there has been quite a bit of debate about the Merton policy and whether it is a ONE-SIZE-FITS-ALL approach to dealing with it [...] but there is recognition by one of the Government departments, DEFRA I think, that the policy needs a bit of a rethink and it has been referred to as the Merton Plus, which says that we do actually need to look more seriously at this. [...] It should not be on-site renewables at any price when people do not understand what that price is, either financially or in environmental terms.'

Further critique comes from Peter Fisher who states that: 'the frustration at the moment with the Merton Rule, and with the EPCs, is that you have lay people in Government, Ministers, telling experts how to do things, not what they should do, but how to do it'. And he continues that: 'I can understand where [the Merton Rule] came from, because there was no policy at all. [...] It just got gridlocked, it is so ludicrously ineffective, especially in the non-domestic sector, not so sure about residential as the loads and energy usage are very different'.

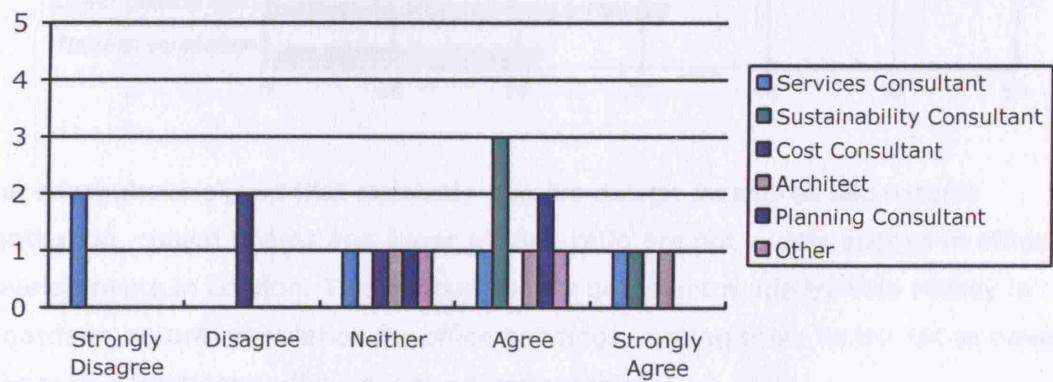
The following two attitudinal statements further assess the acceptance of the regional planning policies.

Q.12: The use of renewable technology for office developments in central London is an important measure to reduce carbon emissions.



Here 10 out of 20 respondents agree with the statement. One service consultant notes that the existing stock is most in need of an upgrade.

Q.13: The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve uptake of renewable energy technologies for office developments.



The majority of the respondents agree but they also voice concerns in regards to the effect the policy will have. One sustainability consultant states: 'it may result in integration of inappropriate technology to developments' and a planning

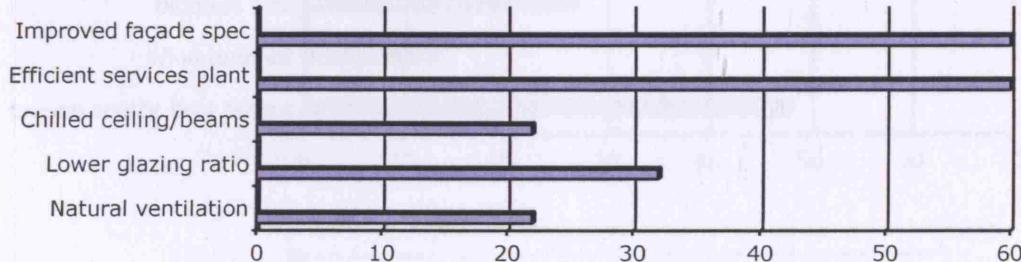
consultant notes that: 'it will but it will be token improvement. Energy reduction and energy efficiency are more significant and deliver bigger savings'. A development adviser concludes that: 'it will reduce the number of new buildings and potentially refurbishments coming to the market, the old inefficient buildings will be used longer'.

These findings reflect proposals published in journals and reports and reviewed in chapter two, which state that more emphasis should be placed on energy saving measures and energy efficiency, and that current policies are too prescriptive as renewable energy technologies are not always best suited for office developments, especially in dense urban locations.

B. Technical constraints

The next question enquires about the application of passive design measures to increase energy efficiency.

Q.6a: Energy efficiency measures implemented in office developments in order to reduce carbon emissions, ranked by frequency of application.



The chart above shows that currently passive design measures like natural ventilation, chilled beams and lower glazing ratio are not widely applied in office developments in London. This concurs with a comment made by Eoin Hickey in regards to natural ventilation for office buildings, stating that: 'in the UK to have a non-air-conditioned office is just not acceptable'.

Further Peter Shaw expressed the view that: 'in terms of designing a building in a Central London location you cannot do anything with the building form to improve its natural energy efficiency [...] and the price you pay for a deeper [floor]plan is that you need to provide as much glazing as possible [to achieve sufficient daylight]'.

When asked if occupiers would accept chilled beams Peter Thursfield of Savills replied that: 'you will have to be a brave developer to choose that sort of system', further strengthening the view that currently passive design measures are not favoured by designers, developers or occupiers.

Based on the findings above the author believes that a shift away from 'glass boxes' to more solidity in building design is necessary to increase acceptance of passive design measures which improve the energy efficiency of office buildings and thus result in reduced carbon emissions.

The next question was selected in order to be able to compare the results with a study assessing the use of different renewable energy technologies (Droege, 2008, pp. 143-172).

Q.6b: Renewable energy technologies implemented in office developments in order to reduce carbon emissions, ranked by frequency of application.

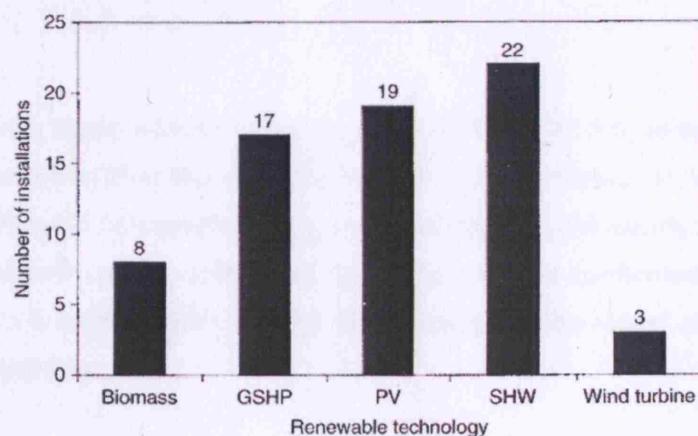
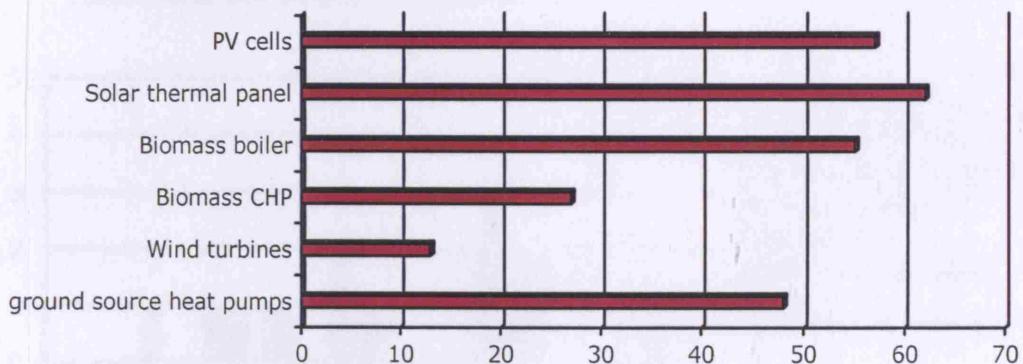
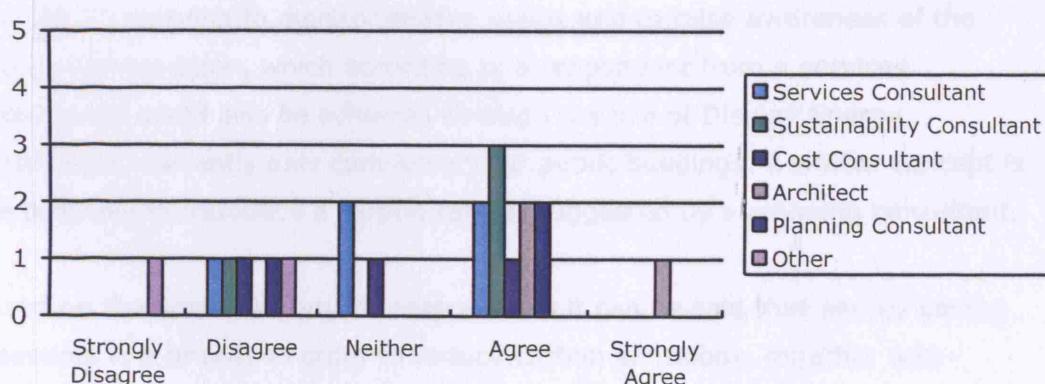


Figure 7: Numbers of proposed installations by renewable technology
(Droege, 2008, pp. 143-172)

The results of the questionnaire show that solar thermal panels are most frequently proposed followed by photovoltaic cells (PV), biomass boilers and ground source heat pumps. Compared with the study the findings are similar with the exception of biomass boiler and ground source heat pumps. The fact that biomass boiler are fairly easy to integrate into the building design and achieve a high percentage of carbon saving has led to an increased application of the technology. However, the study compared all planning applications received by the GLA including mixed-use and residential schemes, whereas the questionnaire focused on office developments.

The large amount for PV cells and solar hot water can be explained with the perceived ease of integrating the technology into the building and services design. In addition PV cells integrated in the façade are a visual sign for the use of renewable energies and can thus be used for marketing purposes.

Q.15: The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.



Half of the respondents agree with the statement. This result is not as expected by the author who assumed that the majority would disagree based on the fact that carbon saving through renewable energy technology is significantly less than what can be achieved with energy efficiency measures. This is confirmed by a sustainability consultant noting that: 'energy efficiency could do more' and the results of the next question.

The following open-ended question asked respondents what in their opinion would be the most effective measure of carbon saving for office buildings.

	Services Consultant	Sustainability Consultant	Cost Consultant	Architect	Planning Consultant	Other
Building design	4	1	2	1	1	
Services design	4		1			
Metering	1	2	1			2
Renewables					1	
CO2 rating		1			1	

According to respondents passive design measures and other changes to the building design, the façade mainly, would be the most effective way to reduce carbon emissions, followed by changes or improvements to the building services design i.e. energy efficient plant, low energy lighting and a revised performance specification for air-conditioning systems. Additionally the respondents suggest the use of metering to monitor energy usage and to raise awareness of the energy consumption, which according to a respondent from a services consultancy could also be achieved through the use of Display Energy Certificates, currently only compulsory for public buildings. A similar concept is the proposal to introduce a carbon rating, suggested by a planning consultant.

Based on the answers from the respondents it can be said that energy saving measures is a priority in order to reduce carbon emissions, together with metering which monitors energy usage and assists in collecting data of energy demand in office buildings, which will inform future design measures.

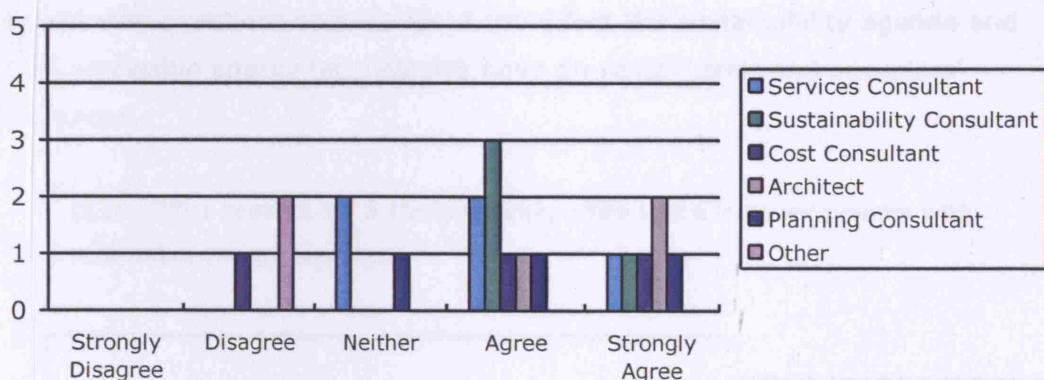
C. Barriers to the uptake of renewables

The next section addresses perceived barriers to the uptake of renewable energy technologies for commercial buildings. Respondents were asked what they think the main reasons are that clients or developers do not support renewable energy applications.

	Services Consultant	Sustainability Consultant	Cost Consultant	Architect	Planning Consultant	Other
Cost		4	3	3	3	1
Viability	3		2		1	1
Practicality	2	2			1	1
Aesthetics		1				

As expected according to the majority of the respondents the main reason given is additional cost, and also the fact that higher carbon savings could be achieved through other measures than renewable technologies, i.e. high-performance façade or building services plant. The results of the next statement confirmed the findings.

Q.17: Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.



Supporting the questionnaire results Michael De Silva expressed the view that: 'there is a lot of talk about ground source heat pumps and again, if you look at the sort of average performance of ground source heat pumps and compare that to a high efficiency condensing boiler and you look at that in carbon impact, it is actually better to have a high efficiency condensing boiler than to put in ground source heat pumps'.

Other reasons listed include the issue of practicality of renewable energy applications for office buildings, the lack of space to install PV cells or biomass boilers, as well as the increased complexity of building services systems and maintenance issues.

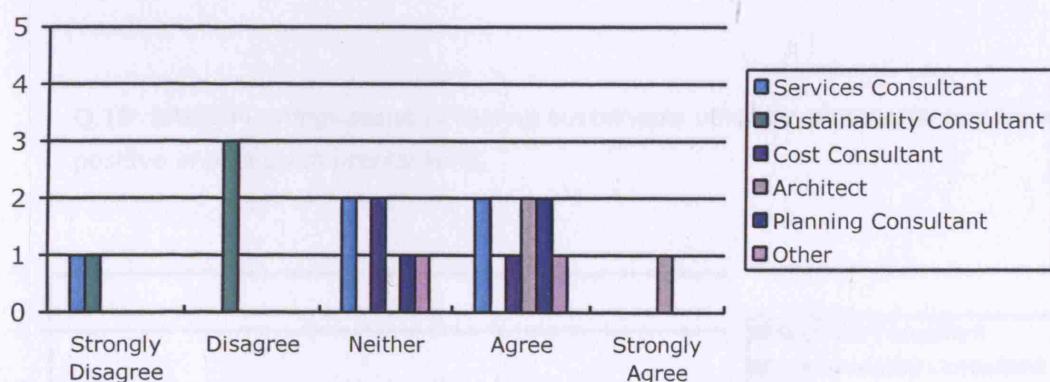
In addition Peter Shaw commented that: 'developers are irritated by the complexity it adds to the planning process', referring to the fact that design teams have to comply with building regulations, as well as with the London Plan requirements and the requirements of the local authority.

From the responses to the questionnaire and feedback in interviews one can conclude that although the most common reason why developers seem to object to renewable energy technologies on-site is the increased cost, there are nevertheless other practical reasons why renewable energy applications are not viable or the best solution for increased carbon savings, which are related to building use, energy demand and location. This is supported by the fact that respondents with expert knowledge in the technical aspects of renewable energy technology listed practicality as another important barrier.

D. Impact on value

The following questions enquire about the effect the sustainability agenda and use of renewable energy technologies have on rental levels and occupiers' preferences.

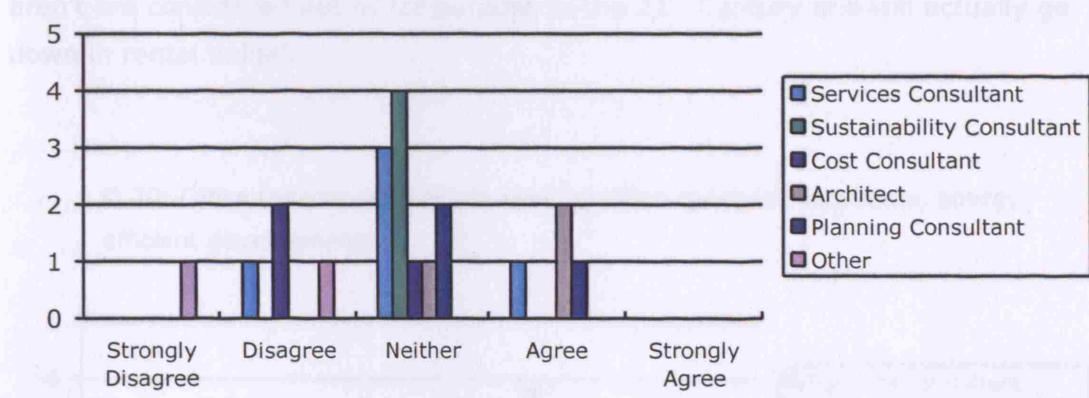
Q.16: Office tenants are actively seeking office space in developments with renewable energy resources.



The result shows that the majority agrees with this statement but interestingly the sustainability consultants disagree, which supports a comment by Peter Thursfield: 'occupiers are not rating buildings in regards to renewables, but certainly through BREEAM ratings [...] and in their corporate social responsibility statement it is a very easy box to tick'.

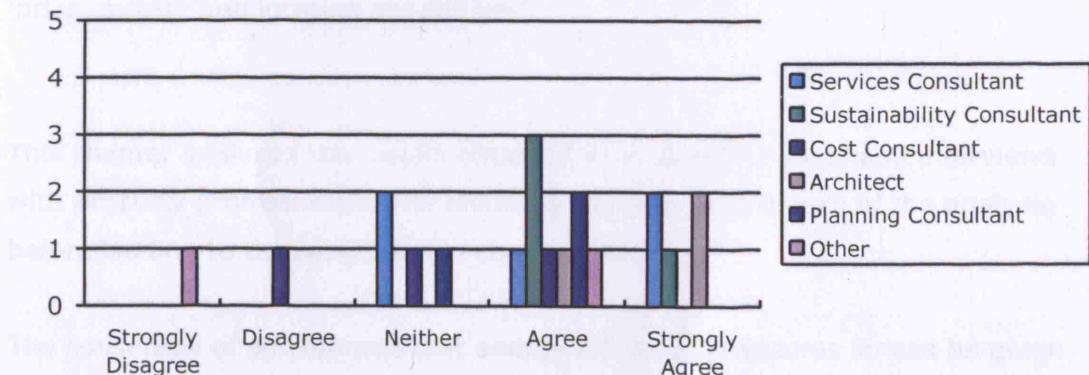
In addition James Crawford notes that: 'BREEAM rating is in the public spotlight, people know about it and are asking about it, but the next level of detail is unknown to them'.

Q.18: Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.



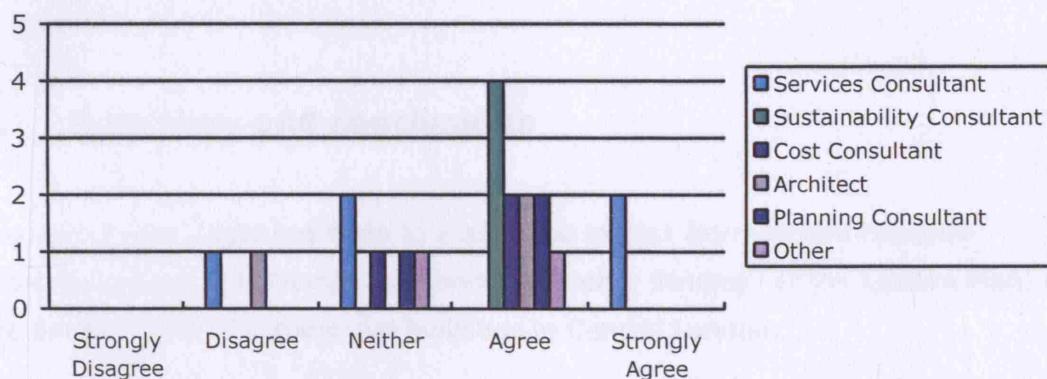
Only 4 out of 20 respondents agree with this statement and the majority has no opinion. Renewable energy applications as such are not influencing occupiers in their choice of office space as the topic is too complex. However it is noted by an agent that buildings which do not have any visible use of renewables might see a decrease in rent.

Q.19: BREEAM ratings assist in valuing sustainable office developments and have a positive impact on the rental level.



The statement tests the impact of BREEAM ratings and as expected a large majority, 14 out of 20, agree. As mentioned before occupiers are very much aware of BREEAM and use it as a tool to assess the sustainability of a building in order to comply with internal corporate requirements. However as one cost consultant notes: 'might make difference between tenants selecting one or the other building, but has no impact on rent'. In addition Michael De Silva states that: 'green buildings actually maintain their rentable value and the ones that aren't are considered not fit for purpose in the 21st Century and will actually go down in rental value'.

Q.20: Office tenants are actively seeking office space in sustainable, energy efficient developments.



The last statement tries to establish if sustainability and energy efficiency are important factors for occupiers as stated in occupier surveys, and if that fact has filtered through to the design team. This can be confirmed as 13 out of 20 respondents agree with the statement. But as one planning consultant notes: 'price, quality and location are still key'.

This chapter analysed the results obtained from questionnaires and interviews with property professionals. The following provides a summary of the analysis before leading to the conclusion in chapter four.

The consensus of opinion was that energy efficiency measures should be given priority in order to reduce carbon emissions as they lead to larger carbon savings. Not all passive design measures can be applied in dense urban locations due to environmental constraints and occupiers resistance.

The main reasons why renewable energy applications for commercial developments are not being pursued as vigorously as they could be are given as cost, viability and practicality. Technical constraints include the high complexity of integrating renewable energy technology with standard building services, as well as maintenance and operating issues. Practical constraints include lack of space to install technologies on roof, façade or below ground.

Current policies are regarded as too complex and too prescriptive, but the principle concept of having a planning policy promote renewable energy is widely accepted. According to the results occupiers are interested in BREEAM rating but are not specifically asking for buildings with renewable energy technologies. It is noted that occupiers are not prepared to pay a higher level rent and the current economic situation has pushed energy efficiency as a criteria for new office space to the bottom of the list.

4. Summary and conclusions

The aim of this thesis has been to assess the impact from current regional planning policies, the Merton Rule and the Energy Strategy of the London Plan, on the development of commercial buildings in Central London.

It can be concluded that both policies had a positive effect on the uptake of renewable energy technologies for office developments, but the viability and actual carbon reduction achieved have yet to be demonstrated. The crux of the matter is that no distinction is made between different building types with heterogeneous uses, e.g. residential or office, the location of the developments and the potential achievable reduction through on-site renewable energy technologies. In addition the focus on renewable energy is misplaced and should be on energy efficiency and energy saving measures in order to achieve the largest possible carbon reduction. The industry is unclear about the actual requirements of the various regional policies and the fact that individual local authorities within Greater London have different targets.

The requirements for carbon saving measures, either through more energy efficiency measures or through renewable energy applications increases construction cost, adding pressure on developers as occupiers are not prepared to pay a premium for energy efficient office space. Based on feedback from

interviews it can be said that a 'Circle of Blame' exists which needs to be broken in order to achieve a paradigm shift towards energy efficient office buildings. The phrase 'Circle of Blame' was first coined by Professor David Cadman and describes a process by which every entity in the property sector is able to blame at least one other entity for failing to 'change', and it has been used not only in regards to climate change but also in regards to supply chain management (Fell, 2008).

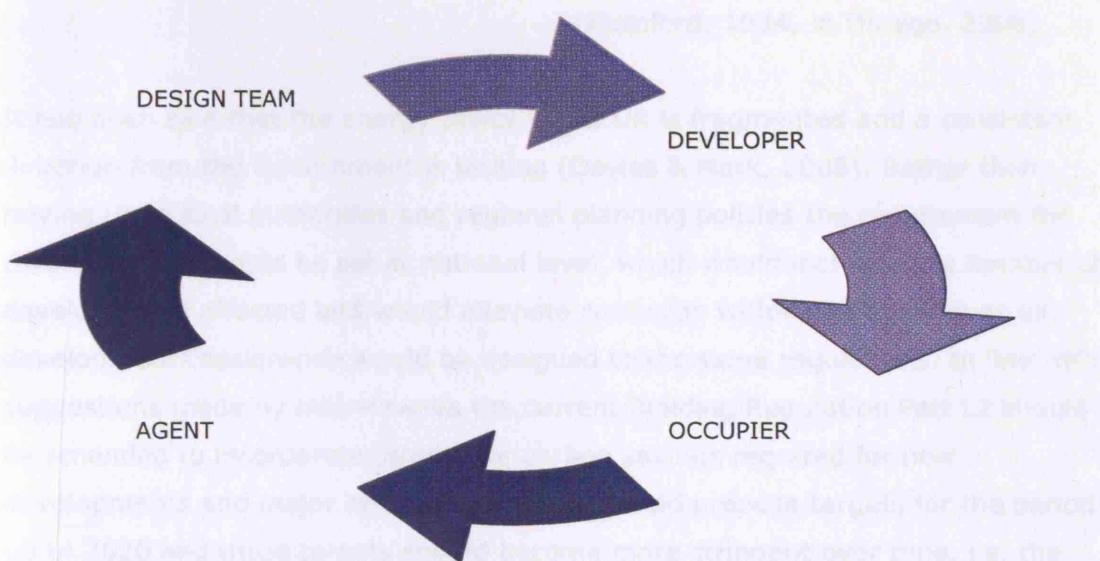


Figure 8: 'Circle of Blame' in the property industry

Figure 8 illustrates the 'Circle of Blame' in the property industry. The diagram shows four entities arranged in a circle: DESIGN TEAM (top), DEVELOPER (top-right), OCCUPIER (bottom-right), and AGENT (bottom-left). Thick, dark blue arrows point clockwise between them, indicating a blame cycle. The entities are positioned as follows: DESIGN TEAM at the top, DEVELOPER at the top-right, OCCUPIER at the bottom-right, and AGENT at the bottom-left. The arrows connect the entities in a circular sequence: DESIGN TEAM to DEVELOPER, DEVELOPER to OCCUPIER, OCCUPIER to AGENT, and AGENT back to DESIGN TEAM.

For increasing energy reduction targets will mean that greater and energy reduction measures will need to be taken to achieve the required energy saving and sustainability. This can be done using sustainable and energy efficient principles.

5. Recommendations

'Behind the great materials inventions of the last century and a half was not merely a long internal development of technics: there was also a change of mind. Before the new industrial process could take hold on a great scale, a reorientation of wishes, habits, ideas, goals was necessary.'

(Mumford, 1934, in Droege, 2008)

It has been said that the energy policy in the UK is fragmented and a consistent direction from the Government is lacking (Davies & Mark, 2008). Rather than relying upon local authorities and regional planning policies the requirement for carbon saving should be set at national level, which would increase the number of developments affected and would alleviate confusion within the industry as all developments nationwide would be designed to the same regulations. In line with suggestions made by interviewees the current Building Regulation Part L2 should be amended to incorporate targets for carbon savings required for new developments and major refurbishments. It should propose targets for the period up to 2020 and those targets should become more stringent over time, i.e. the amount of savings required increases every two or five years to a predetermined level. This would send a clear message to consultants, developers and the wider construction industry thus enabling preparation for changes to construction methods and developing the relevant skills.

In addition the Building Regulation should state a clear hierarchy of carbon emission reductions which favours energy reduction through passive design and high specification of building elements followed by the use of renewable energy generation (UK Green Building Council, 2007). However, the regulation should not prescribe how energy reduction and carbon savings should be achieved as this will be dependent on the design and site constraints. The design team is best placed to assess which measures are the most efficient and viable for the building.

The increasing carbon reduction targets will ensure that at some point energy reduction measures will not be sufficient to achieve the required carbon saving and automatically lead to increased use of renewable energy technologies.

The use of renewable energy technologies should be promoted but flexibility is required to allow off-site renewables or as an alternative the contribution to a local fund. Contribution to a fund could be similar to current Section 106 payments, based on a cost per square metre of the project and the money collected could be used by local authorities to upgrade the existing building stock. The concept of a local fund or community fund has also been raised by the UK Green Building Council (2007).

Changing the Building Regulations would create a level playing field across the UK and across the market. In addition it would assist in a shift among designers and developers away from 'glass boxes'. To break the 'Circle of Blame' it is necessary to address not only the design team and developer through tighter regulations but in addition to aim to change the attitude and behaviour of occupiers as well.

Occupiers are currently mainly interested in BREEAM ratings and the introduction of Energy Performance Certificates (EPC) will not change that in the near future (Stocks, 2008). A recent change to the weightings of different areas in the BREEAM rating system places more importance on energy efficiency and also requires post-occupancy evaluations which will indirectly make energy efficiency a criterion for occupiers choosing new office space (Jansen, 2008).

A recommendation made by the All-Party Parliamentary Urban Development Group suggests the introduction of Display Energy Certificates not only for public buildings but for non-domestic buildings as well (Stocks, 2008). The use and display of Energy Performance Certificate will not change the behaviour and attitude of occupiers as it only relates to the building specification and as such the occupier has little or no control over. In contrast Display Energy Certificates highlight the energy usage of a building in relation to the behaviour of the occupiers and would thus raise awareness of the actual energy consumption. It has been proposed that a penalty charge for occupier using more energy than calculated through the EPC would provide a financial incentive to reduce energy further (UK Green Building Council, 2007).

The transition to renewable energy can be compared with the process of industrialisation, and just as in Mumford's (1934) view industrialisation required the reorientation of wishes, habits and goals, the transition to renewable energy technologies in the built environment will require reorientation of occupiers' wishes, architects' habits and planners' goals.

6. Reference literature

BERR Department for Business Enterprise & Regulatory Reform [Online]

Retrieved June 20, 2008, from

<http://www.berr.gov.uk/whatwedo/energy/whitepaper/page39534.html>

Broer, S. & Worthington, D. (2008) Renewable energy lessons from Austria

[Online]. *Building Services Journal*. Retrieved August 18, 2008, from

<http://www.bsjonline.co.uk/story.asp?sectioncode=747&storycode>

Butera, F. (2008) Towards the Renewable Built Environment. In P. Droege (Ed.),

Urban Energy Transition - From Fossil Fuels to Renewable Power, 1st ed., pp.

329-364, Oxford, UK, Elsevier.

Cheshire, D., Attenborough, M. & Grant, Z. (2007) *Introduction to sustainability*,

London, CIBSE.

Communities and Local Government [Online] Retrieved August 25, 2008, from

<http://www.communities.gov.uk/corporate/>

Davies, H. & Mark, B. (2008) *APUDG Climate change and the Urban Built Environment - Written evidence submitted by CIBSE* [Online], London, APUDG.
Retrieved August 4, 2008, from <http://www.allparty-urbandevelopment.org.uk/reports.html>

Day, A. R., Dunham, C., Jones, P. G., Hinojosa, L., Dunsdon, A. & Ogumka, P. (2008) Reducing Carbon Emissions in London: From Theory to Practice. In P. Droege (Ed.), *Urban Energy Transition - From Fossil Fuels to Renewable Power*, 1st ed., pp. 451-474, Oxford, Elsevier.

Department for Environment Food and Rural Affairs [Online]

Retrieved September 3, 2008, from <http://www.defra.gov.uk/>

Fell, D. (2008) *APUDG Climate change and the Urban Built Environment - Written evidence submitted by Brook Lyndhurst* [Online], London, APUDG. Retrieved August 4, 2008, from <http://www.allparty-urbandevelopment.org.uk/reports.html>

Fisher, P. (2007) The Merton Rule could lead us down a blind alleyway as we aim to go green. *Architect's Journal*, 22.

Foreman Roberts. (Ed.). (2007) *Renewables and the London Plan* [Online], London, British Council for Offices. Retrieved September 3, 2007, from <http://www.bco.org.uk/research/researchreports/detail.cfm?rid=90&cid=0>

GLA. (Ed.). (2004) *Green light to clean power - The Mayor's Energy Strategy* [Online], London, Greater London Authority. Retrieved November 5, 2007, from http://www.london.gov.uk/mayor/strategies/energy/docs/energy_strategy04.pdf

Hammer, S. A. (2008) Renewable Energy Policymaking in New York and London: Lessons for other 'World Cities'? In P. Droege (Ed.), *Urban Energy Transition - From Fossil Fuels to Renewable Power*, 1st ed., pp. 143-172, Oxford, UK, Elsevier.

Jansen, M. (2008) BREEAM's green credentials are not what they seem [Electronic version] [Online]. *Property Week*. Retrieved September 2, 2008, from <http://www.propertyweek.com/story.asp?sectioncode=274&storycode=3119943&c=1>

Knight Frank. (2008, September 3) Economic climate has 'surprise' impact on Central London's occupiers' green view. *Knight Frank - News Release*, 1-3.

Kyriakides, R. (2008) Mass confusion - Think again if you believe biomass is an easy response to the Merton Rule. It's not great for the environment, or us. *Building Service Journal online*, 19.

LONDON [Online] () Retrieved August 20, 2008, from <http://www.london.gov.uk/mayor/strategies/sds/further-alts/index.jsp>

Rossiter, J. (2007) Livingstone's green office targets are doomed to fail, say property developers [Electronic version] [Online]. *Times Online*. Retrieved October 12, 2007, from http://business.timesonline.co.uk/tol/business/industry_sectors/construction_and_property/article1951377.ece

Stern, S. (2008) *Stern Review: The Economics of Climate Change* [Online], London, Cabinet Office HM Treasury. Retrieved August 12, 2008, from http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_Report.cfm

Stocks, J. (2008) Better energy use requires more than just a certificate [Electronic version] [Online]. *Property Week*. Retrieved August 31, 2008, from <http://www.propertyweek.com/story.asp?sectioncode=274&storycode=3121085&c=4>

Sullivan, L., Mark, B. & Parnell, T. (2006, September) *Lessons for the Application of Renewable Energy Technologies in High Density Urban Locations*. Paper presented at the meeting of the Conference on Passive and Low Energy Architecture, Geneva, Switzerland.

The Merton Rule.org - Best Practice in Low Carbon Planning [Online] (2004) Retrieved June 22, 2008, from <http://www.themertonrule.org/>

Turrent, D. (Ed.). (2007) *Sustainable Architecture*, 1st ed., London, RIBA Publishing.

UK Green Building Council, M. (2007) *Report on carbon reductions in new non-domestic buildings* (Research) [Online], London, Department for Communities and Local Government. (07 BD 05001) Retrieved July 20, 2008, from <http://www.communities.gov.uk/documents/planningandbuilding/pdf/carbonreductionsreport.pdf>

United Nations Framework Convention on Climate Change [Online] Retrieved June 20, 2008, from http://unfccc.int/kyoto_protocol/items/2830.php

van der Bergh, J. C. & Bruinsma, F. R. (Eds.). (2008) *Managing the Transition to Renewable Energy*, 1st ed., Cheltenham, UK, Edward Elgar Publishing Ltd.

Wikipedia The free encyclopedia [Online] Retrieved September 2, 2008, from http://en.wikipedia.org/wiki/Feed-in_Tariff

7. Appendices

I. Extract of Reviewed Policies

Extract of Planning Policy Statement 22:

8. Local planning authorities may include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments. Such policies:
 - (i) should ensure that requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable given the type of development proposed, its location, and design;
 - (ii) should not be framed in such a way as to place an undue burden on developers, for example, by specifying that all energy to be used in a development should come from on-site renewable generation.

[Planning Policy Statement 22, p.10]

18. Local planning authorities and developers should consider the opportunity for incorporating renewable energy projects in all new developments. Small scale renewable energy schemes utilising technologies such as solar panels, Biomass heating, small scale wind turbines, photovoltaic cells and combined heat and power schemes can be incorporated both into new developments and some existing buildings. Local planning authorities should specifically encourage such schemes through positively expressed policies in local development documents.

[Planning Policy Statement 22, p.12]

II. Renewable energy technologies

Source: Department for Business Enterprise & Regulatory Reform
(<http://www.berr.gov.uk/energy/sources/renewables/explained/index.html>; accessed 8th September 2008)

Onshore/ Offshore Wind: How It Works

Turbines catch the wind's energy using propeller-like blades (usually three blades), which are mounted on a shaft to form a rotor. The blades use aerodynamic forces ('lift' and 'drag'), in a similar fashion to an aeroplane wing, to produce mechanical power. This power rotates the blades and the shaft. The shaft is connected to a generator, normally via a gearbox, which produces electricity. The rotor blades and shaft are connected to the nacelle, which contains the gearbox and other power/mechanical components and sits at the top of the wind turbine tower. The nacelle can rotate freely, allowing the wind turbine blades to align with the direction of the wind and helping them to extract as much energy as possible.

Wind turbines are mounted on a tower to optimise energy capture. This is because, in general, wind is stronger, more consistent and less turbulent the higher off the ground it is.

Wind generators range in size from kilowatt-sized machines (suitable for domestic buildings) to large multi-megawatt devices (1 megawatt = 1,000 kilowatts) for use onshore and offshore wind farms into the national electricity grid. Electricity will not be generated when there is no wind. This means that there are some technical challenges with incorporating this form of generation into the electricity network to provide power as needed.

However, wind farms are distributed throughout the UK so the changes in power from individual turbines will be evened out; if the wind drops in one area of the UK it is still highly likely to be present in others. The National Grid Company has estimated that the extra amount of conventional back-up power needed to cope with an increasing level of wind generation is likely to be small.

Offshore wind, however, is a larger-scale, more technologically challenging and expensive undertaking than onshore wind. However, it has huge potential due to

the UK's excellent offshore wind resource, which is stronger and more consistent than the wind resource onshore, leading to higher power outputs per turbine and more hours spent generating each year.

Offshore turbines operate in much the same way as onshore turbines, although in general they are larger and more powerful. The construction, delivery and assembly of such large machines require specialist equipment, for example special facilities at ports and installation vessels. Careful scheduling is also needed as offshore turbines can only be installed in calm seas. Changeable weather and sea conditions also mean that offshore turbines need to be extremely robust. Offshore wind turbines also require underwater cabling to transport electricity back onshore and into the grid.

Solar Energy - How It Works

Solar energy involves capturing and harnessing the sun's energy. There are three main ways of doing this:

- ◆ Passive solar design
- ◆ Active solar water heating
- ◆ Solar photovoltaics

Passive solar design

Passive solar design involves the application of design principles (such as south-facing windows) to make sure that excess heat loss is avoided and solar radiation is captured, in order to minimise the need for heating and lighting. The reverse is also true, so that minimising the capture of solar radiation, coupled with the use of natural ventilation, helps to reduce dependency on mechanical systems such as air conditioning.

Active solar water heating

Active solar water heating uses collectors, usually on the roof of a building, to capture and store the sun's heat via water storage systems. The collectors provide heat to a fluid that circulates to a water tank. The heat is primarily used for heating water in domestic dwellings, industrial facilities and commercial buildings. This includes the growing market for solar swimming pool heaters.

Solar photovoltaics

Solar photovoltaics (PVs) convert energy from daylight into electricity using a semiconductor material such as silicon. When light hits the semiconductor, the energy in the light is absorbed, 'exciting' the electrons in the semiconductor so that they break free from their atoms. This allows the electrons to flow through the semiconductor material (in a similar manner to a normal electrical circuit) producing electricity.

There are a number of PV technologies, including polycrystalline, monocrystalline and thin-film. Solar PV cells can be arranged in panels on a building's roof or walls, and can often directly feed electricity into the building. With the latest PV technology, cells can also be integrated into the roof tiles themselves.

Groups of solar PV cells can be added together to provide increasing levels of power. This can range from small, kilowatt-sized solar panels for use in domestic households, to larger arrays, which function as separate solar power plants feeding power directly into the electricity grid.

Solar PV cells can be used in both stand-alone and grid-connected systems. Solar energy is only produced during the day and also varies in output due to cloud cover. In the case of small-scale solar PV systems, batteries or other forms of electricity storage can be used to store the electricity for periods when the output is low but the demand is high. For solar thermal systems, the hot water can be stored for a limited period of time in well-insulated water tanks.

Biomass - How It Works

Biomass, also known as biofuels or bioenergy, is obtained from organic matter, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products.

The use of biomass is generally classed as a 'carbon-neutral' process because the carbon dioxide released during the generation of energy is balanced by that absorbed by plants during their growth. However, it is important to account for any other energy inputs that may affect this carbon-neutral balance on a case-by-case basis, for example any use of fertiliser, or energy consumed in vehicles when harvesting or transporting the biomass to its point of use.

Biomass falls into three main groups:

- Dependent resources:

These are the co-products and waste generated from agricultural, industrial and commercial processes. This includes forest products, waste wood, straw, slurry, chicken litter and industrial and municipal wastes (such as food processing wastes). For example, for every tonne of wheat harvested, a certain amount of 'waste' straw is created, or for every tree felled to make furniture, a certain percentage cannot be used. These co-products can be utilised as biomass fuels, for example, in combustion.

- Dedicated energy crops:

These are short-rotation crops, such as coppice, miscanthus, willow and poplar, which are grown specifically to generate biomass fuel.

- Multi-functional crops:

These are crops that can be used to create different types of energy. For example, the ears of wheat can be used to create fuel (including bioethanol and biodiesel), while straw can be used to generate electricity.

Biomass can be converted into heat and electricity in a number of ways.

Depending on its source, these processes include burning, pyrolysis (the decomposition or transformation of a compound caused by heat), gasification (the conversion of solid biomass into a gaseous fuel), anaerobic digestion (the decomposition of an organic biodegradable material by bacterial action in the absence of air, and in warm, moist conditions) or fermentation.

Woody biomass

Energy can be derived from woody biomass sources (including forest products, waste wood and straw) using combustion systems, which can be used to heat anything from a domestic stove or hot water system to an entire community.

Biomass can also be used on its own or by co-firing it with fossil fuels in power stations, reducing greenhouse gas emissions by replacing a component of the fossil fuel required. In industrial or agricultural use, boilers fuelled by woody biomass such as cardboard, wood and waste pellets or straw can help reduce waste removal costs.

Biogas, landfill gas and fermentation harness the natural process of anaerobic digestion.

Biogas

Biogas is generated from concentrations of sewage or manure. These are usually in the form of slurry comprising mostly water (almost 95 per cent). The slurry is fed into a digester, either continuously or in batches. Digestion takes from about 10 days up to several weeks, at a temperature of 35°C.

Landfill gas

Landfill gas arises from waste deposited underground in landfill sites.

Biodegradable organic waste decomposes anaerobically to produce a gas that is roughly an even mixture of carbon dioxide and methane. The methane content gives it the potential as a fuel, which can then be used to generate electricity or to provide process heat. The amount of gas available from a landfill site depends on the type of waste, moisture content, temperature, acidity of the waste and the design of the site. Gas is drawn up from vertical or horizontal wells through a system of pipes. The generating equipment is usually contained within the same area as the extraction plant.

Fermentation

Fermentation occurs when anaerobic digestion converts sugars into ethanol with the use of micro-organisms, usually yeast. Bioethanol can be used as a transport fuel by mixing it with petrol or using it directly in a modified combustion engine. Sugar cane or beet is the most efficient source but potatoes, corn, wheat and barley can also be used. Processes that produce bioethanol from woody material, such as forestry residues, energy crops and waste paper, are also approaching commercial viability and a number of pilot plants are proposed for the UK.

Biodiesel can be made from vegetable oils, animal fats or recycled cooking oils. However, the production of biodiesel requires a high amount of energy, offsetting its ability to reduce carbon emissions. However, it still provides an improvement over fossil fuels, typically reducing lifecycle carbon dioxide emissions by over 60 per cent (source: British Biogen).

Geothermal - How It Works

Geothermal energy involves the exploitation of different grades of thermal energy stored within the earth.

In certain geological areas, heat from deep within the earth's interior can rise up to the surface. Whenever water enters fissures in this hot rock, it can become heated and can emerge on the surface as hot springs, or even as steam, creating features such as steam vents, geysers and hot mud springs. Alternatively, heated water can be trapped below the earth's surface as a geothermal reservoir. This heat can reach temperatures of 400°C. It can be accessed by drilling to depths of over two miles.

Ground-source heat is a different form of geothermal energy. It is extracted from the low-temperature heat (10–20°C) that is found at relatively shallow depths within the earth's crust. This source of heat remains at a relatively constant temperature all year and can be taken from the ground itself or from groundwater. Heat pumps can increase the temperature to provide a more useful output temperature of around 40–50°C, ideal for low-temperature heating systems like under floor systems and radiant panels.

Geothermal energy can be used directly to provide heating. Alternatively, geothermal power plants can access steam, heat or hot water from geothermal reservoirs, which can be used to turn generators and produce electricity. After the geothermal energy has been extracted from the water, the water is returned down the well into the reservoir and reheated. There are several types of geothermal power plant available, depending on the temperature and pressure of the geothermal source.

Ground-source heat pumps are not strictly a renewable source of energy, because they require electricity to extract and make use of low-grade heat. However, there is no reason why this electricity could not be generated by another form of renewable energy. Heat pumps can be very energy efficient, producing four or five times the amount of heat energy for every unit of electrical energy needed. A heat pump takes the heat from a refrigerant fluid (or water) that is in contact with the ground, extracts the heat from this source and transfers it to a heat sink where it can then be circulated through a heating system.

Although the refrigerant fluid is cooled by this process, it can be re-circulated back through the ground where it will absorb more heat before being passed through the heat pump again.

Heat pumps do not produce electricity; however, they can provide heating and can be operated in reverse to provide cooling. They can be used in most kinds of building and have both domestic and commercial applications.

III. Interviews & Questionnaires

Interviews

- ◆ Peter Fisher, Associate, **Bennetts Associates**
- ◆ Eoin Hickey, Director, **Building Services Design**
- ◆ Michael De Silva, Associate, **Davis Langdon** (Sustainability team)
- ◆ Marie Sebba, Sustainability Engineer and Tom Spurrier, Renewable Energy Engineer, **Ramboll Whitbybird** (Sustainability team)
- ◆ Peter Shaw, Principal Director, **RHWL Architects**
- ◆ Peter Thursfield, Director of City office agency and James Crawford, Head of City Investment, **Savills**

Interview with Peter Fisher, Associate, Bennetts Associates, on 24th August 2008 in Islington.

(MS = Manon Stockhammer)

MS: *Will the introduction of Energy Performance Certificates [EPC] assist in lowering carbon emissions?*

Peter Fisher: EPCs are calculated for each building, and do not refer to a common benchmark. Things that really affect the performance of a building environmentally, its orientation and its layout, are already fixed when you calculate the EPCs. I think in non-domestic buildings the average carbon emissions, in this country, of regulated energy, are about 100 kg Carbon dioxide. And I think what we should do is say right, the average is 100 and that is the figure we compare against. There is a lot of confusion at the moment with the number of 100 as it just happens to be the average carbon emissions for non-domestic buildings but also a number the EPCs are using. But if we were to use it as a benchmark for permitted CO₂ emissions and then you do say quartile reductions, it would help.

MS: *One would then be able to actually compare buildings with each other, a glass box against more solid buildings.*

Peter Fisher: What we need to do is verify what that average for non-domestic buildings is, and then from that average, we say that by 2015 we need the average to be 40 less. So we have a really clear path where you say, I do not know, every year it goes down by 10. And there will be buildings which cannot achieve that but they will then have to pay a penalty.

MS: *Or carry out modifications to adapt.*

Peter Fisher: And then I think, if certain councils want to be very strict environmentally they could decide to allow only buildings to be built which achieve at least a 'C' rating. And if you get to that level by using bolt-on Renewables, or if you do it by designing the building so that it is naturally ventilated, it does not matter that is up to the experts. You tell them what they got to achieve and then you leave it to the people who know what they are doing. The frustration at the moment with the Merton Rule and with the EPCs is that you have lay people in the Government telling experts

how to do things, not what they should do, but how to do it. As far as I know there is nobody in the Government in those departments, who has either a science degree or let alone an expertise in the built environment.

MS: *So what exactly is the requirement in the Building Regulation Part L at the moment?*

Peter Fisher: There was a sort of review of Buildings Regs in 2006, and what that introduced is called the LZC, low zero carbon technologies. From 2003 onwards all you had to do was to comply with u-values for the building fabrics, or if you wanted to do something slightly different you calculated the so-called notional building model using the prescriptive values for the fabric, and then running the model for the glass box, which had some element in the design that was beneficial. And provided you were not worse than the notional building, you complied. In 2006 it introduced the LZC technologies and put that on top, so you still work out your notional building model and then you apply a reduction factor for the LZC technology on top. This actually favours natural ventilation, because for a while it was easier to use mechanical ventilation. That reduction factor then gives you the target emissions, which is what your building needs to achieve. It was all developed by Faber Mansell and it is not very good.

MS: *What is the main weakness in your opinion?*

Peter Fisher: It is set up too complicated because you do not know what your target is before you are well in the building design phase. We should just have an average emissions target for office buildings, which is say 60, and in 5 years time it is 50.

MS: *Do you think there should be a mechanism, say for some reason the building can not achieve the target, and you still achieve planning permission but there is an arrangement whereby the equivalent of what it would cost to achieve the target is paid into some fund which can be used to say upgrade existing building stock?*

Peter Fisher: Yes, absolutely. You could have something where you either have to buy a fibre-wire connecting to Renewables elsewhere or you pay something into a fund or something which funds the development of Renewables.

MS: *Or maybe a fund used to upgrade the existing building stock?*

Peter Fisher: Yes, or that. It would be effectively a system of off-setting and it has to be quite expensive for that to work. It has to be say twice as expensive as reducing

emissions at source, e.g. the building. And what that would do, it would very quickly establish the most efficient method of reducing carbon emissions. To start with it would concentrate on the reduction of thermal loads through passive design. And then as time evolves and the target comes down, we will then get more and more interested in on-site electrical generation through Renewables. But that will be down the line, as technologies evolve and change, and they will be that is guaranteed. It has changed in the last years, there are now third generation PV cells, experimental PV cells that operate at 30% efficiency, whereas the current conventional PV cells operate at around 10%, and lose efficiency after around 10 years. [...]

Peter Fisher: There is a company called Conar in the USA, which is developing these experimental PV cells, which are silicon based and could be applied to fabrics. Kodak is involved as well, and the Pentagon is financing some research as it could be a fabric generating energy which could be used for soldiers' uniforms. There is that moral irony that it could possibly be the Pentagon that saves the world, which is a terribly frightening thought for most environmentalists. But those developments, and they are still very experimental and not making money at the moment, but those are the ones at 30%. And as soon as you get that, a fabric film that is just rolled out on the roof, it will be the cheapest way to generate energy.

Peter Fisher: I am convinced that the electrical technologies will evolve I have no doubt about that, and it will come quickly, quicker than people think but right not it is not there. And we have to keep pushing that industry.

MS: *And is the current planning policy the right mechanism to push?*

Peter Fisher: With what is effectively an industrial tax on new buildings is not the way of doing it. We need a tax on everything and everyone, if we want to do that convincingly like a carbon tax or you use a feed-in-tariff. But it has to be something that covers all buildings, the entire built environment, the whole process, and we get there much quicker. But you do not do it as a hidden and ineffective taxation, which is what it effectively is.

MS: *The policy currently only applies to new developments, which are say 5% of the existing build stock?*

Peter Fisher: Approximately 1-2% per year is replaced in Britain, so yes the impact is small. I mean the guys who introduced the Merton rule, I can understand where it came

from, because there was no policy at all. It a piece of socialists legislation, which is not in favour of the private sector economy. It just got gridlocked, it is so ludicrously ineffective. Especially in the non-domestic sector, not so sure about residential as the loads and energy usage is very different, but for offices for example, the loads are electrical.

MS: *So Renewables are not that practical for office type developments?*

Peter Fisher: If you are not careful you can get forced down routes, that are theoretical efficient, but not really. Things like the biomass CHP with tri-generation. Not sure if you know how that works, you end up producing heat, well you produce electricity actually, a by-product of which is heat which you can use to heat buildings. But of course most buildings, non-domestic buildings, do not need heating. And that is actually quite an inefficient way of generating electricity anyway. So, what you do is using absorption chillers rather than condensing chillers, you can use heat to create cooling. But what you are effectively doing is you are taking a very inefficient way of generating electricity and are using the by-product heat to power an incredible inefficient way of generating cooling. And you would actually be better off with a conventional boiler. On day one the theoretical analysis will show that it all stacks up. But the problem is because they are all new and untried technologies if you go back after a couple of years all the absorption chillers are nowhere close to approaching the theoretical efficiencies, because no one actually knows how to service and maintain them. That is one of the beauties of fan coils, fan coils are not a particular good thing but everybody knows them. So you will potentially find that with fan coils, even so they are theoretical less efficient than replacement systems, fan coils are actually operated very close to their efficiency whereas other systems, which are less understood, are not. You engage in this kind of theoretical optimisation that does not actually work. And there is a big push at the moment I know by the Greens and other campaign bodies, to use CHP and biomass but at the end of the day they actually do not stack up. This is where we need more data on how systems and buildings perform. The UK Green Building Council's very first campaign has been what is called 'The campaign for real data'.

MS: *Is that the requirement for post occupancy surveys?*

Peter Fisher: Yes, but not only. When the Government says we are going to reduce carbon emissions by 25% by year X that means nothing because nobody knows where they are now. So you cannot say we reduce carbon emissions by whatever figure, you

could say we reduce them to a number, say an average of 55kg per square meter, but that would be a risk because we do not know what they currently are, so we do not know if that is a 25% reduction or a 50% reduction, we just do not know.

MS: *Do you know any office development in Central London which would be a positive case study for sustainable design?*

Peter Fisher: I do not know of any, really. It would not be a glamorous building, probably more like a Quinlan Terry or something, something with a glazing ratio of a Georgian building for example. As you know I did Environmental Engineering in Cambridge and for one of my essays I compared the IBM building by Foster with Richmond Riverside by Quinlan Terry to see which is the more inherently sustainable, and they were selected to be controversial. Most architects would say IBM is absolutely acceptable modern architecture, whereas Terry in Richmond is unforgivable. The conclusion was that fundamentally Richmond Riverside was the much better façade design purely from an environmental perspective: it had lower glazing ratios and much more solidity.

MS: *So how should the planning policy change to avoid more 'glass boxes' being built?*

Peter Fisher: The only real way of making a big difference is by introducing a carbon tax. Is what The Economist has been campaigning for, not as a tax increase, but a transfer that is very, very important. So you would be reducing another tax, transferring tax for good things say income, to something bad say pollution or carbon tax. That is what the Economist has been campaigning for quite a while now, and it is the only way of really getting a level playing field. If you said a year ago we are going to put a massive tax on petrol to reduce the number of journeys, people would have said that is just another tax on people and it won't change anything. Since January this year the high fuel price has reduced the number of car journeys by 29% in Britain. Ultimately what people like Greenpeace should be doing is shutting up about the Merton Rule and they should be relentlessly campaigning for, first of all a feed-in-tariff and secondly a carbon tax. That would push the renewable industries, and it would affect more than just new build developments.

MS: *Thank you very much for your time.*

Interview with Eoin Hickey, Low Carbon Consultant and Director of Building Services Design (BSD) on 15th August 2008 at BSD London offices

(MS = *Manon Stockhammer*)

MS: *On what sort of office projects with renewables have you worked on?*

Eoin Hickey: We have worked on Barking Town Hall, which I initially did some work on and a W1 block in Regent Street. We helped with the design on that project.

MS: *Were any of those projects in a Conservation Area and what kind of renewable energy installations were used?*

Eoin Hickey: The W1 block was, I believe, in a Conservation Area. They did have photo voltaic cells on the roof, but that was for the BREEAM requirement. It was not for Planning purposes or for the 10% Renewables, they did not have to do it for that.

MS: *And the Barking Town Hall project?*

Eoin Hickey: They are going for 20% Renewables at the moment. I was only involved in the initial design and they were looking at putting a wind turbine on site, photo voltaic, anything that was visual really. They did not seem that interested in saving energy though, because they would not put in double glazing or improve the insulation of walls.

MS: *So they wanted to be 'visually green' but not really.*

Eoin Hickey: Yes, they are putting in quite a mix, but a lot of it is visual. The main application where they are achieving the percentage is biomass.

MS: *Generally have you also applied passive design measures for office developments?*

Eoin Hickey: Yes, I have done quite a bit in the past where we have tried to use minimum energy. So you use passive vents, low energy lighting, try and avoid air conditioning, with some clients, and look at external solar shading.

MS: *Was that mainly for office buildings where the tenants were already known, or was it for speculative developments?*

Eoin Hickey: No, it was always where the tenants were known. The main one in particular we did was a large office for the MoD and they did not want air conditioning in the office, they wanted it passive or natural ventilated, so we had wind catchers on the roof and utilised night time cooling. The biggest problem we had was trying to get solar shading in because they wanted a glass building, and we tried and explain to them that if you have a glass building you need air conditioning basically. They went back to a more traditional heavy-weight building with less glazing.

MS: *In regards to the requirement of the London Plan to achieve 10% or even 20% Renewables, do you think it is a good thing to say one must use Renewables, or do you think people should try and achieve an additional say 20% reduction of energy by applying other sustainable measures first?*

Eoin Hickey: I think it has been a good thing, because in the past you never really put in Renewables, because it was a cost saving, and one always tries and reduce the energy somewhat. It has driven Renewables to the forefront, but I think a lot of the Renewables are not the right thing to use. The emphasis is not on saving energy anymore, it just seems to be on Renewables. It should be both, there should be a big emphasis on energy saving, and in normal Part L which is part of the Building Regulations you do have that, but there should be more in Planning as well.

MS: *So at the moment some people are designing to comply with Part L but then skip any further energy saving measures say by specifying triple glazing, because the money is used for Renewables. Is that correct?*

Eoin Hickey: Yeah, well. As well as that because if you are trying to comply with Part L it is only so much carbon saving, so instead of reducing your energy to achieve in Part L if you reduce your energy by 20% over your target building if you put in Renewables, you are making that reduction anyway by having Renewables. So you could still have the same amount of emissions as you would have had by the energy saving, just by having Renewables. A lot of people aren't doing that to be fair, it is still improving but it is sort of a loop hole you could use and exploit. Most people just put in building fabric as per Building Regulations, and then bolt on 10% Renewables and that is it, that is all they want to do. Whereas if the costs are increased just to improve your U- values slightly and your air permeability you get better savings, as it genuinely reduces the CO₂ emissions. Because some of the Renewables, they are not entirely carbon neutral either, I do not think. You have to think if you have a

photo voltaic panel that has got to be made somewhere in China in a factory. With the amount of CO₂ generated to make that panel, and then shipped over, it is not really sustainable.

MS: *Which renewable applications do you think would be suitable for office buildings?*

Eoin Hickey: The easiest one to utilise is biomass, wood chip or wood pellet for heating. The only problem with London is that you have the Clean Air Act, and so it can become a problem. But it is the easiest, because you get all your heating for free basically and that easily makes up the 10%. Photo voltaic cells are very expensive, and you need a very big roof area to get enough energy. Solar thermal is great for residential use, but it is no good for office as you do not have enough hot water usage.

MS: *When you say biomass, do you mean biomass boilers or biomass CHP?*

Eoin Hickey: Biomass boilers. I mean you can use biomass CHP but it is a bit unproven in the UK and there are some systems out there but there are big questions over reliability I think. Biomass boilers, wood powered boilers have been used for a long time. You know it is a good kit, but you are going a bit back in time, to the risk potentially if everyone was to go with biomass boilers in London, we would get the smog back.

MS: *Where do you get the all the wood supplied from?*

Eoin Hickey: That as well. Assuming you can get the timber version because a lot of the local authorities now are asking for air quality reports, and if you are putting in biomass how is that going to affect the air quality. Now we have to have computer generated models of the buildings and the air quality, and of the flues, to see how it's going to affect the area. That is just starting to come in because they are realising that biomass is the easiest way to get your 10% from Renewables. You can actually get onwards 30% or 40% on biomass and if everyone goes with biomass then you could have potential smog problems.

MS: *I thought office buildings do not really need heating, they need mainly cooling.*

Eoin Hickey: They still need heat but they will need more cooling. You could also go for tri-generation boilers.

MS: *For say a 20 storey office building how large is the wood storage area for a biomass boiler?*

Eoin Hickey: It would be pretty big, unless you could rely on very good deliveries. Typically we try to limit it to four deliveries a year to keep it practical, but we are looking at some schemes where just to get it through planning, they are saying you have deliveries every 2-3 weeks. When you think about it, there has to be a big arctic trying to get in to site it just seems you are getting forced down a road that is not necessarily practical, just to try and get the planning consent. The biggest thing they should be trying to do, in my opinion, is if they limited the amount of emissions you were required to have, you would force architects to change building design from glass boxes to 'real' buildings, and definitely they would use less energy.

MS: *Basically you calculate the notional building model energy use and then just say, ok we are going to cut off X% and that is the energy you are allowed to use?*

Eoin Hickey: Yes, because you have got your notional building from Part L2, and you have got to have a percentage improvement and you can keep improving that percentage every few years. You could say well currently its at 30%, in 2015 its going to be 40% and 2020 its going to go to 45%, and then people know they are going to have to push down from that. It would force them to use a lot more energy efficient lighting, using LEDs in lighting, and just generally improve things really. Because I cannot believe buildings like the Gherkin and stuff, these glass boxes all around London, they are lovely you know, but not sustainable.

MS: *Do you know a speculative office building where you think the design team has done something to improve the sustainability of the building, and not just tagged on Renewables?*

Eoin Hickey: Not really, not a speculative development. We have done a development for Daimler Chrysler, one of their buildings, and they used wind catchers and they used a lot of the things similar to what the MoD wanted, they were quite good clients. But they were brave in a sense that they were prepared to have a non-air-conditioned office. Well, subsequently though they have put air-conditioning in a few areas. Not throughout, but just in a few areas. But I think the problem is that in the UK to have a non-air-conditioned office is just not acceptable. Certainly for a developer if you want to rent it out. People expect an air-conditioned office in the UK.

MS: *You are saying that the market will not accept non-air-conditioned offices.*

Eoin Hickey: Yes, but with air-conditioning you could say, right well, we will do an air-conditioned office, but instead of trying to keep it at 22 degrees you will allow the temperature to go to 24 degrees and that would save a massive amount of energy, and it is not that uncomfortable. But people want it spot on 22 degrees and then you get some people saying it is too cold at 21 degrees, and some other people say it is too hot at 23 degrees. And you think well, if you would just allow it and people are a bit more sensible in their expectations it would save a lot of energy.

MS: *Why do you think clients and developers do not like renewable applications?*

Eoin Hickey: It adds extra cost and it can be very difficult to incorporate, particularly if you are trying to develop an existing building, you are then really trying to design with one hand tied behind your back. It is a very difficult starting place to try and say, right we are going to develop this building, and then someone saying you have got to have 10% Renewables, and if it is a listed building or in a Conservation Area you have got someone else saying, you can not do this and you can not do that, and you can not put a wind turbine on there, and you can not put anything on the roof and you can not have a flue sticking out. And you are like, well what can we do. You just get into this no-win situation.

MS: *And for a new development, what are the main reasons there? Cost again?*

Eoin Hickey: Yes, I think cost, and there are very few Greenfield sites in London, where the London Plan is applicable, and if you do get one it is very easy to put in Renewables. But I think things like bore holes and ground-source heat pumps, I don't view them as renewable, because they are just an efficient heating system. They are still using energy. Things like solar thermal is a renewable energy source as you are getting free energy from the sun. Biomass is arguable I suppose because you are still burning fuel, but I do not think ground-source heat pumps should be classed as Renewables to be frank. In my opinion you are using quite a bit of electricity, they are not massively more efficient than a VRF-type system, which is an air-source heat pump, a standard commercial system.

MS: *Ground-source heat pump is a system where you have open loops or closed loops buried underground?*

Eoin Hickey: Yes, there are various types. There is one where you have the slinky buried in the ground, and then you have bore holes, you have got open and closed loops in the bore holes. They do work better when you use it for heating and cooling because in

the summer time you are putting heat back down in to the bore hole to try and get your cooling for the building so you are regenerating the bore hole so that in winter time, when you are extracting the heat out, there is something in there. If you are using it for heating at all times I have heard people say, I do not know how true it is, but some of the bore hole manufacturers say that after 10 years it will be knackered and it needs time to regenerate and you are not giving it time, because you are all the time extracting heat out of it, and you know, the COPs are very good but they are still sort of 7-8, so you are still using 1 kilowatt of electricity for every 7-8 kilowatts of heat you are getting out, so its not free energy, it is just more efficient. But they class that as a renewable, which I disagree with.

MS: *Would you have any suggestions what changes should be done to the current planning policy to reduce carbon emissions in a sensible way?*

Eoin Hickey: I think the whole 10% needs to be looked at from the point of development, because certain building types are easier than others. For residential use solar thermal works really well at 10% and I think it is very good. For office, obviously you are looking at, well you have got photo voltaic, but you will never get enough and it is so expensive and it has a sort of 50 - 60 year pay back, and the life of the panels is probably 30 - 40 years, so it will never really pay for itself, which is not commercially viable. I think you would have to look at it, to have some sort of renewable is not a bad thing but again just look at emissions, there is also a limit to how far we can go. I mean you are never going to get all buildings, it is not practical to say you are going to get every building down to zero carbon, because we need energy to run the building so we just need to look at where our energy source is. Maybe a source at power stations.

MS: *Do you think that one should say to developers and clients, ok, we do not want you to install Renewables if they are not suitable, however you will then have to allocate some money towards other projects off-site, like a wind farm in Scotland?*

Eoin Hickey: Yeah, that would be something. I do not know how you would put a value on that, but if you could come up with a scheme whereby you have to keep a minimum efficiency of your building, and then as a minimum you have to have that, and then you should get so much Renewables and so much better than that, and if you do not, there is a sliding scale on how much you pay for how much you are over. That would be good. Because at least then for existing buildings that are in a heritage area you can do something with them, it is just a cost but it keeps the building.

MS: *I have put a couple of statements together for your comments: The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.*

Eoin Hickey: Sort of agree, but I would not really use the word renewable technology. I would say reducing carbon, because if everyone switched the lights off in the building it would save a lot more energy. Offices do use a lot of energy and this can be reduced, but I think there is a limit to how much you can do with renewable technology. Because a lot of the ones on the market produce heating and offices do not need that much heating.

MS: *So it also depends on the behaviour of the people occupying the building, as well as the building design.*

Eoin Hickey: Exactly.

MS: *Another statement: The requirement of high flexibility for future tenants especially in regards to heating and cooling system hinders new office developments to achieve full potential of carbon saving.*

Eoin Hickey: I agree with that completely.

MS: *Is the BREEAM rating assisting in the development of more sustainable buildings, has that helped push the agenda forward as well?*

Eoin Hickey: Well, you can get sort of contradictions with the BREEAM, it is not just about energy. BREEAM has a lot of other things involved and some of them do sort of contradict each other, you know. By and large it is good, but when you get in to the BREEAM Excellent degree you are really pushing for those points. You start doing things that you think how practical are they really? You are doing stuff just to get the points, and not in regards how suitable they are for the building. A lot of the things in the BREEAM you can see there are good reasons for, but they are not necessarily applicable to each building. You are just doing things to get points, which is not really right, but you have to get the rating.

MS: *Who do you think should take the lead in the effort to reduce emissions?*

Eoin Hickey: I think it needs to be a team effort. I mean, ideally it probably should be in a way the architect, because traditionally the architect has always been the lead consultant on the job. And what happens at the moment is that the architect goes

along, they get a scheme together, they go down a road, quite far away down along the design, and they are thinking: we will get the M&E guy in to do the Renewables later. By the time M&E gets on board a lot of the stuff has been decided, like what the building is going to look like, sometimes a building has gone through planning, and you have got the shape of the building, which can be a glass box and you start looking at it and its unbelievable that they have not run it through a software. Just to get it past Part L can be a problem, and we think they must have run it through the software just to check, especially as the building has got all that glazing. And then we end up coming in and saying you need solar shading or the most expensive solar glass you can get on the market and straight away you are on the back foot and it's difficult. I think it needs to be a team effort and the M&E consultant needs to get involved earlier on.

MS: *I have not seen many architects using software and running those calculations*

Eoin Hickey: Well, the software is free. The way it is designed is reasonably good in the sense that there are loads of default values, so if you do not know what the heating system is, or the air conditioning you just tick on 'norm' and it gives a reasonable though slightly poor value, so you know when the M&E guy comes in you can actually adjust the COPs of your air-conditioning instead of using 2.5 its 3.5, so it gets better. If they run through on that and the building passes, then when the M&E get involved there will not be any problems. Or at least if it gets close to passing, you can look at it. They are way out a lot of buildings. It is just the industry, people have not realised, the developers and a lot of other people want a big glass building, and they do not necessarily realise that it is very difficult to get that because of Part L. I mean, Renewables as well on top of that, so I think it will get better over time, as people will become more aware about what they can and can't have.

MS: *Thank you very much for your time today Eoin.*

**Interview with Michael De Silva, Associate, Davis Langdon, on 28th August 2008 at
Davis Langdon London office.**

(MS = *Manon Stockhammer*)

MS: *Thanks for seeing me today. You are working in the Sustainability team at Davis Langdon.*

Michael De Silva: Yes

MS: *Are you involved with many projects where Renewables are installed?*

Michael De Silva: The role that we play is not always directly linked to delivery of some of these projects. Some of the work we are doing is much more strategically orientated. Having said that we are aware of the renewable planning requirement and certainly at the moment we are involved assisting as the sustainability team in these project, and as a company Davis Langdon is involved in quite a large number of projects which are looking at the requirement.

MS: *Do you think that renewable applications are suitable for buildings which have purely office use?*

Michael De Silva: Depends on the technology. There is no, I would not say there is not any kind of standard answer to that question. Certainly it is about scale, if you have one type of use then that does affect some of the things you can do viably. You can always put enough money in to these things to have the technology, but what value that's actually going to bring you in terms of energy paybacks as well as financial paybacks is a big issue. So certainly if you are looking at mixed use schemes you are tending to look at larger schemes that kind of give you much more opportunity in terms of the technology that you might be able to use.

MS: *So if it is an office building with say 10 to 15 storeys, which technologies do you think would be viable?*

Michael De Silva: I think it is a question of what is viable like if you have very deep pockets and you want to just make some sort of statement, perhaps a visual statement of your sustainability credentials, which one or two people have done. But I think the market is actually changing a little bit.

MS: *Was that the case for speculative office developments or for headquarters where an owner/occupier builds something for their own use and therefore is prepared to pay extra, maybe as marketing exercise?*

Michael De Silva: Yes, it tends to be that really. The speculative market is very different and you do find that for most of these developments the people that are looking at any of these things really seriously are owner/occupier type situations where they are prepared to cost in, factor in the operational use, the whole life cost, rather than speculative developers who really want to build it as cheaply as possible and get the rents. But again I think there is going to be maturation in the market, probably gone off at a tangent here, but I think as the market matures ultimately it is about building assets that maintain their value. As this market matures and the biggest driver ever, you know we have been talking about sustainability now for a good number of years and the benefits of it from a kind of view of minimising environmental impact, the biggest driver inevitably has been the rather dramatic rise in energy prices. And now suddenly people are looking at this very seriously and now even for speculative offices you think in terms of how you maintain the value of that asset for you, it is very much more about how the operational impacts and the cost of the operation. Because if you are not going to get tenants moving in to those buildings, because the operational costs are high, then the developers will start to rethink seriously.

MS: *Do you think that the introduction of Energy Performance Certificates is helping to raise the awareness of energy efficiency?*

Michael De Silva: Yes, definitely. It has a role at least in a way of illustrating things, you know people talk about the use of these things in terms of domestic appliances first of all, and again as the market matures there is an awareness raising thing so you know it is sort of a visual demonstration. I think its early days, but yes I think it will start to have an impact.

MS: *Is it possible to say how much the cost increase of the build cost is if you try to achieve say 10% renewable as per the policy requirement?*

Michael De Silva: Well people have looked at this in one way or another, and you know there is this common number the 10%, not just the 10% energy rule but the 10% premium figure that gets mentioned quite often, and certainly some of the figures I have seen would suggest that that the 10% cost premium is probably not too far off the mark but that is not looking just

necessarily at the renewables it is looking at a number of sustainability features in the building. If you are looking at reaching something like BREEAM Excellent you know and you budget appropriately, so if you committed to an assessment methodology at the onset and your budget has been set with that in mind, I think you are looking at doing within that sort of premium in terms of the costs. If you actually set off with a building and then suddenly think later on, oh well I think we need to look at getting BREEAM Very Good or Excellent then I would suggest you are looking at a higher cost escalation, so you know the importance of actually setting budget with a clear idea of what you are actually aiming for is where the brief is very important.

MS:

So now with the market weakening tenants might be able to choose between more available office space and demand higher environmental specification for the same rent, and developers who are already well advanced with their development and need to adjust to that would pay an even higher price to upgrade the building

Michael De Silva:

Absolutely, then the costs of doing that are actually significantly more than making sure that you have that in mind when you design the building in the first place. Also you hit on another important thing, because my belief is that as the market matures, here is what you will see, and again it is going back to the protection of asset value, what you will see rather than people being prepared to pay a premium in terms of rent for green buildings, I think it will start to go the other way round where the green buildings actually maintain their rentable value, and the ones that aren't, are considered not fit for purpose in the 21st Century and will actually go down in rentable value, so you can see the market potentially going the other way. And when we start factoring in things like potential impact of climate change and the needs for climate change adaptation, again I think this is going to play out even more in that area, because if a building is not able to maintain say thermal comfort within a certain band of energy usage I think you will have to go very much outside of that range of energy usage then that is going to have significant impact of costs in terms of operating and maintenance cost, plus the incentive that the tenant won't accept.

MS:

Especially if occupiers have other buildings to choose from.

Michael De Silva: Yes.

MS:

Do you think it would be better to invest the money in sustainable passive design measures, or stick to the glass box design and then just add on the required renewables, where do you think the money should be spent?

Michael De Silva:

A personal view is that I would not encourage people to think the answer to this is putting renewables in. There is a lot that we must do first and foremost about the fabric of the building, the fabric improvements are the most important thing first of all. And you know there are examples now of BREEAM Excellent buildings which are sealed and mechanically ventilated. Having achieved good thermal performance, air tightness and this sort of thing and then mechanically ventilated. There is some comfort cooling but it is minimal, but you know that is a potential route and I think an efficient route, I do not think one must be preoccupied totally with the idea that this has to be done purely by passive means, I think that is one route, but there are potentially other routes. But it is about minimising your energy requirement first and foremost before actually saying well, actually now we have to meet our energy requirements what technology do we use to meet that, and a case in point, and you know this is becoming sort of apparent to me quite recently, is that there is a lot of talk about installing ground source heat pumps and again, if you look at the sort of average performance of a ground source heat pump and compare that to a high efficiency condensing boiler, and you look at that in carbon impact, it is actually better to have a high efficiency condensing boiler than to put in ground source heat pump. So again I think one has to ask the question, what is it we are actually trying to promote by having on-site renewables. Is it about providing a context, an encouragement of using these technologies as a way of creating demand, and the demand then creating the investment in development in the industry to improve the efficiency and the performance of these things, but in the meantime somebody is having to pay the price. And the question is in a hard commercial market who really wants to invest in that now, because in the future somebody else is going to get the benefit of the technological advancement, so again there are some interesting curve arguments here I think that need to play out. Again when we start looking at photovoltaics, we know the situation with photovoltaics in the northern hemisphere.

MS: *They do not have a very good efficiency and you might need to replace them after 10 years.*

Michael De Silva: Yes exactly, and you are not going to get your embodied energy payback let alone any financial payback in that time. So again until we start looking again at the maturing market and maturing technology and we start looking at it mono crystalline, the sort of thin film type PV applications incorporated in to glazing this sort of thing yes, then we might actually start to see some slightly better benefits, some conversion efficiencies as well as some item to electrical energy but you know there is still a long way to go before we get to that.

MS: *Do you know which of the renewable energies or applications at the moment is generating the most energy for the money you actually pay to install it?*

Michael De Silva: I would say if you have got a community scale combining heat and power that is the only thing that you are probably going to see giving you a fairly effective return.

MS: *For an office building?*

Michael De Silva: No, you could not put it in an office building.

MS: *I think that an office building is the worst case scenario of a building use where you have to apply renewable energy to comply with the policy...*

Michael De Silva: Yes, it is the worst case. I can say at the moment, and again this is a personal view, if you are doing this speculatively one could ask the question why put in any of this stuff, could you just concentrate on doing the fabric improvements and basically in terms of future proofing that building, so that you could retrospectively put in some sort of technology when the technology becomes more viable, so the financial paybacks are more attractive, so the embodied energy paybacks are more attractive than they are at the moment. Because in the meantime by doing that, by improving the fabric you are actually improving the efficiency of your building, than putting appropriate condensing boilers or whatever to provide the heat you need, for example looking at solutions to more efficient cooling requirements and then making sure the building has some flexibility to deal with technologies later on. It is arguable a good way to go if the developer does not want to take on the risk of putting in lots of on-site renewables.

MS: *The trouble is that it is not left to the developer to decide*

Michael De Silva: No, that is true.

MS: *There are certain planning officers who understand the argument and who are actually willing to take it into account, and then allow the developer to achieve the required I think it is 20% energy saving through building design measure, but ask the developer to achieve say 30 or 40% but without renewables. It really depends on the Local Authority and the planning officer.*

Michael De Silva: Yes absolutely. Again it is interesting there has been quite a bit of debate about this Merton Rule, and whether it is a 'one-size-fits-all' approach to dealing with this and even by the admission of the architects of the Merton Rule, it was dreamt up in a pub, you know, after a few drinks. I think it was well meaning but I think one has to be very realistic about how it is actually applied. In fact recently the UK Green Building Council has been in discussion with the Department of Community and Local Government, Defra, and BERR as well, and have put together a position paper which looks at the Merton Rule. Not sure what it was called, I can't remember. But there is also recognition by Defra, I think it is Defra, by one of the departments, that maybe the Merton Rule needs a bit of a rethink and it has been referred to colloquially as the 'Merton Plus' which says, no actually we do need to look more seriously at this and does it have to be an on-site requirement or can we meet the 10% renewables or whatever the target might be, with off-site renewables. And I think that argument or that discussion is long overdue, because as I say it is really about saying what is it we are really trying to get out of the Merton Rule. It should not be on-site renewables at any price, when people do not understand what that price is, either financially or in environmental terms.

MS: *I think it should also not be used as a tool to push the renewable industry because the Government has not been able to do it, and all of a sudden they are putting it on the private sector and wash their hands of it.*

Michael De Silva: Yes exactly.

MS: *I think that in other countries on the Continent where they have the feed-in tariff, people are quite willing to retrofit their houses with PV cells or solar thermal panels. And in those countries the renewable industries are*

buoyant without some planning rule which forces everyone to install it on new buildings whether it is suitable or not.

Michael De Silva: Yes, absolutely. Well Germany is a good case in point here, where the feed-in tariff is very attractive for people to do that. But again you know that is one side of it and I think an important one in stimulating the market, but again you know the flip side of it, as we mentioned earlier is that, in doing that are they actually promoting a technology that in terms of its broader environmental impact in terms of embodied energy and materials etc is not actually that good.

MS: *Do you think that there could be some sort of mechanism where you could say the developers and design teams have to look at reducing the energy demand in accordance with the Building Regulations, they then should look into reducing it even more and then assess if they could apply on-site renewables. But if they cannot apply on-site renewables then there could be something similar to the Section 106 mechanism where you have a certain amount of money to pay per square feet, and that money is put in a fund and the Government or the Local Authority could use the money to upgrade the existing stock.*

Michael De Silva: Absolutely, and that is something I have actually said before at a conference for Ecobuild and at a seminar for CIRIA that I was speaking at, where I actually suggested that very same thing. Because as we all know the biggest impact is from the existing stock, particularly when you look at the housing for example. We still live in a country which has an aging housing stock, much of which is still going to be there because the replacement rate is quite low and the fabric improvements that we can bring to Victorian and Edwardian buildings would be significant, if you divert that money to fabric improvement, you know cladding systems etc. Again we have kind of a planning implication there and I mean Section 106 is a very good mechanism potentially to do that. There is an issue I think, in terms of aesthetics, an element to this where I think planning authorities still have this vision of tree lined Victorian Streets with brick buildings, and if we are looking at cladding it may be that our streets start to look very different. So again I think that there is an important planning implication where I think we need more enlightened Planning Officers to actually say, well no we do actually have to accept that this is going to be the case, and our housing stock is going to look very different.

MS: *That relates somewhat already to my next question: what sort of changes do you think should be applied to the current planning policy, do you think they should maybe just leave it out of the planning policies and let the Building Regulations deal with it?*

Michael De Silva: I think there is a strong case for that to be honest you know, and I think that whether its planning policy or Building Regs, they are two different mechanisms but yes, ultimately if you were to say look all future buildings have to reach an improved performance, so it is an improvement of Part L, in the next revisions of Part L or whatever, as a way of actually achieving this. Then you have an even playing field, you are not going to get different views from different Planning Officers and yeah, I think that should also do a lot to actually kind of generate I think innovation and improvements in the technology, because again you are going to have a huge scale there, because just taking the UK for example, if that was a Building Regulation and all future developments have to built to that then the industry will need to respond accordingly.

MS: *I think it probably would not be as prescriptive, the designers would have to look in to the building design, the detailing rather than just building another glass box. Is there an office building in London where you would say that it is a good example for a sustainable or energy efficient building - or do you think there are none in Central London?*

Michael De Silva: Well, I think Central London is an issue I think, because again this tendency to go for lots of glass and steel. Arguably it does not lend itself to this sort of thing, if you move out of the Central London area and again unfortunately I can't remember where, I think it is the Waterloo area, there is an office block which has been built on passive house principles.

MS: *Do you know if it was recently built?*

Michael De Silva: A couple of years ago, two - three years ago. One of the problems that we always have in this game is getting performance data. Lots of information on what buildings are designed to and how they are supposed to perform, but actually getting performance data. Post occupancy-type evaluation is lacking and we need a lot more of that data. One example I suppose in this area is the GLA offices, the 'Motor Cycle Helmet' as it has been called it, this has a number of different sustainability attributes to it but if you look at how the building is actually

performing compared to how it was designed to perform, it is not meeting that performance criteria.

MS:

It still is not, I thought that it had a big retrofit?

Michael De Silva:

No I believe it is still not. Apparently again this is where things start to get complicated, it is important to start pulling it apart, if you look at the way the building is actually being used, again it was not the way it was actually designed to use so it does not kind of fit in to the Econ 19 type of this is how we would expect this sort of building to perform. Because if you look at how it is being used, it is being used a lot in the evenings for events and things like this, and all these things need to be factored in to kind of give a true story of how it is performing and why it is performing, and why it is performing the way it is. So it is important to try and understand how buildings are actually being used, what are the occupancy rates compared with the design rates etc you know.

MS:

I think with the introduction of the Energy Performance Certificates in parallel for public buildings at least they are also introducing Display Energy Certificate, the DAC. The way I understand that is they are actually using the utility bills from the last year to show what the usage is. Do you think that this should be applied to every building not only to public buildings. Then you would have your energy rating and you would have your usage, so that would then maybe raise the awareness with an occupier especially when renting a BREEAM Excellence building but the occupancy behaviour is making this building perform badly.

Michael De Silva:

Perform less than it is designed for. Absolutely and I think, my feeling is that it is probably only a matter of time before that happens. I kind of think that the introduction in terms of public buildings is kind of maybe a bit of a test bed before it becomes a requirement across the board and I think that will act as a huge incentive. Because once people are seeing that data as a prospective tenant, again, yesterday on the news the days of cheap energy are gone, I think that is going to be the pattern.

MS:

Having said that I think I read that the cost for energy is still only 2% or 3% of the overall cost of running an office. So if you need to save money you are still better off to make someone redundant than try and switch off your lights.

Michael De Silva: Yes. That is right and again this is the kind of thing, I always forget the ratio, but it is the ratio of construction, operation and staffing costs etc and then if you look at it the energy costs are quite small. But equally when you see it on your balance sheet, I think it is something to kind of think you need to do something about and again, if you look at Econ 19 figures obviously its like looking from the left to right hand side, there is a lot of stuff on the right hand side which are behavioural changes and the combination of awareness, and that is the thing a lot of people are just unaware of the implications and the combination of awareness and a few but simple retrofits to the building management, protocols and so on can actually get you those quick mends.

MS: *Inform occupiers and educate them how to use the building*

Michael De Silva: Yes and also when we start to look at how the carbon market might start to work and the price of carbon, I think we could get the point where the price of carbon is such that it would certainly become a much bigger incentive to start managing those costs, even if it is only 3% while at the moment if you have a carbon cost associated with that, carbon credits.

MS: *Is that the scheme where the Government gives out the certificate to big users, which allegedly the first time round they gave out for free?*

Michael De Silva: Yes, there is a bit of a tightening up in the market, yes, I think basically there were more credits around than actually needed. So again in a maturing market more of those credits need to be taken out of the system. Take them all out of the system and then price them appropriately. Again that is going to start to have an impact, and again people are talking about as individuals, each of us having an annual carbon budget something again which is a tradable budget. If you do not use your entire carbon quota for the year because you do not fly to Australia, then you are in credit you can sell that to somebody else. As long as you have that scheme that is capped and reduced on an annual basis, I do think they are measures that do need to be seriously thought about.

MS: *Do you think that is more appropriate than having a carbon tax, where you just say ok we charge you less on your income tax but we introduce a tax where you have that much to use and if you do more you pay for it?*

Michael De Silva: I think it can be introduced I think the trouble with all of these systems though is that particularly if it is done on an individual basis is how it is tracked, it becomes very complicated doesn't it. The Government needs to look at fiscal incentives, whether it is this and again in the commercial sector, good incentives for these improvements as well and I think it is a balance at the end of the day between saying well, actually what we will do is that the Government will have a light touch approach but we will do is put the general kind of framework in place to allow the market to dictate and that will move things on, or whether it has to be done by legislation and taxation. I think if the more pessimistic views on climate change are to be believed I am not sure that we have the luxury of letting the market dictate the speed. Because I think it will take longer, of course if Governments actually intervene then there is obviously the concern about how that may actually upset the balance of the market and disadvantaging certain industries and of course now that we are looking at much more global markets across Europe etc and again in terms of competitions and monopolies, it is starting to get a bit complicated and in fact you may have heard of this thing called 'The German Ruling' in relation to the Merton Rule.

MS: *That it is unlawful to have your own supply only and not the national grid or something like that?*

Michael De Silva: The German Ruling is about the potential of the creation of a monopoly because if you have an on-site renewable source, that is the only renewable source that is available to you, you are effectively creating a monopoly. So there is this German Ruling and there is now some sort of discussion in regards to how that will affect the Merton Rule.

MS: *Michael, thank you very much for your time, it was very useful.*

Interview with Marie Sebban, Sustainability Engineer and Tom Spurrier, Renewable Energy Engineer at Ramboll Whitbybird, on 22nd August 2008 at Ramboll Whitbybird London office.

(MS = MS Stockhammer)

MS: *I assume you have experience working on office developments where you have to deal with renewable energy requirements. Are there any recent projects you can tell me about?*

Marie Sebban: I think my first project at Ramboll WhitbyBird was an office refurbishment in London and we had to meet the GLA requirement of 10%. We are working mainly on mixed-use office projects at the moment.

Tom Spurrier: I did one office project in Grosvenor Street that was mainly office with a small part of retail at ground and first floor. For that we proposed ground source heat pump system.

MS: *For the mixed-use office schemes what renewable energy technologies would you generally suggest for those?*

Marie Sebban: Combined Heat and Power (CHP) gets suggested quite a lot.

MS: *Does that provide the required 10% or 20% renewables?*

Marie Sebban: Gas CHP does not give 10% but can help to reach the target, in addition to energy efficiency and then sometimes we propose biomass boiler.

Tom Spurrier: We tend to recommend CHP and ground source pump systems, solar hot water systems. Photovoltaic cells are a slightly different category as it costs too much.

Marie Sebban: Yes, you pay a lot of money for PV cells.

MS: *What is the best renewable energy application if you compare it based on £ per generated energy?*

Marie Sebban: Biomass heating.

Tom Spurrier: In terms of £'s per kilo of carbon, things like CHP, solar hot water and ground source heat pumps, ground sources tends to be a bit more expensive, but they tend to sit together viability-wise and then it depends on the actual project and the energy mix and how well you are utilising.

Because if you are getting the maximum performance out of your solar hot water then it does quite well on the economic side. But for whatever site constraints if you are not able to maximise the use then the price creeps up. I think generally CHP generally comes in quite low.

Marie Sebban: And Biomass would be the first one.

MS: *I have heard that if everyone in London would utilise biomass we would get smog, is that correct?*

Marie Sebban: That's one of the problems with the GLA calculations, when you compare biomass with other options it comes in as the cheapest and if it is chosen for every development I would think it could become an issue.

Tom Spurrier: In terms of going through this exercise it jumps out as the best one, because it is the cheapest and it does the most, but in terms of actual sustainable design, once you install it it commits you to a fuel supply, wood pellets or something, for the long term.

MS: *I know it is very popular in Austria and also in some German regions but there are large areas of forests where they actually have all that waste wood which is then fairly close to the biomass installations, so it's not transported from how many kilometres.*

Tom Spurrier: We were doing a project in Romania a big refurbishment of a big retail park. We were looking at biomass there because it actually makes sense because you have got both forestry waste and sawmill, sawdust which they actually have problems with people dumping sawdust, and they have got large district heat networks so there is a few projects where they have set up energy centres and converting them all to runoff of sawdust. That works in a country where you have got high heat demand because it is pretty cold, you have got well established district heating networks so you only have to install one installation of biomass heating, and the fact that half the country is forest. It works because that's a pretty strong argument.

Marie Sebban: It is really sustainable.

Tom Spurrier: I have heard stuff about the amount of biomass allowance per person in the world, or per country. People say you know it is split up evenly, this is the kind of sustainable limit on how much biomass can be used in a year. The principle of, I do not know, it just does not strike me as a long term solution.

MS:

What about ground source heating and cooling. I have heard that you need to put in quite a bit of energy into the system to create energy, so it is not really a renewable energy source when compared to wind or the sun. And the other point I heard is that it's complicated if you always extract heat but you do not allow it to recharge than after ten or twelve years that's it.

Tom Spurrier:

Yes, we have looked at ground source heat pumps because obviously Central London due to the density of buildings you know it's a better option to go down in the earth. In terms of it being renewable, in my experience with M&E engineers they will say that people have been using heat pumps for years. But I have to be honest it is an interesting point, it is a standard bit of kit, but you are using as kind of natural resource, you know a renewable, hopefully renewable, resource to increase your efficiency significantly so I do not have any issue with it being a renewable energy.

MS:

Another concern which has been raised is in regards to locations in Central London and many developments using ground source heat pumps then you have too many too close together and the efficiency drops and you have to find out if the neighbouring development are already using the system because then you might not be able to, is that correct?

Marie Sebban:

Yes, that is correct. You have to know and investigate what happens on the adjacent sites and what has already been installed. And it is first-come-first-served really.

Tom Spurrier:

They are very fairly complicated systems in that when you are trying to calculate the carbon savings. It is not the same as saying this is my building with a boiler and electricity and I am going to stick on this much PV and I am just going to add this much electricity. With ground source heat pumps you have to make sure the entire system from the coils in the earth in to the heat pump, in to the distribution systems, the whole system is designed correctly and that all your flow temperatures everywhere and the whole system works correctly otherwise you will not achieve the efficiency that is stated. I think it is really important that people doing GLA calculations and look at installing ground source heat pump if you have an old-school M&E engineer and you have someone else looking at renewable energy as a separate thing it doesn't work. There are a load of specialists in the field for ground source systems and you really do need to look at the whole lot.

Tom Spurrier:

In terms of the first-come-first-served aspect that is a big thing, because it is underground and you are looking at the aquifers, it's quite interesting when

you want to dig somewhere you would have to see what all others are doing within about 100 metres or even 50 metres.

MS: *Basically if one achieves planning permission this year with a ground source heat pumps but does not start on site for another 2 years, because of the market, then it could happen that by the time that development gets built it cannot use the ground source heat pumps because the adjacent buildings are already using it. That would then mean that the renewable percentage will not be achieved.*

Tom Spurrier: The people who got planning permission in 2006 and 2007, then when these things get built in 2009 there is no guarantee. I think it is worth mentioning that at the moment there are two types of ground source systems, the main difference is the open loop system where you just go in to a well and you get the water direct from the aquifer you just suck it up and then chuck it back in. Or the closed loop which is just putting the tubes in and you run your water through, just getting the heat. For the open loop there are planning issues which have to be resolved first.

Marie Sebban: You have to contact the Environmental Agency (EA) and it is more complicated but less expensive.

Tom Spurrier: You have to get a license and it is checked at planning stage and you have to check that nobody else is doing it, so that your water is not contaminated by theirs etc. But for the closed loop system when I had a meeting with a specialist maybe three months ago I believe, he was saying at present there is no planning requirement, no legal requirement to check whether somebody else has got a closed loop system. So if we want to install it, we can and if the guy next door has already got one and we install ours and we heat up his bit of earth and there comes the temperature differential drops, both of our systems then drop in efficiency, and there is nothing to stop that. There is nothing to stop us installing an inefficient system, there is nothing to stop us making his system more inefficient. I think it was at the time there was a consultation going on. Its one of those things that in Central London with renewables and the high density of buildings, there is only so much natural energy going on. Under London anyway the amount of sewage and postal service railways and other things, it is incredible.

MS: *In regards to the requirement from the London Plan to achieve the minimum target of 10% and the aspiration of 20%, do you think it is actually a good thing that they say you must use renewables or do you think that maybe it*

should just say you must reduce your energy consumption by 20% or 30% but then leave it open to the design team how they achieve that.

Marie Sebban: I think it is good there is a target for renewable energy, or at least supply from low carbon technologies and which need to be on top of energy efficiency. When we do the GLA study we need to demonstrate we tried to reduce the natural amount as a maximum before putting the renewables on the top, they want to see that first. I think it is good but they are speaking about making it more flexible in the future. Some council are now speaking about possibly using carbon off-set finance or allowing the use of off-site renewable energy, but I think the GLA won't accept that at the moment.

MS: Do you think that for pure office use it actually makes sense to say you have to use renewable or do you think there should be something where they have to go through the process, but if the whole design team concludes it does not make sense for whatever reasons should it be an option where they pay into a fund for renewables somewhere else, rather than enforcing the use of inefficient renewables?

Tom Spurrier: I think it can be a bit too prescriptive in some instances, I think that possibly it should be more emphasis on just the total buildings carbon emissions in terms of energy efficiency. That probably would be a good idea in terms of Central London office blocks. There already exists a framework and I think it is good there are renewable targets of 10% because the renewable industry in this country, unless people push it is never going to get cheaper and so on and so forth. So I think it is good but I think you need more flexibility because the point of putting renewable energy on a building is to reduce the buildings energy use and carbon emissions from that and there already exists a framework to access that with the Part L Building Regs which is about total conservation of fuel and power, and that is just done on total carbon emission figure and within Part L they put an improvement factor from 2002 and then they have put a low zero carbon technology improvement factor, and they did not really have to do that, they could have just put one figure of 20% but they have split it out with the sole reason of saying look guys as we go on you are not going to be able to do it, as the targets gets stricter and stricter, now we have got the framework then in 10 years time you have to be down here, you are going to have to start using this low zero carbon technologies so I think that is why it is good to have targets of 10%. But in terms of actual requirements I do not see the difference between the Planning Authority saying right for your office block in

say Newman Street you have to maximise the energy efficiency and then we will put on the 10% on site renewables or saying you need to achieve a 30% improvement on Part L requirements. Then it is up to the design team to go and recognise the things that are going to achieve it. In the end it will be the same, the carbon emissions will be 30% lower it is just a case of whether you use renewables to achieve it or if you do improvements to building fabric and services for example. If you have got the whole building to look at the architect and M&E consultants can look at everything and it may be that it costs half of what the PV panels would cost to put triple glazed windows in and it might be that the developer may never have thought of spending that much on their glazing but actually its better and cheaper.

MS: *If the overall cost is slightly less then that is the way the developer will go plus if it is easier to integrate.*

Tom Spurrier: So I think that would be probably helpful because when you go through the GLA process and it is not working and they are pushing, there are so many options that I you end up looking at in terms of where you can stick PV on and you just think why not just put triple glazing in or can we please just please specify a really high air-tightness value, which will be hard to achieve but makes more sense. I think it should be a mixture, I think you need targets for renewables and for on-site renewables as well you need targets otherwise no one will ever do it. I think it is good that they are mandatory, I think they should possibly be fully mandatory and I think that actually a more helpful final requirement would be an improvement on Part L.

MS: *This is your building, this is your notional model and they just say reduce it by 30% and then in 2015 say reduce it by 50% and then as you say people will have to look into renewables potentially to achieve the higher targets.*

Tom Spurrier: Because once you are getting past 20% over Building Regs you are going to need to be using CHP and whatever else and the energy guys will know that.

MS: *Or is the other way to achieve the reduction that architect change the design of office buildings so that we do not have all these glass boxes, maybe get a bit more solidity?*

Tom Spurrier: They will have to do that, that will come. If you did that it would come as a result because your M&E guys would turn round and say, look guys if we stay with this glazing percentage this project is going to cost X to achieve that, because we are going to have to triple-glazed argon-filled facade and your

lettable area is going to be 10% less and the clients say that that they should make the windows a bit smaller. I think a lot of architects are realising that they cannot just build glass offices and air-condition them.

MS:

At what stage do you usually get involved in projects?

Tom Spurrier: I think that at the moment we have all been involved in projects where it has been quite last minute and the design is fairly developed and you are kind of Stage D and then you are suddenly on board. Then you have to produce options which never get picked up because the other design is so far ahead. But I think now for more developments we get involved at planning stages because the GLA requirements are such a big thing because of the implications and the implications of getting it wrong and having to stick on this much cash potentially that needs to be spent, most developers I think will appoint a sustainability expert, someone to cover that at the same time. One assumes they would get someone from services to look at it too.

MS:

Services engineers normally come in after the design is already in place, the building form, shape, size is kind of agreed so I think even that is a bit late.

Tom Spurrier: We are still in that list of consultants that come on boards once the architect has finalised the outline design and has talked to some structural guys as to whether that actually stands up.

Marie Sebban: There are some projects where there are no M&E consultants but we did the report for the GLA. We work with the architect and the client.

MS:

Who do you think should take the lead in the design team to push the sustainability and carbon saving agenda forward? Do you think that it should be the M&E engineers and sustainability engineers?

Marie Sebban: I think definitely everyone should be educated like everyone who takes part in the design, including the client and of course the architect. I would say not many understand all the implications, at least if design team members were educated it would help to make a change and convince the client.

Tom Spurrier: I think M&E consultants and sustainability consultants, whoever is doing the kind of energy assessment, and those guys will always be taking the lead because they have the knowledge. To be honest it is fairly complicated, I mean I have been doing it for a while now and it kind of feels I have a good handle on it, but to sit down and explain to a client who said right I am going to build an office in London what do I have to do on the energy side, to

explain the requirements and how you have to prove it and what it involves, the ins and outs of the separate tools you have to use for compliance and what is considered and what doesn't and the implications when you actually build it and what you need to plan and how much depth you have to go in to at planning stage to demonstrate it, is quite big and complicated. So I think those people that are doing it will always naturally be taking the lead because they understand it. I think architects and clients/developers need to be educated, like I said, some architects are very good at realising the simple things, like façade design, glazing, shading etc and stuff like that but some of them aren't very good and developers need to well it would be good if they started to think about the simple things, not just about glazing and buildings. You know what simple things make energy efficiency buildings and know about renewable. Again just to do simple things like the relationship between the glazing ratio and what type of glazing it is. That compared to renewables and how much renewables cost and if they had a bigger understanding of the energy efficiency of the design.

MS:

Is there a sustainable office development not necessarily one you have worked on which you think is a very good development, either because they have maybe employed passive design measures or maybe they have just designed a decent façade with external shading, enough massing.

Tom Spurrier: Off the top of my head, it goes back to what is best practice. As I think that the GLA building, the Mayors building down on Southbank, the big one. Has a lot of information in the press about how energy efficient that is, how it uses ventilation and kind of river source cooling, but it has a high amount of glazing so it is hard to tell. I can't think in my head a kind of best practice office in London.

Tom Spurrier: We are working on an office at the moment we are doing a review on renewable strategy and that is targeting an Excellent rating.

Marie Sebban: It is not in London, it is in Coventry.

Tom Spurrier: It has a tower and you could say they have pretty much looked at the first principles in terms of the overall strategy and how the façade and the glazing etc is going to work, and what the cooling system is going to be and how they are going to do that, and then which renewables they are going to have in. They are targeting an 'A' rating with the EPC.

I think it probably needs a bit of a step change in preconceptions of what an office is and what the requirements are, because for as long as developers have in their minds it has full glazing and full air conditioning you are not going to get anywhere with it.

MS: The trouble is it is mainly the tenants driving it, if you build something and you do not put air conditioning in they won't accept it.

Tom Spurrier: I think that is the way M&E consultants really have a job to do in educating tenants to understand it and building managers about different cooling methods.

We should design for climate change and we should be designing for 37 degree summers, so you are going to need cooling in an office that is certain. I think it is up to the M&E expert to step in and say look you guys are hung up on air conditioning, but what do you mean by air conditioning. This is one option, this is another option.

MS: Thank you both very much for your time.

**Interview with Peter Shaw, Principal Director of RHWL Architects, on 28th August 2008
in RHWL London offices.**

(MS = Manon Stockhammer)

MS: *Peter, could you please briefly describe your recent experience with the planning process in regards to renewables?*

Peter Shaw: King Cross and this is in the London Borough of Islington, has been requiring slightly more than 10%, they have been requiring a systematic approach to the design that ends at the 10%. So in other words the first thing that you've got to do is comply with better than Part L from the Building Regulations in terms of the insulation and so on, then you've got to look at CHP and other ways of improving energy efficiency, and then you look at on-site Renewables.

MS: *That is the Energy Strategy from the London Plan: you need to be lean, supply efficiently and then be green e.g. have some on-site renewable energy installation.*

Peter Shaw: The problem we have encountered recently at Kings Cross is that the London Plan only came in January and prior to that there had been a thing used called the Mayor's Toolkit, which was a user friendly method of calculating things. When the London Planning came in, which was exactly coinciding with our planning process, there is not Toolkit yet, for boroughs such as Islington to implement this plan. So everything had to be made up as we went along, effectively inventing the entire process. So once it's been made up of course you can do it easily again. But the extra complexity of the planning is huge, the amount of work that needs to be done by mechanical consultants is huge compared to what it was previously.

MS: *And did the planning officers provide any guidance or did they not know how to implement the policy themselves?*

Peter Shaw: I think they could certainly understand the regulations but they didn't know how to interpret them in terms of sensibly implementing them, so all you get is effectively played back to you the regurgitation of exactly what you can read for yourself. And what would be more useful is a more understanding interpretation of those rules because some things are actually contradictory, if you do one thing it contradicts

something else, and so a greater understanding is necessary I think, before it can be sensibly implemented.

MS: *What type of renewable applications do you think are useful for a building which has purely office use?*

Peter Shaw: I think the only ones that we found that make any sense are ground source heating and cooling which is fairly commonly used now I think photovoltaic panels are best used in Dubai I do not think they make any sense in London. I have often asked the question with things as sophisticated as photovoltaic panels, never mind how much they cost and how much it cost to repay them because that is influenced by subsidies, taxation and so on, but the energy that they take in manufacturing and shipping, how long does it takes to repay that. As for other things that you could do – what have we been doing? Where we have got residential we have been using solar hot water and that's better I think than generating electricity with photovoltaic. In terms of actual renewables I do not think there is anything else we have used in central London.

MS: *On the 30 Crown Place project I think you installed ground source cooling, and also photovoltaic panels on the roof?*

Peter Shaw: Yes we did and yes there are. There are photovoltaic panels which have just been installed on the roof and look very beautiful but you can't see them because they are in the plant rooms. But they had to be installed to get to the highest possible percentage but I am still pretty sceptical whether they make any real environmental sense.

MS: *What other measures do you think could be or should be taken to reduce carbon emissions for office buildings in Central London?*

Peter Shaw: Well, the difficulty in Central London is that the sorts of organisations that want the office buildings require deeper buildings, and they are going to be using information technology to a larger degree, and it's very noisy outside so it is unrealistic to open windows to cool the building or to provide fresh air. I think one could look at a system we used in Berlin on the Axel Springer Building. There we used a system called Parallel Fenster [parallel window], it was actually invented by a chap called Shock for the Main Tower in Frankfurt. It is designed so that you can open it and get natural ventilation without getting wind and without getting noise.

MS: *So it is not a double façade?*

Peter Shaw: It is the way the window opens which prevents noise coming in. But even so the amount of cooling and so on you get from that is impractical for a big building. The building that we were doing in Berlin was only 14 metres wide, whereas here 20 or 30 metres is normal. So in terms of designing a building in a Central London location I think you cannot do anything with the building form to improve its natural energy efficiency. Orientation you can certainly do something to passively shade because cooling is the biggest problem.

MS: *What about changing the glazing ratio, do you think that occupiers would be willing to accept something other than a glass box.*

Peter Shaw: No, because the buildings are so deep. When we had buildings with load bearing masonry and small windows they were very shallow, and I think that the price you pay for a deeper plan is that you need to provide as much glazing as possible. Heat loss and heat gain through the perimeter is nothing like as difficult to manage as heat gained from the equipment and the people within the building. So I think that improving the facades energy efficiency by let's say 50% is still problematical for an office building because you are effectively compromising its utility to achieve that. Again different out in the countryside where a few openable windows would be a very pleasant way to have an office ventilated.

MS: *Who do you think should take the lead in the effort to drive down carbon emissions? Should it be the M & E consultant, architects or should it be the client or developers by changing the brief and therefore influence the design from the outset.*

Peter Shaw: The answer is it has to be done through legislation. Because if it is not legislated and developers are not obliged to do it, then they will not do it. So there is no point really, there are only two things which could make developers produce more energy efficient buildings, one is legislation and the other is price of oil. The price of oil has gone very high, when it reaches \$200 or \$300 a barrel then I think that will become a big factor in renewable buildings. I do not think the M & E consultant or the architect can generally have much influence, they can be good at their jobs and implement their own tasks more efficiently in terms of the design but in terms of persuading the client it's unrealistic to expect that.

MS: *Why do you think that the client or developers do not like renewable energy applications?*

Peter Shaw: It's an extra cost.

MS: *Any other reasons or do you think that is the only one?*

Peter Shaw: I think that if every new building has to do it, they do not mind. I think they are irritated by the complexity it adds to the planning process which is already ridiculous, beyond ridiculous. Kings Cross was a scheme which is Phase 3 of an already agreed master plan, something like £1.5M worth of cost and the renewable side of that is adding to the cost. If you think about it the renewables is now being dealt with by Government legislation through the Building Regulations, it is also being dealt with through the planning process by the Mayor first and the local authority second. There are too many people doing it, frankly it should just be done through the Building Regulation.

MS: *So you think that policy should be amended so it may be just within the Building Regulations and everyone knows this is what we are going to do, no matter if we are building in Islington, the City or Hackney.*

Peter Shaw: The idea that some zealous local authority can do better than their neighbour is barking mad. This has to be done through a centralised Building Regulation.

MS: *Do you think that maybe the Building Regulations should change so rather than saying you have your notional model, have 20% reduction or 30% reduction, do you think it may be better if one just says ok, lets review what is actually average emission of a standard office building in London, lets say its 100. And then In five years time it has to be reduced to 70 and in another five years we have to cut down to 60. Rather than trying to do this notional model type calculation and then try to design something which is a percentage. Don't you think that maybe it should just be done a different way to set clearer targets, where someone can check after the building has been built and measure the emissions and then say right we did achieve it or not?*

Peter Shaw: Ok, what happens if the measurements demonstrate the building was not achieving its target?

MS: *Go back and fix the problem. I have heard from M&E consultants that mostly it is the commissioning of the mechanical and electrical systems. Or how the occupier is using the system, if the settings are not correct.*

Peter Shaw: But that's effectively beyond the control of the designer. A good example I know of is an office building where after a year they demanded that the M & E consultant come back and explain why their energy consumption was astronomical. They discovered the people running the building were running the heating and the cooling at the same time. By simply explaining how it works it halved the emissions.

MS: *I do not think that is the only case where things like this happened.*

Peter Shaw: What you can achieve through building legislation is that you can set easy targets, easy as in easy to understand, like u-values, they are the easiest possible calculation to make. In terms of things like carbon generation by an office building, it is going to be very hard to say you can only have 18kg per year per sq. ft. because they are so different the buildings that are likely to be designed. I had not really thought about the best way to do it to be honest. But certainly the way we are doing it is too complicated.

MS: *Maybe it would help to introduce Display Energy Certificates in addition to Energy Performance Certificates, so that the energy usage can be related to the anticipated energy usage as calculated in the EPC.*

Peter Shaw: Possibly. Obviously people use the office buildings in different ways and have different hours or working, different equipment, so it is very hard to compare two floors even within the same building. If you were running a small call centre 24 hours a day compared to someone who is a lawyer working sort of 9-5, there is a different level of energy.

MS: *Do you know any office building within central London where you think this is a very good sustainable or energy efficient office design?*

Peter Shaw: None spring to mind that stand out for that reason. Partly because there is an inherently un-green characteristic for an office building in Central London. There is only so much you can do with an office building in that location. Unlike like say BedZed in the residential area which everyone knows and it is famous.

MS: *Peter, thanks for your time and assistance.*

Interview with James Crawford, Head of City Investment and Peter Thursfield, Director of City office agency team at Savills, on 27th August 2008 at Savills City offices.

(MS = Manon Stockhammer)

MS: *Do any of the office developments you are involved with contain renewable energy installations?*

James Crawford: I am not sure, we are working on the Pinnacle, the Shard and then some of the big refurbishments in the City of London. Peter, do any of these have renewables?

Peter Thursfield: At the moment I do not think so. Miltongate did not, 20 Gracechurch Street did not, as for the Shard, the Shard is very energy efficient, actually there are some photo voltaic cells on the 'Baby Shard' on the south facing elevation, but I do not know if they put that in because of planning requirements.

MS: *I assume it has to do with the planning requirements and maybe because they want to be seen as a 'sustainable development'. Have you come across occupiers asking you to find space to let in buildings which have certain 'green' credentials?*

James Crawford: Yes, I have.

Peter Thursfield: Yes, but I do not think occupiers are rating buildings in regards to renewables, but certainly through BREEAM ratings, and to a certain degree LEED ratings, they are very much aware of it, and in their corporate social responsibility statement, which they have to produce every 3 or 6 months, it is a very easy box to tick. And more and more they are insistent that they do have this box to tick. One of our clients when they did their search, refused to look at any buildings which were not BREEAM Excellent.

MS: *So if you have two neighbouring buildings with the same size and specification but one building is BREEAM Excellent and the other building only Very good – do you think occupiers would be prepared to pay a higher rent for the Excellent rating?*

Peter Thursfield: There are terrible complicated cash flows for the cost of occupying buildings but I do not think that anyone is sophisticated enough and begins to understand them, and knows how much you could save in the service charge, and the energy cost is too small a percentage. Energy is maybe 40 - 50% of the service charge, which is say £8 - £10 per square foot?

James Crawford: If you look to save money you make some people redundant, rather than trying to save on service charge. The BREEAM rating is in the public spotlight, people know about it and are asking about it, but the next level of detail is unknown to them.

Peter Thursfield: I think if you have building A and B and only one building A has BREAAM Excellent rating, then an occupier would tell the Landlord of building B that they take the space, but he needs to install some wind turbines on the roof or some other Renewables and do whatever is necessary. I have heard that it is possible to retrofit buildings, for example with the Palestra building they put the turbines on when the LDA took some space. I can not believe that those couple of turbines on the top make an iota difference, presumably they have to go around to be working, but they are never going around.

James Crawford: It would be much better for those buildings if you have central systems which control the lighting, which we see now in quite a lot buildings, where the lights come on as you walk onto the floor, because that is a great energy saving. Still at the moment if you walk around in the City at night the place is completely and utterly lit up, and the biggest saving would be to having systems closing down all computers, lighting, heating or cooling, really simple things.

MS: *Do you think that in the last 4-5 years there has been a shift in perception and that occupiers are now demanding energy efficient and sustainable buildings?*

Peter Thursfield: I think there is far more awareness of it, and I think it is led by occupiers, because they occupy and use the buildings. And developers will broadly do whatever is necessary to get occupiers inside their buildings to pay rent as soon as possible. So I think people are becoming more aware of it.

James Crawford: On one of my projects they reduced the amount of glazing, that was related to BREEAM rating and the energy efficiency of the building and occupiers are used to all these big glass boxes which you see in the City and Canary Wharf. But I think you will now see more of a requirement for traditional materials and less glass, which is not necessarily what occupiers want.

MS: *This leads onto my next question, do you think that occupiers will accept buildings with less glazing and more solidity in the facades?*

Peter Thursfield: I think more and more tenants are becoming acceptable of mixed facades, if they understand that it is what is necessary to make the building more energy efficient, than I think they will accept it. They are becoming far more aware of the situation and that is changing all the time.

James Crawford: We are coming into a market where the vacancy rates in the City have increased from 5-6% up to more than 10%, our agents can now look at 10 buildings and not 2. If tenants who are looking for 100,000sqft space can only choose between 2 buildings you are not going to look at the energy efficiency, you are going to look if it works occupationally, is it the right location and is the rent right, and you take it. But if you have 20 buildings to look at you get to be much more selective.

Peter Thursfield: Also you can now get away with shading and printing on glass, like you did with 30 Crown Place, and that is becoming more common now. But all the towers are still going to be glass, and the new Cheapside proposal is all glass. The environmental strategy for the Shard includes CHP, heat recovery systems, where they use the heat generated by the air-conditioning of the offices to provide the heating for the hotel and the residential use. So they are looking at ways to reduce energy. The Pinnacle development which is classed for offices, retail and food, has got triple glazing. At high level they are looking at natural ventilated office space, and it is feasible and viable. Because the office space is above the level with all the noise, the dust and the dirt, but they will have supplementary systems for hot summer days.

MS: *Do you think that tenants will also start to accept chilled ceilings or chilled beams?*

Peter Thursfield: I think you will have to be a brave developer to choose that sort of system.

James Crawford: I have seen developments with chilled beams, but they are not flexible enough for the tenants. The debate is still ongoing if they use them for Argent's King's Cross development. They have also used them for the Helical development, above the M&S around the corner, but also with blinds which trap the light and the sun and are operated by a BMS [Building Management System]. Not sure if it works but looks quite pretty.

Peter Thursfield: The tenants in the Gherkin moan like hell, they got these retractable blinds operated by the BMS and they hate it. They sit in their office and suddenly the blinds go up with some noise, and they really object to it and there is no overriding system in place. They also had problems with the natural ventilation, with the atriums over 6 storeys which was not feasible as the floors were supposed to let as packages of 6 and that did not happen.

Peter Thursfield: To come back to the point about chilled beams, tenants always want to have control as with the blinds. So I can not see developers putting in chilled beams as a final specification.

James Crawford: That is the occupier side, and if you also look at the investor side, investors are looking for standard products which can be sold into the institutional UK and European markets, so as soon as you go non-conventional you then have the concern if the tenant goes bust, will it let? If the fit-out is the typical, standard specification everyone will take it. And I think with chilled beams the base building systems cannot be that easily adapted.

Peter Thursfield: We are not seeing tenants doing much in regards to improving energy efficiency in their fit-out, are we? If they take a floor and do their Cat A fit-out they could do modifications to increase the energy efficiency.

James Crawford: No, we do not see that. I think that tenants want to be able to be provided with a building or space which is categorized as BREEAM Excellent and I do not think they have come to terms with the Renewables percentage. Americans think in terms of LEED, UK in terms of BREEAM, and they just want to be able say we are in a BREEAM Excellent building and they have not got any further. And if you were to tell a tenant that they have to make certain modifications to get there, they would demand that the landlord does that. Most of the tenants we deal with in the City are too small to organise those works themselves and they do not have the capabilities.

MS: *What implications do you think the introduction of Energy Performance Certificates (EPC) will have on the building rating, will it affect the market?*

Peter Thursfield: I think lots of buildings will do it and I do not know who exactly will carry out the assessment. The real concern I have is that the size of the label is just not appropriate, if they want to have it displayed at the entrance. I think it is like 12 x 12 inch and it just looks ugly, if it were a little strip it would be fine, it is those sorts of practical things which are annoying. It is treating everyone as though they are 2 year olds because tenants in the City are relatively sophisticated, they do not want to be told that they have to have a 12 inch x 12 inch sign next to the tenant name saying EPC rated building. It just looks wrong. I would do a tiny, tiny plaque, or keep it with the building manuals.

James Crawford: One thing which we will see, because construction cost are still rising, what happened in the past was that lot of the old buildings became redeveloped with big, new buildings, but as the market goes into a decline we will see refurbishments coming back in. So there will be more existing stock from the say 80ies, which will perhaps get some renewables installed and maybe new glazing but not many. So there will be many old buildings with bad EPC rating.

MS: *Have you heard about the so called 'green leases' whereas a standard lease has additional clauses to enable certain upgrades to be carried out with the tenant cooperation and potentially extra cost accepted by the tenants?*

Peter Thursfield: I have not come across one yet, but I know that they are in existence. I think Land Sec and Hammerson are trying to use them. I suspect what you will find with those green leases is that in certain markets, probably not in the City of London that will be difficult, but in certain out of town business park it is easier to do that sort of thing. I do not think that you will find people using green lease in London as standard, I just do not see how. Especially if it inconveniences the tenants because the landlord is trying to install new air-conditioning when the tenant is still in-situ. I think in London they will be watered down to a high degree, as tenants will just not accept it.

James Crawford: Some occupiers will do it, like Goldman Sachs, who is really great in corporate social responsibility. But they will want to do it themselves, under their management and control.

MS: *Why do you think that clients and developers are opposed against Renewables for new office developments?*

James Crawford: We do not really know about the requirement for Renewables. I think you have to be involved in a project quite closely to get to that amount of detail, and we tend to be looking at the bigger picture, is it lettable, what is the specification. But we do not necessarily know about planning requirements.

Peter Thursfield: We do development consultancy but a lot of it does not involve the details, but more the floor plate design, the glass to glass distances, lift servicing strategy and such. We are quite good in pointing out the obvious mistakes, we look at the big picture.

MS: *Who do you think should lead the effort to increase carbon saving in office buildings and make them more energy efficient?*

James Crawford: The driver is usually when you are required to do it. If you can not sell your real estate because it does not have the specification or standards, you will then have to focus on it. I can not see at the moment that the energy cost, unless they spiral out of control, will ever be material enough to then say it is worth putting in resources to bring our fuel bills down, as it is such a small percentage. Now it would become more material if actually there were issues on the grid, and we have heard about this in the City, the power has gone down and the building back-up power was not sufficient.

Peter Thursfield: I think that dual power for buildings will become more attractive. To answer your question, I think it is up to the developers and the property industry to forecast what tenants will want out of their building in the future and that is where we got to go in. So is that the tenant driving the process, or the landlord or the professional, the developer, I am not sure. It is either the property professionals to forecast what they think the tenants want, or then I suspect that some of the property professionals will tell the tenants that that is what they should want. Is almost goes round in a full circle, the tenants then say, oh that is a good idea, and then it comes back round again

as they tenants then demand it from the developers. So I am not sure who is driving it.

MS: *It has been said that the circle of blame applies as well, with the assumption that sustainable buildings are not demanded by tenants and therefore are not built and tenants therefore have no choice and thus no demand.*

Peter Thursfield: It all comes down to when there is the cost advantage of doing things. So in a different market, when rents are going up and everything is fine and dandy, then a developer might choose to do it, because it is a differentiator to another building and at that point it drives it forward a notch, it costs him another 2% of the build cost, but he expects higher rents.

MS: *Do you know an office building in London which you think is a good example for a sustainable and energy efficient development?*

Peter Thursfield: I do not know what to look for, does it need wind turbines on the roof and such?

James Crawford: Or maybe the building with the lowest service charge, but then you would have to assess the service charge components.

Peter Thursfield: Maybe New Street Square, is that clever and sustainable?

MS: *Yes, you could say that New Street Square is sustainable as they used external solar shading to cut solar gain, have the option of openable windows for natural ventilation and the building orientation is aiming to maximise daylight into the offices.*

Peter Thursfield: That has never been part of the marketing, as far as I am aware that has never been mentioned. I think that Heron tower is fairly sustainable, they have the cores onto the south facades, with photo voltaic cells in one of the elevations.

James Crawford: I think that the Parry building on Finsbury Square is also very clever designed, with stone in front of the glazing. But I am not sure if it is energy efficient.

MS: *So at the moment you do not really get enquiries where occupiers ask you to find a sustainable building for them to let?*

James Crawford: If the market is tough and it is a requirement then it needs to be achieved, but if the lawyers or surveyors do not ask for it that this certification is needed then it does not play a role really.

Peter Thursfield: But surely there should be property funds which invest purely in energy efficient buildings. And it is a general property fund where you and I can go and we can invest our money, what little money there is, into a fund and we feel we want to do our bit for the environment at the same time. I am sure you would find a market for energy efficient property fund, rather than your standard. And it makes you feel better.

MS: *Last question, do you think that a carbon tax could be a solution?*

James Crawford: Tax has to be efficient, it does not work if it gets complicated. It needs to bring in large amount easily that is why we have income tax, VAT and stamp duty. So I can not see how a carbon tax can work.

MS: *Thank you very much for your time.*

Questionnaires

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description: Director Building Services

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 8
- Projects in construction stages: No. 10
- Projects completed: No. 8

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 46

And how many of those developments have renewable energy technology integrated in the design? No. 6

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. If 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: 4
- More solidity in the façade design Rank: 3
- Application of natural ventilation Rank: 5
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 4
- Installation of solar thermal panels Rank: 3
- Installation of biomass boilers Rank: 1
- Installation of biomass CHP Rank: 6
- Installation of micro-wind turbines Rank: 5
- Installation of ground-source heat pump Rank: 2
- Other measurement/ application: Gas CHP
(not renewable) Rank: 2

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

we have made in excess of 50 applications not just about a 12 projects

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. around 10.

- Projects where the amount of renewable energy applications increased from planning to construction stage: No. None.

Please list the reason(s) given for any change: Negotiate a Carbon Reduction measures more important than renewables.

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

One office development is Ealing and at Kings Cross.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

A problem in getting 10% due to the cooling nature of offices and the lack of a heating requirement which relies on Solar thermal + biomass. CHP biomass is just not practical.

So the only real solution is CHP + absorption cooling for carbon reduction but it needs a large building to be economic

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Concentrate on the CHP is doing now on carbon reduction in design i.e. facade etc and less on renewables

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Good design on the facade and fabric and energy saving on the HVAC systems.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: Waited use on new buildings. I would concentrate on the existing building stock.

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: Completely impractical to design a building to do so without my comments under 9.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: Good design and BMS + meter can overcome this.

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: The two are not always compatible

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: Not that we have seen yet in the market

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: Can be but operatinal issues are more important

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: Debnds Sustainability is very important and
gimmicks are not and renewables are sometimes seen as they

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: Agreed

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: Deagred but not no gimmicks see 18 above

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy
 Cost consultancy
 Planning consultancy
 Other, pls describe: _____

Architecture
 Agency
 Developer

2. What is your job description: DIRECTOR (MECHANICAL)

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 2
- Projects in construction stages: No. 1
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 0

And how many of those developments have renewable energy technology integrated in the design? No. 2

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 1
- Installation of solar thermal panels Rank: 2
- Installation of biomass boilers Rank: 3
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: _____
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. 0
- Projects where the amount of renewable energy applications increased from planning to construction stage: No. 1

Please list the reason(s) given for any change: Client change due to Premium

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

W1 Block Regent St. - Very little renewables were utilised however the facade and M+E services were very carefully designed to minimise CO₂ emissions.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Renewable energy which is easily utilised and can achieve 10% or more savings do not readily lend themselves to office developments (e.g. solar thermal hot water generation is very good but offices have small hot water + heating loads)

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office

developments? More emphasis should be placed on saving energy. Also measures need to be put in place to ensure that proposals suggested at planning are implemented throughout the life of the building.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

Improving the envelope of the building by reducing glazing, Internal summer time temperatures of 24 degC instead of 27 degC would further reduce Air Conditioning (load)

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1

2

3

4

5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1

2

3

4

5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1

2

3

4

5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1

2

3

4

5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1

2

3

4

5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

Questionnaire

MSc Report - 2008

Manon Stockhammer

(3)

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: _____
- Architecture
- Agency
- Developer

2. What is your job description: PARTNER

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 2
- Projects in construction stages: No. 3
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 1

And how many of those developments have renewable energy technology integrated in the design? No. 2

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. If 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

Questionnaire

MSc Report - 2008

Manon Stockhammer

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 3
- Installation of more efficient mechanical and electrical plant Rank: 3
- Installation of chilled ceiling or chilled beams Rank: 3
- More solidity in the façade design Rank: 4
- Application of natural ventilation Rank: 0
- Other measurement/ application: CCHP Rank: 8

Be Green:

- Installation of PV cells Rank: 2
- Installation of solar thermal panels Rank: 2
- Installation of biomass boilers Rank: 8
- Installation of biomass CHP Rank: 8
- Installation of micro-wind turbines Rank: 1
- Installation of ground-source heat pump Rank: 0
- Other measurement/ application: _____ Rank: _____

Questionnaire

MSc Report - 2008

Manon Stockhammer

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. N/A *Generally no change*
- Projects where the amount of renewable energy applications increased from planning to construction stage: No. N/A

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

N/A, Most scheme have a target in mind.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Better carbon savings can be achieved through energy saving in more efficient cladding, M+T etc.
Renewable energy in an urban environment tends to be inefficient.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Concentration on energy saving rather than insisting on renewables.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Improved insulation and naturally ventilated buildings.

Questionnaire

MSc Report - 2008

Manon Stockhammer

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: _____

Questionnaire

MSc Report - 2008

Manon Stockhammer

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments

1 2 3 4 5

Comment: Generally the renewable options are not practical

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Architecture
- Agency
- Developer

Other, pls describe: Quantity Surveyor

2. What is your job description: Partner

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 3
- Projects in construction stages: No. 1
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 3

And how many of those developments have renewable energy technology integrated in the design? No. 3

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 2
- Installation of more efficient mechanical and electrical plant Rank: 1
- Installation of chilled ceiling or chilled beams Rank: 3
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: _____
- Installation of solar thermal panels Rank: 2
- Installation of biomass boilers Rank: _____
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 2
- Other measurement/ application: Gas CHP Rank: 1

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. 0
- Projects where the amount of renewable energy applications increased from planning to construction stage: No. 0

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

I can't think of an exemplar spec. office.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

mostly cost. The more financially viable options are usually the worst thought of by planners.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Allowing the incorporation of off-site renewable energy into the equation for reduction of a building's CO₂ footprint

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Reduce the need to use electricity by smarter use of materials and optimisation of natural light and ventilation.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: The technology needs to be cost effective or new buildings will not happen

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: This will price new buildings out of the market as developer margins will be hit.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: I feel this is largely driven by perceptions within the letting market

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: CSR dictates their need to do this but they are not prepared to pay additional rent to achieve this

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: If rental income increased to pay for the incorporation, it would. As it doesn't, the developer is left to pay for it.

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: It may make the difference between a tenant selecting one building or another but it has no impact on rent.

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description: Partner

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 3
- Projects in construction stages: No. 2
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 7

And how many of those developments have renewable energy technology integrated in the design? No. 5

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 2
- Installation of more efficient mechanical and electrical plant Rank: 1
- Installation of chilled ceiling or chilled beams Rank: 3
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 2
- Installation of solar thermal panels Rank: _____
- Installation of biomass boilers Rank: _____
- Installation of biomass CHP Rank: 3
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 1
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 0
- Projects where the amount of renewable energy applications **Increased** from planning to construction stage: No. 3

Please list the reason(s) given for any change: EDITION OF DESIGN PROJECT

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

ADDITIONAL COST OF PROVIDING RENEWABLE ENERGY APPLICATIONS.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments?

NOT SURE CHANGE TO PLANNING POLICIES IS THE ANSWER BUT GRANTS OR OTHER INCENTIVES FOR DEVELOPERS MIGHT BE.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

MORE SOPHISTICATED BMS WITH IN BUILT MEASUREMENT TECHNIQUES

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1

2

3

4

5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1

2

3

4

5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1

2

3

4

5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1

2

3

4

5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1

2

3

4

5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description: DIRECTOR3. What is the amount of speculative office developments you were involved with/

working on in the last 6 months: NONE *THIS PAGE INFO RELATES
TO COMMERCIAL PROJECTS
GENERALLY*

- Projects in planning stages: No. 2
- Projects in construction stages: No. 2
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 1

And how many of those developments have renewable energy technology integrated in the design? No. 1

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. If 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 2
- Installation of more efficient mechanical and electrical plant Rank: 1
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: _____
- Installation of solar thermal panels Rank: 3
- Installation of biomass boilers Rank: 1
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 2
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 1 (BY ABOUT 30%)

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 0 • RENEWABLE ELEMENT WAS NOT A SPECIFIC PLANNING REQUIREMENT.

Please list the reason(s) given for any change: • PROJECT BECAME DFB AND CONTRACTOR VE ITEMS WERE ACCEPTED

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

N/A

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

TENANTS ARE NOT YET FULLY AWARE/DON'T CARE ABOUT POTENTIAL RUNNING COST SAVINGS/ENVIRONMENTAL BENEFITS OF GREEN BUILDINGS

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? NONE - THE INTRODUCTION OF EPC'S FOR ALL NEW DEVELOPMENTS WILL PROMOTE THIS THROUGH MARKET FORCES

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? ENERGY/ELEC/WATER/GAS/HEAT METERS AND THE REQUIREMENT OF DEC'S - THIS WILL BE EXPANDED AND IN A COUPLE OF YEARS BECOME ESTABLISHED

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: EXISTING BUILDING STOCK MOST IN NEED OF UPGRADE

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: WILL HAVE TO BECOME COST EFFICIENT FIRST

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: VRF BASED WATER COOLED EQUIPMENT WITH
CONDENSER WATER HOUSE SYSTEMS ARE
MAKING A HEADWAY INTO THIS PROBLEM

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: USAGE HAS TO BE CAREFULLY CONSIDERED
SIMPLER IS BETTER SOMETIMES

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: EXCEPT FOR PUBLIC/ECO COMPANIES
I DONT THINK SO AT THE MOMENT

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: Cost vs RENT rather than cost only

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: NOT YET

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: Only public bodies at present

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: COST IS STILL MAIN DRIVING FACTOR

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description: TOWN PLANNER3. What is the amount of speculative office developments you were involved with/
working on in the last 6 months:

- Projects in planning stages: No. 1
- Projects in construction stages: No. 0
- Projects completed: No. 0

How many of the above listed projects fall under the requirement to provide a
minimum of 10% renewable energy on site? No. 0

And how many of those developments have renewable energy technology integrated
in the design? No. 0

4. What is the majority of building sizes, measured in gross floor area, of these
developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box
only):

< 50,000 sqft

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: _____
- Installation of more efficient mechanical and electrical plant Rank: _____
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: _____
- Installation of solar thermal panels Rank: _____
- Installation of biomass boilers Rank: _____
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: _____
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 0

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 0

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Increases initial build costs

10. What changes should be made to the current planning policies (London Plan,

national and regional level) in order to encourage CO₂ emission savings in new build

office developments? Should allow more flexibility in using off site renewable energy as I don't think in the long run having each development providing energy on-site is more efficient. It should be done on a more borough wide basis as you would get economies of scale then.

11. In your opinion what would be the most effective measurement for carbon saving

in speculative office buildings and what would be involved to implement the measurement?

Using regional based renewable energy and better use of modern materials and technology

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

(8)

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: _____

- Architecture
- Agency
- Developer

2. What is your job description: DIRECTOR

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 6
- Projects in construction stages: No. 1
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 3

And how many of those developments have renewable energy technology integrated in the design? No. 3

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: 3
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: _____
- Installation of solar thermal panels Rank: _____
- Installation of biomass boilers Rank: 2
- Installation of biomass CHP Rank: 1
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 3
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 1 **N/A**

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 1 **N/A**

Please list the reason(s) given for any change: No CHANGE @ construction

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

COST

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments?

CURRENT LEGISLATION APPROPRIATE

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

<input type="checkbox"/> M&E services consultancy	<input type="checkbox"/> Architecture
<input type="checkbox"/> Cost consultancy	<input type="checkbox"/> Agency
<input type="checkbox"/> Planning consultancy	<input type="checkbox"/> Developer
<input type="checkbox"/> Other, pls describe: <u>Development Consultant</u>	

2. What is your job description: Development Advice

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 4
- Projects in construction stages: No. 1
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 2

And how many of those developments have renewable energy technology integrated in the design? No. 2

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

*Best 10
Least Effective 1*

- Improved façade/ envelope design Rank: 5
- Installation of more efficient mechanical and electrical plant Rank: 10
- Installation of chilled ceiling or chilled beams Rank:
- More solidity in the façade design Rank: 5
- Application of natural ventilation Rank:
- Other measurement/ application: Ground Water Cooling Rank: 2

Be Green:

*Best 10
Least Effective 1*

- Installation of PV cells Rank: 3
- Installation of solar thermal panels Rank: 3
- Installation of biomass boilers Rank: 2
- Installation of biomass CHP Rank: 2
- Installation of micro-wind turbines Rank: 11
- Installation of ground-source heat pump Rank: 5
- Other measurement/ application: _____ Rank:

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. 0

- Projects where the amount of renewable energy applications increased from planning to construction stage: No. 1

Please list the reason(s) given for any change: Design Development

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

Welsh Parliament

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Commercial Reality - The main savings can be made through more capital spend on M+E but market rentals do not allow it. Other fashionable options are ineffective

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Reward lower energy usage. Do not plan a capital/operational burden on the property.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Energy consumption - the electric/gas meter readings

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4

5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: But will reduce the number of new building /refurb building coming to market. Hence old inefficient building will be used,

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4

5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

3

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

(10)

1. What is your area of occupation (pls tick one box):

M&E services consultancy
 Cost consultancy
 Planning consultancy
 Other, pls describe: _____

Architecture
 Agency
 Developer

2. What is your job description: MECHANICAL SERVICES DIRECTOR

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 3
- Projects in construction stages: No. 3
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 2

And how many of those developments have renewable energy technology integrated in the design? No. 2

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 10
- Installation of more efficient mechanical and electrical plant Rank: 10
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: 2
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 2
- Installation of solar thermal panels Rank: 8
- Installation of biomass boilers Rank: 2
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: _____
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage? NONE

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. NONE

- Projects where the amount of renewable energy applications increased from planning to construction stage: No. NONE

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

HEAT PUMP SYSTEMS ARE CONSIDERED MOST BENEFICIAL AS THEY ARE MORE EFFICIENT COMPARED TO OTHER SOURCES OF ENERGY & PROVIDE COOLING AT THE SAME TIME.
THESE SYSTEMS SHOULD ALSO BE CONSIDERED IN CONJUNCTION WITH NATURAL VENTILATION WITH INTERLOCKS TO PREVENT ENERGY WASTAGE

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

APART FROM SOLAR HOT WATER PANELS & RAINFOREST HARVESTING, ALL OTHER RENEWABLES ARE CONSIDERED ECONOMICALLY UNVIABLE

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? CLIENTS SHOULD BE ALLOWED TO DEVELOP BUILDINGS WITHOUT RENEWABLES BUT CONTRIBUTE TOWARDS A CENTRAL MORE EFFICIENT RENEWABLE ENERGY GENERATOR I.E. WIND TURBINE FARMS, WASTE POWER GENERATORS, etc.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? BORE HOLE HEAT PUMPS & PV CELLS ARE THE MOST EFFECTIVE MEASUREMENT AFTER THE BUILDING FABRIC DESIGN BUT HAS COST IMPLICATIONS.
THE DEVELOPMENT OF MORE ENERGY EFFICIENT LIGHTING IS THE KEY TO REDUCING CO₂ SUBSTANTIALLY

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: TRANSPORTATION, SPACE, ETC IS UNVIABLE

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: CLIENTS WILL HAVE NO CHOICE BUT TO COMPLY

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: No IMPACT

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: ONLY AS IT REDUCES THEIR ENERGY BILLS.

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

11

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description:

PRINCIPAL MECHANICAL ENGINEER

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 1
- Projects in construction stages: No. 4
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 3

And how many of those developments have renewable energy technology integrated in the design? No. 3

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 2
- Installation of more efficient mechanical and electrical plant Rank: 3
- Installation of chilled ceiling or chilled beams Rank: 1
- More solidity in the façade design Rank: 2
- Application of natural ventilation Rank: 0
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 2
- Installation of solar thermal panels Rank: 2
- Installation of biomass boilers Rank: 0
- Installation of biomass CHP Rank: 0
- Installation of micro-wind turbines Rank: 1
- Installation of ground-source heat pump Rank: 1
- Other measurement/ application: _____ Rank: 0

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. 2
- Projects where the amount of renewable energy applications increased from planning to construction stage: No. 0

COST AND PLANNING

Please list the reason(s) given for any change: CONSTRAINTS

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

OFFICE REFURBISHMENT AT HOUNSDITCH
IN THE CITY OF LONDON

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

SOLAR: TOO MUCH ROOF SPACE IS REQ'D TO GET 10%,
PANELS TOO LARGE, ALSO NEIGHBOURING BUILDING SHADE PANELS.
BIOMASS: TOO MUCH SPACE IS REQUIRED FOR BOILERS AND
HOPPERS, ALSO STORAGE SPACE FOR FUEL AND DISPOSAL PROBLEMS
GROUND-SOURCE: EXPENSIVE AND NOT PRACTICAL IN CITY DEVELOPMENTS

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build

office developments? IMPROVE INSULATION TO BUILDING FABRIC,
REDUCE GLASS FACADE - ENCOURAGE MORE FACADES
TO USE 'MASS' SUCH AS THICK STONE SUCH AS
PORTLAND STONE - LESS SOLAR GAINS - RETAINS HEAT

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

DESIGN OF FACADE, MORE EFFICIENT HVAC
PLANT AND REVISE INTERNAL TEMPERATURE SPEC
IE: INTERNAL COMFORT TEMP FROM 21-22°C TO 23-24°C
FOR COOLING - HUGE SAVING!

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: RENEWABLES ARE DIFFICULT IN CENTRAL LONDON. MAKE + DESIGN BUILDINGS + PLANT TO BE EFFICIENT TO REDUCE CARBON EMISSION

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: THIS LEGISLATION WILL FORCE UPTAKE OF RENEWABLES BUT WILL BE VERY DIFFICULT TO PROVIDE. SEE COMMENTS ON 9

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: FLEXIBLE CONTROLS + BMS SYSTEMS + GOOD DESIGN. IF THIS IS DONE THEN THIS IS NOT AN ISSUE.

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: NOT COMPLETELY TRUE, BUT DOES HELP

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: NOT MAIN ISSUE.

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: TO SOME DEGREE, BUT ACCOMMODATION OF PLANT IS AN ISSUE

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

IT'S OK FOR TENANTS TO SHOUT 'HEY I'M GREEN'

Comment: BUT WOULD NOT BE WILLING TO PAY EXTRA FOR THIS ESPECIALLY IN THIS ECONOMIC CLIMATE

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: YES

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: YES BUT NOT AT TOO GREAT A PRICE

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

12

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: Sustainability consultancy
- Architecture
- Agency
- Developer

2. What is your job description: Renewable energy engineer

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 10
- Projects in construction stages: No. 0
- Projects completed: No. 0

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 5

And how many of those developments have renewable energy technology integrated in the design? No. 5

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

<input checked="" type="checkbox"/> Improved façade/ envelope design	Rank: <u>1</u>
<input checked="" type="checkbox"/> Installation of more efficient mechanical and electrical plant	Rank: <u>2</u>
<input type="checkbox"/> Installation of chilled ceiling or chilled beams	Rank: _____
<input type="checkbox"/> More solidity in the façade design	Rank: _____
<input checked="" type="checkbox"/> Application of natural ventilation	Rank: <u>3</u>
<input type="checkbox"/> Other measurement/ application: _____	Rank: _____

Be Green:

<input checked="" type="checkbox"/> Installation of PV cells	Rank: <u>3</u>
<input checked="" type="checkbox"/> Installation of solar thermal panels	Rank: <u>1</u>
<input checked="" type="checkbox"/> Installation of biomass boilers	Rank: <u>2</u>
<input checked="" type="checkbox"/> Installation of biomass CHP	Rank: <u>4</u>
<input type="checkbox"/> Installation of micro-wind turbines	Rank: _____
<input type="checkbox"/> Installation of ground-source heat pump	Rank: _____
<input type="checkbox"/> Other measurement/ application: _____	Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No.

- Projects where the amount of renewable energy applications increased from planning to construction stage: No.

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your

opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Increased capital costs, increased complexity of M&E design /systems
Maintenance issues?

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments?

hove, already advanced regulations if in operation
- Bring energy efficiency & renewables targets in line with
current Part L regs. I.E. target specific % improvements on Part L.
This would enable the holistic design of low carbon buildings. (& renewable

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Kg CO₂ / employee bills, TMI22 tool, payroll world probably be required anyway to meet overall carbon targets,

- Part L2a at design & construction stages.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1

2

3

4

5

Comment: many offices; result in a large contribution to CO₂

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1

2

3

4

5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1

2

3

4

5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1

2

3

4

5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1

2

3

4

5

Comment: cost may be the drivers

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

(13')

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No. 1
- Projects where the amount of renewable energy applications increased from planning to construction stage: No. 0

Please list the reason(s) given for any change: cost rationalisation

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

can't think of any. In general I'd say would need:
-passive design (color, cooling, thermal mass...)
-energy efficient services
-renewable energy (PV most appropriate, or CHP?)

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

1. -added cost
2. aesthetics
3. lack of understanding of systems

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? -more emphasis on energy efficiency (such as natural ventilation + passive cooling) currently too much focus purely on renewables

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? Energy use comparison with building of standard/ building regulation fuel specification. i.e. comparison takes into account energy efficiency AND renewables.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: But may result in integration of inappropriate technology to development.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: But energy efficiency could do more

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: Renewables get phased in right up to the point of cost rationalisation!

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: Some companies considering rental specifically look for BREEAM. But maybe millions...?

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: as above, some.

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: Sustainability Consultancy
- Architecture
- Agency
- Developer

2. What is your job description: Sustainability/RE engineer

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 6
- Projects in construction stages: No. 0
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 2.

And how many of those developments have renewable energy technology integrated in the design? No. 2.

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: 9
- More solidity in the façade design Rank: 5
- Application of natural ventilation Rank: 3
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 3
- Installation of solar thermal panels Rank: 1
- Installation of biomass boilers Rank: 2
- Installation of biomass CHP Rank: 4
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 5
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications decreased from planning to construction stage: No.

- Projects where the amount of renewable energy applications increased from planning to construction stage: No.

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Cost.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? *flexible planning based on saving. could have a part from energy of other from renewable systems on the top of it.*

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? *kgCO₂ / number of employees.*

metres, bottle, TPR22.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: Result in a lot of CO₂ emissions
- area where there is more than residential

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 → 4 5

Comment: more driven by cost

Cost could be higher
but bill, reduced bill can help.

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1. 2. 3. 4. 5.

Comment: Capital cost (practical issues as well reason)
n=2

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1. 2. 3. 4. 5.

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1. 2. 3. 4. 5.

Comment: Quite known Bream Excellent is a very good marketing asset.

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1. 2. 3. 4. 5.

Comment: Cost... but rentality are changing.

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: _____
- Architecture
- Agency
- Developer

2. What is your job description: Director

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 5
- Projects in construction stages: No. 1
- Projects completed: No. 0

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 2

And how many of those developments have renewable energy technology integrated in the design? No. 3

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. If 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

1 = most frequent
3 = least

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 3
- Installation of chilled ceiling or chilled beams Rank: 2
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 3
- Installation of solar thermal panels Rank: 3
- Installation of biomass boilers Rank: _____
- ~~Installation of biomass CHP~~ Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: 2
- Other measurement/ application: yes CHP Rank: 1

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 0
- Projects where the amount of renewable energy applications **Increased** from planning to construction stage: No. 2

Please list the reason(s) given for any change: Part 1 introduction

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

Sorry can't name names!

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Cost / viability and the return. Energy efficiency to reduce CO₂ is more deliverable and viable. Small footprint schemes are hard to increase renewables above tokenism.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Promote energy efficiency for individual schemes and district heating/power for large schemes or free standing sites.

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? CO₂ rating. BREEAM/Code ratings are much more general.

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: It will but it will be token improvement. Energy reduction and energy efficiency are more significant and deliver bigger savings.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: define substantial - it makes a positive but small difference.

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: they would like to be green - but would not pay extra for it!

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

 1 3 4 5

Comment:

and viability lack of space, feedstock (biomass) supply, lack of wind, limited surface area for PV

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

 1 2 4 5

Comment:

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

 1 3 4 5

Comment:

helps clarify but not sure if helps value

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

 1 3 4 5

Comment:

believe they would but price, quality and location are key.

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: _____
- Architecture
- Agency
- Developer

2. What is your job description: Director City Office Leasing

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 4
- Projects in construction stages: No. 3
- Projects completed: No. 2

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 8

And how many of those developments have renewable energy technology integrated in the design? No. 8

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft *Tout of 9*
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 1
- Installation of chilled ceiling or chilled beams Rank:
- More solidity in the façade design Rank: 3
- Application of natural ventilation Rank: 5
- Other measurement/ application: Using thermal mass cooling Rank: 4

Be Green:

- Installation of PV cells Rank:
- Installation of solar thermal panels Rank:
- Installation of biomass boilers Rank:
- Installation of biomass CHP Rank:
- Installation of micro-wind turbines Rank:
- Installation of ground-source heat pump Rank:
- Other measurement/ application: _____ Rank:

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No.
- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 2

Please list the reason(s) given for any change: Occupier requirements

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

Wings Cross (Brent) . Use of CCHP and district heating, wind turbines, solar thermal, PV, ground source, biomass, natural ventilation, innovative facade designs, thermal mass, low energy air conditioning systems . . . 4-9 million sq ft over next 10 years .

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Hesitancy of some technologies such as PV or biomass & site constraints in urban settings

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? Presumption against glass facades . . .

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

power consumption per sq ft or per person . . . very simple to implement with accurate metering

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: More important to reduce wasted energy at sources,
is lighting and air conditioning

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: Site constraints & commercial viability will prevent it
in many cases.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: Some, but not all, are doing so.

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: Practicality on site.

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: Nonsense. But those which do it will = get in value. There is a difference!

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: Becoming a discredited measure. It does not enhance value but makes a building more lettable.

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

The is a difference

Comment: Some but by no means all in the City ...

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

17

1. What is your area of occupation (pls tick one box):

- M&E services consultancy
- Cost consultancy
- Planning consultancy
- Other, pls describe: _____



Architecture
Agency
Developer

2. What is your job description: ASSOCIATE

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 1
- Projects in construction stages: No. 1
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. All !

And how many of those developments have renewable energy technology integrated in the design? No. All !

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: 1
- Application of natural ventilation Rank: _____
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 2
- Installation of solar thermal panels Rank: _____
- Installation of biomass boilers Rank: _____
- Installation of biomass CHP Rank: _____
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: _____
- Other measurement/ application: CHP Rank: 1

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. _____

N/A

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. _____

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

7

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

COST

MARKET RESISTANCE

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? BETTER COORDINATION BETWEEN REGULATORY BODIES

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? CURRENT REFERENCE/NOTIONAL BUILDING BASELINE : CO₂ REDUCTION METHOD SEEMS AS GOOD AS ANY!

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: NECESSARY FOR PLANNING APPROVAL!

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: ? NOT SURE

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: SOME ARE

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

 1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

 1 2 3 4 5

Comment: Probably...

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

 1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

 1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy Architecture
 Cost consultancy Agency
 Planning consultancy Developer
 Other, pls describe: _____

2. What is your job description: Planner

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 5
- Projects in construction stages: No. _____
- Projects completed: No. _____

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 5

And how many of those developments have renewable energy technology integrated in the design? No. 5

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: _____
- More solidity in the façade design Rank: _____
- Application of natural ventilation Rank: 3
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: _____
- Installation of solar thermal panels Rank: _____
- Installation of biomass boilers Rank: 1
- Installation of biomass CHP Rank: 2
- Installation of micro-wind turbines Rank: _____
- Installation of ground-source heat pump Rank: _____
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 0

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 0

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

Construction imposed by cost

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments? The provision of benefits for taller offices which go beyond the requirements for CO₂ emission savings - better transport

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: _____

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

 1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

 1 2 3 4 5

Comment: _____

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

 1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

 1 2 3 4 5

Comment: _____

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box):

M&E services consultancy
 Cost consultancy
 Planning consultancy
 Other, pls describe: _____

Architecture
 Agency
 Developer

2. What is your job description: Architect3. What is the amount of speculative office developments you were involved with/
working on in the last 6 months:

- Projects in planning stages: No. 1
- Projects in construction stages: No. 1
- Projects completed: No. 1

How many of the above listed projects fall under the requirement to provide a
minimum of 10% renewable energy on site? No. 1

And how many of those developments have renewable energy technology integrated
in the design? No. 3

4. What is the majority of building sizes, measured in gross floor area, of these
developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box
only):

50,000sqft - 150,000sqft
 150,000sqft - 300,000sqft
 over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

1 - 5 storeys above ground
 6 - 12 storeys above ground
 13 - 20 storeys above ground
 More than 20 storeys above ground
 More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 4
- Installation of more efficient mechanical and electrical plant Rank: 3
- Installation of chilled ceiling or chilled beams Rank: 6
- More solidity in the façade design Rank: 1
- Application of natural ventilation Rank: 2
- Other measurement/ application: LSHP Rank: 5

Be Green:

- Installation of PV cells Rank: 1
- Installation of solar thermal panels Rank: 3
- Installation of biomass boilers Rank: 2
- Installation of biomass CHP Rank: 1
- Installation of micro-wind turbines Rank: 1
- Installation of ground-source heat pump Rank: 4
- Other measurement/ application: _____ Rank: 5

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. 0

- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. 0

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

BRE STANDARD

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

COST

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office developments?

ENOUGH ALREADY

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement?

DAYLIGHT + HEAT LOSS MITIGATION

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

 1 2 3 4 5

Comment: They form a standard for others to follow

13. The proposed policy change to increase the percentage of renewable energy technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

 1 2 3 4 5

Comment: _____

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

 1 2 3 4 5

Comment: _____

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

 1 2 3 4 5

Comment: _____

16. Office tenants are actively seeking office space in developments with renewable energy resources.

 1 2 3 4 5

Comment: _____

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: _____

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: POINTER ON COST

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: _____

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: GOT TO LOOK NICE FIRST

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post:

1. What is your area of occupation (pls tick one box): (pls tick that you feel most accurate)

- M&E services consultancy
- Architecture
- Cost consultancy
- Agency
- Planning consultancy
- Developer
- Other, pls describe: _____

2. What is your job description: Head of Sustainability

3. What is the amount of speculative office developments you were involved with/ working on in the last 6 months:

- Projects in planning stages: No. 20
- Projects in construction stages: No. 0
- Projects completed: No. 0

How many of the above listed projects fall under the requirement to provide a minimum of 10% renewable energy on site? No. 0

And how many of those developments have renewable energy technology integrated in the design? No. 0

4. What is the majority of building sizes, measured in gross floor area, of these developments (e.g. if 6 out of 10 projects are over 300,000sqft pls tick that box only):

- 50,000sqft - 150,000sqft
- 150,000sqft - 300,000sqft
- over 300,000sqft

5. What is the majority of storey heights of these developments (pls tick one box):

- 1 - 5 storeys above ground
- 6 - 12 storeys above ground
- 13 - 20 storeys above ground
- More than 20 storeys above ground
- More than 50 storeys above ground

6. Which measurements have been implemented in the projects you worked on in order to reduce carbon emissions during operation of the building (not embodied carbon):

More than one selection can be made, please indicate which was used most by ranking all selected items.

Be Lean & Be Clean:

- Improved façade/ envelope design Rank: 1
- Installation of more efficient mechanical and electrical plant Rank: 2
- Installation of chilled ceiling or chilled beams Rank: 3
- More solidity in the façade design Rank: 4
- Application of natural ventilation Rank: 5
- Other measurement/ application: _____ Rank: _____

Be Green:

- Installation of PV cells Rank: 1
- Installation of solar thermal panels Rank: 2
- Installation of biomass boilers Rank: 3
- Installation of biomass CHP Rank: 4
- Installation of micro-wind turbines Rank: 5
- Installation of ground-source heat pump Rank: 6
- Other measurement/ application: _____ Rank: _____

7. How many projects have you worked on where the amount of renewable energy applications proposed at planning stage has changed at construction stage?

- Projects where the amount of renewable energy applications **decreased** from planning to construction stage: No. _____
- Projects where the amount of renewable energy applications **increased** from planning to construction stage: No. _____

Please list the reason(s) given for any change: _____

8. Please name and briefly describe a speculative office development, which in your opinion could constitute as a good example for carbon saving and a way forward for the industry. Integrated renewable energy sources are not compulsory.

9. What are the main reasons in your opinion that clients and/ or developers are not supportive of renewable energy applications for speculative office developments?

These are seen as an expensive extra which do not obviously contribute to the success of the buildings as workplaces.

10. What changes should be made to the current planning policies (London Plan, national and regional level) in order to encourage CO₂ emission savings in new build office

developments? *1) Demand management - limiting the energy use per m² of floor area through an energy supply obligation*

11. In your opinion what would be the most effective measurement for carbon saving in speculative office buildings and what would be involved to implement the measurement? *Higher U-Values achieved through better fabric design*

On the following statements please indicate if you agree or disagree.

If you feel 'strongly' about any statement could you pls elaborate on the reasons.

Many thanks.

[1 = strongly agree, 2 = agree, 3 = neither, 4 = disagree, 5 = strongly disagree].

12. The use of renewable technology for office developments in Central London is an important measure to reduce carbon emissions.

1 2 3 4 5

Comment: I think that renewables are better applied on a neighbourhood scale, rather than at a building scale.

13. The proposed policy change to increase the percentage of renewable energy

technologies required for new developments from currently 10% minimum to 20% minimum requirement will improve the uptake of renewable energy technologies for office developments.

1 2 3 4 5

Comment: It will improve the uptake, but may not make a positive impact in the long term.

14. The requirement of high flexibility for future tenants, especially in regards to heating & cooling systems, hinders new office developments to achieve the full potential of carbon savings.

1 2 3 4 5

Comment: A better landlord-tenant relationship is required

15. The use of renewable energy technologies substantially lowers the carbon emissions of new office developments.

1 2 3 4 5

Comment: The technologies that can be applied are unlikely to

16. Office tenants are actively seeking office space in developments with renewable energy resources.

1 2 3 4 5

Comment: Location and appropriateness of space and rental terms are much higher on the list of priorities.

17. Cost is the most common reason given for the rejection of renewable energy technologies in regards to new office developments.

1 2 3 4 5

Comment: The payback periods for many technologies is still longer than many leases

18. Visible use of renewable technologies leads to an increase in rent for the development as occupiers are getting more conscious of sustainability.

1 2 3 4 5

Comment: Visible use of renewables is a good sales feature, but I doubt if it leads to a higher rent.

19. BREEAM rating assist in valuing sustainable office developments and has a positive impact on the rental level achieved.

1 2 3 4 5

Comment: Because BREEAM takes other features into account, such as lighting, transport and waste it has a positive impact.

20. Office tenants are actively seeking office space in sustainable, energy efficient developments.

1 2 3 4 5

Comment: Yes, there is a general movement in this direction.

Thank you for your time and assistance.

Could you please return the completed questionnaire to:

Fax:

Email:

Post: