LONDON
LEADING TO A GREEN LONDON

BETTER BUILDINGS PARTNERSHIP

Low Carbon Retrofit Toolkit

A roadmap to success

Acknowledgements

The Better Buildings Partnership (BBP) brings together a number of the largest commercial and public property owners in London in one collaborative organisation. All members are working together to improve the sustainability of London's existing commercial building stock and accelerate the reduction in CO_2 emissions from these buildings.

Principal Author:

John Rhoads	Accenture

Editors:

Neil Pennell	Land Securities
Christopher Botten	London Development Agency

Special thanks go to the participants of the Building Performance and Sustainable Retrofit Working Group for their contributions and critical comments.

Kate Freer	Blackstone Group
David Hodge	Canary Wharf
Sean Jordan	City of London
Robyn Pender	English Heritage
David Short	GE Capital Real Estate
Katherine Emmerson	Grosvenor
Nigel Hughes	Grosvenor
John Fyfield	Hermes Real Estate
Keith Bugden	RPI Consult Ltd
Neil Pennell	Land Securities
David Mummery	Legal & General Property
Christopher Botten	London Development Agency
Joel Quintal	PRUPIM
Andy Stanton	Transport for London
David Whiter	Workspace Group

The views expressed in this document are not necessarily those of either the individuals who provided input or of their organisations.

Supported by

accenture

Copyright © 2010 BBP. All rights reserved

Contents

Chairmen's Statement

Neil Pennell

Peter Clarke

Demanding times call for ambitious agendas and innovative solutions. The Government has committed the UK to binding carbon targets to reduce emissions by 80% below 1990 levels by 2050 and for its part London has set a goal of a 60% reduction by 2025. It is estimated that 70% of existing buildings will still be in use in 2050. Improving the environmental performance and reducing the carbon emissions of these properties is therefore vital if we are to meet such challenging targets. This Toolkit is about understanding the barriers to sustainable retrofit and finding ways to accelerate the retrofitting of low carbon technologies to existing buildings to improve energy efficiency and generate on-site low and zero carbon energy streams. This Toolkit is freely available to download from the Better Buildings Partnership (BBP) website for members and non-members alike and we hope that it will inform all those engaged in owning, occupying and operating commercial property.

Despite the clear benefits for owners and occupiers, low carbon technology retrofitting initiatives are not being taken up sufficiently widely to have significant impact on reducing the carbon emissions of commercial buildings. We can no longer afford to wait for the traditional refurbishment and new development cycle to make significant improvements to building performance. The BBP Building Performance and Sustainable Retrofit Working Group, charged with identifying the barriers and informing possible solutions to stimulate broader implementation of building improvements within occupied buildings, commissioned a specialist research project to gain a deeper understanding of the issues which have until now restricted investment in this area.

The resulting Toolkit provides an insight into how the complexity of the commercial property market in the UK, the regulated relationship between owner and occupier (particularly in multi-tenanted buildings), the challenges in making a compelling business case and the lack of focussed responsibility in building management teams can all conspire to frustrate the implementation of retrofit projects. More importantly it offers commercial property owners some tools and solutions to overcome these barriers. These approaches are endorsed by the BBP and will be trialled by its members.

In the course of drafting the Toolkit it became clear to the Working Group that the range of solutions and technologies is constantly evolving, making it difficult to provide definitive answers to the challenges posed. Further work is therefore being undertaken to extend and underpin the advice given in this document. We would value feedback on the solutions proposed and information on any other successful strategies used by organisations engaged in this area.

On behalf of the BBP I would like to thank all those who participated in developing this Toolkit. This is important work in the challenge to reduce the UK's carbon footprint and we are grateful for everyone's contribution.

Neil Pennell
Chairman
BBP Building Performance and
Sustainable Retrofit Working Group

Peter Clarke
Chairman
Better Buildings Partnership

Executive Summary

Despite the urgent need, very little work is currently being undertaken for the primary purpose of improving energy efficiency and reducing carbon emissions in the UK's existing commercial building stock. Most often improvements are driven by commercial or operational necessity: through redevelopment projects, major refurbishment, occupier fit-outs or the replacement of equipment at the end of its service life.

Where low carbon retrofit is considered, it is usually on the basis of either a simple economic payback or a CSR driven agenda to reduce carbon emissions in owner-occupied buildings or single tenanted premises on a long lease term. This works best in these situations as the benefit of any investment in retrofit is directly attributable to the party making the investment and the long term association with the building helps to underpin the business case.

Making a business case for low carbon retrofit in multi-occupied buildings is more difficult. The complexity of leasing arrangements, varying lengths of tenure and the split incentives, which do not always align the party making the investment with the benefits accrued, often conspire to frustrate potential improvements. Where investments are made they are usually driven by a financial or business imperative, rather than to improve energy efficiency and reduce carbon emissions, for example, to encourage an existing occupier to extend their lease, reposition the building in the marketplace, reduce voids or to replace failing plant and equipment.

Additionally, such works can be disruptive to the workplace and it is much easier, therefore, to undertake them when part or all of the building is vacant. For this reason owners are understandably reluctant to carry out retrofits when buildings are fully occupied.

Nevertheless, there are two key retrofit activities that stand out as major carbon-reducing opportunities in multi-occupied commercial properties. These are low-disruption retrofits intended specifically to improve energy efficiency; and accelerated replacement of existing services plant and equipment.

The aim of this Toolkit is to identify the barriers limiting the uptake of low carbon retrofit in the market place and provide a 'low carbon retrofit roadmap' to help overcome these, supported by BBP member case studies.

Through a series of interviews with property professionals and industry representatives the following five key barriers emerged:

Commercial – failure to provide a compelling business case for investment in retrofit and the inherent split incentive between owners and occupiers.

Roles and Processes – no designated role within an organisation with the responsibility and authority to identify, plan and deliver energy saving and carbon reduction interventions. Additionally, the lack of any clearly defined approvals process or evaluation criteria.

Financial – lack of availability of capital funds.

Technology – skills shortage, immature technologies, supply chain failure, building and operational constraints, lengthy pay back periods.

Policy – lack of regulation or incentives for action. Insufficient focus by policy makers on existing building stock compared to new build.

Prior to the study being carried out, members of the Working Group felt that access to funding would be the major limiting factor to the growth of low carbon retrofit, particularly in the current economic climate. However, it was found that funding is generally available provided that a robust business case and financial model for payback can be provided. More significant barriers were identified, such as, not having access to the skills and resources to develop the business case, cost sharing mechanisms and payback options. Furthermore, the lack of designated individuals tasked with identifying opportunities on a portfolio scale as well as a clear process to prioritise buildings for low carbon retrofit and gain approval for projects were found to be critical to the process.

To overcome these barriers a planned approach is required. The BBP recommends the following steps:

1. **Set clear corporate retrofit goals** to include energy saving and carbon reductions, introduction of new technologies and accelerated replacement of inefficient services equipment. These goals should be clearly articulated and in line with broader organisational emissions reduction targets.

2. **Designate roles and define processes** to ensure that a dedicated individual within the organisation is given the responsibility and authority to assess retrofit opportunities across the property portfolio. Develop a clearly defined internal approvals process specific to low carbon retrofit projects.

3. **Prioritise buildings most suitable for retrofit** by analysing portfolios against key selection criteria.

4. **Engage occupiers** to determine common goals, identify barriers and formulate solutions. The BBP Green Lease Toolkit[1] provides an ideal platform to start this engagement process.

5. **Agree financing arrangements** between owner and occupier typically via the service charge using an exceptional expenditure clause to repay costs through the Hard Services portion or through a sinking fund. Whichever option is considered, transparency is crucial to gain occupier buy-in. For high cost projects third party finance may be sought or performance contract options through an ESCO model.

6. **Select appropriate technology** best-suited to the constraints of the building and which minimise the level of disruption to the occupiers.

7. **Delivery** using a trusted supply chain with a performance guarantee.

8. **Evaluate** performance in-use to inform future internal retrofit projects as well as the wider market.

Low Carbon Retrofit Roadmap

[1] BBP Green Lease Toolkit (2009) www.betterbuildingspartnership.co.uk/working-groups/green-leases/green-lease-toolkit

1. Introduction

What is Low Carbon Retrofit?

In this Toolkit we define low carbon retrofit as incremental improvements to the building fabric and systems with the primary intention of improving energy efficiency and reducing carbon emissions. This definition excludes disruptive refurbishment that would require the building to be vacated for an extended time, behavioural training programmes and space rationalisation or utilisation.

The UK Government has committed the UK to binding carbon targets to reduce emissions by 80% below 1990 levels by 2050 and for its part the Mayor of London has set a goal of 60% reductions by 2025 for the capital. Despite the urgent need, however, very little work is currently being undertaken for the primary purpose of improving energy efficiency and reducing carbon emissions in the UK's existing commercial building stock. Most often improvements are driven by commercial or operational necessity: through redevelopment projects, major refurbishment, occupier fit-outs, or the replacement of equipment at the end of its service life.

1.1 The Current UK Market for Low Carbon Retrofit

Most retrofitting of commercial buildings that has taken place in the UK is of owner-occupied properties. Since the benefits accrue directly to the owner, these initiatives are not faced with many of the major barriers to retrofit identified within this report. Owner-occupiers can also afford to take a long-term perspective on building improvements, and the return on their retrofit investments which is often not the case in rented buildings. However, owner-occupied buildings only represent around one third of the commercial property market[2].

Within the commercial property sector, most attention is devoted to designing new buildings with energy-efficient features. Many occupiers are now setting clear minimum standards for new buildings. For example, since 2003 the Office of Government Commerce has set a minimum standard of 'BREEAM Excellent' for all new buildings[3]. This trend is expected to accelerate as more and more occupiers in the private sector adopt a similar approach[4]. Property owners are responding to this trend by setting their own standards; for example, Land Securities sets a minimum target of 'BREEAM Very Good' for all major new office and retail shopping centre developments, together with carbon reduction targets above current Building Regulations.

While these are important advances, they do not address the existing commercial building stock. Tackling energy consumption in existing buildings is extremely important, as with annual replacement rates of 1-1.5% it is estimated that in 2050 some 70% of today's buildings will still be in use, with 40% having been built prior to 1985 (when Part L of the Building Regulations – Conservation of Fuel and Power – was first introduced).

1.2 The Benefits of Low Carbon Retrofit

Low carbon retrofit is a crucial issue for the property owner and occupier market. With break clauses and shorter lease lengths becoming more common, owners are recognising that retrofit can play an important role in retaining and attracting new occupiers. Offering occupiers a building with a lower total cost of occupancy, and moreover one which aligns with their own carbon reduction and sustainability commitments, can translate into a compelling case for occupier investment. For owners, it provides an opportunity to increase occupancy rates and reduce vacancies by demonstrating improved building performance.

Energy efficient buildings also have higher Energy Performance Certificate (EPC) and Display Energy Certificate (DEC) ratings. Such ratings are of interest to a growing number of occupiers and are likely to increasingly be a factor in their decision making process. Lower energy consumption levels will also help to reduce liabilities under the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme.[5]

[2] Property Data Report 2009 www.bcsc.org.uk/media/downloads/BPF_PIA_REPORT_9587.pdf
[3] Sustainable Procurement and Operations on the Government Estate 2009 www.ogc.gov.uk/documents/Delivery_plan_update_17July09.pdf
[4] For example, accountancy firm PWC has specified a 'BREEAM Outstanding' rating for their new MoreLondon headquarters.
[5] www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/crc.aspx

There is a view within the market that, in time, sustainable buildings will be worth more, or at least have lower long-term investment risk, with sustainability viewed as a way of 'future proofing' investments. However, evidence of a link between the sustainability credentials of a building and its rental and capital value is still in its infancy. A recent review of academic work in this area by the RICS identified that while there is some evidence in the USA of a connection between higher rents achieved for LEED and Energy Star accredited buildings compared with similar non-accredited buildings, there is currently no evidence of a link between sustainability and increased value in the UK[6].

Institutional investors are now generally vetting property investments in order to manage their exposure to carbon risk. As a result, they are becoming more attentive to the carbon intensity of their portfolios, with energy efficient buildings more likely to retain their value and avoid premature obsolescence. This interest is likely to increase following the recent introduction of CRC Energy Efficiency Scheme. This will affect both property owners and occupiers and add a clear financial incentive to limit the carbon liabilities of their buildings.

1.3 Identifying the Barriers

To understand why low carbon retrofit has not been occurring on a wide scale in the UK the BBP commissioned consultancy firm Accenture to conduct a study aiming to identify the barriers to low carbon retrofit ('retrofit') in existing commercial buildings and highlight possible solutions for these barriers.

This report identifies how the complex nature of the commercial real estate sector affects both the ability to obtain approval for retrofit and find appropriate solutions. The findings from the study provide property owners, occupiers and managing agents with clear guidance on how to gain approval and financial support for retrofit. Best practice strategies are illustrated in a number of case studies from BBP Members.

The report includes retrofit experiences in both the public and private sectors, but its primary focus is multi-occupier commercial buildings, where the barriers to retrofit appear to be the greatest.

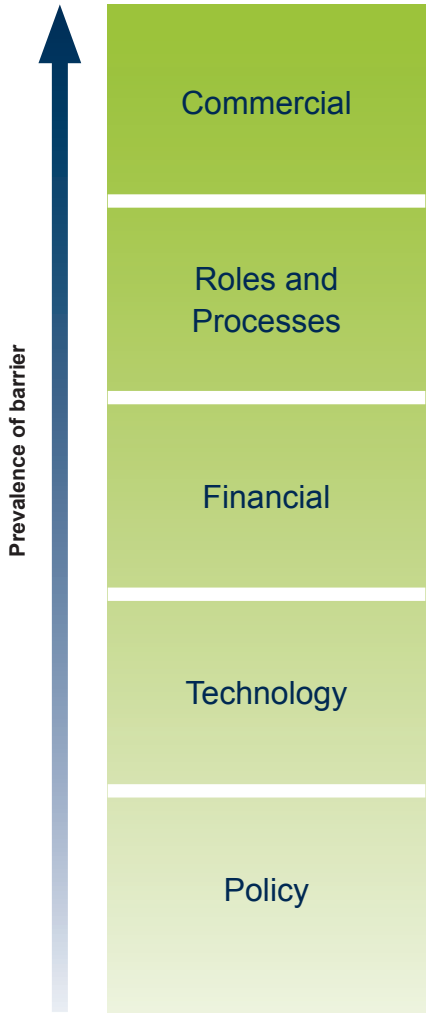
1.4 Industry Based Research

In carrying out the reseach, forty individuals representing more than twenty of the UK's largest property owners, real estate investment trusts, managing agents, independent property consultants, retrofit providers and public sector groups were interviewed. The results were analysed with the support of the BBP Building Performance and Sustainable Retrofit Working Group and industry experts.

The focus in the interviews was on understanding barriers to retrofit, as well as investigating and prioritising potential solutions. Best-practice approaches were then chosen from the methods used to overcome the most common problems to illustrate the various practical steps that are needed to effectively deliver retrofit projects.

6 Is sustainability reflected in commercial property prices: a review of existing evidence. RICS, January 2010. www.rics.org/site/download_feed.aspx?fileID=5752&fileExtension=PDF

2. Barriers to Low Carbon Retrofit



2.1 Key Barriers to Low Carbon Retrofit

This report identifies five key barriers to retrofit in the UK commercial property market.

1. Commercial

Failure to provide a compelling and viable business case for investment in retrofit and the inherent split incentive between owners and occupiers. This includes how payment is made to service providers, how the cost is passed on to the occupiers, and how guarantees and risks are shared amongst the parties involved.

2. Roles and Processes

No defined process to designate individuals within an organisation with the responsibility and authority to identify, plan and deliver energy saving and carbon reduction interventions. Also, the lack of any clearly defined approval process or evaluation criteria for retrofit projects.

3. Financial

Access to and availability of capital funds – whether they are provided by the owner, occupier or third party.

4. Technology

A lack of knowledge of the options available to upgrade buildings and issues associated with the implementation of specific retrofit activities, for example building constraints, occupier disruption, compatibility with existing systems, insufficient understanding of appropriate analysis and planning, payback periods and an endemic skills shortage in the built environment sector.

5. Policy

A lack of regulation or government intervention to stimulate the uptake of retrofit activity. There has been an insufficient focus by policy makers on the existing building stock compared to new build.

Surprisingly the study found that the primary barrier in multi-occupier buildings is seldom the lack of available funding for works as is often perceived. It was often the case that organisations can make capital available providing there is a compelling business case. The main barriers were commercial or organisational problems within businesses frustrating the approval of capital expenditure on retrofit. These barriers to progress are frequently rooted in an organisation's failure to define the necessary 'roles and processes' to deliver the required step change. Policy was rarely seen as a direct barrier, but rather as an insufficiently strong incentive to promote retrofit.

2.2 Commercial Barriers

The primary barrier experienced by all stakeholders in the study was in the structure of commercial terms for procuring retrofit. There are number of factors involved: split incentives, developing a business case, balancing costs and benefits and risk aversion.

Split Incentives

The most identifiable benefit to low carbon retrofit is reduced energy consumption and associated cost savings. Whilst the study identified that there are other less tangible benefits that accrue to the building in terms of minimising risk of obsolescence, maintaining asset value and improving occupier attraction, the primary beneficiary of reduced energy costs is the occupier who pays the bills. This provides little incentive, when a building is not owner-occupied, for an owner to invest in capital works unless they are funded by the occupants.

Conversely occupiers may take the view that any change to the building fabric or plant is an improvement, with financial responsibility resting with the owner.

To unlock this problem it is clear that a sound business case needs to be made for each improvement, where benefits to both owner and occupier are transparent. Clearly shorter payback projects will be easier to justify, particularly when remaining lease lengths are short. In situations where the current occupier will realise only a portion of the benefit within the remaining time of their lease more complex solutions are needed to accrue cost and benefits to future occupiers.

In multi-occupied buildings this is an even greater issue. The process requires whole building buy-in which can be difficult to achieve with the need to convince all parties of the benefits, agree costs and demonstrate how they will be apportioned fairly. Often the payback period is limited by the lease length of the occupier with the shortest term remaining, which discourages larger scale works which may have longer term payback periods.

Development of Business Case

Organisations often lack the expertise to bridge the gap between identifying retrofit projects at the operational level and translating them into viable business cases. A compelling business case is critical for approval of a retrofit project and a clearly defined process essential to prevent projects failing at the first step.

There are a number of obstacles to overcome in producing a business case:

1. The correct pricing of retrofit measures may be difficult if an owner has little experience with these specific measures.

2. The impact of retrofit on operating and maintenance costs may not be easy to calculate.

3. It can be difficult to quantify the benefits of retrofit in terms of increased occupancy rates or improved occupier satisfaction.

4. The lack of clear evaluation criteria for retrofit means that business cases may be unfocused; as a result, resources will not be used in the most effective way.

All these barriers can be overcome with good research and analysis. If the owner or building management team does not have in-house expertise then they should employ specialists with the necessary skills to identify retrofit opportunities and produce a viability study.

> ***‘ To be successful we found it was important to not only have a sound business case but to make the process, including costs and benefits, transparent to all parties.’***
>
> Independent Property Consultant

Balancing Costs and Benefits through the Service Charge

Currently, the cost of retrofitting usually falls to the occupier. In some cases, to reduce sudden and possibly significant increases in occupier outlay, the initial capital expenditure may be funded by the owner. The standard approach to passing on this cost is through the service charge using an Exceptional Expenditure clause. There are two ways this can be achieved:

- Through the Hard Services portion of the service charge in which an occupier repays the cost of work carried out within the lease term. Often this is within the year of the expenditure.

- Through a Forward Funding system, whereby a sinking fund is set up to recover the expenditure over an agreed period. Costs of a project may need to be carried across several occupier leases.

Cost categories must be allocated as defined in the 2007 RICS Code of Practice: *Service Charges in Commercial Property*[7]. Under this code, all mechanisms for passing on cost require the owner to engage directly with the occupiers to justify the expenditure. Understandably, this is always a difficult conversation, and a single uncooperative occupier in a multi-occupied building can prevent a project progressing.

Risk Aversion

Owners and their managing agents are typically risk-adverse and often reluctant to try new technologies, even those with proven short payback periods. Any intervention within an occupied building carries a level of risk; the default position is to not take that risk which often results in no improvement action being taken at all. A general lack of understanding of available retrofit measures and their associated risks contributes to the inertia. Further education is clearly needed to appropriately inform decision makers of the benefits of retrofit.

2.3 Role and Process Barriers

Insufficient organisational resources can be an impediment to retrofit. There may simply be too few designated individuals with the time to devote to retrofit projects, and often the processes for identifying and developing projects are inadequate. These limitations present a real barrier to the approval of retrofit, even in situations where commercial obstacles have been surmounted.

Corporate Strategy

Commercial property owners rarely have a corporate strategy or commitment for retrofitting their property portfolio. The Carbon Trust[8] has noted that organisations without a clear corporate strategy and commitment to drive down emissions will devote only limited time and resources to the implementation and management of retrofit. Conversely, organisations with strong commitments and clear targets for reducing emissions empower their people to search out and develop low carbon solutions.

> ***'It's all about taking the commitment to improve building performance from the boardroom to the boiler room.'***
>
> Major UK REIT

Clear Roles and Incentives

Without appropriate leadership at senior management level or a clear mandate to improve existing assets, organisations will lack the impetus to designate a clear role for retrofit. This is a complex task, requiring time and resources. As with any organisational priority, key roles need to be specifically identified, and incentives put in place to motivate effective action. At present, there are few good examples of this happening, perhaps because the low level of retrofit currently underway makes development of effective processes difficult.

If roles and responsibilities are unclear, it is difficult for an organisation to acquire an effective market understanding of not only the available retrofit measures, but of the necessary commercial and financial structures needed to deliver them. To make accelerated retrofit a reality, organisations need to invest in dedicated resources, and define clear roles and responsibilities within the senior management team.

Currently owners and their managing agents are primarily driven by customer satisfaction, which means that their main concerns are maintenance, avoidance of outages, and the upkeep of the building environment at an economical cost. The focus is on maintaining rather than improving properties.

[7] www.servicechargecode.co.uk

[8] Carbon Trust (2008) Low carbon refurbishment of buildings - Management guide. www.carbontrust.co.uk/Publications/pages/publicationdetail.aspx?id=CTV038

New plant and equipment is usually more energy efficient than the existing kit it is replacing, so when there is a need to replace failed or life expired equipment an improvement in energy use is a positive but usually unplanned outcome. Historically, plant replacement choices are driven by capital expenditure limits, reliability concerns, maintenance costs, occupier comfort issues or aesthetics, with little account taken of the impact on carbon emissions or whole life cost. Although for the purposes of this study these opportunistic changes would not qualify as planned retrofit, there is a significant opportunity to accelerate carbon reduction initiatives by integrating low carbon emission criteria into purchasing decisions driven by equipment failure or planned plant replacement cycles.

Processes

As retrofit is generally not a business priority for commercial property owners, the processes involved in managing a retrofit project throughout its life cycle, from identification to approval, delivery and evaluation are rarely in place.

A key process barrier is the lack of clear organisational guidelines and criteria for evaluating projects and a defined procedure for approving or rejecting retrofit. If these criteria remain unclear and the approach to approval is ad hoc, retrofit will remain peripheral. To embed retrofit into an organisation, appropriate practices must be introduced to reduce the burden on individuals charged with the responsibility to champion retrofit projects.

2.4 Financial Barriers

> ***'If the payback spans over a lease renewal period then the project will almost certainly be dropped.'***
>
> Major UK REIT

A surprising finding of this study is that availability of capital is not the primary barrier to retrofit approval, although it is often cited as such. Instead, the stakeholder analysis revealed that a more significant barrier is the lack of a defined process for justifying expenditure and accessing capital. These are considered process barriers and are described above in Section 2.2.

Feedback suggests that in most cases capital can be made available if a project sponsor can demonstrate a viable business case to justify the retrofit expenditure to occupiers.

Owners of commercial property are highly experienced at accessing capital for promising investments, and this includes structuring financing to match the project-specific risks related to their property portfolios; raising capital and arranging financing to purchase property are core functions for commercial property owners. If there is a solid justification for the expenditure, capital will usually be found. If internal benchmarks are met, financing options for retrofit do exist within the commercial property sector.

What owners do not have under existing lease structures, the interviews revealed, is sufficient incentive to drive retrofit projects. Organisational incentives to drive retrofit do not exist to the extent that they do for property acquisition or refurbishment. Retrofit projects, it seems, are not yet viewed as a core activity.

The BBP recognises that, while financial barriers are not currently the primary obstacle to retrofit, the role of finance and the availability of capital could increasingly become an issue as the volume of retrofit work increases. In this situation external sources of financing from either the public or private sectors may be an appropriate option (see Section 3.5).

2.5 Technology Barriers

Selected retrofit options must match the project objectives to succeed. Selection of retrofit measures should therefore be driven not only by financial or commercial considerations but also by other factors, such as:

1. **The ability to predict performance.** How retrofit measures actually perform in situ can vary significantly. The impact of central plant changes, controls upgrades and envelope improvements are often difficult to predict prior to project implementation, and so a pre-project assessment to calculate a baseline performance will be required. This could involve using building performance data from previous years or from specific measurement exercises before the retrofit is carried out. The process is further complicated when a number of initiatives are applied at the same time.

2. **The ability to verify performance.** Efficiencies made by replacing energy-using equipment with more efficient alternatives are often easy to verify by comparing before-and-after performance. Some, however, are more difficult, particularly those having impacts at a building wide level which can be complicated by changes in building use and occupancy or seasonal weather related effects.

> ***'Customer satisfaction is always a priority and activities which may impact on that are considered a risk.'***
>
> Managing Agent

3. **The acceptable level of disruption.** Disruption may include the need to vacate offices or shut down parts of the building, as well as other workspace impacts such as noise. The introduction of technologies which require extended periods of power outage is particularly challenging when they impact on the central IT facilities. To avoid disruption, works are often undertaken during the night or at weekends, but this can significantly increase costs, both because of the higher costs associated with out-of-hours works and the reduction in working efficiency. Technologies which have the least impact on occupiers will clearly be favoured for retrofit works.

4. **Lack of understanding of available technologies.** In its 2008 report *Energy Efficiency in Buildings: Business Realities and Opportunities*[9], the World Business Council for Sustainable Development highlighted the widespread lack of knowledge of available energy efficiency technologies that could be used as part of retrofit. Linked to this lack of knowledge are some commonly held but mistaken assumptions about cost and payback associated with retrofit. Stakeholder interviews conducted during the study generally confirmed this, with many participants admitting that they had limited understanding of the range of retrofit measures available to commercial property owners. There were some notable exceptions where a few more proactive owners have made a conscious effort to investigate the opportunities available, or have employed third parties with experience in energy conservation to undertake the work for them.

Of all the technology barriers listed above, the one most frequently cited during the study was the perception of disruption. This concern is consistent with the focus of owners and their managing agents being on simply operating their buildings whilst minimising the impacts on occupiers and reducing complaints, rather than on pro-actively decreasing carbon emissions and energy use.

[9] World Business Council for Sustainable Development (2008) Energy Efficiency in Buildings, Business Realities and Opportunities. www.wbcsd.org/DocRoot/44DMJMJE2Y0ggJFRYPW8/WBCSD_EEB_final.pdf

> ***' To be successful in cutting CO_2 emissions policies must acknowledge the owner-occupier relationship which is currently often over looked.'***
>
> Property Owner

2.6 Policy Barriers

Policy is rarely a barrier to retrofit, but a lack of policy to incentivise it is a lost opportunity. The study shows that, overall, little existing energy or carbon reduction legislation is driving building owners to implement retrofit in commercial buildings. The Government's interventions have to-date been principally focussed on new build commercial stock. It has, for example, announced a target of making all new commercial buildings zero carbon by 2019 and has taken measures to achieve this through progressive Building Regulation requirements and its own estate procurement standards. Although these initiatives are to be commended carbon emissions reductions within existing building stock is the major challenge and yet this is the area which has been neglected.

This is now beginning the change with the introduction of the CRC Energy Efficiency Scheme in April 2010, the recast of the Energy Performance of Buildings Directive, as well as initiatives such as the Feed-in-Tariff and Renewable Heat Incentive.

What is key to the success of these policies in cutting carbon emissions is a detailed understanding of the complexity of the owner-occupier relationship, particularly in multi-occupied buildings, and the problems this can create. To date this has not been fully recognised by policy makers.

An example of where the owner-occupier relationship has not been fully acknowledged can be seen within the CRC Energy Efficiency Scheme. Whilst the industry supports the principle of the scheme many feel that in its present form it is unlikely to secure the engagement and the carbon savings anticipated.

The main focus of Government policy related to the energy performance of existing buildings to-date has been on Energy Performance Certificates (EPCs), an asset rating which measures the energy efficiency standard that individual buildings can theoretically achieve. Producing an EPC also includes an improvement report with energy efficiency and retrofit recommendations to reduce carbon emissions. EPCs represent a step forward, but they do not give a clear picture as to how a building is actually performing in reality. Far more is likely to be achieved by a greater focus on Display Energy Certificates (DECs), an operational rating that identifies the actual energy use of a building and also makes recommendations for improvement. In line with the EU Energy Performance of Buildings Directive the roll-out of DECs has up to now been confined to public sector buildings. However, many in the property industry believe the focus and investment on EPCs in preference to DECs is a missed opportunity for the commercial property sector to build a detailed knowledge of how buildings perform in terms of actual energy use and understanding where improvements can be made.

In the absence of effective legislation to incentivise owners and occupiers to work together to reduce energy and carbon emissions, the property industry has started to develop initiatives such as the BBP Green Lease Toolkit and the BPF/CIBSE sponsored Landlord Energy Statement Tenant Energy Report (LES-TER).

UK Government Policy

The following are newly introduced policies that will potentially accelerate low carbon retrofit in the UK.

Feed-in-Tariff (FiT)
The UK Feed-in-Tariff came into operation 1st April 2010 to incentivise an increase in small-scale generated renewable electricity. The scheme is a financial subsidy for renewable electricity generators below 5MW. The scheme offers a legally guaranteed minimum payment per unit of electricity (p/kWh) for renewable electricity generated and a further payment for each unit of electricity exported on to the local network. Payment varies depending on technology type and size of generator. The FiT payments are made by licensed electricity suppliers, and are costs that they may pass on to their electricity consumers. FiTs are already in operation in 19 other EU member states.

Renewable Heat Incentive (RHI)
The RHI is a proposed framework to incentivise an increased uptake of renewable heat for homes, businesses and public sector facilities. It will operate in the same way as the FiT by providing financial subsidy in the form of guaranteed minimum payments per unit of usable heat generated. Payment will vary depending on technology type and size of generator. The costs are planned to be recovered through a levy on suppliers of fossil fuels, but the levy arrangements have not yet been settled. The scheme is scheduled to start in April 2011 and aims to increase UK renewable heat levels from 1% to 12% by 2020.

CRC Energy Efficiency Scheme
The CRC is a 'cap and trade' scheme providing financial incentives for larger public and private sector organisations which are not already covered by the EU-ETS cap and trade system or climate change agreements with the UK Government, to improve their energy efficiency. The CRC applies to organisations whose total electricity consumption exceeds 6000MW hours of electricity per year, recorded through half hourly meters. A 'cap' is placed on total allowances (priced at £ per t/CO_2) for each group of CRC participants. Individual organisations must then purchase allowances based on their emissions forecast. This will promote organisations to find the most cost-effective ways of reducing their emissions by investing in opportunities to decrease the number of allowances they purchase depending on the market price of carbon. The 'introductory' phase of the scheme will run between April 2011-2013 with subsequent phases following. A league table of performance will be published each year and is likely to provide a public relations spur to companies to improve their position in the table by reducing their carbon emissions, in addition to the financial incentive embodied in the scheme itself.

For more information, please visit www.decc.gov.uk

3. Solutions for Low Carbon Retrofit

Stakeholder interviews revealed that while significant barriers exist which have limited the uptake of retrofit, there are some clear steps owners can take to overcome these obstacles.

3.1 Define Corporate Retrofit Goals

A strong corporate commitment to reduce carbon emissions can greatly influence the success of retrofit. A number of commercial property owners have clearly outlined their carbon reduction goals, setting annual targets for either total building emissions across their portfolios or as a reduction of energy consumed in common areas over which they have greater control.

To accelerate retrofit, organisations will need to take a further step and develop commitments and strategies specific to retrofit. This report recommends that commercial property owners define and commit to one or more of the following:

- A portfolio-wide percentage reduction in total emissions specifically from retrofit;
- Accelerated equipment replacement;
- Identify a specific number of buildings in which low carbon retrofit projects will be carried out over a defined period, engaging occupiers where appropriate.

3.2 Designate Appropriate Roles, Responsibilities and Processes

The setting of corporate retrofit goals will help raise the profile of retrofitting within business activities. However, to translate these goals into action, clear roles must be identified and a defined approval process established within the organisation to identify, prioritise, and approve retrofit opportunities.

Roles and responsibilities

The BBP recommends property owners introduce the following roles into their organisational structure:

- **A Board level champion** to ensure low carbon retrofit is a recognised part of corporate strategy and is incorporated into business practice.
- **Senior management positions with responsibility for energy and carbon reduction.** Responsibilities would include holding regular meetings with managing agents, property managers and occupiers, reporting back on progress against corporate responsibility targets and strategically reviewing opportunities for retrofit.
- **A role within the business or an external specialist engineer to identify and drive retrofit projects at a portfolio level.** Clear roles, together with an incentive to meet specific performance criteria, have proven to be effective in overcoming the common barriers of time, resources and lack of expertise. Appropriately qualified managing agents could also be used to fulfil this role as they are well positioned to identify opportunities for retrofit due to their detailed understanding of the buildings they manage and their regular interface with owners and occupiers.

Further guidance on the development of specific project roles can be found in the Carbon Trust's 2008 report, *Low Carbon Refurbishment of Buildings*[10].

[10] Carbon Trust (2008) Low carbon refurbishment of buildings - Management guide. www.carbontrust.co.uk/Publications/pages/publicationdetail.aspx?id=CTV038

Approval Processes for Retrofit

When retrofit projects are identified, the individuals charged with delivery often find it difficult to gain approval to proceed as an established approval process for retrofit has not been put in place.

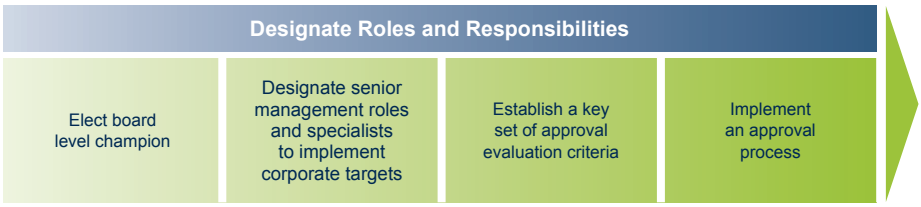
Organisations need to set up a clear approval process which is specific to retrofit projects as they generally have different characteristics to typical business operations. This process does not need to be complex, but should contain a series of approval 'gateways' or 'stages' by which projects are evaluated against pre-agreed criteria. These criteria will need to be set by each individual organisation to link with their particular corporate objectives, acceptable payback periods, and to fit within their financial constraints etc.

Requiring retrofit projects to be evaluated through a defined approval process will allow organisations to set a strategic approach as to the type of projects they wish to carry out, ensure resources are most appropriately allocated, assure quality and minimise risk.

An approvals process should as a minimum include:

1. Alignment with corporate retrofit goals and targets;
2. Assessment of project capital costs;
3. Alignment with specific financial targets set for retrofit works e.g. payback periods;
4. Assessment of project viability and deliverability;
5. Consideration of the financing mechanism to be employed;
6. Assessment of each parties share of costs and benefits.

The process should also track the sequencing of key actions; for example, an initial 'gateway' or 'stage' at which a project is aligned with the owner's corporate goals should also trigger a dialogue with occupiers.



Simple templates for assessing and prioritising retrofit initiatives at an individual building and portfolio level are provided in Appendix 1.

3.3 Prioritise the Portfolio

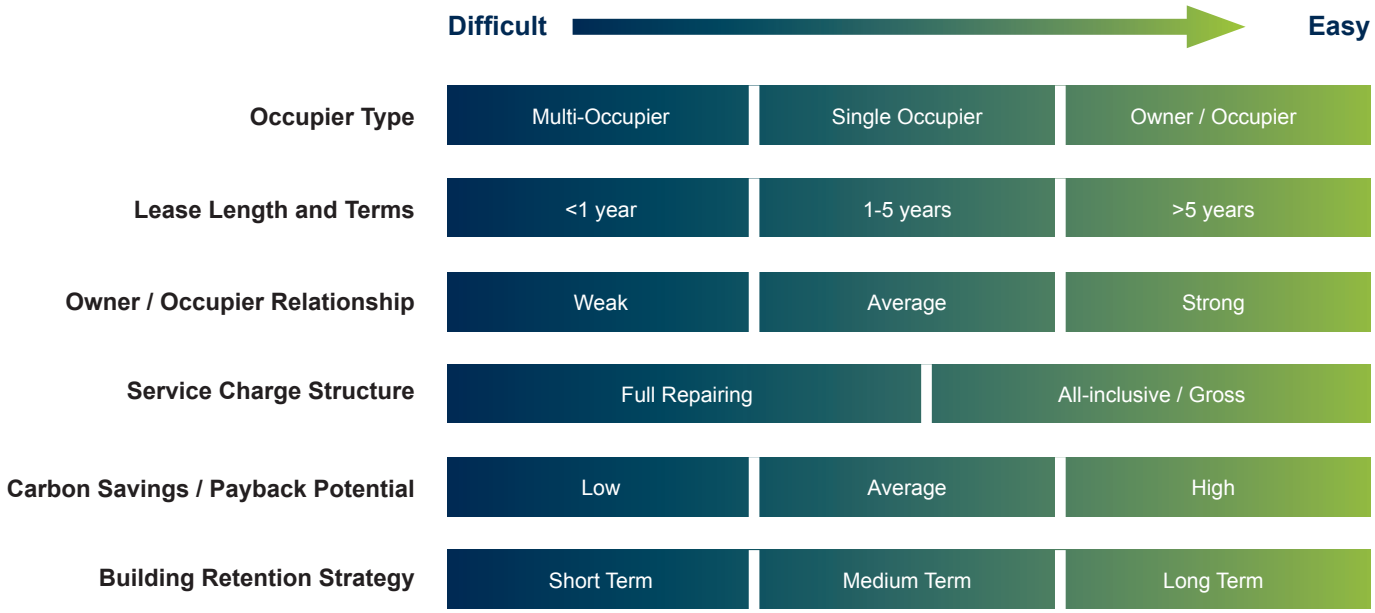
By investigating opportunities and implementing solutions across a portfolio of properties there are advantages through economies of scale and the range of retrofit technologies that can be considered.

When appropriate roles and processes for retrofit have been established, organisations then need to identify where the best opportunities exist. Each property within a commercial portfolio will be unique and present different challenges and opportunities to retrofit. It is therefore important to prioritise the portfolio to concentrate resources on those properties offering the best chance of success. This is a change from the current approach, where typically retrofit opportunities are identified at an individual building level. A strategic 'joined-up' approach offers greater potential for accelerating retrofit.

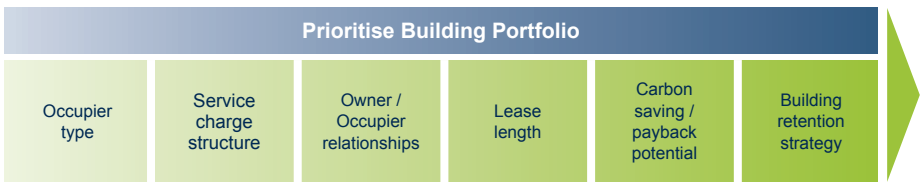
The traditional approach taken has been to roll-out short payback retrofit measures across a portfolio and recycle the savings accrued to fund further retrofit measures within a given payback criteria. This can often be set up as a 'revolving fund' but has limitations in that once 'easy wins' are achieved measures with longer payback period often do not meet internal approval requirements.

As an alternative, an aggregated approach can be taken when applying a number of retrofit measures with varying payback periods across a portfolio of buildings at the same time. By choosing an 'average payback period', measures with medium/long payback periods, that otherwise would not be considered economically viable on their own, can be implemented as their payback periods are offset by measures with shorter returns.

The diagram below summarises a simple prioritisation model that can be used for retrofit. When moving from left to right, gaining approval becomes more likely.



The model can be used to grade the suitability of a building for retrofit at a subjective level or a specific weighting/scoring mechanism can be added to give a more objective measure. Property owners can develop their own prioritisation models or use external specialists to identify opportunities across their portfolio.



3.4 Occupier Engagement and the Importance of Good Relationships

After identifying and prioritising potential retrofit projects it is important that occupiers are engaged at the very start of the process. Interviews found that where owners and occupiers had been able to agree to implement retrofit projects, trust and a good working relationship between both parties was the critical ingredient. Unfortunately, within the commercial property sector owner-occupier relationships often involve little direct dialogue. The nature of the commercial property market can in many instances lead to a confrontational relationship between owners and occupiers, with a frequent cause of dispute being the service charge and its make-up within the framework defined by the 2007 RICS Code.

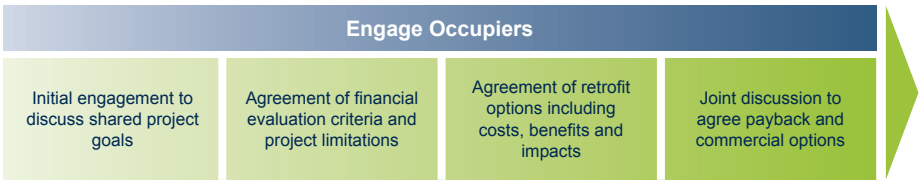
Where it has been possible to agree retrofitting, this has paid dividends beyond those of reducing carbon emissions and operating costs. Many have seen the benefits in improved relationships, limiting risk to upcoming legislative changes, improved CSR compliance, increased occupier retention rates and the potential to retain building value in the future. Moreover, by working closely with occupiers on retrofit projects, owners can also build momentum for further building improvements.

The adoption of a green lease or Memorandum of Understanding (MoU) based on the BBP Green Lease Toolkit[11] is an excellent way of stimulating dialog between owners and occupiers and agreeing joint commitments on specific sustainability goals.

How to Develop Good Relationships?

There are clear steps that can be taken to build good relationships and trust. Following them can lead to productive discussions and speed approval for retrofit.

- **Understand each others needs:** if progress is to be achieved each party needs to understand the others desires and needs in terms of improving their environmental performance.
- **Engage at the earliest possible stage:** retrofit cannot happen without buy-in from both parties; therefore owners need to engage occupiers to present their ideas and aims. Whilst meetings can be facilitated by managing agents it is preferable that senior representatives from owner organisations engage directly with the occupiers.
- **Clearly articulate reasoning and desire for retrofit works:** occupiers need to clearly understand the benefits. The most successful projects have been where the outcome has been focussed on reducing operational costs rather than just the environmental benefits.
- **Agree project goals:** since in most cases the occupiers will bear some or all of the cost of the retrofit, they must first agree the project goals, a mechanism to address financing concerns and the evaluation criteria.
- **Ensure project transparency:** the whole process must be transparent and agreed by both parties.



[11] www.betterbuildingspartnership.co.uk/working-groups/green-leases/green-lease-toolkit/

3.5 Agree Financing Arrangements

There are three principle ways retrofit projects can be financed:

1. Owner funded (part or all).
2. Occupier funded through the service charge.
3. Third party financing.

Owner Funded

Owners can in some cases justify funding retrofit projects without the need to recover the cost from the occupier(s). Typically this would be justified on the basis of attracting new occupiers or retaining occupiers at end of a lease or at rent review. Additionally, owners may consider the use of retrofitting to protect building value with the anticipation that more and more organisations (particularly the public sector) will set minimum sustainability standards for occupancy. With the introduction of the CRC Energy Efficiency Scheme there will be additional incentives for owners to improve the energy performance of their buildings to minimise the costs of carbon credits and improve their standing in the league table.

Owner contributions do set a positive context for conversations with occupiers. It clearly demonstrates the commitment of the owner to improve the performance of the building which may lead to further agreement on mutually beneficial energy saving goals. Owner contributions also allow for a broader range of retrofit measures, with longer payback periods to be considered than would be envisaged under financing mechanisms based solely on occupier contributions.

Occupier Contributions through the Service Charge

There are clear precedents for discussion between owners and occupiers on the question of passing on retrofit costs through the service charge in line with the RICS service charge code (see left).

The most common approach used to fund retrofit projects within the commercial property market is for owners to fund projects upfront and then recoup the costs of financing from the occupiers through the Hard Services portion of the Service Charge. The cost is recouped over a period agreed by the parties and the occupier benefits from reduced operational costs which ultimately leads to a lower total cost of occupancy throughout their lease period. The time frame for payback is normally set within the period of a occupier's lease but can potentially be recovered across succeeding leases for a given space when one occupier leaves and another takes their place. This mechanism is similar to that used when replacing large items of failed equipment.

An alternative option is to fund retrofit projects using the Forward Funding mechanism. Forward Funding can be set up either as a sinking fund, a forward fund, or a depreciation charge (the RICS Industry Standard Cost Headings give a detailed explanation of these different structures). Under these models, projects can be paid for by the owner out of an established fund which is continually replenished through a negotiated element of the service charge. This option is now less popular than in the past following changes in the service charge code which now requires specific legal structures to be put in place and the funds to be operated by a trust set-up to serve both owner and occupier, adding a greater level of complexity and administrative burden.

> *"Service charge costs may include enhancement of the fabric, plant or equipment where such expenditure can be justified following the analysis of reasonable options and alternatives. Owners will provide the facts and figures to justify such a decision."* RICS Code of Practice, Service Charges in Commercial Property, Section 30, April 2007

Hard Truths about the Service Charge Discussion
Using the service charge for retrofit requires approval from the occupier(s) in a building. All parties need to be aware of the significant investment in management time and level of commitment required to achieve a positive outcome.

Increasing the service charge is not an easy discussion, especially where occupiers have had no prior direct contact with owners. They may be highly sceptical, and the discussion can easily become a forum for occupiers to express dissatisfaction with existing services. If the current lease agreement has capped the service charge, the conversation will be even more complicated.

Setting additional service charge costs in multi-occupied commercial properties is particularly challenging as there is a need to get all parties to agree. The more parties involved in the decision making process the more difficult agreement becomes. Typically, the potential for large-scale retrofit is limited by the occupier with the shortest lease, who by default sets the required payback period for a project to be given approval to proceed. The shorter the acceptable the payback time the less funds are available, so there is an inevitable focus on low-cost short-payback projects.

Despite the difficulties, if occupiers are engaged at an early stage and enough time is devoted to the discussion, owners and occupiers can make substantial progress on mutually beneficial projects, effectively reducing overall operational costs and carbon emissions.

Third Party/ Energy Service Company (ESCO) Funding

In situations where exceptionally large projects are proposed, either ESCO agreements or energy bonds may be considered to finance retrofit. In the case of energy bonds, project organisers can offer investors a bond that pays a dividend based on the project's performance over time. For both options, there are significant costs in drawing up and agreeing contracts. The current small scale of retrofit activity in the UK, however, has not been conducive in the widespread use of these mechanisms.

ESCO Contracting Models
ESCOs are still a relatively new concept in the UK and come in many different forms. On one level they can provide funding towards the design and construction of on-site energy centres, such as combined heat and power plants or biomass district heating systems, in which the ESCO then takes responsibility for the ongoing operation and maintenance of the facility. The aim is to use their expertise to generate energy as efficiently as possible, cutting carbon emissions and recouping their investment over the long term by selling the heat and power back to the development at a more competitive rate than a large energy provider would be able to. At the other end of the scale, and the area which is relevant to this report, an ESCO can take on responsibility for improving the energy efficiency of an existing building, funding and installing energy saving measures, recouping their investment through a share of the money saved from lower energy bills.

The ESCO model is one way to overcome many of the barriers to retrofit identified in this report, including:

Commercial
The ESCO model usually includes a provision for guaranteeing the performance of installed retrofit measures. This guarantee effectively transfers the project and performance risk from the buyer to the supplier, and can take the form of either a performance guarantee where the provider is liable for delivering an agreed project outcome or a share-of-savings model, as is common in the USA.

Roles and Processes
ESCO providers commonly take on not only the initiation of the project, but also the identification of appropriate retrofit measures, planning, installation, measurement and verification. This allows for a more rapid identification and installation of projects across a wide portfolio of buildings and can help to overcome a lack of internal processes for identifying and contracting for retrofit.

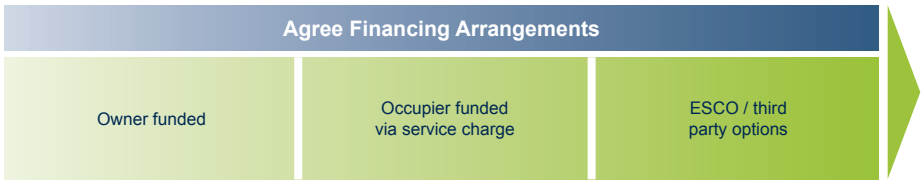
Financial
ESCO contracts commonly contain provisions for financing, usually in the form of vendor-provided financing through a third party. Often the retrofit is structured as a service provision, allowing the buyer to account for the expenditure as an operating cost rather than a capital expense, and allowing the asset to sit on the balance sheet of a special purpose vehicle rather than on the balance sheet of the buyer. To date this approach has not been tested in the UK commercial sector.

Limitations and Drawbacks of the ESCO Model
An ESCO model is generally only suitable for high-value contracts covering a portfolio of properties. The detailed and extensive contracting process, which is expensive both for buyers and providers, is usually only justifiable for projects exceeding £1 million in value. Additionally, the experience base in the UK is limited, and it is questionable whether the legal, financial and procurement expertise required is sufficiently developed. The LDA's RE:FIT programme is the highest-profile attempt to date to develop this market for the UK public sector (see Section 4.6).

An ESCO contract in a multi-occupied building would still require the owner to recoup the ongoing payments from future occupiers and this is the primary barrier to using an ESCO model in multi-occupier buildings.

The vast majority of ESCO contracts are undertaken by the public sector in owner-occupied buildings and so do not address the problem of gaining agreement from occupiers to contribute to the retrofit. An ESCO contract in a multi-occupied building would still require the owner to recoup the ongoing payments from future occupiers and this is the primary barrier to using an ESCO model in multi-occupier commercial buildings.

The ESCO model often requires transferring significant control of the building to the providers, and can include contracting for facilities management activities in a package including the retrofit works. The packaged approach can make accurate measurement and performance verification easier to deal with and provide an opportunity for contractual incentives for proper maintenance to assure maximum performance from the installed retrofit measures, but a transition of this kind can often take place only when facilities management contracts are being renewed. This can be difficult as often the contract renewal periods are different for different buildings within the owner's portfolio. Furthermore, the drivers for the appointment of a facilities management service provider are much wider than their ability to deliver successful retrofit projects alone.



Membership lists of the following professional organisation are a good starting point for identifying potential retrofit providers:

BCIA: www.bcia.org.uk
Carbon Trust: www.carbontrust.co.uk
CIBSE: www.cibse.org
ESTA: www.esta.org.uk
HVCA: www.hvca.org.uk

3.6 Selecting Appropriate Technology

The following questions should be considered when selecting a specific technology:

- Is it a proven technology?
- Are there case studies or examples where the technology has been implemented in similar situations?
- Is there a viable economic payback period?
- What level of disruption will its implementation cause the occupiers?
- Are the suppliers prepared to offer performance guarantees?

There are a number of issues to consider when selecting which type of retrofit technology is best for a particular project. For example, it can be difficult to predict their potential carbon emission savings or more importantly verify their performance once installed, even for those which in theory have strong business cases. Where it is possible to implement advanced verification methods, these often add to project expense. Many technologies are also disruptive to occupiers during their installation which is a major concern for owners and managing agents.

Successful implementation of retrofit measures depends on good communications and a strong relationship between the owner, occupier and technology provider, particularly where energy savings cannot be directly measured and improved performance levels have to be estimated based on mathematical models.

Overcoming Occupier Disruption

The most straightforward solution is to select either non-disruptive retrofit measures, or solutions that can be implemented to coincide with planned maintenance. These types of retrofit measures often focus on control systems, sensors, or operational optimisation, but could also include improvements to central plant and equipment, where access to occupied areas is not necessary.

Timing of works can minimise occupant disruption: this could mean seasonal phasing of the works and project activity outside of normal working hours. Some system upgrades, for instance, can be implemented outside of the main heating and cooling seasons when the equipment is not required to operate the building. Occupants are less likely to mind about disruption if the retrofit ultimately improves conditions in the building or if the performance improvements in terms of reduced energy use, cost savings or carbon emissions are well communicated.

Some occupiers may require a more detailed impact assessment before agreeing to the work. Such assessments can help reassure occupiers that disruption has been fully evaluated and a plan has been developed to minimise it.

Managing Risk

Much of the risk perceived by owners and managing agents in carrying out low carbon retrofit works comes from a lack of awareness of the technologies available. While the UK has some long-standing providers offering energy efficient retrofit solutions, they have yet to effectively promote their solutions to customers in the commercial property sector. Increasing market awareness of available retrofit measures and the savings they bring is critical if retrofit activity is to be accelerated.

A list of possible low carbon retrofit measures to serve as a starting point for organisations considering retrofit is provided in Appendix 2.

There are ways to address these concerns. Owners and managing agents can invest in research and training to develop a better understanding of the available technologies and the benefits they offer. Another option is to employ solutions where providers offer energy saving performance guarantees. Voltage optimisation is an example of a technology which has been used in this way within the UK (see Section 4.2 and 4.3).

3.7 Delivery

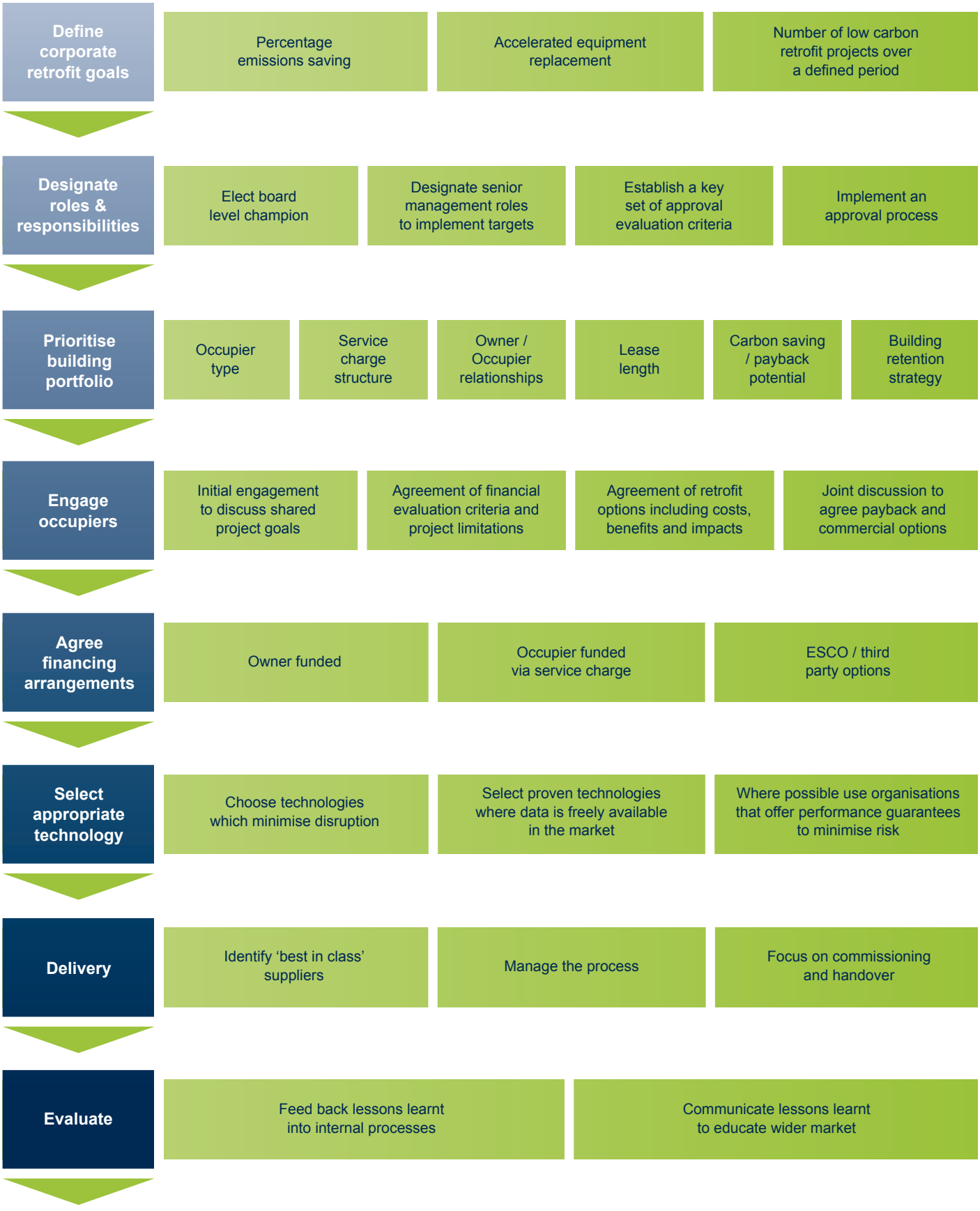
A detailed analysis of project delivery is beyond the scope of this report; however a best in class supplier should be chosen and appropriate project management processes used. It is also critical to ensure that any technology or system installed is properly commissioned and handed over to the buildings' management team with good supporting documentation and any necessary training to ensure successful operation and verifiable performance.

3.8 Evaluation

Evaluation is a vital process once a retrofit project has been carried out for two main reasons. Firstly, lessons learnt should be fed back into the business and cover all aspects of the retrofit process. This can help improve the implementation of any future retrofit projects and should include commentary on how occupiers were engaged, what financial mechanisms were used, the type of technology chosen, how performance was verified and payback calculated.

Secondly, it is important to publicise successful retrofit projects to the wider industry in the form of best practise case studies. The uptake of retrofit will greatly increase once more information on proven examples are in the public domain as it will demonstrate and educate the market, particularly in terms of the commercial and finance structures used and the most appropriate type of technologies which can be applied.

Low Carbon Retrofit Roadmap: At-a-glance



4. Case Studies for Enabling Retrofit

These case studies illustrate best practices in low carbon retrofit. Each highlights a specific barrier that was addressed and overcome, enabling the retrofit project to proceed.

Climate Change Capital®

4.1 Climate Change Capital: Owner Funding; Owner / Occupier Relationship Management

Climate Change Capital's property fund is driving the approval of retrofit through a clear management strategy focused on improving the value of its portfolio through increased energy efficiency and reduced carbon intensity. Climate Change Capital engages with occupiers to discuss mutually beneficial options for improving energy efficiency and is prepared to fund a portion of the cost of retrofit projects directly.

Building background	A six-story office and retail building in a major UK city Property comprises 13,000 square feet of retail and 67,000 of office space
Occupier and lease environment	Single public sector office tenant and three retail occupiers No breaks 12-year lease
Retrofit technology	Strategy for lighting, plant improvement/replacement and air conditioning controls
Financing arrangements	Typically, Climate Change Capital will fund or share costs 50/50 with occupiers Public sector occupier was able to access EU funding to support their contribution
Commercial factors	Five-year payback for retrofit Capital expenditure formed a basis for joint funding Independent consultant provided evidence that the payback period was achievable

Key Drivers for Retrofit Approval

Clear Corporate Strategy

- Retrofit approached as part of a total property portfolio strategy to enhance building value.
- Improved building performance, reflected in DEC/EPC ratings, is expected to translate into value gains through lease negotiations.

Strong Processes

- A property's potential for energy efficiency improvements is assessed before purchase.

Strong Owner / Occupier Relationships

- Open dialogue with occupiers is fundamental to the owners' approach to retrofit. Potential occupiers will be engaged before the building is purchased and discussions started to explore compatible energy efficiency and carbon reduction goals.

British Land

4.2 British Land: Process and Role Excellence; Owner / Occupier Relationship Management

British Land has developed a structured process to identify opportunities for low carbon retrofit. The company has involved a third-party provider to help develop and structure business cases to be taken to senior management for approval. British Land has also developed direct long-term relationships with key occupiers. These have formed a sound basis for discussion over the use of the service charge to recoup the cost of financing retrofit projects.

Building background	A commercial office building in a major UK city with 440,000 square feet of floor space, built in the 1980s
Occupier and lease environment	Multi-occupier building 10 occupiers
Retrofit technology	Voltage optimisation
Financing arrangements	Capital expenditure was recouped using a negotiated increase to the service charge
Commercial factors	Retrofit measures selected had a guaranteed payback over two years, representing an 8% saving on the annual energy spend

Key Drivers for Retrofit Approval

Clear Corporate Strategy

- Top-down energy efficiency targets have been translated into action by engaging the occupier in discussing shared energy efficiency goals.

Strong Processes

- A pipeline of retrofit opportunities is identified across the portfolio using a third-party advisor.
- Opportunities are qualified and a business case is developed.
- Opportunities are reviewed regularly by the head of the business group to ensure a sufficient project pipeline. They are also reviewed by British Land's asset manager, who approves outlays.

Strong Owner / Occupier Relationship

- British Land has developed strong relationships with their occupiers by communicating their strong desire to reduce carbon emissions and save their occupiers money through reduced energy costs. This has helped identify occupiers with common aspirations.
- Through their close relationships with the occupiers, the owner negotiated approval of payment for retrofit works through the service charge that all parties agreed to.

4.3 Hammerson: Role and Process Excellence

Hammerson has developed a clear process for identifying low carbon retrofit projects. It has successfully engaged with occupiers, aided by performance guarantees for retrofit technology, to negotiate an offset to service charges to recover the cost of retrofit.

Building background	A large retail site in Southampton
Occupier and lease environment	96 occupiers
Retrofit technology	Voltage optimisation (VO) equipment on incoming electricity supplies. Replacement of existing 'T8' fluorescent tubes with more efficient 'T5' alternatives, together with the introduction of a system which allows lights to operate at 10% in low use areas when no-one is present. The forecast payback period for the projects is within three years, based on a combined cost of £510,000 and current energy savings of £184,000 p.a.
Financing arrangements	Owner-financed from capital budget Occupiers charged through negotiated service-charge offset
Commercial factors	14% energy savings were guaranteed by the voltage optimisation provider

Key Drivers for Retrofit Approval

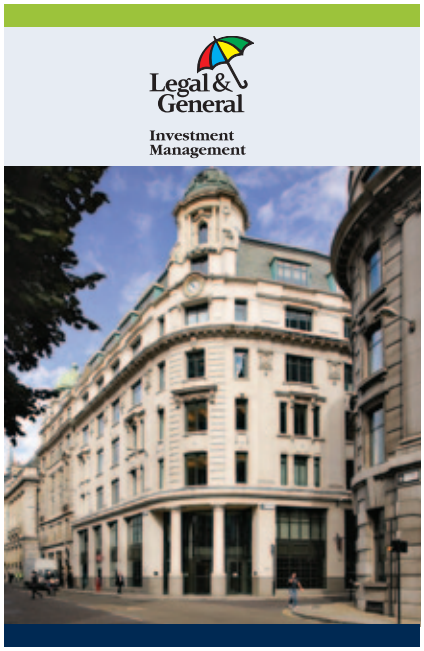
Strong Roles and Processes

- Individual asset managers are asked to provide retrofit proposal project details.
- Proposals are reviewed by the head of facilities or an environmental advisor. Recommendations are submitted to the Corporate Responsibility Operations Group for review.
- Approved projects are then piloted and assessed according to their value across the property portfolio.

Performance

Taking into consideration a 19% increase in opening hours at the shopping centre, the like-for-like year-on-year reduction in energy consumption achieved by the projects was between 31% and 35%, exceeding the original projection.

Prior to installation, the shopping centre would have qualified in its own right under the CRC Energy Efficiency Scheme, as its annual consumption exceeds 6,000MWh. However, the savings achieved by the projects mean the centre no longer falls under CRC, saving an additional projected £40,000 p.a. When factoring in this saving, the projects' payback period is within two years.



4.4 Legal & General Property: Owner / Occupier Relationship Management

Legal & General Property has built strong relationships with occupiers and managing agents around the shared agenda of carbon and cost savings. They have successfully funded low carbon retrofit measures in a number of their buildings where costs are recovered through a negotiated increase in the service charge. Establishing a clear dialogue with occupiers has increased the company's capacity to discuss and gain agreement using service charges to fund these green projects.

Building background	Central London commercial office property of 100,000 square feet Rebuilt in the late 1990s
Occupier and lease environment	7 occupiers 1 sub-tenant
Retrofit technology	Re-lamping Optimisation of the building-management system
Financing arrangements	Financed through negotiated service charges, with key potential savings identified and applied Energy reductions credited back at year-end reconciliations
Commercial factors	Project justified as a way to increase customer satisfaction and encourage long-term leases through strong relationships with occupiers

Key Drivers for Retrofit Approval

Clear Corporate Strategy

- Corporate sustainability goals translated into focused efforts to identify opportunities to implement retrofit projects.

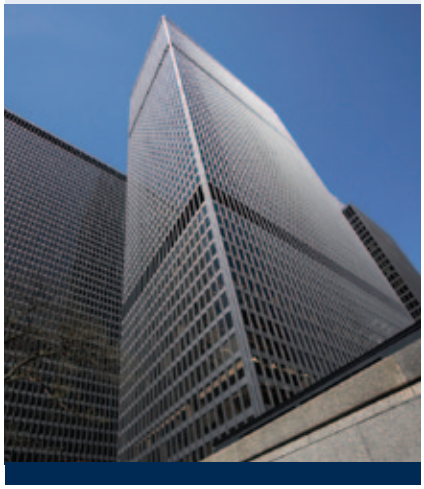
Strong Roles and Processes

- Facilities manager assigned to be responsible for identifying opportunities for retrofit projects.
- L&GP discusses the potential funding and savings with occupiers to decide on whether to move forward on projects.

Strong Owner / Occupier Relationships

- Occupiers engaged early in the decision process, to discuss compatible energy efficiency goals.
- The owner-occupier relationship is aided by the active engagement of the facilities manager.

CADILLAC FAIRVIEW



4.5 Cadillac Fairview and The Toronto Dominion Centre: Clear Strategy; Roles and Processes Excellence

Cadillac Fairview is one of North America's largest owners and managers of commercial real estate. Working with AMERESCO and the Toronto Better Buildings Partnership, Cadillac Fairview completed an extensive building retrofit of a landmark office and retail complex – The Toronto Dominion Centre – without disruption to its current occupiers.

Building background	56-story, 4.5 million square foot, 1960s mixed office and retail building Fully occupied at the time of retrofit
Occupier and lease environment	Nearly 100 occupiers with varying lease lengths Leases structured to pass on the cost of utilities to the individual occupant through the service charge
Retrofit technology	Lighting controls HVAC control optimisation Boiler upgrades Optimisation of building-maintenance system
Financing arrangements	Total project investment was borne by the property owner, who financed the initial cost of the works directly Project cost recouped from occupiers through a service charge increase
Commercial factors	Cadillac Fairview was provided by AMERESCO with credible estimates of efficiency savings Although they were ultimately not used, Cadillac Fairview was offered performance guarantees which increased confidence in the expected project outcomes

Key Drivers for Retrofit Approval

Clear Corporate Strategy

- Low carbon retrofit for the purpose of increasing long-term asset value and repositioning the asset in the market.
- Decrease in operating costs expected to increase asset value through better occupancy rates, lease negotiations and renewals.
- Offer to finance retrofit works if cost can be recouped or offset through a service-charge increase.

Strong Roles

- AMERESCO established credible energy savings estimates and evidence of an acceptable return on investment for the owner, and the owner financed the initial cost of the project. AMERESCO provided the expertise needed for managing all phases of retrofit implementation, including monitoring and verification of retrofit performance.

Strong Owner / Occupier Relationships

- Working with the Toronto Better Buildings Partnership, which organised positive press coverage and provided expert advice and advocacy for retrofit, Cadillac Fairview engaged occupiers to agree to repay the project costs through an increased service charge.
- Cadillac Fairview worked with occupiers to design a retrofit program that would minimize disruption. Overnight, each floor was retrofitted and the occupier space made fully operational for the next morning.

4.6 London Development Agency RE:FIT Programme: ESCO model

To meet the aggressive targets set by the Mayor of London, the London Development Agency (LDA) has developed a building energy efficiency program (RE:FIT) that offers a framework for all public sector organisations to procure energy performance contracting works to improve energy efficiency and reduce carbon emissions of their buildings.

Building background	The first phase of the programme initially trialled energy performance contracting in 42 buildings, including office, police and fires stations, from Transport for London, Metropolitan Police and London Fire Brigade. This was to test and develop a framework A second phase will trial with a further possible 58 buildings across the same three organisations RE:FIT is now being set up as a supplier framework that can be used by all UK public sector organisations
Occupier and lease environment	Currently all buildings are owner-occupied Future implementation is expected at single-tenant properties, and potentially at multi-tenanted buildings where all occupiers are public-sector organisations
Retrofit technology	Wide range of retrofit measures, focusing on all aspects of energy efficiency including on-site generation
Financing arrangements	The initial contracts did not incorporate any type of vendor financing, but all had paybacks of less than 10 years Future participating organisations will either borrow or self-finance, potentially with the support from the London Green Fund which is being set up to fund climate reduction projects
Commercial factors	Project justified as the primary way to reduce the carbon emissions from existing public sector buildings in London Contracts structured to transfer much of the project and performance risk to the providers, and are backed by parent-company guarantees and endorsed-savings guarantees Contracts also rely on the providers to contribute resources and expertise throughout the project cycle

Key Drivers for Retrofit Approval

Clear Corporate Strategy

- Strong support and clear targets set by Mayor of London.
- Committed central support from the London Development Agency, including support from a dedicated Programme Management Office.

Strong Roles and Processes

- Legal, financial, procurement and project management positions defined before project implementation.
- Provider expertise used to identify opportunities.
- Clear benchmarks for project approval based on business case and payback period.
- Use of standard contracts and processes, supported by LDA Project Management Office.

Innovative Commercial Structure

- Partnership with a single provider for delivering all aspects of the programme.
- Providers' performance guarantee of minimum level of savings.
- Rate cards and open book pricing used to assure transparency.

4.7 Land Securities: Role & Processes Excellence

Land Securities has developed a clear process for low carbon and resource efficiency projects by creating a low carbon fund. Monies that were previously used to offset carbon emissions from the owner's energy use for common parts within their shopping centres have been re-directed to individual emission reduction and water efficiency projects put forward by the retail centre staff. Proposals are made to a judging panel and the monies released, subject to key criteria being met.

Building background	Land Securities Portfolio of Retail Centres
Occupier and lease environment	Not applicable: Focus on landlord and common parts areas
Retrofit technology	Various: New high efficiency lighting and lighting controls. Rainwater harvesting and installation of low water use fittings
Financing arrangements	Owner financed from monies allocated to profit centre budgets originally intended to purchase carbon offsets
Commercial factors	All schemes have to be presented to an internal judging panel including a business case and projected performance improvements and cost savings

Key drivers for retrofit approval

Strong Roles and Processes

- Retail centres are advised of the potential value of their budget, based on offset allowances (set at £8 per tonne CO_2).
- Retail management teams prepare retrofit proposals.
- Internal expert panel judges each proposal on its merit and awards the capital to schemes able to demonstrate measureable carbon or resource savings.
- Approved projects are monitored and best practice ideas shared across the business.

Innovative commercial structure

Costs were already allocated to purchase carbon offsets but the scheme instead allowed the money to be spent within their own shopping centres on low carbon retrofit projects to reduce CO_2 emissions and water consumption.

Performance

- £150,000 has been invested with estimated savings of £100,000 per year resulting in an estimated payback of 1.5 years.
- CO_2 reductions of approximately 600 tonnes a year and over 5,000 when taking into account the lifetime savings.

4.8 Joanneum Research: ESCO model

Austrian electronics firm Joanneum Research worked with local Energy Services Company ABB to structure an Energy Performance Contract for its head office and research centre. The structuring of a 15 year contract which included an energy saving guarantee encouraged Joanneum to approve retrofit works.

Building background	Commercial office block and electronics research centre Originally built in 1962 and renovated in 1974
Occupier and lease environment	Single owner-occupied building
Retrofit technology	Optimisation of the existing heating regulation system Upgrade of the existing building management system Installation of thermostat valves and installation of a cooling system for laboratory appliances (closed circulation heat exchanger)
Financing arrangements	The client established an Energy Performance Contract with German Energy Services Company, ABB Building & Infrastructure Solutions. A comprehensive Energy Performance Contract was developed with a 15 year contract period Under this model ABB took control of the facilities and management contract for the building and responsibility for the operation, maintenance and control of the building and its energy consumption. ABB received payment from the shared energy savings delivered through the retrofit measures implemented Owner Contribution/ Use of vendor financing
Commercial factors	The building owner, stood (as the only occupant of the building) to gain directly from the establishment of the Energy Performance Contract. ABB offered energy savings guarantee for the client, transferring performance risk onto the provider and away from the building owner. ABB committed to deliver the project without disruption to operating activities and were able due to their extensive buildings expertise to install proprietary technology and low cost. The establishment of a 15 year contract period allowed ABB to invest in substantial retrofit activities with relatively long payback periods.

Key Drivers for Retrofit Approval

Tenant and Lease Environment

- The Existing Owner-Occupier situation supported the use of an Energy Performance Contract as the full benefit of energy savings accrued to a single party.

Commercial Structure

- In order to gain approval for retrofit ABB took over the facilities and management contract for the building incentivising them to drive efficiencies and invest in building performance.
- Providers' performance guarantee of minimum level of savings.
- Long term contract incentivised the provider, to make substantial investments in retrofit measures.

Provider Experience

- Crucially for the Occupier, the Energy Performance Contractor was able to conduct extensive retrofit activity without disruption to the normal operation of the building through project phasing.

4.9 Clinton Climate Initiative, Empire State Building – Best practice: ESCO contract, strong processes

A landmark retrofit project initiated by the Clinton Climate Initiative. The owner, the Empire State Building Company worked with Jones Lang LaSalle, Johnson Controls, and the Rocky Mountain Institute to develop a replicable process to assess, quantify and document the benefits of energy efficiency retrofits in the existing built environment. This process, which is publicly available on www.esbsustainability.com, led to a performance guarantee contract to reduce the Empire State Building's energy use and carbon footprint by more than 38% with a payback in three years. The Clinton Climate Initiative convened the international icon's owner and leaders in sustainability, and used sophisticated energy modelling techniques to build a clear picture of the potential efficiencies from retrofit implementation. Jones Lang LaSalle managed the project for the owner and created an integrated occupier engagement plan. The success at the Empire State Building has achieved international recognition and can inform building owners and policy makers with replicable practice and show that the least expensive new energy and carbon reduction comes from an aggressive approach to energy conservation.

Building background	A 102 storey landmark commercial office in New York. The property comprises 2.85 million sq ft of office space. The property was built in 1931
Occupier and lease environment	Multi-tenant building with approximately 300 occupiers with multiple lease lengths
Retrofit technology	The initiative considered 67 energy efficiency measures and arrived at eight projects for implementation. The work is scheduled to be completed in two phases. Building systems work to be finished by June 30, 2011 which will account for more than 50 percent of the guaranteed savings. The work to take place in occupier spaces should be completed by 2013. Measures include: Window light retrofit: refurbishment of existing windows, on site, using existing glass and sashes to create triple-glazed insulated panels Radiator insulation retrofit: installation of insulation between radiators and exterior walls to heat more efficiently with less steam consumption Occupier lighting, daylighting and plug upgrades: improved lighting designs, daylighting controls, and plug load occupancy sensors to reduce electricity costs and cooling loads Chiller plant retrofit; whole-building integrated control system upgrade including ventilation control upgrade
Financing arrangements	The project is being financed by the Empire State Building Company out of cash from operations.

Commercial factors	The Clinton Climate Initiative convened a team of building retrofit experts to assess the potential of incorporating efficiencies into an already planned building upgrade. The team identified areas where energy efficient technologies could be incorporated for less than 4% of the originally planned project cost. The team was able to prove the value of the new measures by adopting existing energy consumption modelling software, comparing the improvements against the building's baseline energy consumption, and demonstrating the positive impact of retrofit on energy consumption and emissions. The performance contract for five of eight key retrofit projects reduced project risk for the owner. Additional Owner expenditure was motivated by the expectation of increased long-term building asset value based on increased occupancy and rents due to improved energy efficiency and reduced total cost of occupancy

Key Drivers for Retrofit Approval

Strong Relationships

- Supported by the Clinton Climate Initiative the building owner was able to work with a consortium of energy services and management experts to engage with occupiers and persuade them of the benefits of retrofit works.
- The owner and delivery team are working collaboratively with occupiers as some of the retrofit measures involve occupier spaces. The delivery team created an occupier engagement plan and is working closely with occupiers as they plan their spaces. For example, the occupier Skanska worked with the owner and the larger retrofit project as it developed its full-floor Empire State Building offices, resulting in a LEED-platinum rated space with energy use 44% less than its previous location.

Strong Processes

- The process created at the Empire State Building changed the dialogue in the U.S. on energy efficiency retrofits in the built environment by providing proof of success, a programme for quantifying costs and benefits, and a versatile and flexible program for a variety of building types, systems, and geographic locations.
- The delivery team worked closely to develop replicable, quantitative energy modelling, measurement and projection expertise to quantify costs and benefits of various retrofit scenarios, narrow the options and arrive at a programme that maximised energy savings and provided an advantageous return on investment.
- The owner and the team considered the tenant perspective from the start and involved the building's tenants early on to bring them into the process.
- The delivery team documented its work throughout the process to ensure that the ESB project would be accessible and replicable for a variety of building types, systems, and geographic locations.

Innovative Commercial Structure

- Partnership with an energy services provider for major elements of the retrofit project reduced risk for the building owner.
- A minimum level of savings was guaranteed by the Energy Service Company.

For further information, visit: www.esbsustainability.com

Building Low Carbon Retrofit Summary Sheet													
	Project Savings (OpEx)			Project Costs (CapEx)						Additional Benefits			
Retrofit Measures	Direct Energy/ Water cost saving (£/pa)	Operational/ Maintenance saving (£/pa)	Total (£/pa)	Contractor (£)	Fees (£)	Other (£)	Total (£)	Simple Payback (years)	% Energy Reduction	CO_2 Savings (tonnes CO_2 e/pa)	CO_2 Savings (£/tonne CO_2)	CRC Saving (£/pa)	Comments*
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
Total													
Target													

* e.g. impacts to EPC, DEC ratings, BREEAM etc

Porfolio Low Carbon Retrofit Summary Sheet

Building asset	Total Project Savings (OpEx)			Total Project Costs (CapEx)						Additional Benefits							Comments
	Direct Energy/ Water cost saving (£/pa)	Operational/ Maintenance saving (£/pa)	Total (£/pa)	Contractor (£)	Fees (£)	Other (£)	Total (£)	Simple Payback (years)	% Porfolio Energy Reduction	CO_2 Savings (tonnes CO_2e/pa)	CO_2 Savings (£/tonne CO_2)	CRC Saving (£/pa)	EPC Rating		DEC Rating		
													Current	Predicted post retrofit	Current	Predicted post retrofit	
A																	
B																	
C																	
D																	
E																	
F																	
G																	
H																	
I																	
J																	
Total								[1]	[2]	[3]	[4]	[5]					
Target																	

[1] Average across the portfolio
[2] Agregated % reduction of total portfolio energy consumption
[3] Total CO_2 savings
[4] Average £ per CO_2 ratio across the portfolio
[5] Total CRC savings

Appendix 2. Low Carbon Retrofit Measures

The following provides a sample list of potential low carbon retrofit measures*.

		Measure relevant to your building
1	**BOILER PLANT IMPROVEMENTS**	
1.1	Boiler control improvements, new controls or upgrades of existing systems	☐
1.2	Boiler burner replacement with higher efficiency models	☐
1.3	Replacement of existing boilers with high-efficiency condensing boilers	☐
1.4	Connection to low carbon community heating schemes	☐
2	**CHILLER PLANT IMPROVEMENTS**	
2.1	Chiller plant upgrades or replacement with higher efficiency equipment (for example variable speed drives)	☐
2.2	Chilled water system improvements: pumping, piping, and controls retrofits and replacements	☐
2.3	Re-commissioning of chillers and associated equipment to optimise performance	☐
2.4	Installation of plant specific power factor correction equipment	☐
3	**CONTROLS AND BUILDING ENERGY MANAGEMENT SYSTEMS (BEMS)**	
3.1	Control systems upgrades. For example replacement of pneumatic and analogue controls to direct digital control systems	☐
3.2	Upgrade or replacement of existing BEMS systems and control devices with more effective and efficient alternatives	☐
3.3	Re-commission building control systems to optimise operation	☐

* The list does not include all potential measures and any number may not be appropriate for any given building.

4	HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) SYSTEMS	Measure relevant to your building
4.1	Packaged air-conditioning unit replacement with more efficient models	☐
4.2	HVAC damper and controller repair or replacement	☐
4.3	Replace older unitary split system air-conditioning systems with new high-efficiency units	☐
4.4	Cooling tower retrofits or replacements	☐
4.5	Economiser installation	☐
4.6	Fan and pump motor replacement with high-efficiency alternatives	☐
4.7	Thermal energy storage	☐
4.8	Demand led ventilation systems	☐
4.9	Windcatcher natural ventilation units	☐
4.10	Low pressure drop variable air volume terminal units	☐
4.11	EC or ECVAV fan coil units	☐

5	LIGHTING IMPROVEMENTS	
5.1	Interior and exterior high efficiency lighting retrofits and replacements	☐
5.2	Intelligent lighting controls	☐
5.3	Occupancy sensors	☐
5.4	Light-emitting diode (LED) technologies	☐
5.5	Maximise daylighting (light shelves, motorised external louvers and blinds etc)	☐
5.6	Spectrally enhanced lighting	☐
5.7	Fibreoptic lighting technologies	☐
5.8	Sun-tubes	☐

Measure relevant to your building

6 BUILDING ENVELOPE MODIFICATIONS

- 6.1 Insulation improvements ☐
- 6.2 Improve building airtightness ☐
- 6.3 Window/cladding refurbishment or replacement ☐
- 6.4 Reflective solar films ☐

7 WATER AND STEAM DISTRIBUTION SYSTEMS

- 7.1 Improved insulation standard on piping and equipment ☐
- 7.2 Steam trap repair and replacement, repair steam leaks ☐
- 7.3 Repair or replacement of existing steam system condensate-return installations ☐

8 ELECTRIC MOTORS AND DRIVES

- 8.1 Motor replacement with high-efficiency motors ☐
- 8.2 Variable speed motors and inverter drives ☐

9 REFRIGERATION

- 9.1 Replacement of ice storage and process refrigeration equipment with high-efficiency units ☐

10 DISTRIBUTED GENERATION

- 10.1 Combined heating and power (CHP), Combined Cooling Heating and Power (CCHP) ☐
- 10.2 Microturbines technology ☐
- 10.3 Fuel cell technology ☐

11 RENEWABLE ENERGY SYSTEMS

Measure relevant to your building

- [ ] 11.1 Photovoltaic system installation
- [ ] 11.2 Solar hot-water system installation
- [ ] 11.3 Solar ventilation preheating system installation
- [ ] 11.4 Wind-energy system installation
- [ ] 11.5 Passive solar heating installation
- [ ] 11.6 Landfill gas, waste-water treatment plant, digester gas, and coal-bed methane power-plant installation
- [ ] 11.7 Wood-waste and other organic waste stream heating or power-plant installation
- [ ] 11.8 Replacement of traditional air-conditioning and heating units with ground and air source heat pump systems
- [ ] 11.9 Micro-hydro power

12 ENERGY AND UTILITY DISTRIBUTION SYSTEMS

- [ ] 12.1 Transformer calibration
- [ ] 12.2 Power quality upgrades
- [ ] 12.3 Power-factor correction
- [ ] 12.4 Voltage optimisation

13 WATER CONSERVATION SYSTEMS

- [ ] 13.1 Low-flow water fittings and showerheads
- [ ] 13.2 Low-flow plumbing equipment
- [ ] 13.3 Water-efficient irrigation
- [ ] 13.4 On-site sewer treatment systems
- [ ] 13.5 Grey-water systems and rainwater harvesting

		Measure relevant to your building
14	**ELECTRICAL PEAK SHAVING AND LOAD SHIFTING**	
14.1	Thermal energy storage	☐
14.2	Ice storage	☐
14.3	On site electrical generation	☐
14.4	Non-essential system load shedding	☐
15	**COMMISSIONING**	
15.1	Retro-commissioning services	☐
15.2	Continuous-commissioning services	☐
16	**ADVANCED METERING SYSTEMS**	
16.1	Half hourly metering	☐
16.2	Smart metering	☐
17	**APPLIANCE AND PLUG-LOAD REDUCTIONS**	
17.1	Replace air-cooled ice and refrigeration equipment	☐
17.2	Replace white goods with A rated devices	☐
17.3	De-lamp vending machines	☐
17.4	Plug timers	☐
17.5	PC shutdown, and other IT-based measures	☐

LONDON | BETTER BUILDINGS PARTNERSHIP

LEADING TO A GREEN LONDON

British Land · Canary Wharf London · GE · Grosvenor · Hammerson · Henderson Global Investors · Hermes · Land Securities capital commitment · Legal & General Investment Management · London Development Agency · PRUPIM · Quintain · The Blackstone Group · Transport for London · Workspace Group

We are committed to improve the sustainability of London's existing building stock, to accelerate the reduction in CO_2 emissions from those buildings and in doing so significantly contribute to achieving London's target of a reduction from 1990 levels of CO_2 emissions of 60% by 2025.

The Building Centre
26 Store Street
London WC1E 7BT
e: info@betterbuildingspartnership.co.uk
www.betterbuildingspartnership.co.uk

May 2010