Can Energy Services Companies deliver low carbon new build homes?

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Abstract

The UK has set for itself an ambitious target of reducing carbon dioxide emissions by 60% by 2050. To achieve this target, carbon reductions would need to be made by all sectors including the residential sector which presently accounts for 27% of CO_2 emissions.

Energy Services Companies (ESCOs) could address the barriers to energy efficiency and microgeneration through design build, finance, operation and maintenance provision (DBFO). Energy services contracting will only be chosen where the reduction in cost of supplying energy services can more than offset the additional transaction cost compared to conventional supply.

Previous work has identified three broad models of energy services: the Facilities Management or performance contract model for business commercial and public sector customers; the Community Model where decisions are taken on behalf of a group of customers (predominantly householders) in the same location; and the Supplier model where existing energy suppliers could evolve their offer to domestic customers.

The Community model in new build has particular interest, in that it offers a viable route for the development of ESCo services to households. The paper explores the social, technological, economic and policy issues (a STEP analysis) that will play a key role in the emergence of ESCOs in new build housing in the UK.

Key findings are:

- London appears to be a key market within the UK, and in particular in dense build (eg flats) the whole development may be on a communal solution. Economic analysis shows the conditions under which it would be cost effective to develop this approach.
- The changing building regulations and planning framework may require significant microgeneration which, it is argued, are best delivered through ESCos
- Purchasing new build is a very different purchasing decision to purchasing an existing home, and an A rated home guaranteed by ESCO services could provide a key part of the marketing offer;
- housing developers may be attracted by being able to contract out the whole energy infrastructure;
- A combination of information, incentives and regulation could transform the market for ESCos in new build

1 Introduction

The domestic sector accounts for 27% of UK's CO_2 emissions (DTI, 2002) and is critical to tackling climate change. It is essential to reduce emissions from both new and existing homes. Boardman et al (2005) estimated that of the 23.9million homes already in existence, 21.8million of them will still exist in 2050. An additional 10million homes need to be built by 2050. In order to deliver a 60% reduction in CO_2 from homes by 2050, these new homes would have to be near-zero carbon. This paper focuses on how 10million near-zero carbon homes could be delivered. One possible route is that the current business model of the developers can be modified sufficiently to manage the incorporation of a range of microgeneration technologies. The current business model of developers is to design, build and finance developments (which are capital intensive), and to recover that capital investment by sale very quickly, and to move on to the next build project with no contractual ties to the last project. Any post construction issues are usually covered through a National House Building Council (NHBC)[1] Guarantee, leaving the developer free from encumbrance.

Microgeneration[2] needs careful design and installation and once installed, continual monitoring, and maintenance to perform best. This paper explores an alternative business model: that housebuilders could contract out all energy services associated with new housing to an Energy Services Company who would design, build, finance, operate and maintain microgeneration on a Facilities Management, or whole life cost model. The paper explores whether Energy Services Companies (ESCOs) can play a role in creating low carbon new build housing in the UK by analysing the associated social, technological, economic and policy issues (a STEP analysis).

2 The proposition

2.1 The New Build Market

New build has a significant role to play in reducing domestic emissions and the emerging housing in London could be a key area for implementing low carbon solutions. The graph in Fig 1 shows how the proportion of new build in London vs. the rest of the country has been steadily increasing. This is because of concern that London will face the highest shortage of housing in the coming years, not least because there are a high proportion of one and two person households, but also because London is the destination for most immigration (Ahmed and Dorward, 2003). This demand is reflected in the house prices in London which are rising much faster than the rest of the UK (DCLG, 2006b).

In the UK, there is a distinct trend towards denser build in new construction. The average density of new developments is 41 dwellings per hectare (dph) up from 25 dph in 1997 (DCLG, 2006c). This is being achieved by constructing more flats and fewer detached houses. Fig 2 shows the proportion of flats vs. houses built in the last 5 years. The proportion of flats in new build has steadily increased. Although the trend towards more flats exists all over the UK (DCLG, 2006d), it is more pronounced in London (Fig 2). In the year 2004, nearly 83% of all new homes built in London were in the form of flats (DCLG, 2006e).

[1] National House Building Council is the standard setting body and leading warranty provider for new homes in the UK

[2] Microgeneration is defined as any energy generation technology with a capacity below 50-100 kW

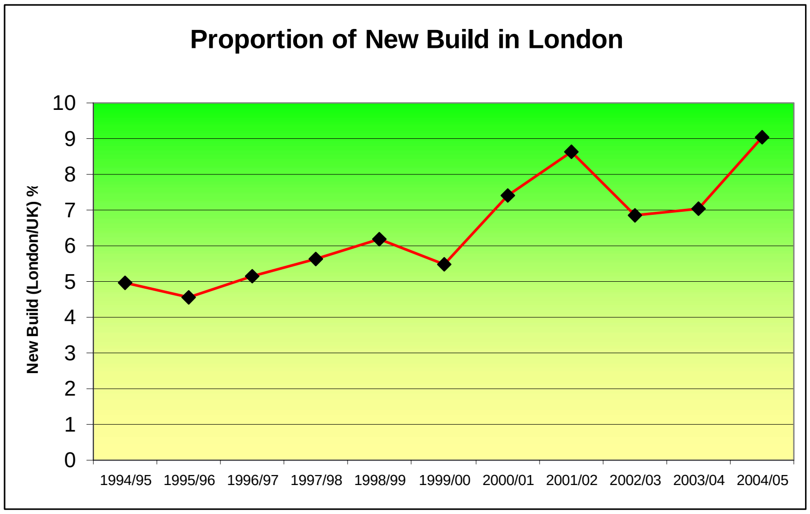

Fig 1 New Build in London as a % of New Build in UK *(data from DCLG, 2006a)*

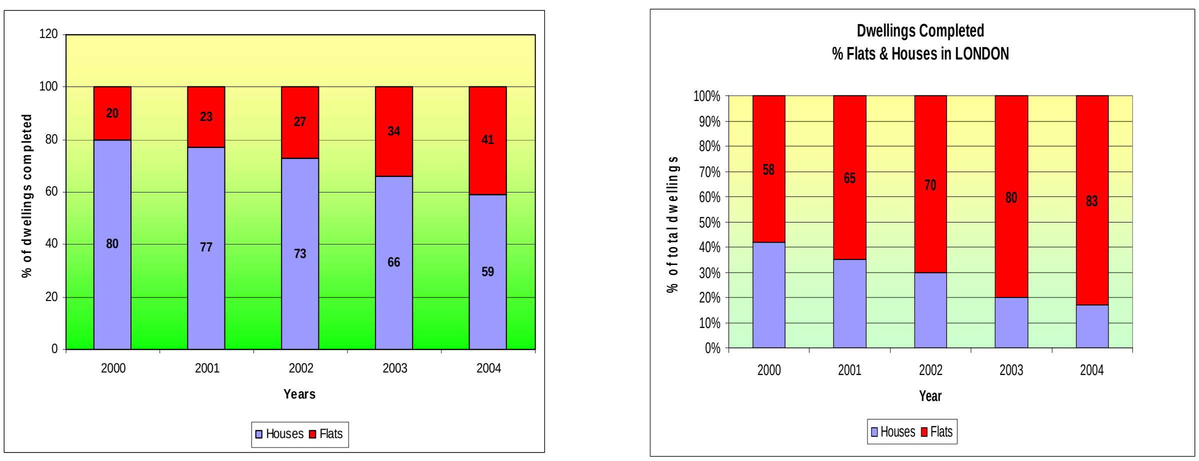

Fig 2 Proportion of Flats vs. Houses in New Build in UK and London
(DCLG, 2006d and DCLG, 2006e)

Higher density brings with it leasehold as a more common form of ownership rather than freehold; and the provision of concierge services is common (A service charge of £100-200 a month covers maintenance, lighting and security for common areas like car parking, gardens and walkways; maintenance of a reception or porters lodge, and sometimes additional facilities such as improved IT and data systems). Such an offering does not yet commonly include energy and car clubs, but could do in the future.

Dense new build is more amenable to the ESCO approach as it can be provided with a community based combined heat and power solution. Considering that much dense new build is provided with electric heating, this could also provide significant gains in environmental terms.

2.2 Legislative drivers in new build

There are several legislative drivers for making the New Build into Low or Zero carbon.

- **Revised Building Regulations** came into effect in April 2006. New buildings will have to meet increased energy standards, which are expected to lead to an average 20% reduction in carbon emissions when compared against homes built under the previous standard. Whilst the regulations do not require the incorporation of microgeneration, it will be easier to meet the higher emissions standards required, through their use. In fact the guidance accompanying the new Approved Document L highlights the contribution that microgeneration technologies can make (DTI, 2006a).
- **The Code for Sustainable Homes** is a new approach to improving the sustainability of new homes (DCLG, 2006f). The code is being demanded for homes which are built using public money – e.g. through Registered Social Landlords, and is expected to be higher than current building regulations. It may be used to test higher standards which could be introduced in future building regulations. The Code is performance based which means that it does not prescribe how a particular standard should be achieved, but it is extremely likely that compliance with the higher levels of the energy elements of the Code will not be achievable without the incorporation of microgeneration technologies (DCLG, 2006g).
- **Planning Policy Statement 22 (PPS 22)** has given local authorities (in England) the power to require “a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments” (DCLG, 2006h). The London Borough of Merton was the first to stipulate a requirement for 10% onsite renewable energy for all new major developments in the borough (Solar Century, 2006). This requirement came to be known as the Merton rule and was adopted by other Local Councils (TCPA, 2006). The Government has indicated it now expects all authorities to implement a similar requirement (Cooper, 2006).
- **Energy labelling for homes** Directive 2002/91/EC requires the energy labelling of buildings (DEFRA, 2003), and will become a requirement in the UK from June 2007 (Figure 3). All homes must be labelled at point of sale, including new and existing. The average existing home in the UK is around an E. The average new home is currently around a C. The top end of the A class is equivalent to zero net emissions. In the Australian housing market, once the major determinants of price have been accounted for (location, size, condition etc) there remains a relationship between price and efficiency, because consumers discount inefficient homes by the cost of refurbishment (Berry *pers. comm.*).

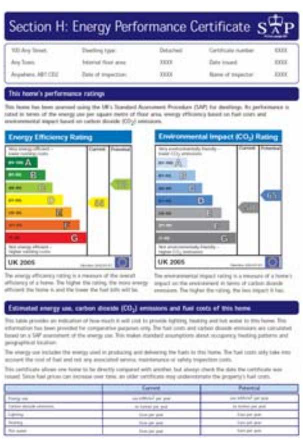

Figure 3 Energy Performance Label for homes, England

2.3 Microgeneration

Boardman et al (2005) explored a range of microgeneration devices that might provide low or zero carbon heat and or electricity. They include:

- **Combustion based opportunities** - those that generate heat and may in the process generate electricity. They would replace a conventional (gas electricity coal or oil) heating system at the end of its life, typically every 12-18 years. These again divide into group systems (community heating) or individual systems (micro CHP, or biomass). Combined Heat and Power (CHP) is predominantly a technology for dense urban communities. Micro CHP[3] is essentially a suburban or rural technology.

- **Rooftop opportunities** – these capture wind or sun and may be competing for roofspace. A low cost replacement opportunity occurs in new build when a roof is installed anyway, or when a roof is replaced, which may be every 50-100 years, or when a roofspace is converted for living space.
- **Rural opportunities** – where location dictates availability such as biomass, or heat pumps which need space and are only really cost effective when a home is not on the gas network.

A study commissioned by the DTI through the Energy Saving Trust (EST) suggested that by 2050, micro generation could provide 30-40% of the UK's electricity needs and help to reduce household carbon emissions by 15% per annum (EST, 2005). For Community heating, more than 20% of UK homes could be served by Community Heating with 27% of the potential for CHP in London, and 66% in half a dozen major cities (EST, 2004).

There are several reasons why relying on individual householders to uptake these technologies as well as improve the energy efficiency has not worked in the past (Schipper et al, 1994). These could include:

- Lack of understanding of the saving opportunity
- Lack of time to tackle these issues
- Lack of capital, or a high cost associated with borrowing capital
- A lack of capacity to install measures

Microgeneration could of course be installed by a housing developer without an ESCO. Indeed, many of the examples to date have been on the basis of a contract to design and install the kit. There are numerous examples of such cases causing problems. For example, the biomass CHP system at Bedzed[4] was leading edge, and the gasifier proved unreliable. Without access to a natural gas supply, it has not run[5] (Slavin, 2006). At Greenwich Millennium Village (GMV) several natural gas CHP engines were installed but it appears that at least one of the engines has never run, with at least part of the system operating in heat-only mode (based on site visits over a period of time). The issue is not confined to CHP. PV installed in offices belonging to West Oxfordshire District Council generated a lower proportion of the electricity than originally anticipated (ECI, 2006). Many of these issues are due to poor specification; or poor integration of the different system components (energy centre, heat network, customer interface units; poor installation; or poor maintenance. In other words, simply kW of microgeneration installed is not sufficient. Contracts need to be framed in terms of kWh of energy supplied, rather than kW of capacity installed, and this is analogous to an ESCo contract.

2.4 Energy Services Companies (ESCOs)

There is a large international market for Energy Services Companies in the industrial, commercial, and public sectors. In Scandinavia, individual homes and apartments are also served by municipal companies similar to ESCos. ESCos were originally founded either by large companies or as subsidiaries of large companies e.g. equipment manufacturers, facility management companies, and energy utilities (Bertoldi and Rezessy, 2005).

Previous work has identified three broad models of energy services: the Facilities Management or performance contract model for business commercial and public sector customers; the Community Model where decisions are taken on behalf of a group of customers (predominantly householders) in the same location; and the Supplier model where existing energy suppliers could evolve their offer to domestic customers (UKERC, 2005 Bertoldi et al, 2006).

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[3] MicroCHP is simply CHP on a small scale (upto 5kW electric) for the individual home
[4] Beddington Zero Emission Development – is one of the best known projects of Low/Zero carbon housing in the UK
[5] Based on site visits over a period of time and discussions with BioRegional

The Community model in new build has particular interest, in that it may offer a viable route for the development of ESCo services to households. In this Model the ESCO partners with the Developer at the time of development and delivers all energy infrastructure. In return, the ESCO would be awarded long term contracts for providing energy services to the community. Examples include Thameswey Energy Ltd, Utilicom, and EcoCentrogen (EcoCentrogen, 2006). Thameswey is a public/private joint venture Energy Services Company. Thameswey designs, finances, builds and operates local community energy systems for both new and existing developments. Thameswey owns and operates a number of local community energy systems on private wire district or distributed energy networks in Woking. These include the Woking Town Centre and Woking Park district energy systems as well as a number of residential local community energy systems around the Borough based on CHP, fuel cell, photovoltaic, thermal storage and heat fired absorption cooling technologies (Jones, 2006). Utilicom run a number of schemes in Southampton and London (Utilicom, 2006).

3 Analysing the proposition in depth: a STEP analysis

Having laid out the potential role of ESCOs, the remainder of this document explores the social, technical, economic and policy issues in determining their viability.

3.1 Social Issues

Buying a New Build home is very different from buying an existing house. A new home is often bought off plan, before physical completion. Purchasers cannot wander around a prospective home but have to rely on models, drawings and brochures. In that sense, they are often buying into a concept rather than something which is yet a physical reality. A key part of the concept could be that the home will achieve a low or zero carbon rating. A key issue is, is there a market for low or zero carbon homes?

There is some limited evidence that this is so. Research by Energy Savings Trust (EST) reveals that many buyers are prepared to pay more for an environmentally friendly home. “Rising fuel prices and greater environmental awareness are encouraging buyers to pay closer attention to a home’s running costs and its impact on the planet” (EST, 2006a). Research into public attitudes to energy efficiency measures, was conducted by marketing specialist TNS for Wolseley UK, a plumbing and building company. The survey revealed that 63% people would be willing to pay out more for a home that offers improved energy efficiency (Wolseley, 2006). Once the energy label for homes is in place, it is possible that more evidence of a relationship between price and efficiency may be obtained.

3.2 Technology

This section analyses the technologies which an Energy Services Company may provide in order to create more sustainable homes. Some of the areas which the ESCO could invest in are as follows:

- **Energy Efficient Appliances and Lighting**: New Build Housing is usually sold with fitted electrical appliances. Energy efficient appliances are a simple way of achieving environmental savings. They may add costs which can be recovered through different revenue streams. A+ and A++ models have the potential for large energy savings over even the A models. For example, A+ saves 23 % more energy than a standard A model and A++ saves nearly 50% of a corresponding A model (EST, 2006b).
- **Enhancing the energy efficiency of the homes** Based on BedZED, this could include purchase and installation of more (or better) wall, floor and loft insulation; purchase and installation of triple glazed rather than double glazed windows; improved airtightness, or recovery of heat from ventilation systems; improved use of solar gain for space heating through better orientation of the building, and the glazing elements as well as improved hot water storage.
- **Microgeneration**: to achieve the target of a 60% reduction in CO_2, increasing the uptake of these technologies is necessary. With very high levels of installation, capital costs could fall considerably (Hinnells, 2005) and with the development of Energy Services Companies (ESCO’s) that invest in microgeneration technologies, it can be ensured that the capital cost may not fall on the householder,

but be considered as an investment justified by a return (Hinnells & Bertoldi, 2006). The first technology to be cost-effective is Combined Heat and Power.

In new build developments, the cost of these technologies is effectively the marginal cost over and above what would be installed anyway (e.g. gas boilers, gas network). Economies of scale can also be attained by installing appliances and devices in hundreds of homes in one go. The ESCO could leverage significant bulk discounts. Hence fitting all the homes in the development with the most energy efficient fridges, freezers, washing machines and light bulbs could prove much cheaper to ESCO than if all the residents bought these individually. Discounts of up to 30% were achieved on BedZED (Lazarus, 2003). ESCOs could also aggregate the excess electricity generated from individual homes and export it with payment via a single contract.

3.3 Economic and financial analysis

To illustrate the financial model from the perspective of the energy service provider, a simple spreadsheet model was built with input assumptions based on feedback received during interviews with companies which finance energy services or those which have implemented energy efficiency, microgen and CHP in new build. The model evaluates the project by offsetting the required initial capital investment through potential revenue streams over a long term. Various scenarios have been developed to determine rates of return and how they compare with the cost of capital. The decision to invest capital towards microgeneration and energy efficiency will be evaluated through the process of Capital Budgeting. The analysis used two methods viz. Net Present Value (NPV) and Internal Rate of Return (IRR) using the incremental cash flows from potential investments.

The Capital Investment needed will vary significantly based on the choice of technology which itself is dependent on the nature of build viz. dense or detached, rural or urban etc. In this case, CHP is chosen because a distinct opportunity was identified for dense build in London. PV is a relatively expensive technology and has been chosen based on the BedZED model. Similarly investment on energy efficiency and efficient appliances was also assumed based on the BedZED project (Gardiner and Theobold, 2001). PV is also a more visible technology and hence be preferred despite the higher costs. Developing the sensitivities around the choice of technologies is for future research.

Table 1 – Example of the capital investment per home (marginal)

Capital Investment – Assumptions **(All costs based on 2001 prices)**	**Cost as per BedZED Toolkit** **Average per flat (£)** **Based on Gardiner & Theobold, 2001**
Combined Heat & Power Plant	4,279
Enhanced Energy Efficiency	3,201
Efficient Appliances	715
Photovoltaics	5,266
Total per flat	**13,462**

The Operating costs for maintaining the above assets have been assumed to be primarily fuel costs of the CHP, maintenance of the CHP and other technologies, administrative overheads, marketing costs etc. These are assumed on a single project basis; however an ESCO with several projects could reduce the overheads.

The Revenue Streams for an ESCO could be from:

- Sale of electricity to the residents
- Sale of heat to the residents
- Renewable Obligation Certificates (ROCs) based on renewable electricity produced on site
- Export of excess electricity produced on site

- And recovery of some of the cost of investment, either through levy of a standard Fee from the residents generated out of the savings in energy bills, or through a higher sale price, where the additional borrowing on the mortgage on an interest only basis is less than the energy savings

The revenue from the sale of electricity and heat are the standard revenue streams. In the present case, it has been assumed that all households buy all the required heat and electricity from the ESCO and also pay their bills on time. In practice, some people may not sign up for the electricity, and some (especially tenants) may be late or non-payers and that should be factored in as a risk factor. The other possible revenue streams viz. an annual fee based on savings, ROCs and electricity export revenue are discussed in subsequent sections.

A fee could be generated from the savings in the energy bill as compared to a standard New Build. A fee from each household is calculated based on the savings made by each flat owing to the enhanced energy efficiency and energy efficient lighting and appliances provided by the ESCO. The fee is based on savings over a standard new build although a person moving from an average existing house would experience far more savings in the energy bills. Table 2 gives an approximate calculation of the savings potential.

Table 2 Savings potential over a standard New Build & Existing Homes
(delivered energy)

		Existing Homes (kWh)	*New Build (kWh)*	*Improved Standard (kWh)*	*Savings (£) over existing homes*	*Savings (£) over standard new build*
1.	Space Heating	14600	8000	1360	530	266
2.	Water Heating	5000	5000	5000	Nil	Nil
3.	Electricity	3000	3000	2700	36	36
	Total Savings				566	302

NOTES

a) The space heating requirement for New Build is based on a study at *Gallions Ecopark* (Housing Corporation, 2004). The revised regulations (April, 2006) are tighter and buildings conforming to those would have a lower space heating requirement. It must however be pointed out that quite a few studies on the energy performance of new buildings suggest that standards are frequently not met (Bordass, 2001). The improved standard for space heating is based on the standard achieved at BedZED.

b) The water heating requirement has been assumed to be unchanged and assumed as 5000 kWh (Boardman, 2005). In BedZED certain innovative measures and behaviour change did lead to a reduced hot water demand but this is not widespread in new build.

c) A marginal reduction in the electricity consumption (10%) has been assumed due to the provision of more efficient appliances and possible behaviour change owing to more effective metering and billing. Although a higher energy saving is possible by introducing CFLs etc. However a conservative figure has been taken on the assumption that some of the savings will be reduced due to high energy consuming devices viz. Plasma TVs.

d) An electricity charge of 12 p has been assumed based on Good Energy rates (10.96p per kWh + annual standing charge £65.40) (uSwitch, 2006). The 12 p rate amalgamates the standing charge.

The basis for charging a fee is based on the principles of Energy Performance Contracting (EPC). This is a form of 'creative financing' for capital improvement which allows funding energy upgrades from cost reductions. Under an EPC arrangement an external organisation (ESCO) implements a project to deliver energy efficiency, and uses the stream of income from the cost savings to repay the costs of the project, including the costs of the investment (Hansen, 1998). In practice however, a fee could be controversial with householders, and other ways of cost recovery may need to be explored, for example, putting some costs on to the purchase price. This would be much easier following the introduction of the energy label i.e. if more efficient homes are considered to be more valuable by the market.

The value of ROCs is calculated based on the electricity produced from the Photovoltaics. Electricity produced from CHP is not entitled to ROCs as it has been assumed that the CHP will operate with gas as fuel. However if the CHP can be run using biomass, as was conceived in BedZED, then the electricity from the CHP would be eligible for ROCs.

The capital investment in the PV is assumed to be on the same scale as at BedZED. Consequently the total electricity produced from the CHP and the PV will exceed the total requirement of the community. The excess electricity will need to be exported. The rate for exported electricity is low (@ 4 pence /kWh. In practice a better alternative may be to reduce investment in PV, or to use the excess electricity to charge electric cars held in a car pool.

Calculation of the Internal Rate of Return

The calculation of IRR was done by solving of the following equation:

$$\text{Initial Investment} = \sum_{t=1}^{N} \frac{C_t}{(1+IRR)^t}$$

The initial investment is the marginal capital investment estimated for each home.
The cash flows (C_t) are (Revenues – Operating Expenses) over a period of time (N).
The analysis was done using N=20 years, that being the approximate life of CHP and PV.

Net Carbon Savings
Apart from the cash savings owing to the reduced energy requirement, the improved standard of homes would also result in significant reduction in CO_2 emissions. Table 3 summarizes the savings over an existing home and a standard new build. The reduced emissions are a result of enhanced energy efficiency as well as the installation of PV and CHP.

Table 3 CO_2 Savings

		Existing Homes (kWh)	*New Build (kWh)*	*Improved Standard (kWh)*	*CO_2 Savings over existing homes*	*CO_2 Savings over standard new build*
1.	Space Heating (Efficiency improvement)	14600	8000	1360	2516	1262
2.	CHP (Space Heating & Hot Water)	0	0	6360	1208	1208
3.	Electricity	3000	3000	2700	129	129
4.	PV	0	0	1080	464	464
Total CO_2 Savings (Tonnes per home per year)					**4.3**	**3.0**

NOTES
Average UK domestic heat and hot water generation results in 0.19 Kg CO_2 per kWh (BRE, 2005)
Average UK electricity generation results in 0.43 Kg CO_2 per kWh (BRE, 2005)

The Weighted Average Cost of Capital (WACC) is an average representing the expected return on the company's source of capital, such as equity and debt (Brealey and Myers, 2003). Each source is assigned a required rate of return, and then these required rates of return are weighted in proportion to the share each source of capital contributes to the company's capital structure. The resulting rate is what the firm would use as a minimum for evaluating a capital project or investment. The calculated IRR was compared against this cost of capital and the project was deemed viable if the IRR exceeded it. The cost of capital for the model was worked out assuming that the ESCO raised the bulk of the capital through debt.

Calculation for the Weighted Average Cost of Capital (WACC)

The cost of capital is given as: $K_c = (1-\delta)K_e + \delta K_d$

Where:

K_c The weighted cost of capital for the firm

δ The debt to capital ratio, $D / (D + E)$

K_e The cost of equity

K_d The after tax cost of debt

D The market value of the firm's debt, including bank loans and leases

E The market value of all equity

In writing:

WACC = (1 – debt to capital ratio) x cost of equity + debt to capital ratio x cost of debt

Assumptions

a) The total capital of the firm is assumed to be distributed between debt and equity in the proportion of 90:10. This is the Debt : Equity structure in the Government's (Private Financing Initiative) PFI contracts and could possibly be used by energy services companies also. Hence D/D+E = 0.9

b) Interest rate for the debt has been taken to be 6%

c) Tax rate assumed to be 19%

Substituting the values: The after tax cost of debt = 4.86%

d) Cost of equity = Expected return + Growth per year

10% + 10% = 20%

The return on equity viz. the dividend has been assumed to be 10%

Growth in the dividends in every subsequent year also assumed to be 10%.

Based on the above assumed values, the Weighted Average Cost of Capital works out as follows:

WACC = (1 – 0.9) x 20% + (0.9 x 4.86%) **= 6.37%**

Scenarios for the Internal Rate of Return (IRR): Several variations are possible in the IRR computed based on the assumptions for capital investment, revenues and operational expenses. In this case, the IRR was computed for different levels of capital investment and developments of different sizes. The project was deemed viable if the IRR computed exceeded the Cost of Capital. It was seen that the internal rate of return for the ESCO would in general be lower than the cost of capital if it was required to meet all the capital investment itself. However if 50% of the capital investment could be met by the developer or even the homeowner then the business case becomes more viable.

The tables 4 & 5 show the calculated values of the Internal Rates of Return for different scenarios i.e. different size of developments and varying levels of developer's contribution. The developer may be induced to invest in order to gain planning permission and the home buyers may be willing to pay a certain percentage more to gain the benefit of living in low / zero carbon homes. In table 4, the resident pays for the investment partly through the fee. Thus the residents may make partial or no savings in their energy bills. However a lower contribution may be needed from the developer or from a higher purchase price. In table 5, with no fee, a higher contribution could be expected from the developer or from a higher sale price, but the higher mortgage thus incurred could be paid for from the energy savings e.g. an additional £6,000 on the mortgage is equivalent to an interest of £300 (@5% interest) which is approximately the savings in the energy bill of the home occupier (Table 2).

Table 4 The Internal Rate of Return (IRR%) (with fee as a revenue stream)

		Developer's Contribution			
		0%	25%	50%	75%
No. of houses in the development	200	1.4	4.0	8.0	17.1
	300	3.5	6.3	10.9	21.5
	400	4.4	7.4	12.2	23.6
	500	5.0	8.0	13.0	24.9
	600	5.3	8.4	13.5	25.8

Table 5 IRR % without fee (needing higher developer or household contribution)

		Developer's Contribution			
		0%	25%	50%	75%
No. of houses in the development	200	-5.8	-3.8	-0.9	4.8
	300	-2.2	0.0	3.5	10.7
	400	-0.8	1.6	5.3	13.3
	500	0.0	2.4	6.3	14.8
	600	0.5	3.0	7.0	15.7

Rates of return higher than cost of capital (green-shaded cells: Table 4 — 25%: 400–600; 50% and 75%: all rows. Table 5 — 50%: 600; 75%: 300–600)

Financial viability is sensitive to the size of the project. Larger projects have higher returns owing to their ability to absorb operating expenses over a larger clientele. However, it may be that a number of smaller adjacent or nearby projects could benefit from similar economies of scale.

Current developments of more than 600 homes in London include Battersea Reach (from Berkeley Homes) a 13 acre mixed-use development fronting the River Thames. This new development will provide 658 new homes which are built as flats (two twelve storey blocks each containing 101 apartments and a fourteen storey tower of 124 apartments) (Berkeley Homes, 2006). Another scheme from Berkeley Homes at Tabard Square in South London will have 572 flats when it is completed next year (Times, 2006). Greenwich Millennium Village (Taylor Woodrow and Countryside) includes in excess of 2000 homes. The whole Greenwich peninsula site which surrounds GMV has planning consent for some 14,000 homes (Sibbald, 2002). In London, the London Development Agency (LDA) and partners have published a framework for the area that sets out how 91,000 new homes and supporting services could be built in the area by 2016. These are the kind of large size dense developments that would be more appropriate for an ESCO offering.

3.4 Policy: Market Transformation for ESCOs

There are a variety of policy measures additional to those which already exist (highlighted in section 2.2) which may have a role in transforming the market for energy services companies through a strategic framework combining information, incentives and regulation. Table 6 identifies the major policies in these three categories.

Table 6 Market Transformation Strategy

Information	*Incentives*	*Regulation*
Energy Label for Homes	Grants – Low Carbon Buildings Program	Revised Building Regulations
	Eliminate the 28 day rule	
	Licensing and Private Wire Networks	
	Personal Carbon Allowances	

The major incentives could include grants, removal of barriers viz. the 28 day rule, and facilitating licensing and establishment of private wire networks.

- **Government support** is available through the Low Carbon Buildings Programme (LCBP). In the LCBP there is scope for Developers and Energy Services Companies to apply for grants and use the funding to provide microgeneration technologies (DTI, 2006b). There remains an opportunity to target ESCos rather than developers to ensure not only that technology is installed but actually operates.
- **The 28 day rule** gives each customer the right to terminate their energy supply contract at 28 days notice. This rule has been cited as a major barrier to the provision of energy services by ESCOs (DTI, 2003). A two-year pilot scheme involving the relaxing of the 28-day rule to encourage energy services in the domestic sector commenced in 2004. During the pilot, energy suppliers could sign up to 4 per cent of their customer accounts or 50,000 customer accounts (whichever is the larger) to deliver a range of energy services. This enables suppliers to sell a range of services such as insulation packages consisting of cavity wall insulation, topping up the loft insulation and improved insulation of the water tank and recover the investment from the savings made over a period of time (DTI, 2006c). Abolishing the 28 day rule would make it easier for energy services companies to operate.
- **Licensing regime:** the Utilities Act 2000 enables electricity to be generated, distributed or supplied by persons authorised to do so by a licence or exemption. The licensed electricity market is the conventional, large scale, centralized power generation market, whereas the exemption electricity market is the local distributed generation market using CHP and/or renewable energy, including private wire networks. Small suppliers (e.g. most site specific ESCOs) are authorised to generate, distribute and supply electricity under The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001. However, it remains very difficult for small suppliers to enter the market and thus there is a need for a different type of license (other than a standard Electricity Supply License) for energy services or bundled services (Bertoldi et al, 2006). It is necessary to review the license exempt supply regime to make it easier for small schemes to sell power in the domestic sector.
- **Private wire arrangements**: although Woking has avoided grid and NETA (New Electricity Trading Arrangement) penalty costs by utilising private wire networks and a local trading system, the existing regulatory regime limits the size of the local sustainable energy system and more importantly substantially limits the number of domestic customers that can be supplied with low cost green energy (Thameswey, 2006). Hence there is a need to allow larger private wire networks. There is also a need to have in place a requirement for distribution network operators (DNOs) to reach agreement with community schemes over ownership of private wires, to enable private wire supply to households.

The above changes in policy will go a long way in encouraging the development of CHP and renewables and local sustainable community energy systems.

A new approach is that of personal carbon allowances (PCAs) (Hillman and Fawcett 2004, Anderson and Starkey 2004).The concept of PCAs is that each adult is allocated an equal carbon allowance which can be used to purchase gas, electricity, petrol and aviation. Unused allowances can be traded, or for high users additional allowances would need to be purchased. With the emergence of PCAs, there could be an increased demand for energy efficient homes as well as energy generation through micro generation. PCAs and ESCOs are seen as complementary: PCAs may create the desire to reduce carbon but does not provide the skills or finance for so doing. ESCOs could provide the capital and the means to implement the measures needed to reduce carbon.

Regulation can play a significant role in moving the minimum required forward and helping define A+ & A++ categories for homes in the future. The Energy White Paper proposed that Building Regulations be revised every 5 years (DTI, 2003).

4 Conclusions and next steps

The New Build market is expanding owing to a variety of demographic pressures and within it, London appears to be a key market. There is also a trend towards more dense build (flats), a trend amplified in London. Changing building regulations and planning are demanding lower, and ultimately zero carbon homes. This would require installation of microgeneration.

ESCOs could provide capital, expertise and long term commitment for installing and maintaining microgeneration, CHP and energy efficient lights and appliances. The investment needed could be reduced through bulk discounts and recovered through long term revenue streams. Revenue streams include ROCs, export of electricity and either charging of fee based on the shared savings concept, or recovery of the additional costs from the developer or the sale of the home if more efficient homes can be shown to command a price premium. The developer may contribute to the capital investment for acquiring planning permission. The houseowners may contribute because energy savings can be more than the interest on the additional capital borrowing. The forthcoming 'Energy Label for homes' is expected to build awareness and sensitivity towards energy issues and could have an impact on the willingness to pay. This could translate into a higher selling price and thus make the ESCO offering more viable. The financial analysis reveals that the ESCO approach is more viable for large developments.

In summary, ESCOs can work but could expand rapidly with the right policy support. A combination of information, incentives and regulation could transform the market for ESCOs in New Build and thus pave the way for creating large numbers of Low or Zero carbon homes in the future.

A key next step would be to explore different technology mixes, and different build densities which may imply a need for different technologies. A further step would be to analyse the opportunity from the perspective of cash flow through a business rather than on a project basis. Once the energy label is implemented, any relationship between efficiency and price needs to be closely monitored.

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