8. Enabling the changes

In this section we explore the potential to manage the costs and risks of investing in low and zero carbon technologies, with a focus on the potential for mechanisms to reduce the upfront capital cost of infrastructure.

8.1 Micro-generation areas

One of the main barriers to reducing the costs of micro-generation technologies is the need for greater economies of scale. Installations currently tend to be isolated projects championed as demonstration projects by pioneers who are 'willing to pay' for the technology. The technologies also require upfront capital investment with the occupier, and usually not the developer, benefiting from energy savings and revenue.

Micro-generation market development areas

Micro-generation planning policy areas could create the opportunity to bring down costs by providing suppliers and installers with greater certainty. The aim of these areas would be to achieve a concentration of new installations, supported through planning policy requirements.

Whilst PPS1 is minded against favouring specific technologies, it does leave open the potential to focus on specific solutions by *'identifying suitable areas….where this would help secure the development of [renewable and low carbon energy sources]'* Clear guidance on Permitted Development would also complement this approach.

As we have proposed elsewhere in this study there could also be potential to use planning gain to finance community micro-generation projects. So, for example, a larger, more cost effective school wind turbine or a solar array on a leisure centre could be part-funded using off-site contributions from a developer. This in turn could help kick-start the market in that local area.

Economies of concentration

In order to bring down the capital cost of micro-generation solutions such as solar thermal collectors and photovoltaics, feedback from suppliers and installers suggests that it will be vital to achieve not just 'economies of scale' but greater 'economies of concentration'. This means more installations within a specific geographical area so that the marginal cost of installations falls, and learning from each project is carried forward more quickly.

Clearly larger house builders will have their own supply chains through which economies of scale could be achieved, but for specialist house builders, social landlords and developers there could be benefit in extending this approach to promote specific technologies. Strategic partnerships could be formed to

identify experienced suppliers and installers – in a similar way to recent RSL initiatives to develop joint procurement.

This approach could be taken a step further if dedicated new manufacturing plant was to be established for specific technologies. For example, a generic photovoltaic module plant could be established utilising 'off the shelf' licensed production lines from a provider such as Spire Solar. A plant could be established as a mutual enterprise to supply modules at least to cost to house builders and RSL's who might own shares proportionate to their share of the order book.

Solar roof space agreements

The introduction in April 2010 of Feed-in Tariffs (FIT's) and in 2011 a renewable heat incentive regime will do much to make micro-generation more economic. Solar photovoltaic's, for example, are likely to become financeable on a 10 year payback with a FIT rate of 30-35p/kWh of electricity generated [103]. This will not, however, reduce the upfront capital cost for developers until it has stimulated significant increase in demand for the technology.

There may therefore be scope to reduce upfront capital costs through City Region support for roof space agreements to finance solar photovoltaics. This is a means by which a third party would finance a solar roof based on the electricity sales revenue. There is speculation that utilities and ESCo's, as has been seen in Germany and the Netherlands, may offer such a package subject to a roof space rental arrangement with occupiers.

8.2 District heating network areas

The main barriers to investment in district heating are the cost and complexity. District heating infrastructure requires long-term investment to create new utility infrastructure with a lifespan of at least 25 years. This does, however, create the benefit of predictable revenue streams from customers – although PPS1 cautions against restricting developers or occupiers to '*any one supplier in perpetuity*'.

Research by the International Energy Agency (IEA) and Poyry/AECOM has demonstrated that the most significant CO_2 benefits from CHP supplying district heating would accrue from larger projects [104] – such as the Carrington CCGT case study. Clearly this does, however, push the focus towards larger more complex projects – something that is beyond the remit of individual property developers.

These potential barriers must be placed in a strategic context. The UK's gas and electricity networks were financed at public sector borrowing rates in order to sustain our economy and provide energy

[103] Department for Energy and Climate Change, *Consultation on Renewable Electricity Financial Incentives 2009*
[104] International Energy Agency (2006) *A comparison of distributed CHP/DH with large-scale CHP/DH*, Research team led by PB Power, IEA District Heating and Cooling research programme, www.iea-dhc.org/010601.html

security. The experience from countries such as Denmark and Germany is that district heating is a strategic utility that has the potential to provide similar, if not greater, benefits.

8.2.1 Energy Service Companies (ESCo's)

The need for third party investment in CHP and district heating has focussed attention on the potential for Energy Service Companies (ESCo's). A concept highlighted by the final report for 'Manchester: Green energy revolution' and by TNEI in their review of the opportunities for Manchester Knowledge Capital [105].

Whilst there is no definitive definition the basic principle is to shift the focus away from it being an elemental cost for property developers, instead seeking to ring-fence the investment within its own standalone business plan. The main benefit of an ESCo to local authorities is that it strengthens their ability to deliver greater CO_2 reductions by mitigating the risk for developers.

Procurement or partnership?

There are broadly two main routes that can be taken to put in place an ESCo, one resembling a procurement process, the other combining partnering arrangements and business startup:

- Identification of a private ESCo partner: Selection of a specialist CHP/district heating utility through an OJEU tender process, based on competitive dialogue in order to fully consider their track record and approach. The contractual relationship with the private ESCo will be defined by the services required, with the Local Authority (or developer) tending to act as a regulator (see below for example companies) e.g. Birmingham City Council and Utilicom, Urban Splash and Ecocentrogen;
- Establishment of a new standalone ESCo: The establishment of a special purpose vehicle with its own business plan. The options will be influenced by the financial stake, degree of influence and share of the risk that the local authority and/or developers and other partners wish to take. They include:
    - Public undertaking: Local Authority CHP and district heating undertaking solely owned and controlled under the provisions of the Local Government Act 1976 e.g. Sheffield Heat and Power (now in the private sector control);
    - Public:private partnership (project specific): Local Authority partnership with a private sector CHP partner to develop specific projects e.g. Southampton Geothermal Heating, Nottingham Enviroenergy, Manchester Energy Company (PFI vehicle responsible for multi-storey block CHP projects);
    - Public:private partnership (area specific): Local Authority partnership with utility, developer and investment partners to provide ESCo services across a broad geographical area e.g. Berlin Energy Agency, London Climate Change Agency;
    - Social enterprise (project or area specific): New enterprise established with Local Authority support (to provide covenant strength) and board representation e.g., Aberdeen Heat and Power;

[105] TNEI, *ESCo feasibility study*, Prepared for Manchester Knowledge Capital, July 2007

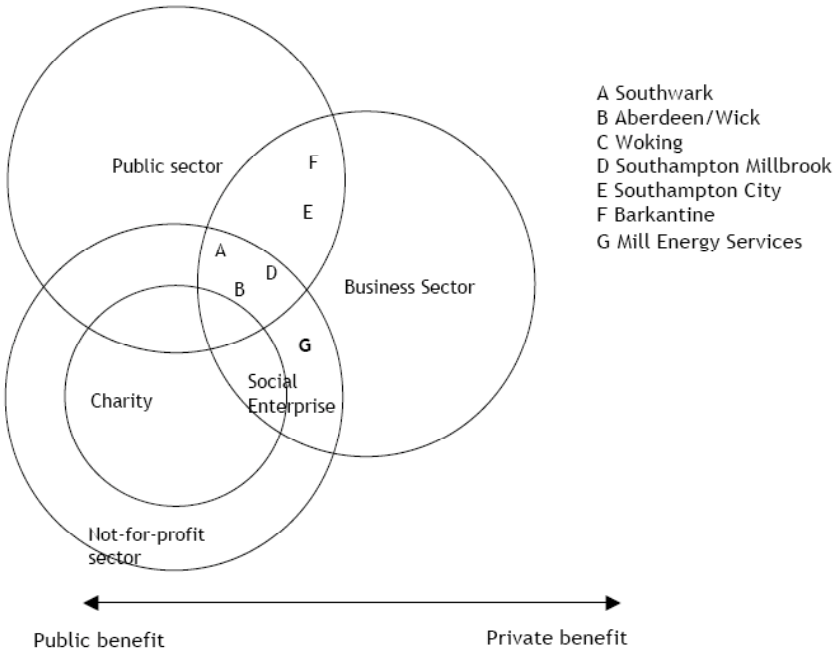
- Consumer-owned enterprise: New enterprise established under the initial direction of a developer or Local Authority, with eventual control by heating consumers e.g. Mill Energy Services, Danish district heating companies;

Social enterprise and consumer-owned structures are receiving attention from developers as they address accountability issues arising for district heating being a monopoly supply. Consumer-owned district heating networks are a tried and tested structure in Denmark, with board control and accountability structures designed to be representative of the heating consumers.

Figure 8.1 below compares the fundamentals of the ESCo models that are currently being used. Whichever route is chosen experience from projects suggests that the ESCo should be put in place as early on in the development process as possible, so that itechnical and financial requirements – which will be driven by its business plan - can be fed through into negotiations with potential heat customers.

Figure 8.1

Comparison of ESCo models



Source: London Energy Partnership (2007)

Private sector ESCo's and utilities active in the market currently include Scottish and Southern Energy, Eon, Elyo, Utilicom, Thameswey, Vital Energi, Font Energy, Ecocentrogen and Econergy. Each has its own distinct business model that will define the way in which it provides services and engages with developers and occupiers. So, for example, Ecocentrogen tends to focus on discrete developments where it seeks to create a captive market for a multi-utility package comprising heat, power and telecoms. It does not generally invest in district heating networks.

Defining the terms and conditions

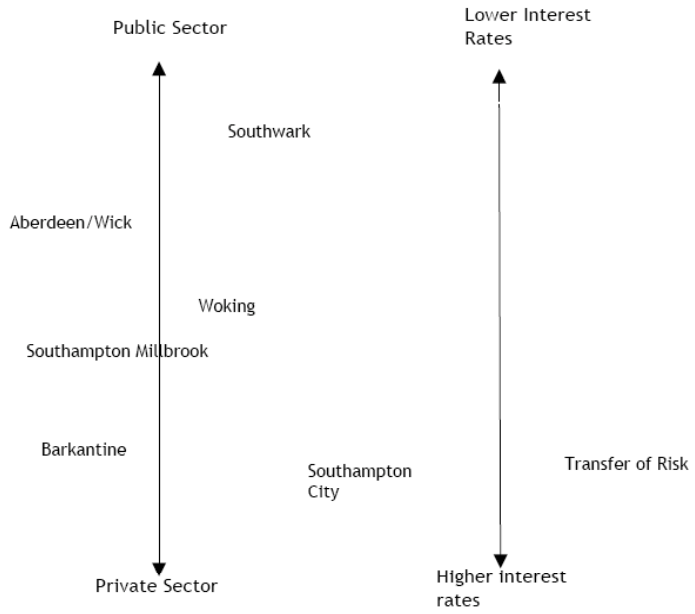
The policy framework developed by this study draws upon experience that suggests that the planning can be used to create the right conditions for investment. This creates the potential to define the terms on which ESCo's can operate – particularly if a private sector partner is to be identified in order to manage the risk. This role is important in responding to PPS1's emphasis on not restricting developers or occupiers to *'any one supplier in perpetuity'*.

For example, the public sector may act as the project champion and set out the regulatory objectives through the governance framework put in place to deliver the project. Private sector companies may then develop the project with the assets then being owned by the banks providing the investment. Management and energy retailing can be sub-contracted to specialist contract energy management companies.

The three key factors that are likely to determine the extent of a local authorities involvement are the degree of control, access to low cost finance and exposure to risk. Figure 8.2 compares the balance of control, finance and risk using example projects.

Figure 8.2

Sliding scale comparison of finance and risk factors



Source: London Energy Partnership (2007)

A key overall consideration is the need to align the local authorities objectives with those of the ESCo. So, for example, Southampton City Council's private sector partner has invested heavily to supply city centre developments but was reluctant to invest in the expansion of its heating network into priority regeneration areas because the cost and risk made it unattractive.

It may be that if a private ESCo partner with a suitable business model cannot be identified, then an arms length company or social enterprise could be established. A report by the London Energy Partnership has highlighted the role that Local Authorities can play in helping to establish ESCos, their powers to facilitate new infrastructure, and the legal scope of their ability to participate in new ventures [106].

A possibility that has emerged from this study is for the development of a partnership between districts and existing distribution network operators, supported by investment in the form of developers' contributions towards strategic infrastructure. A successful precedent for this approach is the Berlin Energy Agency, which we describe in the precedent study below [107].

The licensing arrangements for electricity and gas supply would, however, require closer scrutiny as there may be limitations on their network operators involvement. For example, under the Electricity Act 1989 one company cannot hold a supply and distribution license.

Precedent study

Berlin Energy Agency (Germany)

The Berlin Energy Agency was established as a vehicle to invest in low and zero carbon technologies and the energy efficient upgrade of buildings. It is an award winning joint venture between Land Berlin (the City of Berlin), Vattenfall (the city's Swedish district heating network operator), Gasag (the local gas distribution network operator and retailer) and KFW (a specialist investment fund similar to Salix in the UK). The Agency develops, invests in and operates projects in conjunction with public and private sector partners, drawing on the expertise of its own in-house team.

8.2.3 The fundamentals of financing and risk

In order to evaluate the merits of different ESCo models, it is important to understand the fundamental requirements for the financing of district heating. The requirements of lenders and investors will have a significant influence over the chosen ESCo model. Key considerations and requirements are likely to include:

Return on capital

Borrowing rates, which can range from 3% to 7% for public sector bonds or debt finance to 10% or more for private equity, will influence the revenue and margin from energy sales. The allocation of risk between private and public sector partners in an ESCo will impact upon the borrowing rates required by financiers and may affect the viability of the project. Public sector partners in a project are able to accept a lower discount rate and can access capital at lower rates because of their higher credit ratings.

[106] London Energy Partnership, *Making ESCo's work: Guidance and advice on setting up and delivering an ESCo*, Report by Brodies LLP, February 2007
[107] Berlin Energy Agency (2009) www.berliner-e-agentur.de

Security

The lender will need to be provided with sufficient security in the event that the ESCo is unable to service its debts. It is likely that this would be equity geared 30:70 to debt finance. This could take the form of:

- Contributions towards the capital outlay e.g. gap funding, developer contributions, connection charges;
- Firm energy supply contracts which securitise a revenue stream over a fixed time period;
- Clauses within leaseholds and freeholds to ensure that the heating system is not replaced by building owners or occupiers;
- Bank guarantees or debentures provided by an ESCo partner based on their covenant strength and the strength of their balance sheet.

A further consideration is the credit rating of potential customers. Public sector customers are particularly attractive to investors because of their good credit ratings. As they also are typically major energy users and are able to act as 'anchor loads' for a project, getting commitment from them to enter into heat supply contracts will help to secure investment.

In the 'network connection policy areas' described by the case studies used by this study an emphasis was placed on the need for a contribution schedule infrastructure, which in turn would provide security and certainty. This can be informed by a business planning approach to the new energy infrastructure – as demonstrated by the Ayelsbury Estate AAP contributions schedule (see section 5). .

Loan term

The term of the loan repayment could vary from 5-15 years for Bank debt finance or private equity, to 10-15 years+ for public sector borrowing or European investment funds. Again, this will influence the revenue and margin from energy sales. Several back-to-back loans may be required in order to cashflow phased investments.

Supply agreements

Where supply agreements are used to provide security they will need to extend over a sufficient period of time to provide comfort to the financier - usually the term of the loan - and will need to take into account the credit worthiness of customers. Projects supplying public sector customers, such as the NHS Estate or Local Authority buildings, will have a much greater chance of securing finance because of their higher credit ratings.

Bad debts

There is a significant risk associated with supplying residential consumers, with additional security required from ESCo's to cover disconnections and bad debts - particularly those on low incomes. Supply agreements for homes need to be sufficiently robust to prevent disconnections, and make provision for the recovery of any bad debts.

Multi-utility agreements

Some specialist ESCo's (or MUSCO's – Multi-Utility Service Company's) require a local authority or developer to lock occupiers into electricity as well as heat sales, by selling electricity directly over private wires, but also telecoms services, usually in the form of fibre optic broadband, telephony and digital TV. The main reasons are to maximise income and cross subsidise the energy infrastructure.

8.3 Wind power

With many of the larger and more attractive locations already being pursued by larger investors, investment in smaller 'wind cluster' sites could be driven forward using development contributions, local investment funds and 'merchant' wind contracts.

8.3.1 Merchant wind farms

'Merchant' wind farm developments that are contracted to supply their electricity to a specific end-user are becoming popular on smaller sites. These are being developed by specialist utilities such as Ecotricity, with a focus on industrial sites and the development of renewable electricity supplies for a range of customers including Ford, Prudential, Sainsbury and CIS Insurance. There are also emerging examples of PFI street lighting contracts being linked to potential Merchant energy investments.

Typically the basis for a Merchant wind project is a Power Purchase Agreement between a utility and a single customer (in some cases with multiple sites). This would have, as a minimum, a term of 10 years, and in some cases as long as 20 years, at a commercial rate in order to securitise the investment. Electricity prices would be index linked to a basket of energy prices in order to ensure they remained competitive.

This approach is being supported further by the Carbon Trust, which has established a new venture called Partnerships for Renewables. This initiative is specifically targeted at Local Authorities with an initial focus on the potential for wind power. It aims to harness the latent potential of local authority energy purchasing to support low carbon energy generation, and has a target of supporting 500 MWe of new capacity within five to eight years.

8.3.2 'Allowable solutions' investment funds

There are clear limitations to the Merchant wind approach in the context of new development primarily because it requires a contractual arrangement with a single entity. Without a Power Purchase Agreement to securitise investment a project would require an alternative mechanism to provide certainty to investors.

Planning requirements could not be used to contract occupiers of new development because this would be counter to competition regulations. Instead a work around would be to require an equity contribution

from developers, whilst still allowing them to choose their electricity supplier. The locally generated electricity could still be marketed to them - as demonstrated by Freiburg's 'Regiostrom' electricity tariff.

Precedent study

Targeted sub-regional investment funds, Freiburg (Germany)

FESA is a non-profit organisation that co-ordinates a series of private investment funds focussed on the installation of range of renewable energy technologies across the Freiburg sub-region – including solar, wind, hydro, biomass and even a 'one less power plant' energy efficiency project [108]. To date it has raised 20 million Euros in capital.

'Regiowind' is an example of a specific fund established by FESA. It has directed investment from a range of sources, including households, businesses, local authorities and farmers across the sub-region into small wind farm clusters, including a wind farm developed by Freiburg City Council.

A further example is the municipal utility Badenova's 'regiostrom' electricity tariff [109]. This makes banded contributions to new energy technology projects i.e. an additional levy is added to the tariff which has then been used to invest in biomass CHP, biogas and solar infrastructure projects. This has included the infrastructure for major new development sites, including Vauban and Reiselfeld.

A variation of this approach would be for a proportion of the electricity generated to be contracted directly with a Council to supply its buildings – helping districts deliver CO_2 reductions under the forthcoming Carbon Reduction Commitment. Risk capital to take the wind farm up to planning would be provided by equity in the form forward funding from developer contributions collected.

On this basis, and building on the proposals put forward in the Government's consultation on the definition of zero carbon, it may be possible to establish a sub-regional 'allowable solutions' fund into which developers contributions would be pooled as investment shares in new wind clusters, amongst other technologies.

A number of EU projects illustrate how Local Authorities have supported the development of projects using investment funds – notably Regiowind in Freiburg (Germany) and Lynetten in Copenhagen (Denmark). These projects demonstrate how the relationship between each project and its stakeholders can be formalised through investment shares. In each case the investment share is equivalent to a proportion of the output from the wind farm.

[108] FESA (2009) www.fesa.de *and* Gipe, P (2006) *Josef Pesch – Strom rebel of Freiburg*, www.wind-works.org/articles/JosefPeschStromRebel.html
[109] Badenova (2009) *Regiostrom tariff*, www.badenova.de/web/de/02/privatundgeschaeftskunden/regiostrom/regiostrom.html

Precedent study

Lynetten wind farm, Copenhagen (Denmark)

Completed in 1996 Lynetten consists of 7 turbines of 700 kW with a total capacity of 4.9 MWe. It was the first of two projects to be developed by a partnership between the local authority and an investment co-operative established by the Copenhagen Environment and Energy Office [110]. The project was constructed on industrial land on the cities dockside.

Four of the turbines are owned by Lynetten Wind Co-operative and three by the local power supply company. The co-operative has 800 members, ranging from households to businesses, who between them provided the working capital for the wind farm, purchasing investment shares equivalent to 1,000 kWh of the wind farm's output.

[110] DTI Global Watch (2005) *Co-operative energy – lessons from Denmark and Sweden*, Report of Global Watch Mission.

8.4 What forms of delivery mechanisms may be required?

We have been able to identify a number of specific mechanisms that would enable the costs and benefits of decentralised energy to be mitigated and shared between the public sector, developers, regeneration partners and investors. These could include:

- Public sector underwriting: The public sector taking a pro-active role in securitising and underwriting project finances to provide certainty to investors. This could include signing up to medium term heat and electricity supply contracts, and ensuring that public sector buildings form anchor loads for decentralised energy networks;
- Energy Service Companies (ESCo's): The use of ESCo arrangements to finance CHP/District Heating infrastructure;
- Licensing frameworks: The lack of a clear regulatory framework for what is currently a monopoly supply suggests that a generic 'access and licensing' framework could be developed for the planned networks proposed by this study;
- Procurement routes: ESCo partners will be required to invest in, operate and maintain the infrastructure. Partners could be procured from the private sector, but the limited range of business models and the need for substantial long-term investment suggests that a new ESCo could be established, either at arms length or with the direct involvement of the Local Authorities as partner, to provide the right approach and level of influence;
- Allowable solution contribution and investment funds: The establishment of contribution and investment funds that will pool Section 106 or Community Infrastructure Levy contributions from developers earmarked to fund investment in allowable offsite solutions. Broadly this could take three main forms, which could be adjusted based on values associated with housing market areas:

    - Area-specific: The ring-fencing of contributions for investment in a range of smaller scale projects within a defined local area;
    - Local Authority-specific: The ring-fencing of contributions for investment in strategic infrastructure projects within an LDF boundary;
    - City Region-specific: The pooling of contributions for investment in strategic infrastructure projects across the sub-region;

Supporting market-based mechanisms could include:

- Procurement and supply chain partnerships: The pooling of procurement for specific technologies in order to create economies of scale, develop the supply chain, assure quality and support implementation;;
- Mutual investment structures: The use of mutual models, such as co-operatives or mutual societies, to engage a range of stakeholders in taking forward projects, specifically including district heating networks and wind clusters;

Alongside these mechanisms it is also clear that delivering significant CO_2 reductions will require political and financial commitment by the City Region, the districts public sector stakeholders