Ashford's Future

# Ashford Sustainable Energy Feasibility Study

Delivery Options for Renewable Energy

Document ref
DOC 5 (of 6)

FINAL ISSUE

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## Delivery Options for Renewable Energy

September 2008



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# Contents



## Appendices

# Executive Summary

The Stakeholder Consultation, Document DOC4, identifies five key areas that need to be addressed by the delivery options explored for implementation.

1. Need for co-ordination of opportunities by facilitating wide area district energy schemes
2. Creating an understandable incentive and regulation structure
3. Underwriting demand for services
4. Showing leadership in promoting carbon abatement technology
5. Formulation and ongoing review of an overarching energy strategy

This report addresses these factors that challenge and incentivise the delivery of a sustainable energy strategy in Ashford and highlights pathways for delivery.

The factors to be considered are potentially complex; there are numerous technical, financial and commercial interdependencies that drive the implementation strategy and it should be understood that there is no single 'right answer.' Neither are the recommendations of this report intended to be detailed implementation plans.

Three delivery options have been identified:

Option 1: Ashford adopts an arm's-length position, controlling the environment in which distributed energy projects are identified, created by 3rd party sponsors and operated by commercial companies.

Option 2: Ashford's Future controls the environment in which projects are created but also designs and initiates complementary projects, managing their procurement with delivery being undertaken by commercial companies.

Option 3: Ashford's Future sponsors, designs and initiates, strategic complementary energy projects, managing their delivery and retaining ownership. Governance and regulatory functions are handed off to a District Heating Board representing consumers

There remains much work to be done for Ashford's Future to implement its ambitious plans, but this report explains in some detail how that work can be structured and delivered in a timely manner so as to allow that to happen by recommending a three step approach to the next steps:

1. Undertake a commercial review of the management options
2. Develop an Ashford energy masterplan
3. Resolve the detail of the Ashford Fund

# 1 Introduction

This report addresses the factors that challenge and incentivise the delivery of a sustainable energy strategy in Ashford. It captures the development of the technical and commercial themes that have emerged throughout the Sustainable Energy Feasibility Study and signposts the route towards implementation of the goals of CS10. It has been informed by the various steering group meetings, the stakeholder and planner workshops and other Arup activity in this emergent policy environment. Input has also been received from Kent Foresight[1] with which the fundamental thinking behind this report is broadly aligned.

[1] Kent Foresight is a network which is responsible for the creation of the Kent Sustainable Future Industries Strategy.

# 2 Context: the Distributed Energy Market in the UK

## 2.1 Drivers; the Need for Change

### Climate change and carbon abatement

The UK Government has proposed a number of policy interventions that are intended to bring about affordable carbon abatement. These measures include changes to building regulations that will require new developments to demonstrate improved energy efficiency and, crucially, to contain or support embedded, renewable generation of heat and power. New developments that require provision for a distributed energy scheme represent an opportunity to provide initial capital investment for energy networks that can encompass existing buildings as well. Many of those existing buildings would otherwise be difficult to 'decarbonise'. Those national policy issues have been captured in the Ashford Borough Council CS10 policy.

### Fuel poverty

A household is said to be in fuel poverty if it needs to spend more than 10% of its income on fuel to maintain a satisfactory heating regime (usually 21 degrees for the main living area, and 18 degrees for other occupied rooms). Fuel poverty is caused by the interaction of a number of factors, but three specifically stand out. These are:

- The energy efficiency status of the property
- The cost of energy
- Household income[2]

The number of households in the UK that are believed to be in fuel poverty decreased from over 6 million in 1996 to 2 million in 2004. There was a slight rise in 2005, which is the last year for which data is published by BERR. It is interesting to note that over the same period, the average energy performance of the lowest 30% income households increased to the point that in 2004, it was the same as the average for all households, having previously lagged behind.

### Housing standards

The improvement in energy performance is to a large extent due to Government investment in the affordable housing stock through the Decent Homes programme, which has injected an estimated £19.3BN of additional refurbishment into the sector over the last 5 years. There are however, large variations of fuel price stress within the lowest 30% income bracket and much work still to be done to provide Decent Homes.

## 2.2 A Combined Response; Strategic Energy Management

The above drivers have historically initiated separate policy responses, but that approach is now evolving. Fundamental to that evolution is the emergence and development of business entities whose role is to champion the delivery of affordable, sustainable energy. These may be commercial or public entities and they are generically (although not always accurately) referred to as Energy Service Companies, or ESCos. ESCos exist in and have been proposed in, a wide variety of forms. In the UK, most ESCos that serve residential users have been sponsored by local authorities. We provide in Appendix B a summary of existing municipal district heating schemes. In this section, we attempt to classify the different types of ESCo and to describe their key features and applicability.

At a high level, the many different ESCo options can be grouped according to their method of service provision and their form of ownership.

[2] Fuel Poverty Website, BERR

- Services may be offered to the public through individual supply agreements, or be tailored for specific customers ('bespoke' provision).
- The assets used to provide the service may be owned and operated by a commercial company specialising in the field, or SPV created for the purpose, or the assets may be owned by the sponsor, who could be a developer, landowner, local authority or a customer.

This gives four basic types of ESCo option, as shown in the figure below:

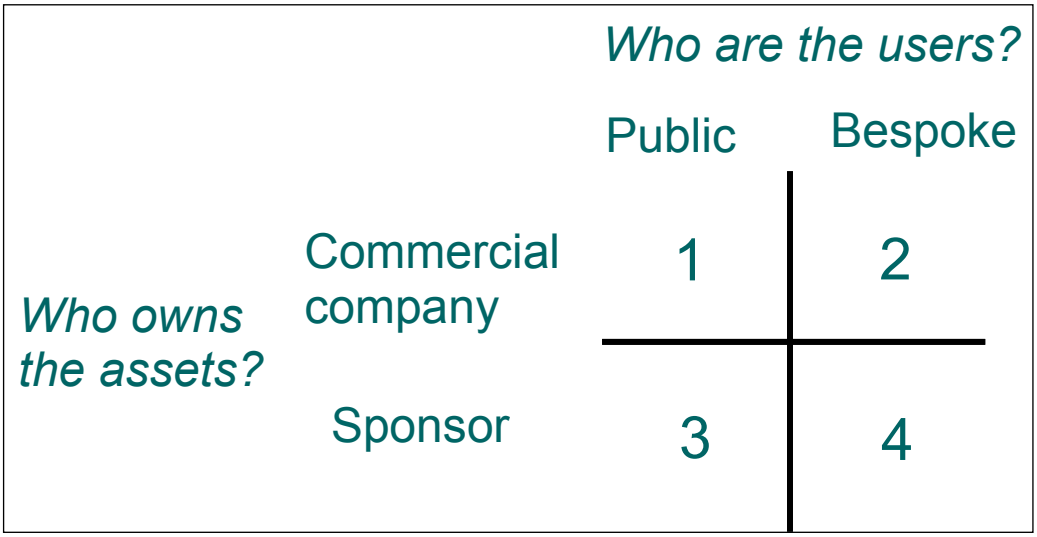



**Table 1 Simplified typology of ESCo schemes**

**Type 1:** the ESCo's assets are owned by investors, and services are provided to multiple customers on standard terms related to market conditions or regulatory requirements. This type is common on the continent but as yet rare in the UK – Southampton Geothermal owned and operated by Utilicom is perhaps the closest among existing schemes.

**Type 2:** the ESCo's assets are owned by investors, but services are designed to meet the requirements of the project sponsor who enters into a long term contract.

Hospital ESCo's operated under PFI schemes and the EDF scheme at Heathrow are examples of this type, as is Barkantine Heat and Power on the Isle of Dogs (also a PFI scheme). The latest municipal scheme in the UK, Birmingham District Energy Company, is understood to be of this type although the contract with the operator, Utilicom, is structured in such a way as to facilitate a transition to standard consumer supply agreements.

**Type 3:** the ESCo's assets are owned by the project sponsor, but services are provided to the public on standard terms. In some European countries, municipal district heating schemes operate on this basis, e.g. the long-running Paris district heating scheme.

**Type 4:** the ESCo's assets are owned by the project sponsor, whose requirements also determine the services provided. Most local authority district schemes in the UK operate on this basis, as does the central Government scheme in Whitehall (operated by Elyo).

It is understood that the existing CHP and district heating schemes in Newcastle, such as the Byker scheme, are examples of a Type 4 ESCo. The City Council owns the assets, which are operated by the City's works department, except for the CHP engines which are operated under contract by the equipment supplier. Services are provided to tenants of the Council, primarily domestic but including commercial. Prices are set to cover costs, rather than in relation to market prices or some other benchmark, and the revenues are collected by the Council.

It appears that, due to the way in which the market for distributed energy is developing in the UK, it is likely that in future, Type 1 schemes will become the norm. The principal drivers for this as regards asset ownership are:

- restrictions on municipal enterprise;
- the need to attract private sector investment to finance the plant and networks;
- the increased interest of investors in asset ownership.

As regards service delivery, the key drivers are:

- the mixing of forms of tenure on housing developments;
- planning and Building Regulation requirements for on-site generation
- Electricity licensing constraints
- the economies of scale in generating and retailing energy services and providing customer services.

Type 1 schemes are, however, not without problems that need to be addressed. Among these are:

i. Investing in plant and networks to supply the public is more risky then investing with a long term contract. This is particularly so for new developments in which customer demands take many years to accumulate. These increased risks will add to the cost of capital. Methods of mitigating risks are therefore required, such as demand guarantees.

ii. Every ESCo is a potential monopoly and so needs to be regulated in order to protect consumers. In the absence of a long term contract, an alternative regulatory framework needs to be developed and applied. In the absence of action at national level, a key role of a city-wide ESCo could be to set out the standards and operating rules for individual schemes.

# 3 Possible Delivery Mechanisms

## 3.1 Barriers and Potential Solutions

By co-ordinating and driving the agenda for renewable energy in the Borough of Ashford, Ashford's Future has an opportunity to undertake a variety of functions that are appropriate to the particular context of its urban environment. Historically, urban, municipal energy initiatives have been undertaken in response to particular strategic objectives including:

- Providing affordable energy at minimum cost
- Optimising the provision of gas & other infrastructure in urban areas
- Enabling an urban municipal waste incineration strategy
- Incentivising carbon abatement technologies
- Engage other community stakeholders and act as an agent of regeneration

Any or all of these objectives may at some time be incorporated into the requirements of an 'Ashford-wide ESCo'. The relative importance of each objective may vary over time and as such it is important to create a flexible organisational structure which will be able to adapt to changing future requirements.

The barriers to implementation that might be anticipated can fundamentally be distilled down to the following:

- Existing monopolies and other barriers to market entry
- Lack of co-ordination of opportunities
- Regulatory uncertainty
- Weak returns on investment
- Affordability to energy consumers
- Technology risk aversion
- Undeveloped supply chains

Some of the means of addressing these potential failures are discussed elsewhere in this report, in the form of roles and interventions that might be assigned to an ESCo in Ashford. More specifically however, the following activities and interventions are proposed as solutions:

**1. Co-ordination of opportunities by facilitating wide area district energy schemes**

A number of cities in the UK have established district heating schemes with the intention of serving homes and commercial premises over a wide area. These schemes have typically achieved a market share less than 10%, serving city council and community premises, social housing and a few private businesses. Interest in setting up such urban-scale ESCos continues, with a new scheme starting in Birmingham late last year. Ashford's Future could develop a similar scheme, and in this report we show how it might be approached. Appendix E illustrates how individual development areas might be developed independently as well as a more coordinated approach with area wide heat networks.

**2. Creating an understandable incentive and regulation structure**

The regulatory environment for energy services in the UK is strongly asymmetrical, being a legacy of the formation and privatisation of large, centralised utility infrastructure. The current electricity supply licensing arrangements for small distributed schemes are somewhat ambiguous and there is currently no regulatory framework for heat. Proposed changes to Building Regulations have implications for on-site generation and at present,

there is some confusion as to the interrelationship between various policy initiatives relating to the regulation of distributed energy. For an Ashford ESCo to be viable it is therefore necessary for a bespoke, regulatory micro-environment to be put in place and managed at least through this period of uncertainty and change.

### 3. Underwriting demand for services

A frequently encountered barrier to the implementation of distributed energy initiatives of significant scale is that the certainty of timing and scale of energy demand represents a risk of significantly weakening the cash flow of the ESCo. This tends to manifest itself as a risk premium applied to investment capital. There is therefore a critically important role for the public sector as sponsor and guarantor of future demand, so that best use can be made of private sector investment at competitive rates. By initiating projects and retaining ownership through the transitionary development phase, an Ashford ESCo would be able to incubate and de-risk investment opportunities for the private sector. This is likely to be the principal means for Ashford's Future to optimise funding for sustainable energy.

### 4. Showing leadership in promoting carbon abatement technology

The problems of climate change calls for a broader response, as exemplified by the London Climate Change Agency which was set up as the primary delivery vehicle for reducing London's carbon dioxide emissions. In this context, the promotion of distributed energy schemes is but one initiative among several. So the LCCA established the London ESCo[3] in partnership with EDF to develop distributed energy schemes, and has sponsored several demonstration micro-generation projects. Evidently, a key strategic issue is the balance to be struck between sponsoring specific distributed energy schemes and broader initiatives to reduce energy consumption and carbon emissions. An appropriately empowered Ashford ESCo could be able to make resource allocation decisions at this level.

### 5. Energy strategy

The CS10 strategy documents have set out the trajectory for carbon neutrality in Ashford. It might be thought that the job of an Ashford ESCo is to help implement the energy strategy for the whole area. This is not necessarily the case. First, an appropriate energy strategy is likely to comprise a process rather than fixed set of objectives to be achieved, and the role of the ESCo might well be to motivate and co-ordinate this process. Second, there is likely to be a number of other entities which are better placed than the ESCo to implement initiatives. This implies that the key tasks for an Ashford ESCo are to keep the energy strategy up-to-date and to co-ordinate the efforts of all stakeholders in its implementation.

### 6. Capturing the benefits of innovation in the Ashford area

A number of national and local government agencies are considering their potential role in the facilitation of distributed energy at present. This will inevitably lead to some standardisation of approaches, but will also give rise to regional, contextual variations. As well as becoming a potential centre of excellence in respect of the commercial aspects of forming an ESCo, Ashford's Future also has an opportunity to design a local supply chain that retains the benefits of the ESCo opportunity in the region, including that of wood fuel production. Such opportunities include long-term partnership engagement with (and indeed vertical integration with) local suppliers of biomass fuel.

[3] The London ESCo has made only slow progress so far, and the London Development Agency has established an internal task force to develop a more suitable approach to creating distributed energy schemes that fit with its priorities and could serve a wide area.

## 3.2 Assessment of Possible Delivery Mechanisms for Ashford

The roles required to deliver a commercially viable ESCo function can be assigned in a large variety of ways. In principle, assignment should be to the party best able to carry out the tasks involved and to manage the risks involved. With this in mind, three options have been developed that illustrate the principal variations of management strategy that could be undertaken by Ashford. Each option allocates the activities required to deliver sustainable energy throughout the Borough. In each case the business that delivers the energy services is termed the ESCo.

***Option 1: Ashford adopts an arm's-length position, controlling the environment in which distributed energy projects are identified, created by 3rd party sponsors and operated by commercial companies.***

Option 1 would require the Ashford ESCo to create a framework for regulation and incentivisation across all the distributed energy schemes in which Ashford had an interest. Project specific schemes would be initiated and driven by any of a number of sponsors, including Ashford, but this role is specifically left open to any 3rd party in this option.

In this option, the management of individual energy schemes is carried out by others, although Ashford's Future may be a shareholder in the ownership of those schemes, retaining ownership of land and would retain step-in rights where the consumers of a scheme include the public. This has been identified by Ashford's Future when referring to the potential for a joint venture. Such a venture might pre-qualify the upper tiers of an appropriate supply chain and create a framework of legal templates in order to improve consistency and reduce scheme transaction costs. This arrangement does not tie Ashford's Future into long-term asset ownership, but conversely does not accord Ashford's Future a high degree of creative control over the portfolio of energy projects.

***Option 2: Ashford's Future controls the environment in which projects are created but also designs and initiates complementary projects, managing their procurement with delivery being undertaken by commercial companies.***

As with Option 1, Ashford's Future takes responsibility for setting the commercial framework in which a portfolio of distributed energy projects will exist. They also undertake a programme management function, developing a portfolio of energy services arrangements across the development area. Since Ashford's Future will be in part regulating its own sponsorship activities, there is a potential for a conflict of interest which could be resolved by having separate departments undertake the regulatory and sponsorship functions.

This option sees the ESCo undertaking the strategic identification and definition, procurement and sponsorship of individual projects within the portfolio. This is therefore a more proactive role than in Option 1 and involves the ESCo undertaking more strategic planning, promotion and procurement of the desired schemes, and analysing the interrelationships between projects in order to maximise their synergistic potential and optimise the performance of the portfolio as a whole.

***Option 3: Ashford's Future sponsors, designs and initiates, strategic complementary energy projects, managing their delivery and retaining ownership. Governance and regulatory functions are handed off to a District Heating Board representing consumers***

In this option, Ashford's Future takes responsibility for project sponsorship and asset ownership. This is therefore a hands-on approach to the provision of portfolio energy management from inception to operation. Projects are regulated under contracts, with supervision of these contracts being in the charge of a board which represents the interests of consumers.

In this option, it is assumed that Ashford's Future takes on responsibility for short to medium term asset ownership, accumulating a portfolio of emergent energy services investments for onward disposal at the appropriate time. The construction and early operational phases of many schemes are typically the least attractive to external investors. Hence by pre-incubating schemes Ashford's Future would prepare them for market, by reducing uncertainty and risk premium. Having done so, Ashford's Future would sell-on their interests to investors, creating a circulating fund for further interim asset ownership.

Aberdeen provides an example of a city council pursuing option 3, apparently successfully. Aberdeen Heat & Power Co Ltd is an independent, not-for-profit company set up by the City Council in 2002 specifically to develop and manage CHP projects to improve energy efficiency on housing estates, mostly high-rise flats. To date, three retro-fit schemes have been developed (see Appendix C), serving about 1000 flats plus some community facilities. The Council plans to continue to install schemes to serve all its tower blocks, to switch in due course from gas to biomass fuel and to connect up the schemes into a city-wide district heating network.

# 4 Conclusions, Recommendations and Timetable

## 4.1 Undertake a Commercial Review of the Management Options

The powers necessary for Ashford's Future to undertake the provision of sustainable energy in the Borough are significant, though not without precedent. It is therefore recommended that a commercial impact assessment be undertaken for the initiatives described in this report.

It is recommended that the technical and financial viability of the proposals to create a Borough-wide ESCo that is initiated by linking development sites is examined in further detail as part of a comprehensive business plan that would include other factors including linkages to:

- Local supply chains, particularly for biomass, in Ashford and Kent generally
- Other development agencies with compatible strategic objectives
- Additional funding streams such as capital and grant awards

This assessment should consider the commercial implications of the allocation of the roles and responsibilities identified in this report. We suggest that this exercise should commence within the next 3 months and take approximately 3-6 months to formulate a business proposal for review by the appropriate government sponsors and regulatory bodies.

## 4.2 Develop an Ashford Energy Masterplan

The success of wide-area energy projects is closely correlated to the availability of a reliable, timely customer base. It is therefore recommended that premises that could be served by a heat network are specifically identified, with particular attention to the town centre. As proposals for the various new development areas are crystallised, it is recommended that the commercial viability of zoned heat networks is assessed. This will require a collaborative approach between landowners, developers and Ashford's Future. The key features of the energy masterplan should be:

- Geographic heat mapping
- 'Optimistic' & 'Pessimistic' build-out programmes
- Identification of compatible technologies
- High-level financial feasibility testing, including affordability to consumers

The masterplan will be an evolving document that will need to be future proofed against changes in technology, market conditions and policy generally. We suggest that the development of a first generation energy masterplan is undertaken over the next 9-12 months.

## 4.3 Resolve the Detail of the Ashford Fund

It is strongly recommended that the detail of the Ashford Fund is developed and articulated to the various stakeholders. The key factors that we believe should be developed are:

- The intended consequences of the presence of the Fund
- The minimum level of carbon abatement at which the fund can begin to contribute
- The price (or price formula) of the fund
- The strategy for using the fund

The operation of the fund will be a feature of the real estate market context in which it operates, but will also be driven by other factors. In particular, the revenue recycling and tax interaction effects need to be evaluated. We suggest that this is started immediately and be completed within 6 months.

The briefing note in Appendix D describes the issues that will need to be considered to determine the buyout price for the Ashford Fund.

Appendix A

# Glossary of Terms

# A1 Glossary of Terms

This appendix provides a glossary of key terms in distributed energy and utilities, most of which are used in the report. The terms defined are listed in alphabetical order.

**DISCO – Distribution Company**

A DISCO is a utility company whose sole activity is the operation of the local distribution network. The scope of this activity varies between sectors:

- in the UK, an electricity DISCO is called a DNO (Distribution Network Operator) and connects users to the national transmission network. DNOs operate only at wholesale level; users contract with a retail supplier. IDNOs (Independent DNOs) provide a similar service for areas within the regions served by DNOs.
- in gas, there are two equivalent types of DISCO, an IDN which operates a local gas distribution network equivalent to a DNO, and an IGT which operates a regional network connecting selected users to NG Gas's national transmission system.
- in water and waste water, the regional WASCs (water and sewerage companies) provide integrated retail and wholesale services that include the abstraction of water and treatment of waste water as well as distribution.
- in telecoms, while most operating companies tend to integrate local distribution with long-distance transmission (e.g. BT), a few offer local connectivity only (MANs or metropolitan area networks) or operate at the level of duct and optical fibre provision ("DuctCo", "FibreCo"). Note that BT's Openreach is a separate division that is required by regulation to provide local distribution at arm's length from the rest of the business.

A DISCO may also be established as an SPV (q.v.) to serve a particular development, e.g. MUJV at Kent Thameside.

**Distributed energy**

Any scheme whereby heat or power is generated in the same local area as the consumers thereof. CHP schemes, wind turbines and building-integrated energy schemes are all examples.

**District heating**

The generation, distribution and supply of heat in a local area.

**ESCo – Energy Services Company**

An ESCo integrates the generation, distribution and supply of heat in a local area with the generation of electrical power. Normally, distribution of the electricity generated by an ESCo is undertaken by the public network (DNO or IDNO). In the case of "private wire" networks, however, the ESCo installs and operates the electricity distribution network itself on a licence-exempt basis. The point of so doing is to be able to supply electricity to consumers of heat on an exclusive basis.

In the USA, an ESCo is a utility company that manages consumption of energy for a user or group of users, in return for a share of the savings made.

**EESCo – Energy and Environmental Services Company**

An EESCo is an ESCo that generates energy from renewable sources (e.g. Thameswey's scheme in Woking).

**GENCO – Generating company**

A GENCO is a company specialised in power generation.

**GRIDCO – Grid Company**

A GRIDCO is an independent company responsible for the operation of an energy grid (e.g. National Grid). The equivalent to TRANSCO (q.v.).

**Multi-utility**

Joint operation of more than one energy or utility network. Note that, in UK industry parlance, multi-utility services may refer to the joint installation of infrastructure for more than one utility, for example the installation of electricity wires and gas and water pipes in a combined trench or utility corridor.

**MUSCO – Multi-Utility Services Company**

A MUSCO is a multi-utility company that provides at least the services of an ESCo and a DISCO for a new development or local area, and may also provide water and telecoms (e.g. the proposed Elephant & Castle MUSCO). It is much the same as a WESCo plus telecoms distribution.

**POOLCO – Pooling Company**

A POOLCO is a power exchange, an independent organisation that operates auctions, and generally functions as a marketplace for energy sales at the wholesale level.

**SPV – Special Purpose Vehicle**

An SPV is a company set up for the purpose of directing an investment project. An SPV is typically the legal entity through which third-party financing of infrastructure projects is arranged. As a legal entity owned by several parties, an SPV has its own management and its finances can also be kept separate from those of the investors in the project.

**TRANSCO – Transmission Company**

An independent company responsible for the operation of transmission lines. British Gas and National Grid used this name for their division operating the UK national gas transmission system. Equivalent to GRIDCO.

**WESCo – Water and Energy Services Company**

A WESCo provides energy generation and distribution plus water and waste water services, much like a MUSCO though that may also include telecoms distribution.

Appendix B

# UK Municipal District Heating Schemes

# B1 Case Studies of UK Municipal District Heating Schemes

District heating schemes set up, owned or run by local authorities come in all shapes and sizes. Table B1 below lists a sample, indicating their approximate age and size. The older schemes tend to be larger, reflecting both the time typically required to achieve scale and changes in the ownership of social housing in recent years.

**Table B1 UK Municipal District Heating Schemes ranked by size**

| Scheme – Operator | Date Founded (approx.) | Residential Customers |
|---|---|---|
| Nottingham – Enviro-energy Ltd | 1970 | 4,600 |
| Leicester -Leicester City Council | 1960 | 4,000 |
| Sheffield - Veolia Environmental Services Ltd | 1988 | 2,800 |
| Byker - Newcastle City Council and Your Homes Newcastle | 1979 | 1,800 |
| Aberdeen - AH&P Co Ltd | 2003 | 1,000 |
| Lerwick - Shetland Heat Power and Power Ltd | 1998 | 840 |
| Wick - Caithness Heat and Power Ltd | 2006 | 600 |
| Falkirk – Falkirk District Council | 2005 | 500 |
| Southampton - SGHC Ltd (Utilicom) | 1987 | 500 |
| Woking – Thameswey Ltd | 1992 | 400 |
| Tower Hamlets – Barkantine Heat and Power Company | 2001 | 350 |
| Milton Keynes – Thameswey | 2006 | 300 |
| Barnsley - Barnsley District Council | 2005 | 200 |
| Glenshellach, Oban - Argyll Council | 2006 | 40 |
| Birmingham - Utilicom | 2007 | 20 |

**Notes on individual schemes**

**Aberdeen:** Aberdeen Heat and Power Ltd, established and owned by Aberdeen City Council, is the largest of the municipal district heating schemes in the UK focussed on residential users to be founded since changes in social housing policy and is described in more detail in Appendix C.

**Barnsley**: Owned and operated by Barnsley District Council. There is currently one 320kW and one 150kW woodchip boiler producing heat for 166 flats. Funding totals £1.7m, and has been provided by South Yorkshire Forest Partnership, Yorkshire Forward, Energy Savings Trust and the DTI's Bio-Energy Grant Scheme.

**Birmingham**: the City Centre CHP scheme is owned and operated by Utilicom, with a long term contract from the City Council. The first phase of the City Centre scheme serves the International Convention Centre, council buildings and a hotel. It is intended to extend the scheme to a hospital and Aston University.

**Byker:** this scheme was founded in 1979 and is currently owned and operated by Newcastle City Council and Your Homes Newcastle. Byker heat station utilises a natural gas CHP engine of 1.16MWth. The scheme currently supplies heat to 1,840 dwellings.

**Central Milton Keynes:** Utilises a natural gas CHP engine with an electrical output of 3.2MW and 3.0MW of heat. The scheme is operated by Thameswey under a 125 year concession. While it currently serves 307 apartments, offices and hotels, Thameswey is committed to connect more developments as they are built.

**Falkirk:** This scheme is owned and operated in partnership between Falkirk Council and Housing & Social Work Services. The scheme provides heat and power to 504 high rise flats at Callender Park.

**Glenshellach:** The Glenshellach housing scheme in Oban is supported by a 650kW biomass engine. The scheme was funded by Highland and Islands Enterprise Communities Scotland. Heat is currently provided to 44 homes. The total project cost £500k.

**Leicester:** The district heating scheme has CHP units at four council sites, serving 17 council buildings and 4,000 residential premises.

**Lerwick:** Is owned and operated Shetland Heat Energy and Power Ltd. The scheme was financed by the Shetland Islands Council Charitable Trust. Operations commenced in 1998, using a 7MW waste to energy plant run by Shetland Islands Council. Properties connected include a swimming pool, three schools, a fish factory, a dairy, residential care centres, library, the main hospital, retail and commercial. Total properties supplied the scheme are 840.

**Nottingham:** district heating scheme has been running since the 1970s. It is run by Enviro-energy Ltd and provides heat and power to 4,600 homes, civic buildings, schools and Nottingham Trent University. The current installation utilises a 15MW gas CHP engine.

**Sheffield:** The district heating schemes is operated by Veolia. It supplies 140 buildings in the city centre with heat and 3,500 homes, the scheme was setup in 1988.

**Southampton:** as part of a joint venture between the council and Utilico SGHC Ltd was established in 1987. Heat and power is supplied to the Civic building in the City Centre, the Holyrood Estate. The current CHP plant utilises a 5.7MWe CHP engine, it supplies 464 Houses and 20 major commercial and public buildings.

**Tower Hamlets:** the London Borough of Tower Hamlets procured the renewal of heating provision on the Barkantine estate through a PFI scheme with funding support of £6m from DETR. The scheme is owned by EdF with Dalkia as the operator of the energy centre. Electricity is sold wholesale to EdF which claims a 25% retail market share among heat consumers.

**Wick District Heating:** the scheme is operated by Caithness Heat and Power, a joint venture between Inverhouse Distillers, Pulteneytown Peoples Project and the Highland Council. The system supplies 600 council houses, Wick Assembly Rooms and Caithness General Hospital. Funding of £1.54m was secured from the community energy programme, further funding from the Highland Council includes £3.5m and 200k fro the European Regional Development Fund. The plant was installed in 2006 and produces 3MW of heat and 1.5MW of electricity.

**Woking:** the well-known scheme in Woking is operated by Thameswey Energy Ltd, a joint venture between the Council and ESCo International a/s, a Danish energy services company (now Xergi). Thameswey Energy operates a number of small CHP plants serving council offices in Woking, community buildings and blocks of flats, and also provides energy management services to the Council.

Appendix C

# Aberdeen Heat and Power

# C1 Case Study of Aberdeen Heat and Power

(Extract from application for a Scottish Award for Quality in Planning: www.scotland.gov.uk/Publications/2007/10/09113958/29)

**Description of project**

Aberdeen Heat & Power Co Ltd (AHP) has developed and installed two combined heat and power (CHP) schemes and is well advanced on a third. Development at each scheme comprises a CHP plant, the heat distribution system, and the installation of heating equipment (the internals) in each flat.

**Stockethill**: supplies heat and hot water to 288 flats, including sheltered accommodation, in four 19-storey blocks. 210kW gas powered generator in separate building.

**Hazlehead**: 300kW generator installed in the former underground boiler room of Hazlehead Academy. Heat and hot water supplied to the school, 4 multi-storey blocks with 184 flats, 45 sheltered housing units, swimming pool and separate sports facility. Electricity is supplied direct to the school by private wire.

**Seaton**: Heat and hot water will be supplied to 503 flats, some sheltered, in 6 multi-story blocks, to a sports changing facility, and to the Council's beachfront complex comprising ballroom, leisure centre and ice-rink. The CHP plant is located in a new building which also accommodates the changing facilities. Currently 1mW gas powered generator with second to be installed. Plans in hand to install 2mW generator and convert all three to biomass.

**Describe the background to the project**

The project was developed in response to the commitment of Aberdeen City Council (ACC) to Local Agenda 21 and to the requirement to comply with the Home Energy Conservation Act 1995. ACC had adopted an Affordable Warmth Policy in 1999 and recognised that many of its tenants suffer from fuel poverty.

The project also emerged from work undertaken by ACC beginning in 2000 in response to the Government's and the Scottish Executive's consultation documents on climate change. That work was being led by a chartered planner who is now on the Board of AHP.

AHP was established as an independent not-for-profit company with powers to borrow capital and trade in electricity.

**What are the aims and objectives of the project?**

To improve the energy efficiency of as many as possible of ACC's 4,500 multi-storey flats most of which were heated by electric storage heating. Specific objectives of the project are:

1. to reduce fuel poverty

2. to reduce emissions of CO2

3. to provide training and employment opportunities in heating installation and maintenance

4. to ensure associated infrastructure is integrated with the local environment

5. to provide a safe and reliable heating/hot water system

6. to ensure capital costs were affordable to the Council

**Over what timescale has the project been developed?**

AHP was established as a company in 2002.

Stockethill scheme commenced in December 2003 and was completed in May 2005

Hazlehead scheme commenced in summer 2005. Work to supply the flats, school and swimming pool was completed by summer 2006. Supply pipes extended to the sports facility pending its completion.

Work at Seaton commenced in 2006 and is ongoing. The combined CHP and changing facility building was completed in April 2007 and 300 flats have so far been connected and are receiving heat and hot water. ACC's beach complex was connected in July 2007; work on internals is in hand. The aim is to extend the CHP building and convert the fuel source to gasified biomass by March 2008.

**Explain the process and action taken**

ACC identified energy inefficient properties in its housing stock and carried out a feasibility study into means of achieving affordable warmth for tenants. CHP was selected as the preferred technology for high rise flats. Multi-storey clusters suitable for the installation of CHP are identified by ACC and referred to AHP for development. Tenants are involved by the Council in decision making.

Feasibility study carried out by Design Engineer, planning permission obtained, tenders sought and contracts awarded. The contractor for the installation of internals is also a training organization and has recruited and trained otherwise unemployed people.

On conclusion of work landscape reinstatement undertaken in conjunction with ACC grounds maintenance staff.

Customer satisfaction surveys undertaken on the completion of each scheme.

**Explain the role of the key partners**

ACC, the Combined Heat & Power Association and Tulloch Training were founding members. Several Council services have been involved at different times and to varying extents: housing, finance, legal, planning, culture and leisure, grounds maintenance. ACC sourced Community Energy Programme and other grants from central Government and the Scottish Executive and underwrote a commercial loan.

Technical design and project management undertaken by Integrated Energy Utilities. Electricity trading managed by Community Energy Services. Both these companies are committed to the aims of reducing fuel poverty and emissions reduction.

The Board of AHP has directors from the Council, the CHP Association, the tenants and SCARF. It also has several independent directors including two chartered planners.

A planning consultant was engaged to identify the best site in an exposed location for the Seaton CHP station and to progress the planning application.

**What results were achieved?**

Three CHP schemes have been constructed. Affordable warmth and significant financial savings have been provided to approximately 1,000 households, including many in sheltered accommodation. Various civic buildings have been connected with considerable cost savings to ACC.

The CHP stations are delivering heat and generating power with 85% efficiency.

The Seaton scheme will provide base load capacity for the extension of CHP into the city centre and to several regeneration areas when capacity is increased and conversion to biomass effected.

The CHP stations have been successfully integrated into the local environment. Particular attention given to siting and design of the Seaton CHP station. Here, use of recycled materials, inclusion of a 'green' roof to reduce rate of rainfall runoff, and employment of SUDS limit environmental impact, while the opportunity to co-locate with the sports facility gives additional benefit to a deprived community

Appendix D

# The Economics of an Ashford Carbon Fund

# D1 Notes on the Economics of an Ashford Carbon Fund

CS10 states in paragraph 9.61 that, "Any remaining $CO_2$ emissions from a development, that is after the 20-40% reduction required through onsite mechanisms, will need to be offset in order to make developments carbon neutral through a financial contribution. This will be through a financial contribution and/or off-site renewable energy facilities, energy efficiency schemes and tree planting as part of Ashford's Green and Blue Grid."

**From our recent discussions with Ashford's Future, we understand that the intention is that new developments should aspire to be carbon neutral and that the majority of the required carbon abatement will be achieved on site. This will be through a combination of:**

- Energy efficiency
- On-site renewables

Under this regime it could be arranged that the carbon fund is an incentive for developers to work towards on site solutions rather than pay a buy-out, which would be more expensive. To understand this it is important to appreciate how the marginal cost of carbon abatement varies in different developments. The table on the next page shows the marginal cost of carbon abatement available to the UK by 2020, as estimated in the 2007 Energy White Paper. The same 's-curve' is typical within developments, showing that as the percentage of carbon abatement increases, the marginal cost of additional carbon abatement escalates rapidly towards uneconomic levels.

When considering the operation of a buyout three factors need to be considered:

- Beyond what level of carbon abatement is it permissible to buyout?
- What is the buyout price (or how is it calculated)?
- How to reach agreement?

The highest cost carbon abatement shown on the graph are the on site renewables that are implied by CS10. Hence was the carbon fund to act as a deterrent, it would be necessary to set the buyout price and its starting point at a level where developers would be better off abating carbon on site than paying into the fund. This would be a very high carbon price, however, and would in all probability have a detrimental effect on land value were it to be rigorously enforced.

Alternatively, the view could be taken that the carbon fund is a desirable mechanism for accumulating a useful fund for investment in infrastructure or renewables that are not directly linked to specific developments. In this scenario, the carbon price would be lower and would be driven by the scale of the fund that was being sought.

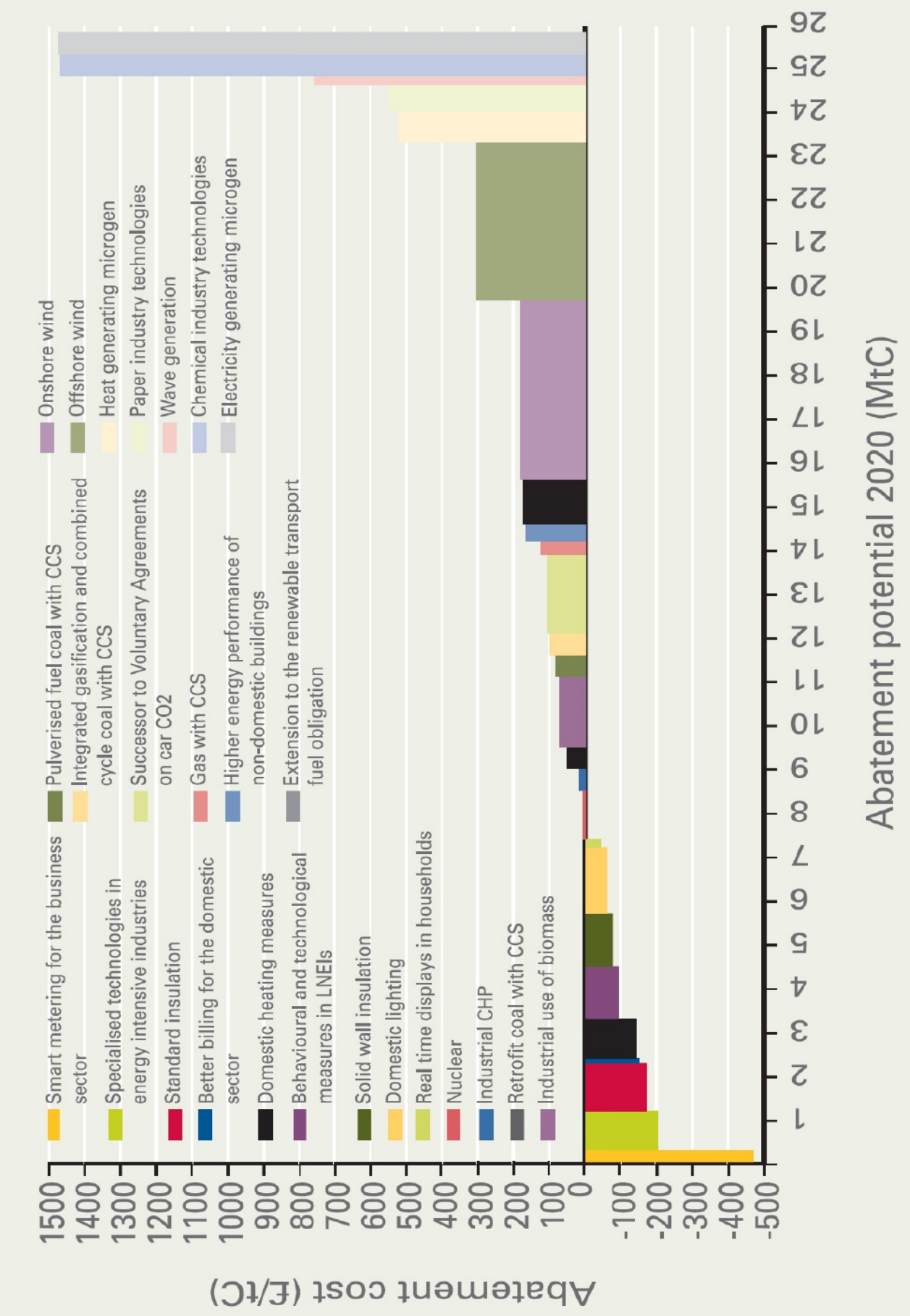
In both cases it might be possible to view the buyout as negotiable, but this in itself could be problematical as the uncertainty around the requirement could adversely affect land values.

Further issues to consider are how the effect of expenditure through a buy-out fund has a feedback or recycling effect on the cost of abatement and whether there is a distortion or interaction with other taxation mechanisms. For example, if Ashford's Future were to invest carbon funds in a heat network, that might make carbon abatement available to some developments at a lower price than would otherwise be the case. However, were developers to chose to provide their own low carbon heat (which is a cheap form of carbon abatement) in order to reduce their contribution into the carbon fund, then this would compete with the heat network initiative for the same carbon abatement benefit.

Determination of the correct level of financial contribution should consider the cost of installing off-site renewable energy facilities to mitigate the required quantity of $CO_2$ emitted over the development's life, the social cost of $CO_2$ emissions and the shadow cost of $CO_2$ emissions as defined by DEFRA. The DEFRA report entitled, "The Social Cost of Carbon and the Shadow Cost of Carbon: What They Are, And How to Use Them in Economic Appraisal in the UK" can be downloaded from the internet at the following site:

http://www.defra.gov.uk/environment/climatechange/research/carboncost/pdf/background.pdf

One approach to resolving this issue would be to calculate the net cost of abatement at the 20-40% level and then estimate the total level of contribution into the carbon fund likely to be required as the development is completed. Following this a mechanism could be developed whereby this can be calculated for real projects, as a formula for negotiation.


Abatement cost (£/tC)
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1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
Abatement potential 2020 (MtC)
1
2
3
4
5
6
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Smart metering for the business sector
Specialised technologies in energy intensive industries
Standard insulation
Better billing for the domestic sector
Domestic heating measures
Behavioural and technological measures in LNEIs
Solid wall insulation
Domestic lighting
Real time displays in households
Nuclear
Industrial CHP
Retrofit coal with CCS
Industrial use of biomass
Pulverised fuel coal with CCS
Integrated gasification and combined cycle coal with CCS
Successor to Voluntary Agreements on car CO2
Gas with CCS
Higher energy performance of non-domestic buildings
Extension to the renewable transport fuel obligation
Onshore wind
Offshore wind
Heat generating microgen
Paper industry technologies
Wave generation
Chemical industry technologies
Electricity generating microgen

Appendix E

# Energy Networks for the Ashford Growth Area

# E1 Independent Distributed Energy Networks

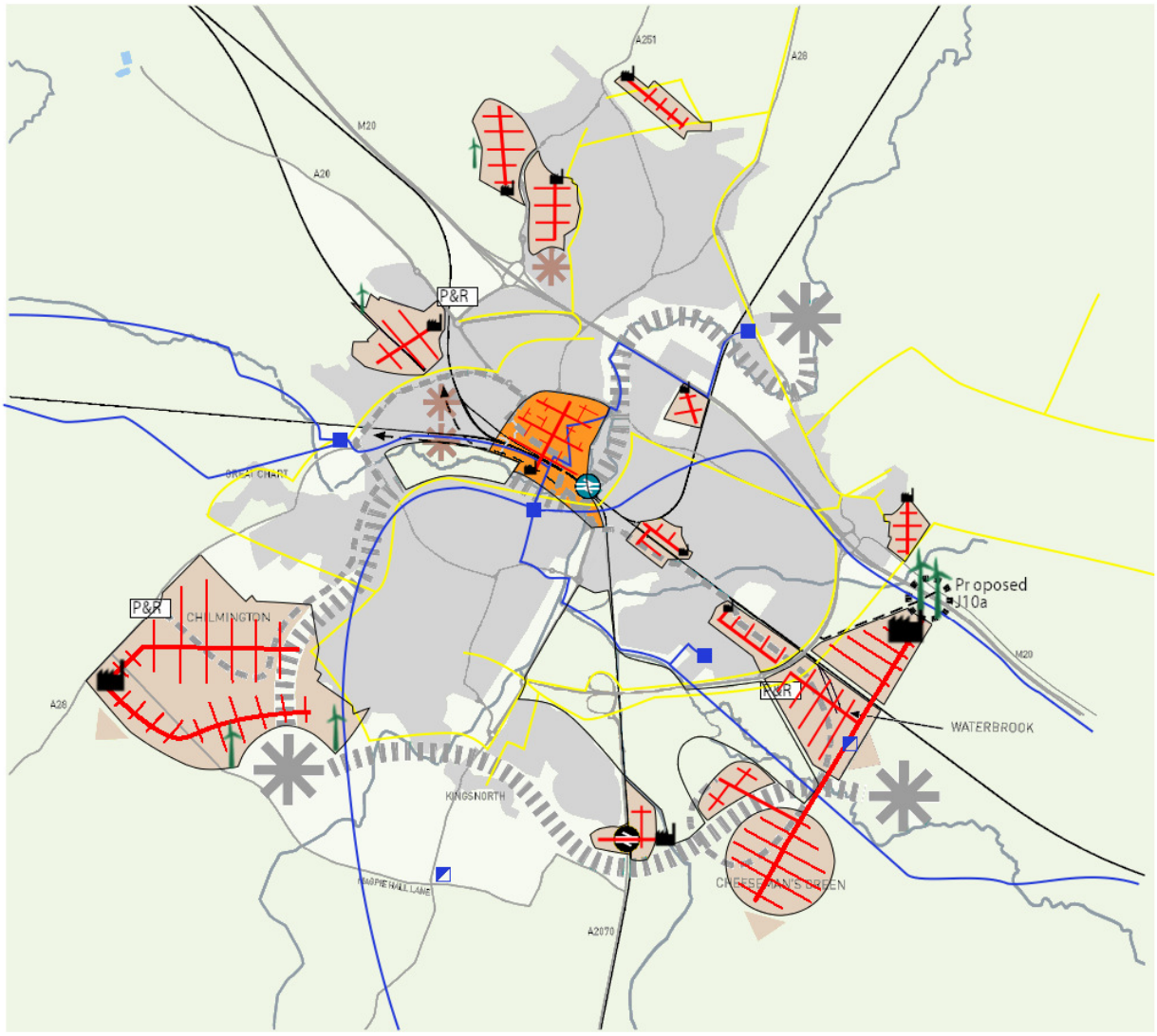




**Figure D1: Independent distributed Energy networks in the Ashford Growth Area**

Figure D1 shows notional locations for CHP plant and wind turbines for the proposed development areas, taking local topography, and existing infrastructure (electricity, gas and transport) into consideration.

The individual networks can be expected to extend gradually as the build out progresses. The heat networks are likely to be supplied by temporary heat generating plant (either gas boilers or possibly biomass boilers) initially. The limited scale of most of the individual sites suggests that it will not be viable to bring centralised CHP based renewable generation capacity on-line until late in the build out after the energy demand has reached the critical mass required to operate smallest viable scale of CHP generation efficiently.

# E2 Coordinated Ashford-wide Energy Network

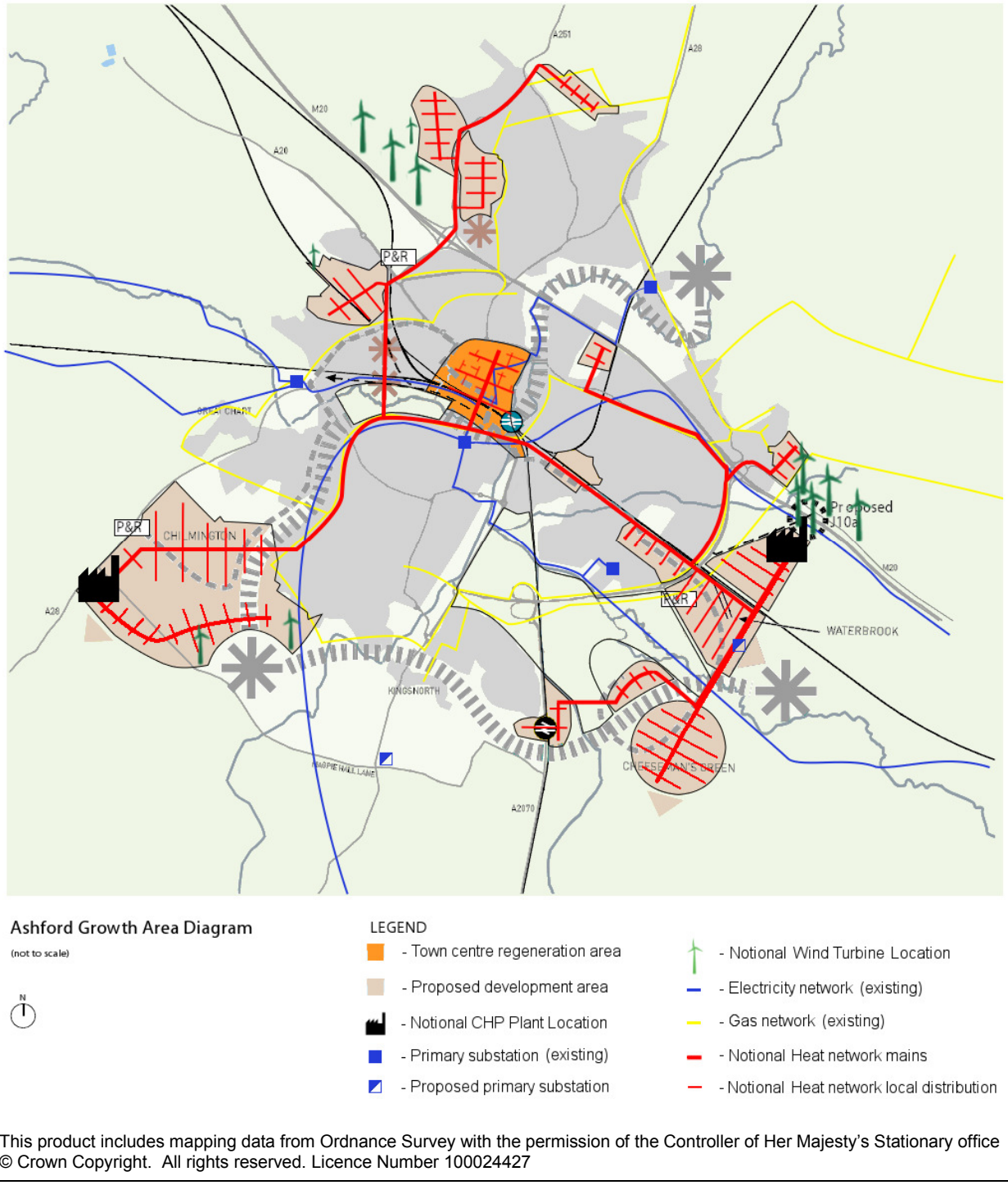




**Figure D2: Coordinated Ashford wide energy networks in the Ashford Growth Area**

Figure D2 shows how the various development areas may be linked together to form an area-wide energy network with fewer locations for CHP plant required. This approach will require an investment in a central infrastructure to link all the various sites together. Once established, the heat demand of all the development areas and existing buildings combined will allow an accelerated build up of renewable generation capacity.

In the context of an Ashford wide energy strategy the addition of further large scale wind turbines should be considered. Locations in close proximity to the M20 should be favourable as the motorway noise will mask any noise from the wind turbines, subject to agreement with the Highways Agency.

Also not shown is the potential to extend heat networks into existing neighbourhoods where heat demand will be much higher than for buildings constructed to higher standards as part of any new development.