Ashford's Future

Ashford Sustainable Energy Feasibility Study

Summary Report

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Summary Report

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Executive Summary

This report is a high level summary which highlights the key findings, conclusions and recommendations made in the course of the Sustainable Energy Study for Ashford's Future. The work completed will inform the implementation of on-site renewables in the Greater Ashford Development area in relation to meeting the policy requirements of the adopted Core Strategy (CS).

The study encompassed an analysis of the potential CO_2 savings and costs for different sizes of development in the Cluster Analysis. Further to this, the CO_2 savings, installed costs and phasing were explored for five Pilot Sites, characteristic of developments coming forward in Ashford. Key stakeholders were consulted on the results of this work and their feedback fed into work on possible delivery mechanisms.

The results of the modelling carried out in the course of this study will allow stakeholders to identify the most cost effective technologies which are likely to be suitable for a development in the Ashford Growth Area and the contribution that can be expected from individual technologies.

The key findings of the study are:

- The minimum and maximum requirements for on-site renewables stipulated in CS10 can be technically achieved for sites of all scales through combinations of renewable technologies
- The costs of meeting these requirements reduce as the scale of the development increases.
- To achieve the maximum CO_2 reduction, the most cost-effective solutions require heat networks.
- The extent to which developers install on-site renewables beyond the CS10 minimum will be determined by the buyout price of the Ashford Fund.

The primary opportunities and challenges for implementation of these findings present have been determined based on Arup's experience delivering low carbon and carbon neutral developments and our consultation with stakeholders.

Opportunities	Challenges
Opportunity to make the most of local biomass resource – most cost-effective solution on most scales of site includes biomass technology	**Only limited on-site CO_2 savings are possible using lower cost or well established technologies**
Opportunity to unlock economies of scale through collective approach	**Issues surrounding co-operation, training, phasing and funding make achieving critical mass for heat network implementation complex**
As developments increase in size CO_2 emissions reductions become more cost effective and lower risk - heat networks allow flexible levels of CO_2 savings and export of heat to existing buildings and neighbouring developments	**High levels of CO_2 savings will require either wind (for which the planning risk is high), PV (which is costly) or the export of heat**

Brief summaries of existing district heating schemes in the UK and an in-depth case study of Aberdeen Heat and Power are provided in Appendix C of the Delivery Options report.

1 Introduction

In line with UK government policy the Ashford LDF Core Strategy policy (CS 10) on sustainable development states that new developments in the Ashford Growth Area should be carbon neutral. This is to be achieved through a combination of three steps:

A – Building Fabric Improvements
B – On-site Renewables
C – Contribution to the Ashford Fund

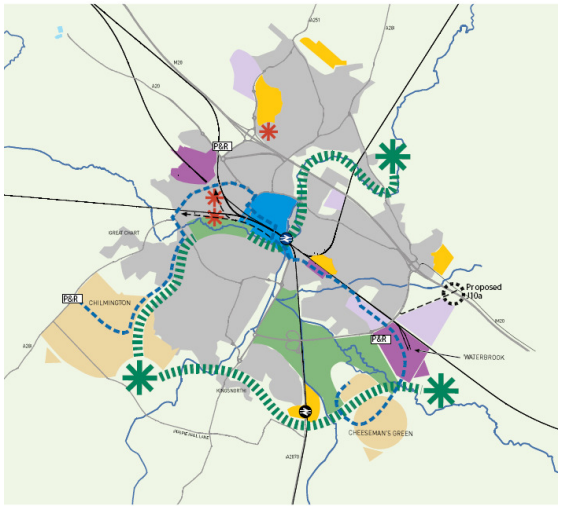

Figure 1: Core Strategy Ashford Growth Area Diagram

In March 2008 Arup were commissioned by Ashford's Future to undertake work to inform the implementation of on-site renewables in the Greater Ashford Development area. The work comprised of the following main elements:

- An assessment of current and future energy consumption for Ashford (see Document DOC6)
- A review of national, regional and local policy
- Analysis of the potential CO_2 savings possible using renewable and low energy technologies for different sizes of development and their associated installed costs.
- A review of the CO_2 savings, associated installed costs and installation phasing for selected Pilot Sites representative of sites coming forward in Ashford.
- Consultation with key stakeholders on the findings of the study
- Discussion of delivery mechanisms and initial guidance for the role the 'Ashford Fund'.

The detailed results of the study are contained in the 5 subsidiary documents shown below, in addition to this report.

• **Document Name**	**Document reference**
• Summary Document	DOC 1
• Cluster Studies	DOC 2
• Pilot Sites Study	DOC 3
• Stakeholder Feedback	DOC 4
• Delivery Options for Renewable Energy	DOC 5
• Background to the Study	DOC 6

This document summarises the key points raised in documents DOC 1-5 and is intended to be used as a high level summary of the work.

2 Policy

A brief overview of the policy context is included here. Further details can be found in the Background to the Study Report (Document DOC6).

2.1 Local Policy

The Local Development Framework Core Strategy for Ashford was adopted in July 2008. The Core Strategy sets a target for all major development to be carbon neutral based on the following hierarchy:

Extract from Core Strategy Policy 10:

"All major developments must incorporate sustainable design features to reduce the consumption of natural resources and to help deliver the aim of zero carbon growth in Ashford.

Unless it can be demonstrated that doing so is not technologically practicable, would make the scheme unviable or impose excessive costs on occupiers developments are expected to:

A) Achieve the standard set out below, or specified in a later DPD, or an equivalent quality assured scheme, with a strong emphasis on energy, water and materials. These requirements will be met through:

(a) Energy and water efficiency,

(b) Sustainable construction materials, and,

(c) Waste reduction.

B) Reduce carbon dioxide emissions through on-site sustainable energy technologies at the percentage set out below or at such other level as may be specified in a subsequent DPD.

C) Be carbon neutral which can be met through a combination of (A) and (B) above, with any shortfall being met by financial contributions to enable residual carbon emissions to be offset elsewhere in the Borough."

CS10 sets a minimum CO_2 reduction which needs to be met by building fabric improvements and 'on-site renewables. The figure ranges between 10 and 30% of emissions depending on classification of the areas where the development is. The classifications covered by this study were:

- Town Centre (min 20%)
- Urban Extensions (min 30%)
- Brownfield Urban Sites (min 20%)
- Greenfield Urban Sites (min 30%)

2.2 National Policy

In 2007, after consultation with the industry, the Government announced that the Building Regulations will be enhanced to include the energy consumption aspects of the Code for Sustainable Homes (CSH).

The Code for Sustainable Homes (CSH) is an environmental assessment method for dwellings. The highest level of CSH is Level 6 which requires the dwelling to be carbon' neutral through the use of on-site renewables.

It is understood that future revisions of the Building Regulations governing energy consumption will require all dwellings to meet the on-site renewables required for Code level 3 or better in 2010, Code level 4 or better in 2013 and Code level 6 in 2016.

An overview of the trajectory for adoption of the CSH in the building regulations and the issues related to this study can be found in the Background to the Study Report (Document DOC6).

2.3 Comparison of National and Regional Policy

The minimum CO_2 reductions stipulated in CS10 include both regulated and non-regulated CO_2.

Figure 2 shows that the minimum CS10 targets for dwellings are higher than those in the proposed timeline for the Code for Sustainable Homes

The 30% minimum target remains ahead of national policy until 2013 and the overall target for all major development to be carbon neutral is ahead of the national trajectory for dwellings until 2016.

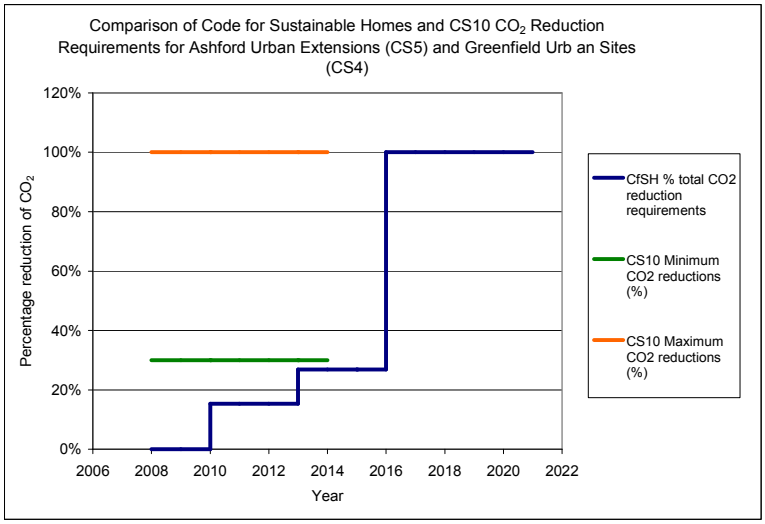

Figure 2: Comparison of Code for Sustainable homes and CS10 reduction requirements

3 Cluster Studies

3.1 Introduction

The focus of the Cluster Studies (Document DOC2) was to explore the potential for the reduction of CO_2 emissions through the supply of low or zero carbon energy to a series of generic development clusters. The Cluster Studies examine seven clusters, ranging in size from 10 dwellings to 18,000 dwellings (as shown in Table 1) along with a representative mix of non-residential development.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Clust er 7
Number of dwellings	10	30	100	500	1,000	6,500	18,000

Table 1: Number of dwellings in each cluster

Details of the technologies included in the analysis are given in the Background to the Study report (Document DOC6). An outline of the technical and economic feasibility of each technology, the performance of certain combinations of the technologies and assumptions made regarding building improvements can be found in the Cluster Studies report.

3.2 Results

The potential CO_2 savings of the individual technologies range from 5% to 76% which means that no single technology can provide 100% CO_2 savings for any cluster size. However, 100% CO_2 savings can be achieved for all clusters through combinations of technology. Please refer to the Cluster Studies report for details of how best to combine technologies.

Figure 3 shows the normalised capital cost of each technology and combinations of technology for each cluster. It can be seen that the most expensive technology for all cluster sizes is small scale wind and the most cost-effective technology for clusters 1-3 is biomass boilers. For the larger clusters sizes, it is gasification biomass CHP or large-scale wind turbines. For ease of reference, matrices which summarise the CO_2 savings potential and additional capital cost for each cluster size are included in the appendix of the Cluster Studies report.

3.3 Conclusions

- To achieve a high level of CO_2 emissions savings a combination of energy generation technologies will be required.
- Different combinations of technologies are appropriate for different sizes of developments.
- The cost of the optimum solution (in £/m^2 of development) decreases as the developments increase in size.

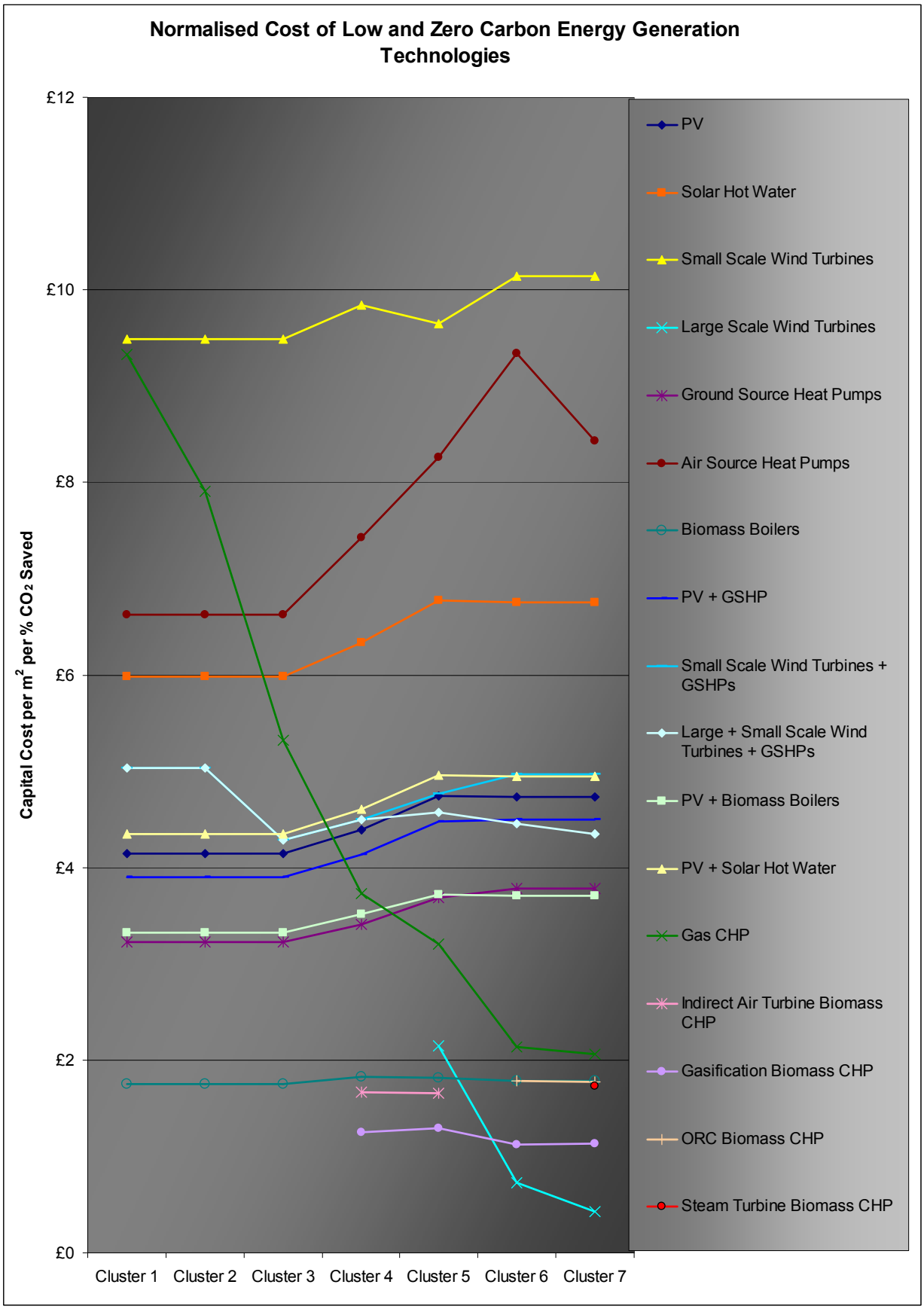

Figure 3: Normalised cost of low and zero carbon energy generation technologies

4 Pilot Sites

4.1 Introduction

The Pilot Site Study (Document DOC3) builds on the Cluster Analysis and assesses the most cost effective means of compliance with the CO_2 saving requirements of Ashford's CS10 policy for five sites characteristic of development coming forward in the Ashford Growth Area. The five Pilot Sites include Urban Extensions, an Urban Greenfield site and a Town Centre site as summarised in Table 2 below.

Pilot Site	1	2	3	4	5
Type	Mixed use	Mixed use	Residential	Mixed use	Mixed use
Location (CS10 definitions)	Urban Extension	Urban Extension	Urban Greenfield	Town Centre	Urban Extension
Minimum onsite CO_2 reduction	30%	30%	30%	20%	30%
Number of dwellings	2,600	2,600	600	300	600
m^2 of non-residential	90,000	6,000	0	17,000	5,000

Table 2: Details of the five Pilot Sites

For each site two principal scenarios were modelled:

1. Minimum CO_2 saving scenario: to meet minimum on-site CO_2 emissions reduction required by CS10.
2. Maximum CO_2 saving scenario: 100% on-site CO_2 emissions reduction

4.2 Conclusions

An analysis of the upper and lower boundaries of compliance with CS10 shows that in some instances different investment choices need to be made depending on the extent to which the carbon fund is used to make up any short fall.

Although investigating the detail of such tipping points is not possible without a robust strategy for the 'Ashford Fund', the results of the Pilot Studies are useful in that they provide an indication of the cost differential between meeting minimum and maximum targets. These results are shown in Table 3 below:

	Cost of achieving CS10 minimum CO_2 Reductions	**Cost of achieving CS10 maximum CO_2 Reductions**	**Cost differential between minimum and maximum CO_2 reductions**
Pilot Site 1	£5m	£35m	£30m
Pilot Site 2	£3m	£20m	£17m
Pilot Site 3	£2m	£9m	£7m
Pilot Site 4	£0.4m	£15m	£14.6m
Pilot Site 5	£1.3m	£8m	£6.7m

Table 3: Comparison of costs for achieving CS10 requirements

	Minimum CO_2 reduction scenario			Maximum CO_2 reduction scenario			
	Fabric Improvement	Biomass Boiler	Large Wind	Fabric Improvement	Gasification CHP+ heat network	Large Wind	PV panels
Pilot Site 1	✓	×	✓	✓	✓	✓	✓
Pilot Site 2	✓	×	✓	✓	✓	✓	×
Pilot Site 3	✓	✓	×	✓	✓	×	✓
Pilot Site 4	✓	✓	×	✓	✓	×	✓
Pilot Site 5	✓	✓	✓	✓	✓	✓	✓

Table 4: Technology combinations for most cost effective technology scenarios for achieving CS10 requirements

Further details of the most cost effective technology combinations required to achieve the CO_2 reductions can be found in Section 9 of the Pilot Site Study (Document DOC3).

- The most cost effective means of meeting the minimum level of compliance with CS10 for all five Pilot Sites is shown to be through fabric improvements and the installation of biomass boilers and/or large scale wind turbines.
- There is a significant cost differential between the minimum and maximum CO_2 reduction scenarios.
- The most cost effective means of providing 100% mitigation of the CO_2 emissions is through fabric improvements and a combination of biomass gasification CHP, large scale wind turbines and/or roof mounted PV panels.

The Pilot Studies report (Document DOC3) gives full details of the results for all 5 Pilot Sites and also includes suggestions for the phased implementation of renewables for each site.

Based on current data biomass gasification CHP appears to be the most attractive renewable CHP technology. This is because biomass gasification CHP achieves the highest electrical efficiency of all the biomass CHP technologies, allowing a higher reduction in CO_2 emissions to be achieved without heat dumping.

There are potentially significant benefits to be gained from connecting existing buildings to a new heat network or linking together the heat networks on the various development sites. The Pilot Site Study highlights the benefits of implementing this strategy, in particular in the town centre, which is characterised by high load densities, all year demand for cooling and constrained opportunities for installing renewable technologies.

5 Stakeholder Consultation

5.1 Introduction

The Stakeholder Consultation report (Document DOC4) report sets out the aims, approach and findings of the stakeholder consultation process for the Sustainable Energy Study. At the core of the stakeholder consultation were two workshops where the Sustainable Energy Study was presented to and discussed by planners, policy makers, building control, utility companies, development agencies, sustainable energy companies, landowners and developers.

5.2 Consultation Aims and Methods

Our work on stakeholder consultation had four aims:

1. To present the range of options identified in our research to key stakeholders, including planners at local and county level.
2. To explain the key characteristics of each of the range of options and explore the implications of each
3. To collate and evaluate feedback on the range of options
4. To report stakeholder feedback on the range of options to the client group

5.3 Summary of Stakeholder Feedback

Following the workshops, all of the feedback was collated and analysed. In this process five key themes emerged. The feedback from both workshops has been summarised below according to these themes.

- Co-ordination of opportunities by facilitating wide area district energy schemes
- Creating an understandable incentive and regulation structure
- Underwriting demand for services
- Showing leadership in promoting carbon abatement technology
- Formulation and ongoing review of an overarching energy strategy

Further details on the Stakeholder Consultation can be found in the Stakeholder Consultation report (Document DOC4).

6 Delivery Options

6.1 Introduction

The key findings of the technical work completed are that:

- The minimum and maximum requirements for on-site renewables stipulated in CS10 can be technically achieved for sites of all scales through combinations of renewable technologies
- The costs of meeting requirements reduce as the scale of the development increases
- To achieve the maximum CO_2 reduction, the most cost-effective technologies require heat networks
- The extent to which developers install on-site renewables beyond the CS10 minimum will be determined by the buy-out price of the Ashford Fund

In the light of these findings, and Arup's experience delivering low carbon and carbon neutral developments and consultation with stakeholders, we have concluded that an Energy Services Company (ESCo) would be a suitable delivery mechanism for coordinating and implementing sustainable energy in Ashford.

6.2 An Ashford ESCo

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.

Establishing an 'Ashford-wide Energy Services Company (ESCo)' would enable the 5 key challenges highlighted through our work and stakeholder consultation to be addressed:

1. Co-ordination of opportunities by facilitating wide area district energy schemes
2. Creating an understandable incentive and regulation structure
3. Underwriting demand for services so as to encourage investment
4. Showing leadership in promoting carbon abatement technology
5. Energy strategy

How each of these issues relates to the context of this study and how each would be addressed by creation of an ESCo is analysed in full detail in the Delivery Options report (Document DOC5). An Ashford ESCo could be operated by Ashford's Future or a new Special Purpose Vehicle (SPV).

6.3 Options for ESCo Management

There are 3 options for how the ESCo could be managed by Ashford's Future or a SPV set up for this purpose:

Option 1: Ashford's Future 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

6.4 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

6.5 Recommendations for Further Work on Delivery Options

The following 5 steps are recommended for future work:

- Undertake a Commercial Review of the Management Options for the provision of sustainable energy in the Borough
- Examine the technical and financial viability of the proposals to create a Borough-wide ESCo as part of a comprehensive business plan
- Develop an Ashford Energy Masterplan including; Geographic heat mapping, 'Optimistic' & 'Pessimistic' build-out programmes, identification of compatible technologies and high-level financial feasibility testing, including affordability to consumers
- Resolve the Detail of the Ashford Fund in particular the intended consequences of the Fund, the price (or price formula) of the fund and strategies for using the fund.