

SALDEN CHASE
OUTLINE PLANNING APPLICATION

Energy Strategy

Prepared by Fulcrum Consulting in partnership with

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SALDEN CHASE

ENERGY STRATEGY REPORT

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1 EXECUTIVE SUMMARY

1.1 This report explains the findings from a detailed analysis of the proposed development at Salden Chase and the ability to achieve both the current Aylesbury Vale District Council's (AVDC) energy related planning policy and the likely future targets for CO₂ emission reductions that are expected to be included in the Building Regulations over the build programme. A number of different scenarios have been presented, based on micro-generation and community energy alternatives, looking at how the tightening of energy related national regulations over the build out timescales will affect the decision making. The scenarios illustrate the solutions likely to be applicable to the development at Salden Chase and conclude that:

- all responses to the currently declared national trajectory towards 'zero carbon' will also meet the AVDC planning policy requirement;
- a micro renewable based approach is only likely to be cost effective in the earlier phases (those that require a Building Regulations application before the Government's declared 'zero carbon' requirement comes into force in 2016);
- a community based approach is technically feasible for the whole development or for the latter phases only (allowing the early phases to be serviced via micro-renewables); and
- the most cost effective solution long term is likely to be one which absorbs the energy demands of the early phases into a community based system rather than marooning them. However, to counter this, the advantages of flexibility and cashflow may mean that a micro-renewables based approach for the earlier phases is still the most advantageous overall for the consortium.

1.2 The document also outlines the significant current uncertainty surrounding the mechanisms for delivering zero carbon through the Building Regulations vehicle. Given this uncertainty and the current lack of precedent within the industry over which solutions will represent a robust response to evolving policy, combined with the need to facilitate flexibility due to current market conditions, the consortium's approach has been to allow the final decision regarding the micro or macro approach to the earlier phases to be made at a later date by instead identifying a number of preferred energy strategy options.

2 INTRODUCTION

2.1 Fulcrum Consulting are advising the Salden Chase consortium in assessing the potential for proposals at Salden Chase to meet current AVDC energy related planning policy (Policy CS9) together with the anticipated, periodically tightening, requirements of future Building Regulations over the proposed build-out schedule. It is the current Government's stated ambition that all new dwellings should be 'zero carbon' from 2016, with non-domestic buildings following from 2019. This report is focused primarily on issues relating to energy and infrastructure, specifically in the context of incipient regulatory requirements and the wider concerns of Sustainable Development.

2.2 As an illustration of the complexity of the issue, Figure 1 below shows the various policy targets that the Government have announced to-date. With the

consortium’s need to firm up proposals for an outline planning application in this current arena of political uncertainty, Fulcrum’s role is to provide guidance as to the direction of policy and indicate the solutions most likely to represent a robust response in the long term.

Carbon Emissions from Buildings

Current timeline to Zero Carbon

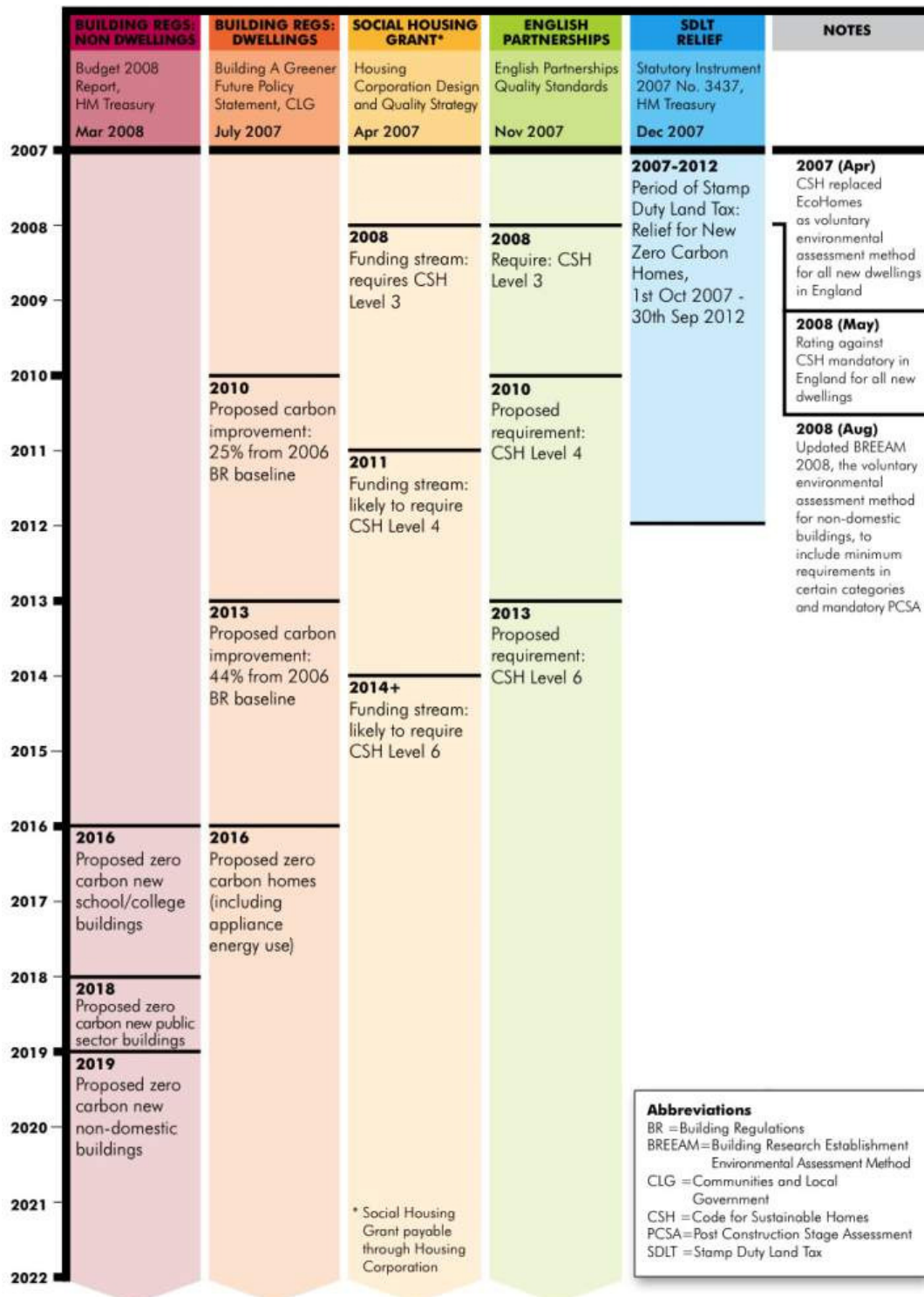


Figure 1: Zero Carbon Policy Timeline

3 DRIVERS FOR CONSIDERING SUSTAINABLE DEVELOPMENT

3.1 Sustainable Development is often defined as:

'Development that meets the needs of the present without compromising the ability of future generations to meet their own'

This definition is often referred to as the Brundtland definition and was first published in a report by the 1987 United Nations World Commission on the Environment and Development (WCED) entitled 'Our common future'.

3.2 The reality of anthropogenic climate change and the threats that it poses to our way of life are now almost universally accepted, from politicians in the highest level of office to the private individuals that ultimately make-up the target market for new development. While it is important to remember that true sustainable development covers a much broader spectrum of issues than just climate change, climate change is arguably the most pressing concern.

3.3 In response to the growing scientific and popular consensus on the need for action Governments around the world are moving to put legislation in place designed to ensure that future development is more sustainable.

THE BUILT ENVIRONMENT

3.4 Energy consumption associated with the built environment is estimated to be responsible for anything up to 50% of Greenhouse Gas (GHG) emissions in industrialised countries. As such, many nations are beginning to focus on the built environment in an attempt to achieve significant emissions reductions.

NATIONAL POLICY

3.5 In 2006 the Department for Communities and Local Government consulted on proposals to increase the requirements of Building Regulations in England and Wales in 3-yearly steps en route to eventually requiring all new dwellings to be 'zero carbon' from 2016. Since 2006, a raft of new policies have been announced aimed at supporting the achievement of this target and further improving the sustainability of future development in England and Wales.

3.6 Key policies – which are explained more fully in the Planning Statement that accompanies the Salden Chase application - are outlined below in sections 3.3 through 3.4.1:

PLANNING POLICY STATEMENT 1 (PPS1)

3.7 PPS1 sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system and it states that:

'Sustainable development is the core principle underpinning planning'

3.8 The PPS covers areas of Social Cohesion & Inclusion; Protection & Enhancement of the Environment; Prudent use of Natural Resources; Sustainable Economic Development; and Integrating Sustainable Development in Development Plans.

3.9 It goes on to lay out how planning authorities should seek to deliver sustainable development through the various regional and local policies they develop.

Planning and Climate Change Supplement to PPS1

3.10 The Planning and Climate Change Supplement to PPS1 outlines how planning, in delivering new development and the associate infrastructure, should help to lower GHG emissions and improve adaptability and resilience to a changing climate. In particular, it provides regional and local planning authorities with Key Planning Objectives¹ and decision-making principles to be used when constructing their spatial strategies.

Planning Policy Statement 22 (PPS22) – Renewable Energy

3.11 PPS22 outlines Government guidance for planning authorities on the use of different renewable energy generating technologies and how planning authorities should consider the opportunity for incorporating these technologies into new development.

Building Regulations and Zero Carbon

3.12 The original timeline to ‘zero carbon’ proposed in the ‘Building a Greener Future’ consultation document is shown below:

Date	2010	2013	2016
Carbon Improvement as compared to Part L 2006	25%	44%	‘True zero carbon’
Equivalent energy/carbon standard in the Code	Code Level 3	Code Level 4	Code Level 6

Table 1: Timeline to ‘zero carbon’ as proposed in *Building a Greener Future*

3.13 The consultation document stated that ‘Zero carbon means that, over a year, the net carbon emissions from energy use in the home would be zero’.

3.14 In the 2009 pre-budget speech the Chancellor outlined an ambition to see ‘zero carbon’ new non-domestic buildings from 2019 with schools and public buildings being zero carbon earlier, in 2016 and 2018 respectively.

3.15 Subsequently there have been a number of different definitions of ‘zero carbon’ used by Government for different purposes. Recently this culminated in a further consultation entitled ‘The Definition of Zero Carbon Homes and Non-Domestic Buildings’ which solicited views on a unified definition of ‘zero carbon’ for the built environment.

3.16 The proposals focused almost entirely on the domestic sector and outlined a hierarchical approach to the definition, requiring high levels of energy efficiency, followed by a degree of on-site mitigation before allowing sites that were unable to mitigate their total predicted carbon emissions on-site to utilize a variety of ‘allowable solutions’ that included various off-site options. This is illustrated in Figure 2:

¹ See PPS1:
<http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement1.pdf>

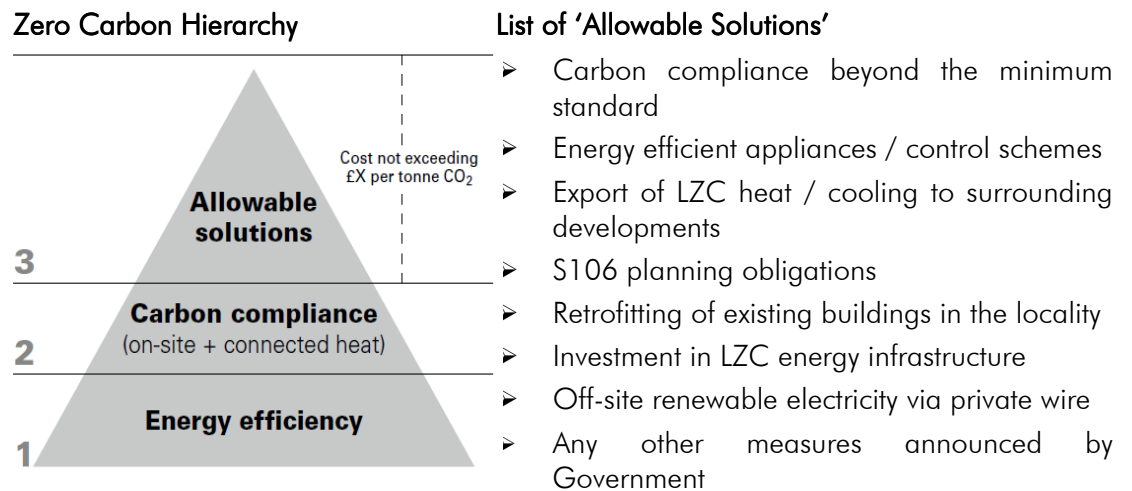


Figure 2: 'Zero Carbon' Hierarchy as outlined in "Definition of Zero Carbon Homes & Non-Domestic Buildings"

Recent Further Consultations

- 3.17 Shortly after the recent consultation on the definition of 'zero carbon' closed CLG released a consultation on proposed changes to the Government's Standard Assessment Procedure (SAP), the calculation tool used to predict the carbon emissions from dwellings and judge compliance with Part L of the Building Regulations. Then, after the opening of the SAP consultation CLG began to consult on proposed changes to Part L for 2010, the first step on the Building a Greener Future timeline toward 'zero carbon', widely expected to be a 25% reduction over Part L 2006.
- 3.18 The outcome of these two most recent consultations will have a fundamental impact on the way developers achieve compliance with the Building Regulations. The consultations closed in September 2009, but a final decision on the new standards is not expected until April 2010 and the new regulations are due to come into force in October 2010.

Recent Ministerial Statement

- 3.19 In July 2009, following the close of the zero carbon consultation, the Minister of State for Housing and Planning issued a written Ministerial Statement on the definition of 'zero carbon' outlining further details on what will be required in the eventual definition:
- **Energy efficiency:** No further details were given regarding the energy efficiency standard that will be required. It was acknowledged that no suitable standard currently existed and a new task group was established to make recommendations. This work concluded in late 2009 and the proposals are currently out for consultation under the Code for Sustainable Homes consultations which run until May 2009.
 - **Carbon compliance:** The level of carbon compliance was set at 70% of regulated energy, based on the assumptions used in the consultation document².

² The assumptions used in the consultation document were not compatible either the 2006 Part L methodology or the proposed 2010 approaches.

- **Allowable solutions:** While the statement highlighted some of the solutions that had received popular support during the consultation, no further details were given on how the allowable solutions will be administered.

Implications for Salden Chase

- 3.20 The current programme for delivery of the proposed development spans the regulatory timeline set-forth in Building a Greener Future³ and beyond the target dates set for zero carbon buildings. The fact that the standards will inevitably change almost constantly as the proposals are designed and built out over the next 20 years increases the importance of long-term planning and providing a flexible solution. Decisions regarding the energy solutions for the earlier phases, where standards are lower, must be made in the knowledge that they could affect the ability of later phases to meet their currently unknown / unspecific targets in a cost effective way.
- 3.21 In relation to this it can be noted that the consortium's focus on achieving optimised land value for all partners across the overall delivery timescale is likely to influence the ultimate choice of solution.

REGIONAL & LOCAL POLICY

- 3.22 Policy CS9 in the Aylesbury Vale District Council Core Strategy document submitted for public comment June 10 – July 22 2009 outlined the following requirements that will be applicable to Salden Chase:
- an expectation that development will meet or exceed minimum national/regional sustainable construction standards and where minimum standards are not met, evidence will be required as to why this is not feasible and/or viable; and
 - that at least 10% of the site's energy requirement must be met from decentralised and renewable or low carbon sources. Again, where this is not proposed the Council will require evidence as to why it is not feasible and/or viable

Implications for Salden Chase

- 3.23 With regards to the expectation that development should meet or exceed minimum national/regional sustainable construction standards the Planning and Climate Change Supplement to PPS14 states that regional and local planning requirements set above national standards should be based on evidence demonstrating a local ability to go further. Where evidence of such opportunities exist Planning Authorities are expected to provide advice to developers in order to help them realise these opportunities. We are not currently aware of any such evidence in AVDC's Core Strategy and have therefore not considered any scenarios which exceed the national standards that are currently proposed.

³ Building a Greener Future:

<http://www.communities.gov.uk/documents/planningandbuilding/pdf/153125.pdf>

⁴ Supplement to PPS1:

<http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppsclimatechange.pdf>

3.24 With respect to the requirement that 10% of the site’s energy requirements must be met from decentralised and renewable or low carbon sources, it is very likely that this target will be achieved as a matter of course in achieving the minimum national standards described above.

4 APPROACH

4.1 The approach taken is to obtain the relevant planning policies and identify their requirements, calculate energy demand estimates for the development and investigate the various energy scenarios possible to meet the policy requirements.

ACCOMMODATION SCHEDULE

4.2 The 5,311 dwellings and 95,500 m2 of non-domestic floorspace have been split into appropriate policy windows in order that they can be assessed against the increasing carbon abatement targets that will be required by planning and building regulations.

Policy window	Year
1	2013 – 2016
2	2017 – 2019
3	2020 – 2027

Table 2: Defined policy windows

The assumed residential mix is shown below:

Type	Dwellings
1 Bed flat	132 – 2.5%
2 Bed flat	400 – 7.5%
2 Bed houses	797 – 15%
3 Bed houses	1,593 – 30%
4 Bed houses	2,124 – 40%
5 Bed houses	265 – 5%
Total	5,311

Table 3: Residential breakdown

POLICY ASSUMPTIONS USED FOR ANALYSIS

4.3 Due to the current uncertainty regarding the future requirements of Building Regulations over the next 20 years or so, a number of assumptions have necessarily been made in order to progress this analysis.

Building Regulations

4.4 The 2010 Building Regulations were widely expected to require a 25% reduction in predicted carbon emissions over 2006 standards. However, initial analysis of the proposals contain in the recent consultation has shown that, in most cases,

due to changes in the SAP model a Part L 2006 compliant building will still pass the proposed Part L 2010 requirements.

4.5 The consultation on the proposed updates to Part L considers two potential approaches to setting the Target CO₂ Emissions Rate (TER). Which approach will be taken, and the details of how this approach will be applied, will only be decided once the results of the consultation have been analysed. A final announcement on the 2010 requirements is not expected until April 2010. Therefore, in order to progress the analysis for Salden Chase the requirements of Part L 2006 will be used for the purposes of this report.

4.6 For future updates of Building Regulations the following targets have been assumed, based on the Building a Greener Future timeline and the Government’s stated aspirations for non-domestic buildings:

Policy Window	Dates	Domestic Target Reduction ⁵	Non-Domestic Target Reduction ⁵
1	2013 – 2016	44%	44%
2	2017 – 2019	‘Zero Carbon’ ⁶	100% ⁷
3	2020 – 2027	‘Zero Carbon’	‘Zero Carbon’

Table 4: Future policy assumptions

‘Zero Carbon’

4.7 The detailed requirements for each step of the hierarchy (see Figure 1) are not expected to be announced until the end of the year (see section 1.2.7).

4.8 In the absence of detailed requirements the following assumptions will be used:

➤ **Energy Efficiency**

It is assumed that dwellings in Policy Window 1 will employ Good practice energy efficiency measures, while the later policy windows will employ Very Good practice measures to satisfy national standards. The specifications referred to throughout this report are shown in Table 5 below:

Case Study Building Fabric and Efficiency Values	EE1 Good EE	EE2 Very Good EE
Wall U-value (W/m ² K)	0.20	0.15
Roof U-value (W/m ² K)	0.15	0.15
Floor U-value (W/m ² K)	0.20	0.15
Window & door U-value (W/m ² K)	1.6	1
Airtightness (m ³ /hr/m ²)	7	3
Heat Loss Parameter (W/m ² k)	1.2	0.8
Thermal bridging (y-value)	0.08	0.08
% low energy lighting	75%	100%
Ventilation type	Natural	MVHR AppQ
Window type	Double low-e	Triple low-e

Table 5: Energy efficiency standards used for analysis

⁵ Target reduction expressed relative to a 2006 gas-fuelled base-case

⁶ “Total carbon”: CO₂ emissions from all energy uses within the building, including appliance loads

⁷ Regulated energy only

➤ **Carbon Compliance**

Assessing a 70% reduction based on the calculation methodology used in the consultation document and referred to in the July 2009 Ministerial statement on the definition of 'zero carbon' would require a bespoke energy assessment model to be created which is beyond the scope of this report. Furthermore, it is considered unlikely that the final requirements will require projects to undertake such a task. Therefore, for the purposes of this report it has been assumed that the carbon compliance target is 70% of the regulated energy as defined under the Building Regulations 2006.

➤ **Allowable Solutions**

While it is recognized that the "cost cap" referred to in the consultation is not intended to be a capped cost above which developers would not be expected to go, it is assumed that it is the Government's intention that the allowable solutions scheme should be structured such that this is, on average, the maximum price paid by developers in order to mitigate emissions via allowable solutions. For this reason, the maximum price assumed in the impact assessment⁸ of £100kgCO₂/a for 30 years has been used for the purposes of this analysis.

5 ENERGY DEMAND CALCULATIONS

- 5.1 The baseline used to compare the CO₂ emissions savings for the various development energy strategies is based on the SAP2005 methodology used in Part L 2006 of the Building Regulations. SAP considers a notional dwelling's CO₂ emissions that are covered under Building Regulations – this is known as the Target CO₂ Emissions Rate (TER) – and compares them to the Dwelling CO₂ Emissions Rate (DER) calculated for the dwelling as designed. The DER reflects the energy saving measures built into the dwelling (e.g. efficient heating systems, low energy lighting).
- 5.2 The dwelling-types used to create the notional dwelling are shown in Table 3 above. The baseline calculation assumes that individual gas-fired boilers are used and electricity is supplied via the Grid.
- 5.3 The outline approach to energy supply for the development framework plan is:
- reduce energy demand to a minimum;
 - meet this demand as efficiently as possible; and
 - use onsite renewable and/or low carbon energy sources to supply a significant proportion of the developments requirements.
- 5.4 Reducing the demand first will reduce the amount of energy that needs to be supplied by renewable or low carbon sources
- 5.5 The established baseline CO₂ emissions for the overall development framework plan and the proposed emissions taking into account energy efficiency measures are shown in Figure 3, and again, separated by policy window, in Figure 4.

⁸ Definition of zero carbon homes impact assessment:
<http://www.communities.gov.uk/documents/planningandbuilding/pdf/1101260.pdf>

5.6 From Figure 4 it can be seen that Policy Window 2 represents a significantly lower overall demand than Policy Window 1 and Policy Window 3, but that the balance of energy use is roughly similar in all three windows.

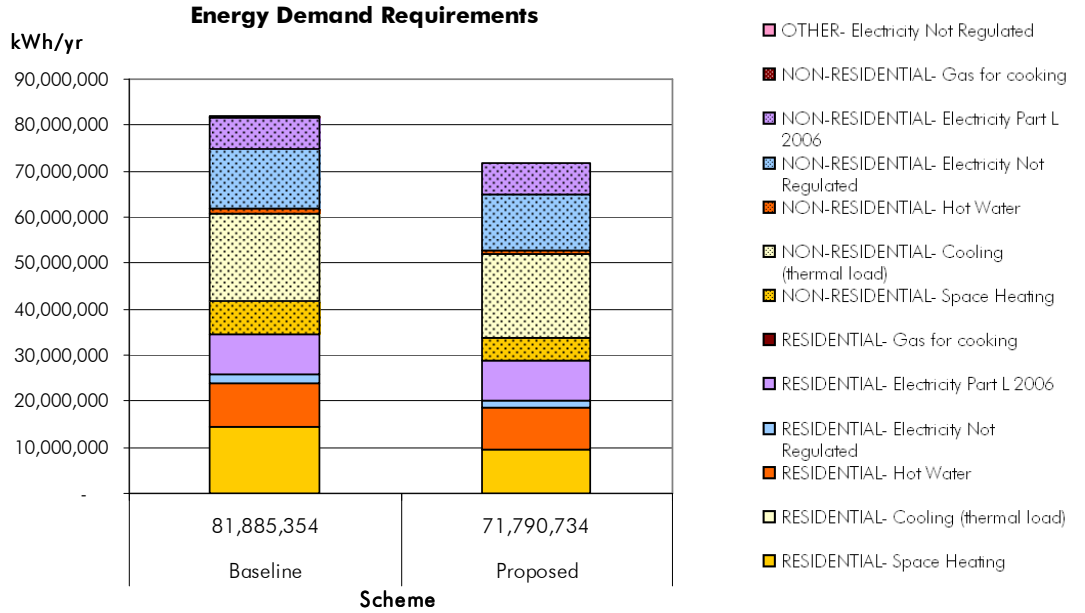


Figure 3: Total predicted energy demand – Baseline vs. Proposed

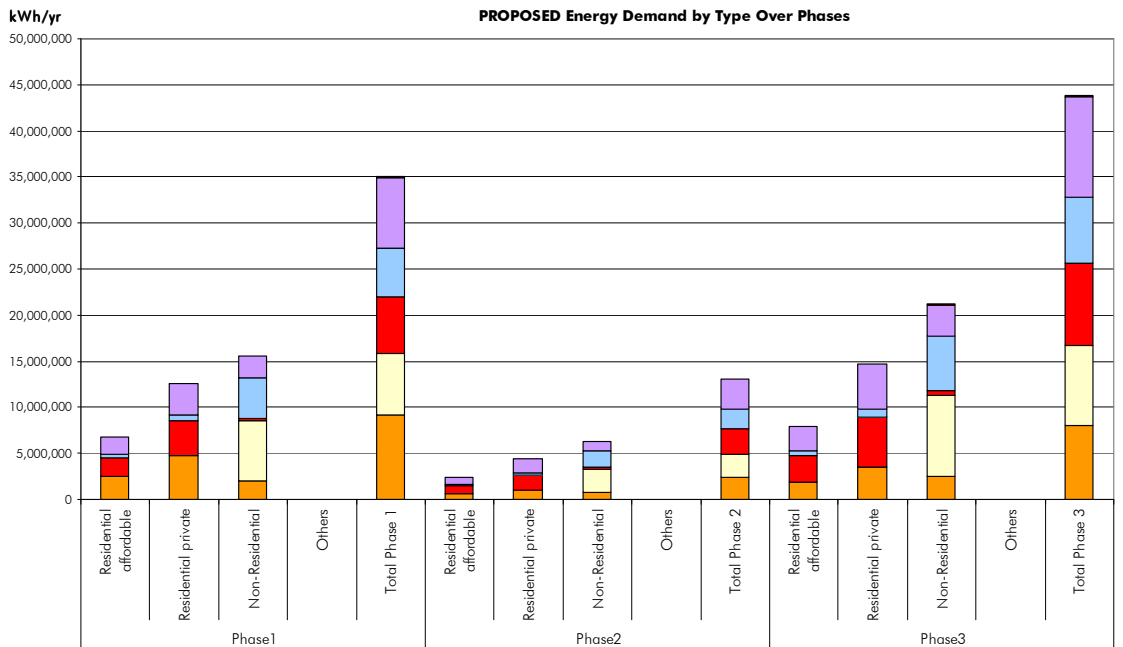


Figure 4: Energy demand by policy window

6 TECHNOLOGY CONSIDERATIONS

6.1 The following low carbon and/or renewable energy technologies have been used in the analysis:

- solar thermal (ST);
- photovoltaics (PV);
- biomass boilers;
- combined heat and power (CHP);
- air Source heat pumps (ASHP); and
- ground source heat pumps (GSHP)

6.2 While it is likely to be possible for each of these technologies to individually achieve the AVDC DS9 policy (for 10% of the site’s energy requirements to be met from decentralised and renewable or low carbon sources), past experience in this type of analysis has shown that such technologies used in combination are more likely to achieve optimum deployment of the overall potential of the site to reach Government targets that are likely to be in place by the time construction begins.

6.3 The list of technologies investigated is not exhaustive but represents a reasonable selection for the development based on the potential of the site; the consortium aims and objectives; and our experience of similar projects and which solutions are tending to illustrate the best response to viability issues in the low carbon agenda.

6.4 The technology combinations have been selected taking into account the energy profiles for the site and the building service requirements for the particular type of energy being generated. The principles of this are shown in Table 6, which illustrates that not all low and zero carbon technologies can meet all energy requirements. The main differentiating factor is those technologies that produce heat and those that produce electricity, although in some instances further restrictions occur.

Energy	Use	ST	PV	Wood	Wind	CHP	ASHP	GSHP
Heat	Hot water supply	✓	✗	✓	✗	✓	? ⁹	? ¹⁰
Heat	Space heating (or for cooling)	✗	✗	✓	✗	?	✓	✓
Electricity	Lights, pumps and fans (Part L regulated); small power and appliances (Non-regulated under Part L)	✗	✓	✗	✓	✓	✗	✗

Table 6: Energy Supply Options

⁹ ASHP can supply hot water but normally with a lower efficiency.

¹⁰ GSHP can supply hot water but normally with a lower efficiency.

6.5 Table 7 below outlines further considerations that are relevant in relation to the choice of technology for a particular situation.

Technology	Considerations	Applicable to Salden Chase
Wood-fuelled biomass boilers	Energy centre(s) Greater space take than regular gas boiler Twin-lined flue Fuel store and access for delivery O&M requirements including ash removal Planning impact of flue Communal heat network Air quality considerations Ongoing cost of fuel	✓
PV (Polycrystalline)	Roof angle, orientation and shading Requires inverter and connection to distribution board Impact of panel on roof	✓
Solar Thermal (flat plate)	Roof angle, orientation and shading Pipe run to cylinder Individual twin coil DHW cylinder or communal system with metering issues Impact of panel on roof	✓
Wind turbine (Building mounted)	Requires inverter and connection to distribution board Noise concerns Output is heavily dependent on site, i.e. gable end or other suitable exposed site on building Industry research indicates that output is often negligible	✗
Wind turbine (Small stand alone)	Requires inverter and connection to distribution board Private wire network connection for CSH credits Noise concerns Output is heavily dependent on exposed site Public perception issues O&M requirements	✗
Wind turbine (Medium/large stand alone)	Requires connection to power distribution network (probably HV) Private wire network connection for CSH credits Noise, radar, flicker and ecology concerns Output is heavily dependent on exposed site EIA and separate planning application O&M requirements	✗
CHP	Energy centre Greater space take than regular gas boiler In most authorities it only counts as renewable if biomass fuelled O&M requirements (including ash removal if biomass fuelled) Planning impact of flue Requires connection to power distribution network Communal heat network	✓

Technology	Considerations	Applicable to Salden Chase
ASHP (Air heat source pump)	Low temperature heating system Current calculation methodology gives undue benefit to ASHP systems, but this 'loophole' is expected to be addressed in the next update to Building Regulations. Can require supplementary systems for extremes of temperature	✓
GSHP (Ground source heat pump)	Greater space take than regular gas boiler Vertical boreholes or external space required for horizontal loop Low temperature heating system Current calculation methodology allows GSHP to emit significantly more carbon than non-electric systems Heat network and energy centre for communal system Can require supplementary systems for extremes of temperature Uncertainties over output in practice	✗

Table 7: Technology Considerations

6.6 Detailed analysis of the available roof space for solar technologies will be undertaken at detailed design stage when roof plans are available. At this stage it is important to note the following issues for development framework plan development in order to maximise the opportunity for roof mounted solar technologies should a solar approach be one of the preferred options:

- on flat roofs, panels need to be tilted for optimum performance. Due to over-shading only approximately 1/3 of the plan roof area is useful;
- on pitched roofs, a south facing pitch of between 30° to 35° is most suitable; and
- apartment buildings may not be suitable for solar thermal implementation as there is likely be insufficient available roof space to meet the total heat demand and there are potential issues with internal connections.

6.7 Wind turbines have not been considered in detail primarily as they are less suited to urban areas (their output being affected by potentially lower and more turbulent wind flows). Furthermore, an assessment of potential turbine siting within the site using rules of thumb for spatial constraints has indicated that there are no locations within the curtilage of the site where turbines of an efficient size could be safely located.

6.8 Ground source heat pumps have not been considered in the options analysis as they typically need significant suitable ground area for effective implementation and performance is variable dependant upon geological conditions.

7 COMMUNITY OR INDIVIDUAL SERVICING APPROACH

7.1 There are two main approaches to servicing large developments such as that proposed for Salden Chase:

- Micro/Individual Servicing
In this approach, individual units receive their own dedicated utilities connections. Individual heating devices are used to heat dwellings and

the owner or lease-holder takes responsibility for maintaining the equipment inside the dwelling. This is the most common approach used in the UK today with the electrical power delivered via the National Grid.

➤ Community Servicing

For a community based system, groups of buildings share generation equipment. Heating and in some cases cooling is distributed via district heat networks. Servicing multiple buildings with different uses, and therefore different demand profiles, can help to smooth out the overall demand profile, meaning that generation equipment can be operated more efficiently. Furthermore, centralised plant can be more easily upgraded in future, possibly for lower carbon alternatives, thus reducing the emissions of all buildings serviced by the network simultaneously.

- 7.2 Building Regulations and planning policies at every level are seeking to encourage more decentralised energy generation, and this is reflected in the reference to decentralisation in AVDC Policy CS9. Furthermore, the stretching targets for carbon reductions are making grid delivered electricity a much less attractive option as it currently has a high carbon content and therefore increases the amount of carbon that must be mitigated via more expensive Low and Zero Carbon (LZC) technologies such as PV. This can increase the build cost significantly.
- 7.3 When attempting to achieve the more onerous carbon targets, individual approaches to energy provision tend to add a significant cost. Overall industry conclusions and work carried out by Fulcrum indicates that a community-scale approach can be more cost effective in overall capital terms, although the upfront cost of installing the associated distribution network in the earlier phases can reduce the attractiveness in cash flow terms. Therefore a thorough financial assessment is recommended before a final decision is taken.
- 7.4 Furthermore, in a full community based approach the energy demands for the early phases can, if planned suitably, be used to improve the financial case for the later phases. For example, where development is due to take place either side of changes to the government targets, as is the case for Salden Chase, the earlier phases will have much less stringent targets to achieve. This might lead to a decision to meet the early phase targets via individual approaches. However doing so could potentially reduce the viability of a large-scale community approach being delivered at an unspecified time in the future, thus increasing the cost for the development overall. Spreading this additional cost equitably, particularly where multiple developers are involved in delivering the different phases, will need careful consideration. It is suggested that the process of finalising the optimum approach would if at all possible be conditioned until the details of the Government's Allowable Solutions scheme are available, such that at this stage a number of preferred options are identified within the development framework plan. The two approaches are discussed further in the following sections.

8 ENERGY STRATEGY ASSESSMENT

APPROACH

- 8.1 In order to develop a robust energy approach for the Salden Chase application a variety of options have been assessed, in order to demonstrate that the project is capable of achieving the potential policy targets in a number of ways and to demonstrate the issues accompanying each scenario.
- 8.2 As described in section 6 above, there are two main approaches to servicing a new development although these can sometimes be mixed to varying degrees based on the details of the proposals and the planned phasing schedule. The development timescale for Salden Chase spans three policy windows¹¹ and for each of these a selection of individual and community-scale scenarios has been assessed. These scenarios are outlined under each policy window in sections 8.1 to 8.3 below. It should be noted that where sizing figures are provided, these are current estimates of those needed to meet the anticipated Building Regulations targets and that all scenarios assessed will meet Policy CS9 as laid out in Aylesbury Vale District Council’s Core Strategy document.

POLICY WINDOW 1

Applicable Policy

Date	Percentage reduction over Part L 2006	
	Domestic	Non-Domestic
2013 – 2016	44%	44%

Strategies Assessed

- 8.3 During the early phases of the development, both non-domestic and domestic Building Regulations are expected to require 44% less CO₂ emissions than Part L 2006 standards. This level of reduction can generally be achieved by micro/individual solutions, such as solar thermal panels and photovoltaic cells.
- 8.4 Three ‘individual’ strategies were therefore selected, each containing a mix of technologies considered appropriate (as noted in Section 6) for cost effectively achieving the 2010 Part L 44% CO₂ emission reduction target and the AVDC 10% energy reduction target. These are outlined below, with technical summaries for each option available in the appendix.

Scenario 11 adopts good practice energy efficiency measures, with solar thermal panels for a renewable contribution to the production of hot water and photovoltaic panels to provide a degree of renewable electricity in order to meet the target. Whilst this is the simplest option on the face of it, PV in particular is among the most expensive renewable technologies. It should be noted that solar thermal technology may not be suitable for use in apartment buildings.


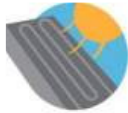
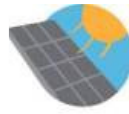

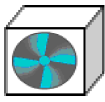



¹¹ See Table 4: Future policy assumptions

Scenario I2 uses good practice energy efficiency measures, air-source heat pumps to provide heating and hot water, with photovoltaic panels to provide a degree of renewable electricity.

Scenario I3 uses an enhanced level of energy efficiency to illustrate the fact that, as a result, significantly less renewable technology would be required. This scenario is able to meet the 44% reduction for both domestic and non-domestic buildings without the need for PV. However, the energy efficiency standards used for this are very ambitious and will therefore carry an increased build cost. Further economic analysis during detailed design would establish where the balance lies between energy efficiency measures and LZC generation technologies. In relation to this, CLG is expected to announce a mandatory minimum energy efficiency standard before the end of the year which is likely to be included in the 2013 update to the Building Regulations and this will also affect the final outcome.

For each of these scenarios it is important to consider the amount of suitable roof space and the development framework plan orientation issues noted in Section 6 above in relation to use of PV and solar thermal panels.

Summary of Strategies Assessed and Approximate Sizing Results

Micro/individual approaches sized to meet target			
I1	<p>Good energy efficiency</p> 	<p>Solar thermal:</p>  <p>4m²/dwelling 540m² non-dom</p>	<p>Photovoltaics:</p>  <p>7m²/dwelling¹²</p>
I2	<p>Good energy efficiency</p> 	<p>Air-source heat pump:</p>  <p>~7MW</p>	<p>Photovoltaics:</p>  <p>8m²/dwelling</p>
I3	<p>Very good energy efficiency</p> 	<p>Solar thermal:</p>  <p>2.7m²/dwelling</p>	

¹² This number assumes that all PV panels will be situated on residential dwellings. In reality, panels may also be placed on non-domestic buildings and other structures, reducing the amount of residential roof space required. Therefore this could be viewed as a worst case scenario.

Policy Window 1 Conclusions

- 8.5 A number of micro renewable solutions have been shown to achieve the AVDC energy reduction target and the national policy that is expected to be relevant for the early phases of the project. The final decision will be made during the detailed design phase, however an approach based on solar panels is considered most likely at this point.
- 8.6 There is also the opportunity to look instead at linking the early phases with the community energy strategy that is likely to be required for the later phases, to achieve longer term benefits (greater overall CO₂ and cost savings) whilst also meeting the appropriate targets. This will be addressed in more detail in the next stages of the design.

POLICY WINDOW 2

Applicable Policy

Date	Percentage reduction over Part L 2006	
	Domestic	Non-Domestic
2017 – 2019	'zero carbon'	100%

Strategies Assessed







- 8.7 For the second policy window, the carbon reduction targets are greater and therefore large amounts of renewables, particularly PV, would be required in order to meet the target. Therefore, due to the limitation of available roof area, together with the increasing cost burden of micro compared with macro based solutions, the micro solution has been discounted from policy window two and beyond.
- 8.8 For these later phases, with possibly more stringent carbon emission targets, community-based approaches start to become more sustainable. However, in this case, the scale of development planned for Policy Window 2 is not sufficient to support some of the centralised technologies that only work at a larger, district, scale.
- 8.9 However, to illustrate the scale of requirements, two community based options in Policy Window 2 have been investigated. The scenarios selected were sized to meet the latest government indication of the minimum on-site requirement only. For this analysis, the on-site target is assumed to be 70% for both domestic and non-domestic buildings. The remaining predicted CO₂ emissions will either need to be offset via the proposed 'allowable solutions' discussed in the policy section above or met with further on-site measures, which could include larger generation plant or supplementary PV panels.

Scenario C1 uses 'Very Good' energy efficiency standards, as by this point national policy is expected to have enforced minimum energy efficiency levels. It assumes that this part of the development is able to take advantage of a site-wide biomass-fuelled CHP installation to supply a percentage of the electricity and hot water demand of the development. All remaining heat demand would be met by centrally located gas boilers.

Scenario C2 utilises the same ‘Very Good’ energy efficiency standards but differs in the CHP and boiler fuel source. To meet the minimum national target with a gas based CHP solution, it would need to provide a significantly larger proportion of the overall load and be sized for the total base hot water load of the phase. A contribution from a renewable technology is still required in this scenario to reach the national target, so biomass has been used as the fuel supply for centralised boilers.

Summary of Strategies Assessed and Approximate Sizing Results

8.10 The following table outlines potential options for the carbon compliance (i.e. on-site) element of a centralised community approach for Policy Window 2:

Community approaches sized to meet target			
C1 (as part of a sitewide system)	Very good energy efficiency 	+  Biomass CHP: 225kW _e	+  Gas Boilers: 1,325kW _{th}
C2	Very good energy efficiency 	+  Gas CHP: 375kW _{th}	+  Biomass Boilers: 1,100kW _{th}

8.11 To illustrate the potential cost and scale of additional requirements in order to fulfil the remaining contribution to zero carbon for policy window two, three broad options are shown in Table 8 below:

Residual CO ₂ emissions	Allowable Solutions	PV	Optimised plant size
1,800t/a	£5,400,000	31,300m ² (£15,000,000)	500kW _e Biomass CHP 1,100kW _{th} Biomass boilers 8,600m ² PV

Table 8: Additional offsets options for policy window 2

A note on each is given below:

Allowable Solutions: Although the details of the Government’s allowable solutions scheme are yet to be announced, the impact analysis associated with the definition of zero carbon consultation used a maximum figure of £100/tCO₂/a, to be paid for 30 years. It is important to acknowledge that it is not the intention that the cost of applying allowable solutions should ever actually be limited, but it

is understood that, should it emerge that allowable solutions are regularly costing more than this figure and then Government will look to expand the range of options in order to reduce the cost. This given figure is therefore a very approximate indicator of the region of likely cost if an allowable solution option is taken. It should be noted that subsequent discussions over which allowable solutions are actually appropriate will happen in due course (once further confirmation is available from government) and will involve a wider assessment of commercial possibilities. A list of suggested allowable solutions is in the appendix.

Photovoltaic Panels (PV): The cost of PV is taken to be approximately £3,800/kW_{peak} and is shown here for comparison purposes only as it is unlikely that sufficient suitable roof space will be available.

Optimised Plant: The 'optimized / efficient plant size' option shown above indicates a suitable plant selection which has been optimised in relation to the heating and electricity demands of the development during policy window 2. This option exceeds the minimum requirement for on-site CO₂ reductions relative to Part L 2006, mitigating over 70% of the CO₂ emissions from the total energy demand of this phase. However it does not achieve current interpretations of the full 'zero carbon' target and therefore additional mitigation measures, such as PV or allowable solutions would still be required. Therefore an indication of the area needed for PV is also given for this option. It should be noted that of the two approaches investigated only C1 is suitable for this optimised approach and even in this case the size of biomass CHP to serve this element of the site alone is at the lower end of validity in terms of efficiency.

Policy Window 2 Conclusions

- 8.12 Micro-based solutions are not expected to compare well with community solutions in terms of viability if the expected requirement for zero carbon dwellings is in place by this point and have therefore not been assessed in detail for this stage of the project.
- 8.13 Community options based on biomass can meet the AVDC energy reduction target and the more stretching national policy target that are likely to exist by this point. A biomass boiler/gas CHP solution could meet the requirements as a stand alone solution for this phase, although it will not be as cost effective overall as a biomass CHP based solution that links with a site-wide approach for the remaining development.
- 8.14 Options have been given for the 'off-site' carbon mitigation measures that will be required to achieve zero carbon, illustrating that an optimised community system or use of the Government's Allowable Solutions proposals are likely to be the amongst preferred options. Given the uncertainty currently surrounding the definition of 'zero carbon' it is appropriate to allow flexibility within the scheme for either option at this stage. Allowances will be made within the development framework plan for the event that an optimised community solution is chosen.

POLICY WINDOW 3







Applicable Policy

Date	Percentage reduction over Part L 2006	
	Domestic	Non-Domestic
2020 – 2027	'zero carbon'	'zero carbon'

Strategies Assessed

- 8.15 By 2020, it is expected that Building Regulations will require all new domestic dwellings, and all new non-domestic buildings to achieve 'zero carbon' status. Due to the high electrical demand of non-domestic buildings, this means that significant quantities of electricity-only renewables will be required. Aside from large-scale wind, which requires a suitable site and has been discounted for this reason, PV is the only readily available mainstream electrical-only option; it is among the most expensive and again, available roof space will need to be assessed before a commitment can be made. Equally, this objective will need to be balanced against the aspirations of AVDC to have other components influence the external appearance and detailed layout of the development – as defined by the draft SPD for Salden Chase.
- 8.16 The scenarios assessed for this stage of the project are similar to those of Policy Window 2, namely biomass CHP with gas boiler back-up, or gas CHP with biomass boilers, both with 'Very Good' energy efficiency. It should be noted that the size of biomass CHP is at the lower end of validity in terms of efficiency and, as discussed throughout, a more robust approach would be to look for solutions that added to the critical mass of development applied to the community solution.
- 8.17 Under the application of the off-site, Allowable Solutions, element of achieving the target the same points apply regarding the potential for further carbon mitigation beyond the 70% minimum for each approach, i.e. only C1 would allow for further savings on site without the need for PV utilisation.

Summary of Strategies Assessed and Approximate Sizing Results

Community approaches sized to meet target			
C1	<p>Very good energy efficiency</p> 	<p>+</p>  <p>Biomass CHP: 600kW_e</p>	<p>+</p>  <p>Gas Boiler: 4,000kW_{th}</p>
C2	<p>Very good energy efficiency</p> 	<p>+</p>  <p>Gas CHP: 1,700kW_{th}</p>	<p>+</p>  <p>Biomass Boilers: 1,000kW_{th}</p>

8.18 As before, the scenarios outlined above are only sized to meet the minimum on-site requirement of 70%. The remaining CO₂ emissions will need to be mitigated either via allowable solutions, or by further on-site measures such as larger plant or PV panels.

8.19 The required additional offset figures for policy window 3 are shown in Table 9 below:

Residual CO ₂ emissions	Allowable Solutions	PV	Optimised plant size
9,441t/a	£28,400,000	165,700m ² (£80,000,000)	1,700kW _e Biomass CHP 3,700kW _{th} Biomass boilers 78,400m ² PV

Table 9: Additional offset options for policy window 3

8.20 Again, the cost of mitigating all remaining emissions on site with PV is very high and almost certainly prohibitive; meanwhile, the optimized plant size scenario still achieves greater than the minimum on-site requirements, achieving a reduction of 70% of total carbon, but would require additional mitigation measures to achieve the full 'zero carbon' target.

Policy Window 3 Conclusions: Site-wide approach

8.21 Two community options have been assessed to indicate that this element of the development in isolation could meet the AVDC energy reduction target and the national zero carbon policy that is likely to be required for all buildings constructed after 2019.

8.22 However as discussed throughout, a larger, site-wide community approach, ultimately serving all phases of the development could achieve the required emissions targets in a more technically robust and capital efficient manner, though detailed cash flow projections would need to be created in order to properly ensure economic viability. The analysis conducted for this report suggests that 3.5MW of biomass CHP and 9.5MW_{th} biomass boilers could achieve the overall reduction target across all policy windows without the need to purge (i.e. waste) heat.

8.23 If gap-funding can be found to ease cash-flow concerns, from schemes such as the HCA's Low Carbon Infrastructure Fund, then this could prove to be a low capital cost solution. Furthermore, the potential for Energy from Waste (EFW) systems should be investigated as this could provide an additional source of income for the project as well as meeting additional targets for reducing waste to landfill and increasing the amount of decentralised energy.

9 DISCUSSION & CONCLUSIONS

- 9.1 Various potential strategies have been assessed for their ability to achieve the targets that are expected to be required over time at Salden Chase. All strategies shown are in compliance with the AVDC policy to achieve a 10% reduction in energy through use of low and zero carbon technology. However, there is also the requirement to comply with evolving national targets through changes to the Building Regulations. Some of the solutions that will be employed in meeting the national targets will almost certainly involve new and innovative techniques and technologies and it would not be appropriate to further refine the options presented here until the full details of future Building Regulations are released. The imminent 2010 update should provide some indication of the future approach to demonstrating compliance, but further significant changes to the methodology are expected in 2013 and 2016 in order to accommodate the zero carbon hierarchy.
- 9.2 The consortium has taken the approach of allowing within the development framework plan for a number of preferred options. The early phases are likely to be a micro renewable based solution, most likely with solar thermal and photovoltaic panels, with a community based system coming online once national targets have been refined, most likely to be through a biomass CHP based energy centre. It is thought likely that deployment of the government concept of the off-site 'allowable solutions' will also form part of the overall solution if the UK's current trajectory to zero carbon is maintained.

10 APPENDICES

SALDEN CHASE PROJECT DESCRIPTION

10.1 The outline planning application for Salden Chase will seek permission for the following:

“Outline planning application with all matters reserved except for access for a mixed-use sustainable urban extension for up to 5,311 mixed tenure homes (C3) to the south west of Milton Keynes, with the following:

- an employment area of 7.4ha including:
 - up to 31,200m² of employment floorspace (Classes B1a, B1b, B1c and B2);
 - utilities and renewable energy infrastructure (sui generis);
 - the relocation of a commercial recycling centre on a site of up to 1 ha (sui generis); and
 - a site for a household recycling centre on a site of up to 1 ha (sui generis);
- a neighbourhood centre of 5.25 ha including:
 - a reserve site for a railway station (sui generis);
 - up to a 5,500m² food retailing supermarket (Class A1);
 - up to 2,000m² (A1 retail, A2 financial and professional services, A3 restaurants / cafes, A4 drinking establishments and A5 hot food take aways);
 - up to 2,000m² small scale commercial (B1a and B1b) uses;
 - up to 274 of the mixed tenure residential units (C3);
 - utilities and renewable energy infrastructure (sui generis);
 - up to a 220m² Thames Valley Police one stop facility (sui generis); and
 - up to 11,250m² a community library (D1), private crèche (D1), community / religious worship / instruction facility (D1) and health (D1), leisure (D2);
 - two local centres and a small mixed use centre on a total of 1.78 ha including:
 - up to 2,435m² (A1 retail, A2 financial and professional services, A3 restaurants / cafes, A4 drinking establishments and A5 hot food take aways);
 - up to 2,420m² community facilities (D1), private crèches (D1) and health (D1), leisure (D2), an emergency / ambulance call point (sui generis);
 - utilities and renewable energy infrastructure (sui generis);
 - up to 90 of the mixed tenure residential units (C3);
 - up to 2,000m² small scale commercial (B1a and B1b) uses; and

- up to 700m² veterinary practice (sui generis);
- provision of 19 ha of land to provide education facilities (sites for four primary schools with ancillary early years provision and one secondary school with a post 16 facility);
- ground remodelling;
- 94.41 ha of multi functional green infrastructure including: parkland, sports and recreational facilities; play areas, wildlife areas, a range of strategic open spaces including new landscaping, a wildlife area, woodland, allotments; foul and surface water drainage networks (including SUDS and lakes);
- associated highway infrastructure (including two spur roads, primary streets, residential streets, pedestrian footpaths and cycle routes); and
- public transport infrastructure (including a community reserve site of up to 2 ha for a Park and Ride site for up to 500 vehicles) and car parking for all uses.”

Outside the remit of this outline application once we have feedback from the various transport authorities all off site work in MKC (Tattenhoe Roundabout) and in MKP (Bottledump Roundabout) will be dealt with via two separate planning applications and a possible negative Grampian condition on the AVDC application which will require the agreement of a Section 278 Highway Agreement/s from MKC and BCC.

SALDEN CHASE SUMMARY LAND USE BUDGET

Land Use	Area(Ha)
Primary Schools (4)	8.84
Secondary Schools (1)	10.04
Open Space (<i>Amenity and Informal</i>)	75.51
Playing Fields	19.17
Existing Woodland	0.29
Primary Streets	8.31
Park and Ride Site (<i>500 Spaces</i>)	2.00
Sub Total	124.16

Residential:		Density	Dwellings
Medium Density Residential	141.58	35	4,948
District Centre (Gross parcel area)	5.24	55	288
Local Centres (Gross parcel area)	1.78	45	78
Sub Total	148.60		5314

Commercial Floorspace:		Plot Ratio	Floorspace (m²)
Employment Area	7.41	0.42	31,122
District Centre (Gross parcel area)	5.24	0.4	20,960
Local Centres (Gross parcel area)	1.78	0.4	7,120
Community Site	0.39	0.5	1,950
Sub Total	7.80		61,152

TOTAL AREA	280.56
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INDEPENDENT STRATEGY 1: TECHNICAL SHEET

10.2 The development’s energy demand was estimated using energy benchmark data from SAP 2005 and CIBSE Part L. 2006. The strategy achieves 44% reduction from regulated energy.

Energy Efficiency

Good Energy Efficiency Standards								
Wall/ Floor U- value (W/m ² K)	Roof U- value (W/m ² K)	Window & door U-value (W/m ² K)	Airtightness (m ³ /hr/m ²)	Heat Loss Parameter (W/m ² k)	Thermal bridging (y- value)	% low energy lighting	Ventilation type	Window type
0.2	0.15	1.6	7	1.2	0.08	75%	Natural	Double low-e

Solar Thermal

10.3 All solar thermal panels are glazed flat-plate collectors, angled at 30% with a south-facing orientation. Typically 50% of the overall hot water demand is supplied by the collectors. The aperture area is an average which would vary depending upon the building’s orientation.

Residential

Total Number of Houses/Flats	1,887
Total Aperture area of solar collector, m ²	6,795
Average aperture area per dwelling, m ²	4
Hot water usage per dwelling (litres/person/day)	113
Annual solar output, kWh/yr	2,908,557
Fuel required from heater, kWh/yr	11,855,500

Non-Residential

540m² total non-domestic. This could be spread out where applicable to match the hot water load (e.g. schools).

Total m ² of Non-Residential	30,750
Total Aperture area of solar collector, m ²	540
Annual solar output, kWh/yr	187,585
Fuel required from heater, kWh/yr	2,443,355

Photovoltaic Panels

10.4 PV panels were considered only on the roofs of houses, at a 30% angle, and south-facing. The type of PV panel considered was poly-crystalline silicon.

Total Number of Houses	1,698
Total Aperture area of PV, m ²	14,000
Aperture area per house, m ²	8.25
S, Solar radiation ,kWh/m ² /yr	1,042
Ke, Module efficiency of conversion	12%
Qpv, electricity produced, kWh/yr	1,400,448

INDEPENDENT STRATEGY 2: TECHNICAL SHEET

10.5 The development’s energy demand was estimated using energy benchmark data from SAP 2005 and CIBSE Part L. 2006. The strategy achieves 44% reduction from regulated energy.

Energy Efficiency

Good Energy Efficiency Standards								
Wall/ Floor U- value (W/m ² K)	Roof U- value (W/m ² K)	Window & door U-value (W/m ² K)	Airtightness (m ³ /hr/m ²)	Heat Loss Parameter (W/m ² k)	Thermal bridging (γ- value)	% low energy lighting	Ventilation type	Window type
0.2	0.15	1.6	7	1.2	0.08	75%	Natural	Double low-e

Air Source Heat Pumps

10.6 The air source heat pumps were sized to provide 100% of the space heating and hot water required. The heat pumps were assumed to have a heating coefficient of performance (COP) of 3 and a hot water COP of 2.

Residential

Total Number of Houses/Flats	1,887
Total power rating of ASHP, MW	5.72
Hot water usage per dwelling (litres/person/day)	113
Annual ASHP output, kWh/yr	9,747,133
Fuel required from heater, kWh/yr	5,016,924

Non-Residential

Total m ² of Non-Residential	30,750
Total power rating of ASHP, MW	0.94
Annual solar output, kWh/yr	1,811,250
Fuel required from heater, kWh/yr	819,690

Photovoltaic Panels

10.7 PV panels were considered only at a 30% angle on the roofs of houses. This was because the roof area per flat was not considered of sufficient size. The aperture area is an average which would vary depending upon the building’s orientation.

Total Number of Houses	1,698
Total Aperture area of PV, m ²	16,000
Aperture area per house, m ²	9.42
S , Solar radiation ,kWh/m ² /yr	1,042
Ke , Module efficiency of conversion	12%
Q_{pV} , electricity produced, kWh/yr	1,600,512

INDEPENDENT STRATEGY 3: TECHNICAL SHEET

10.8 The development’s energy demand was estimated using energy benchmark data from SAP 2005 and CIBSE Part L. 2006. The strategy achieves 44% reduction from regulated energy.

Energy Efficiency

Very Good Energy Efficiency Standards								
Wall/ Floor U- value (W/m ² K)	Roof U- value (W/m ² K)	Window & door U-value (W/m ² K)	Airtightness (m ³ /hr/m ²)	Heat Loss Parameter (W/m ² k)	Thermal bridging (y-value)	% low energy lighting	Ventilatio n type	Window type
0.15	0.15	1.0	3	0.98	0.08	100%	MVHR AppQ	Triple low-e

Solar Thermal

10.9 All solar thermal panels are glazed flat-plate collectors angled at 30%. Typically 50% of the overall hot water demand is supplied by the collectors. The aperture area is an average which would vary depending upon the building’s orientation.

Residential

Total Number of Houses/Flats	1,887
Total Aperture area of solar collector, m ²	4,585
Aperature area per dwelling, m ²	2.7
Hot water usage per dwelling,lr/day	113
Annual solar output, kWh/yr	2,156,292
Fuel required from heater, kWh/yr	10,404,997

Non-Residential

Solar thermal panels were not required on the non-domestic buildings as the target was reached by residential solar thermal and energy efficiency measures.

Photovoltaic Panels

10.10 PV panels were not required in this strategy as the 44% target was reached purely by solar thermal and energy efficiency measures.

ALLOWABLE SOLUTIONS

- Carbon compliance beyond the minimum standard up to 100% of total energy
 - There may be circumstances when paying carbon compliance costs less than other allowable solutions to reach zero-carbon.
- Energy efficient appliances or advanced controls systems
 - This would require appliances used in the development to be of the highest possible standard at the time the home is built.
- Exporting LZC heat/cooling to existing properties
 - Depending on the location, there may be potential to export excess heat to surrounding, existing homes (that would likely have a higher heat demand) or non-domestic buildings (which may have a different demand profile) in the near-by area.
- Section 106 Planning Obligations
 - The Planning Policy Statement: *Planning and Climate Change* expects new developments to be planned to make good use of decentralised and renewable energy. S106 Planning Obligations provide a potential mechanism through which such infrastructure might be delivered. When such contributions are appropriate, it is right to consider them allowable solutions.
- Retrofitting EE measures to existing stock
 - Many schemes exist that currently support relatively easy energy efficiency measures being installed in existing stock. This allowable solution would be the installation of more difficult measures in existing homes which may involve a 'whole-house' transformation.
- Investment in low or zero-carbon (LZC) energy infrastructure (within UK and with 'benefits of ownership' passed to purchaser)
 - The developer buys a financial investment in LZC infrastructure and transfers this investment to the buyer of the zero-carbon home. The buyer should benefit from an income stream from this investment, so there is tangible benefit to owning a zero carbon home.
- Off-site renewable electricity via 'direct physical connection'
 - Currently the Government does not propose to count directly connected renewable electricity towards carbon compliance but this may be re-considered at a later date.
- Any other measures that Government might in future announce as being eligible
 - No such measures are currently planned however, the review proposed from 2012 could potentially lead to further allowable solutions being announced.

Schedule of Revisions

Issue	Date	Remarks	Prepared by	Checked by
A	06/11/2009	Consortium draft	Calum Thompson	Jules Saunderson
B	03/11/2009	Consortium draft with comments	Calum Thompson	Jules Saunderson
C	18/01/2010	Planning final Draft	Calum Thompson	Clare Wildfire
D	4/03/2010	Planning final	Calum Thompson	Jules Saunderson

Distribution	Name	Company
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