

REPORT FOR
Central Bedfordshire Council

**Review of existing evidence base and
recommendations for future local renewable
and energy efficiency policy**

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1. Purpose of the work

Central Bedfordshire Council is in the process of updating its evidence base to support the production of its forthcoming local plan. The Council has identified that the evidence base which supports energy policy requires review, because a number of legislative changes have taken place since the evidence study was done.

The existing evidence base was prepared by Cutland Consulting Ltd in 2014, building upon a previous study also carried out by Cutland Consulting Ltd in 2013. This new report reviews the evidence in the light of the above changes, and makes recommendations for aspects of an energy policy that might be included the new Central Bedfordshire local plan.

The current phase of this project was carried out during March-June 2016 by Cutland Consulting's director, Dr Neil Cutland.

2. Background

In early 2013 Central Bedfordshire Council consulted on its new Development Strategy for adoption in 2014. The Development Strategy was the main planning document for Central Bedfordshire, and set out several policies for development which were intended to be used to determine planning applications.

A key piece of enabling legislation is the Planning and Energy Act 2008, which until recently stated that a local planning authority (LPA) may require a proportion of the energy used in developments to be renewable or low-carbon energy, and/or may require that developments must comply with energy efficiency standards exceeding building regulations.

The Council had originally hoped to set a policy target for all new residential developments to achieve a minimum of 10% carbon dioxide emissions reduction as an improvement on the emissions standard set by the building regulations. Cutland Consulting Ltd report numbers C/128(rev1) and C/129 dated May 2013 explored alternative scenarios for achieving the 10% reduction in carbon dioxide emissions for a variety of on- and off-gas grid dwelling types. The conclusions were that the policy was viable, both technically and financially, using a variety of fabric-based as well as technology-based strategies.

As will be discussed in Chapter 3 of this report, in March 2015 the Government announced that the Planning and Energy Act was to be amended so that LPAs may no longer require housing developments to exceed the energy efficiency standards of building regulations. The ability of an LPA to require a proportion of energy to be from renewable or low-carbon sources, however, was to remain.

As a result, Central Bedfordshire Council decided not to set a policy target based on emissions reductions, but instead to consider a policy based on the proportion of energy provided from renewable or low-carbon sources. Cutland Consulting's report C/140, dated June 2014, presented a variety of modelled and costed scenarios based on delivered energy (as opposed to emissions), from which the Council concluded that a requirement to provide 10% of regulated energy from renewable or low-carbon sources in the locality of the development could be considered 'reasonable', in the terminology of the Act.

A subsequent loophole, also discussed in Chapter 3, means that a policy based upon energy efficiency standards and overall carbon emissions may be possible once again, although it is not recommended.

3. Government policy and legislative changes since June 2014

The timeline of relevant Government policy and legislative changes that have occurred since our 2014 report is as follows:

2014

June

- Carbon Compliance level of the expected Part L 2016 diluted to Code level 4.

2015

March

- Infrastructure Act 2015 included the enabling legislation for Allowable Solutions.
- Deregulation Act 2015 confirmed that the Planning & Energy Act 2008 to be amended by removing LPAs' powers to set energy efficiency standards for dwellings. Clarification from Oliver Letwin MP that the amendment will not take place until zero-carbon 2016 is in force. (Loophole thereby created in July 2015; see below.)
- Housing Standards Review abolished the Code for Sustainable Homes, except in legacy cases.
- Planning Update from Eric Pickles MP exempted small sites from the zero-carbon requirements of Part L 2016.

June

- Energy Bill proposed to abolish Renewable Obligation support for onshore wind energy one year early. (Received royal assent in May 2016.)

July

- Budget statement abolished the Climate Change Levy 'exemption' for renewable energy supplies with immediate effect.
- Productivity Plan 'Fixing the Foundations', HM Treasury, removed any intent to introduce Allowable Solutions or to increase on-site energy efficiency standards in 2016 or 2019, thereby abandoning the zero-carbon newbuild standard for both dwellings and non-domestic buildings. (This created a loophole regarding the amendment to the Planning and Energy Act; see above).
- Consultation response by DECC confirmed that Renewable Obligation support for solar farms up to 50MW to be ceased.
- Statement from Amber Rudd MP that Green Deal energy retrofit scheme was cancelled with immediate effect.

September

- Announcement that feed-in-tariff for domestic-scale PVs to be reduced from 12.8p to 1.6p/kWh (subsequently revised to 4.39p in December 2015).
- Consultation launched regarding business energy tax reform. Government intends to 'simplify' the Climate Change Levy (CCL), the Carbon Reduction Commitment Energy Efficiency Scheme (CRC), Climate Change Agreements (CCA), mandatory greenhouse gas (GHG) reporting, the Energy Saving Opportunity

Scheme (ESOS), Enhanced Capital Allowances (ECAs), and the Electricity Demand Reduction (EDR) pilot.

October

- Finance Bill added community energy to the list of technologies no longer eligible for Enterprise Investment Scheme relief.

2016

February

- House of Lords Select Committee on National Policy for the Built Environment recommended that Government should reverse its decision to cancel the zero-carbon homes policy and its decision to remove the Code for Sustainable Homes.

March

- House of Commons Select Committee on Energy and Climate Change recommended that Government reinstate the zero-carbon homes policy or set out similar policy to ensure new homes generate no net carbon emissions.
- Budget statement confirmed abolition of Carbon Reduction Commitment from 2019, with a 'corresponding increase' in Climate Change Levy income.

April

- Housing and Planning Bill amendment ('new clause 108') by the House of Lords attempted to reinstate the on-site Carbon Compliance element of the zero-carbon homes policy. Following a lengthy parliamentary 'ping pong' period the amendment was defeated.

The Planning and Energy Act 2008 - update

The Planning and Energy Act is such a key piece of legislation for local planning authorities that it is worth repeating the summary from our June 2014 report and bringing it up to date.

The Act states that:

1 (1): A local planning authority in England may in their development plan ... include policies imposing reasonable requirements for—

(a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;

(b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;

(c) development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations.¹

¹ <http://www.legislation.gov.uk/ukpga/2008/21/section/1>

During 2014 the Deregulation Bill (which received royal assent in March 2015) amended the Planning and Energy Act as follows:

In section 1 (energy policies), after subsection (1) insert—

“(1A) Subsection (1)(c) does not apply to ... the construction or adaptation of buildings to provide dwellings or the carrying out of any work on dwellings.”²

That amendment was accompanied by a Member’s explanatory statement which read:

Section 1(1)(c) of the Planning and Energy Act 2008 allows local planning authorities to require that buildings meet higher energy performance standards than those set out in building regulations. The new clause inserted by this amendment disapplies this for dwellings in England, as Government policy is that all such requirements should be set out in building regulations.

The intent was further clarified by a supporting note to a Written Ministerial Statement during the passage of the Bill:

We propose a ‘Building Regulations only’ approach, with no optional additional local standards in excess of the provisions set out in Part L of the Regulations.³

It therefore seemed clear in April 2014 that while local planning authorities could continue to require a “reasonable” proportion of a dwelling’s regulated energy (the energy usage corresponding to the carbon emissions that are regulated by Approved Document L1A) to be provided from renewable or low-carbon energy sources, they could no longer impose performance standards (including for energy efficiency) that are any higher than those in ADL1A.

However, during the third Commons reading of the Bill in June 2014, in response to an Opposition challenge, Oliver Letwin MP stated that:

...the decision on the commencement date for amendments to the Planning and Energy Act 2008, which restrict the ability of local authorities to impose their own special requirements, must be made in such a way that the ending of those abilities to set special requirements knits properly with the start of the operation of standards for zero-carbon homes and allowable solutions.⁴

At that time the 2016 zero-carbon homes standard was still Government policy. With the subsequent abolition of zero-carbon homes and allowable solutions in July 2015, however, the Letwin statement created a potential loophole whereby LPAs are actually still able to set

² <http://www.legislation.gov.uk/ukpga/2015/20/section/43>

³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291796/140313_Building_Regulations.pdf

⁴ http://www.publications.parliament.uk/pa/cm201415/cmhansrd/cm140623/debtext/140623-0004.htm#140623-0004.htm_spmi0

energy efficiency standards higher than those in ADL1A. The Government has remained silent on the matter since then.

Sources close to Government have suggested that the Government may turn a blind eye as long as LPAs do not specify energy efficiency standards that are any more stringent than Code level 4. If, on the other hand, LPAs start to specify higher standards, it will only take a simple Ministerial statement to close the loophole.

In our opinion it would be imprudent for Central Bedfordshire Council to exploit the loophole; a far safer approach would be to continue to set standards based upon renewable and/or low-carbon energy sources alone.

We would reiterate that in our opinion the wording of the Planning and Energy Act only allows policies to be set in terms of renewable and low carbon energy (loopholes aside). A policy framed in terms of energy efficiency or overall carbon emissions would in our opinion be open to challenge. We are not, however, concerned about the possible side-effect that providing a proportion of regulated energy from renewable or low carbon sources might lower the DER to levels in advance of building regulations; our thinking is explained on page 10 of our 2014 report, and for convenience is repeated in Appendix A of this report.

4. The relevance today of the 2014 report

The **technical assumptions** in Chapter 5 of the June 2014 report are still sound, including:

- the base case housetypes
- the SAP methodology (including version number)
- the carbon factors
- the decision to express the amount of renewable or low-carbon energy as a percentage of regulated, rather than total, energy/carbon.
- the '40% of ground floor area' constraint on PV panel area.

There is therefore no reason why the 2014 energy and carbon calculations need be repeated for the purposes of this new work.

The **financial assumptions** and the costing methods used previously are described in Chapter 6 of the June 2014 report. The major sources of cost data in 2014 were:

- 'Domestic low and zero carbon technologies', Energy Saving Trust publication CE317, 2010;
- 'Cost of building to the Code for Sustainable Homes – updated cost review', DCLG, August 2011;
- 'Research on the costs and performance of heating and cooling technologies', DECC/Sweett, February 2013;
- 'Changes to Part L of the Building Regulations 2013: Impact Assessment', DCLG, August 2013, and
- 'Cost analysis: meeting the zero carbon standard', Zero Carbon Hub in partnership with Sweett, February 2014.

For this report we carried out a search for more recent costs in the public domain, and would now add the following:

- 'Small-scale generation cost update', report for DECC ref.3514055A, Parsons Brinkerhoff, August 2015.

We conclude that the above sources represent the best and most up-to-date public data.

Importantly, the February 2014 report by the Zero Carbon Hub and Sweett noted that the additional costs of meeting zero-carbon had more than halved since 2011. It further noted that *"Our analysis shows a continuing reduction in the cost of meeting the Zero Carbon Standard for homes"* and *"It is likely that the relative costs of meeting the Standard for each house type will reduce further between 2014 and 2016 and continue to fall through to 2020"*.

Furthermore, the Association for the Conservation of Energy (ACE) recently stated in a parliamentary briefing, *"Before the Zero Carbon Hub's unfortunate closure on 31 March this year, a well-placed source there told us that today's costs in turn 'are dramatically lower*

than in 2014 due to the industry's greater proficiency at building energy efficient, low carbon homes'''.⁵

We have also spoken to a number of industry observers, who are generally agreed that the costs of energy technology have fallen since 2014. For example, one key player provisionally suggested that the cost of PV has fallen from the £1,500/kWp that we assumed in 2014 to £1,200/kWp today⁶.

The Parsons Brinkerhoff report forecast that the capital cost of small (up to 10kWp) PV systems in 2016 would be between £1,200 and £1,400/kWp, sliding downwards to a cost of £900/kWp for larger (250kWp) systems.

In our opinion the above documents and associated comments provide sufficient comfort that the costs presented in our June 2014 report can still be regarded as valid for the purposes of viability assessment. We can also say with some confidence that the costs are likely to be lower today than they were in 2014.

⁵ Parliamentary Briefing: New Clause 118 (subsequently 108) Housing & Planning Bill Report Stage House of Lords, ACE, 25 April 2016

⁶ Private communication, Solar Trade Association, April 2016,

5. Current Approaches to Sustainable Development

This chapter presents a summary of the commonest approaches to sustainable development which are attracting the interest of progressive planners, designers, builders and occupiers. Central Bedfordshire Council may wish to include selected approaches within its list of aspirations for developments, and/or include more detailed advice on selected approaches within its Design Guide.

5.1 Dwellings

Passivhaus is a low-energy standard focussed on reducing space heating demand significantly via insulation and airtightness. As a voluntary standard Passivhaus continues to attract interest in the UK, although with just 400 certified units completed (and 1,200 under development) the scale of take-up is two orders of magnitude lower than on the continent⁷. The new standards 'Passivhaus Plus' and 'Passivhaus Premium' also include the benefits of renewable energy supply. A study by the UK's Passivhaus Trust in January 2015 concluded that building to the Passivhaus standard incurs a 15-20% cost uplift compared to the energy standard of Code level 4, although a number of protagonists claim that it can be achieved at zero additional cost⁸.

AECB Silver is a voluntary standard operated by the Association for Environment Conscious Building. It takes a similar approach to Passivhaus but is set at a lower level; it is increasing in popularity with, notably, self-builders and social housing providers who 'do not feel quite ready' for full Passivhaus certification.

Home Quality Mark (HQM) is owned and operated by BRE. The HQM is a 1-5 star rating based upon a number of categories including energy and emissions, materials, indoor air quality, daylighting, internal space, water consumption, access to local amenities and purchase and maintenance costs. At the time of writing, the scheme has not been fully launched and there is some debate about the likely degree of take-up by major builders.

Interestingly, the provision of a home office space, which gained some credit in the Code for Sustainable Homes, is not part of the HQM. The ability to work from home is nevertheless a positive feature in principle, so the Council may wish to request that planning applicants address the issue.

Mitigation of summertime overheating is a major topic of conversation in the house building community at present. Recent work by the Zero Carbon Hub and the NHBC Foundation has highlighted the fact that the lightweight construction and airtightness of modern newbuild homes, compared to heavyweight, leaky older dwellings, can make them

⁷ Sources: Passivhaus Trust, Jan 2016, <http://www.passivhaustrust.org.uk/projects/>, NHBC Foundation, Dec 2012, <http://www.nhbcfoundation.org/Publications/Informing-the-debate/Lessons-from-Germanys-Passivhaus-experience-NF47>

⁸ <http://www.passivhaustrust.org.uk/UserFiles/File/Technical%20Papers/150128%20PH%20Capital%20Costs.pdf>

more susceptible to summertime overheating^{9,10}. There is even talk that the enthusiasm of low-energy designers for passive solar homes since the 1970s is now inappropriate.

Design versus as-built performance continues to be a significant issue. The zero-carbon building regulations were to be based upon as-built, rather than as-designed, compliance. In the lead-up to 2016, therefore, the NHBC Foundation and the Zero Carbon Hub carried out extensive research to highlight the scale of the problem and suggest solutions^{11,12}. With the abandonment of the zero-carbon homes policy the regulatory imperative is no longer present, but the problem persists.

The Zero Carbon Hub concluded that *“Expansion of the current evidence gathering process is required to increase understanding of the Performance Gap and disseminate findings and feedback to developers, industry and government”*, and that *“There remain conflicting views on the most commercially viable way to demonstrate a building’s as-built performance”*. We therefore suggest that it is too soon for Central Bedfordshire Council to request evidence of as-built compliance.

An ‘as-built EPC’ is already required by building regulations, but this is a theoretical calculation based on the as-built specification rather than measurements of actual performance in use.

5.2 Non-domestic buildings

The UK Solar PV Strategy (DECC, 2014) stated that the Government will *“work with planning authorities ... to cut red tape and sweep away barriers”* in order to *“achieve one million roof installations by the end of 2015”*. A major aspiration is to exploit the unused roofs of the UK’s commercial and industrial units. The status of this strategy is unclear in the light of the subsequent policy changes discussed in Chapter 3, but Central Bedfordshire Council may nevertheless wish to state its support for the strategy in principle.

Passivhaus applies to non-domestic buildings as well as dwellings, although it is far less widely used in the non-domestic sector than in housing. Several of the approaches below have a greater following than Passivhaus in the non-domestic sector.

BREEAM and LEED are rival third-party certification programmes focussed on holistic sustainability. Both BREEAM¹³ and LEED¹⁴ address the design, construction and operation of ‘green’ buildings. They aim to ensure that buildings are environmentally compatible and provide a healthy work environment. In the UK BREEAM has a long track record with developers, building owners and local planning authorities (including Central Bedfordshire

⁹ <http://www.zerocarbonhub.org/sites/default/files/resources/reports/ZCH-OverheatingEvidenceReview.pdf>, and related reports via <http://www.zerocarbonhub.org/current-projects/tackling-overheating-buildings>

¹⁰ <http://www.nhbcfoundation.org/Publications/Guide/Understanding-overheating-Where-to-start-NF44>

¹¹ <http://www.nhbcfoundation.org/Publications/Informing-the-debate/Low-and-zero-carbon-homes-understanding-the-performance-challenge-NF41>

¹² http://www.zerocarbonhub.org/sites/default/files/resources/reports/Design_vs_As_Built_Performance_Gap_End_of_Term_Report_0.pdf

¹³ Owned and operated commercially by BRE (UK)

¹⁴ Owned and operated by the not-for-profit US Green Building Council (USA)

Council). Quantifiable standards can be set, with certification at levels such as ‘Good’, ‘Excellent’ and ‘Outstanding’. LEED is predominantly used in the USA, but has its proponents within the UK whose preference is based upon the detail of exactly what is assessed, and how.

Health, wellbeing and productivity (incl. WELL). The benefits to employers of providing a pleasant and healthy working environment in terms of workforce wellbeing (and hence improved absenteeism, productivity and staff retention), are compelling. Staff costs can comprise typically 90% of business operating costs, so even a modest improvement or deterioration in health or productivity can have huge financial implications for the company. Recent work by the World Green Building Council and others has produced a consensus that the phrase ‘green building’ should be redefined to more strongly incorporate social welfare.

The US ‘WELL’ standard is a recent initiative that focuses solely on the health and wellbeing of building occupants. It identifies 100 performance metrics, design strategies, and policies that apply to all stages of a building’s life cycle. It is based on thorough scientific and technical review, and includes a process of on-site assessment and performance testing by a third party leading to formal certification.

Climate change resilience and adaptation, in addition to energy and emissions reduction measures, is a core part of many corporations’ activities. Marks and Spencer, for example, set standards for their new developments which include thermal mass, solar shading, planting to improve the microclimate, permeable parking surfaces and enhanced storm water swales. When appropriate, specific M&S buildings have been built on stilts, have been surrounded by flood walls and earth bunds, and have incorporated reflective roofs and covered car parking spaces to reduce local overheating.¹⁵

Post-occupancy evaluation (POE) is all too infrequently undertaken. Only by assessing the occupied performance of a building can problems be rectified and lessons be learnt for future developments. Anecdotally, a review of occupied non-domestic buildings in 1997 revealed that the three commonest issues were (i) lighting systems not being operated as intended, (ii) heating and cooling systems that ‘fight’ each other and (iii) Building Energy Management systems not being set up properly – and exactly the same results were found in a review of ESOS reports by the Carbon Trust in 2016¹⁶. This indicates that there is still a pressing need to carry out POE.

Making the business case for green buildings could arguably be described as a formal approach to sustainable development in itself, since financial sustainability is one of the ‘three pillars’ of sustainability. However, it is quite clear that all of the other approaches above (low-energy design, broad environmental sustainability, health and wellbeing, climate change resilience and post-occupancy evaluation) each have very direct financial implications themselves. Our preference, therefore, is to consider financial aspects within the adopted approach, and *not* to describe ‘making the business case for green buildings’ as a standalone approach.

¹⁵ Private communication, Marks and Spencer’s Property ‘Plan A’ Project Manager, March 2016

¹⁶ Private communication, Acclaro Advisory (Carbon Trust consultants), May 2016

5.3 Cross-sector

The **National Planning Policy Framework** states that local planning authorities should “adopt proactive strategies to mitigate and adapt to climate change”, “plan for new development in...ways which reduce greenhouse gas emissions”, “actively support energy efficiency improvements to existing buildings” and “when setting any local requirement for a building’s sustainability, do so in a way consistent with the Government’s zero carbon buildings policy and adopt nationally described standards”. LPAs should also “help increase the use and supply of renewable and low carbon energy”, “have a positive strategy to promote energy from renewable and low carbon sources” and “design their policies to maximise renewable and low carbon energy development”.

Clearly the statement on zero-carbon buildings no longer applies, since the policy no longer exists. Whilst the statement concerning energy efficiency improvements does not apply to newbuild (hence could not be said to override or contradict 2015’s changes to the Planning and Energy Act), consequential improvements might nevertheless form part of Central Bedfordshire Council’s local plan.

The NPPF also states that LPAs should “help increase the use and supply of renewable and low carbon energy”, “have a positive strategy to promote energy from renewable and low carbon sources” and “design their policies to maximise renewable and low carbon energy development”. Central Bedfordshire Council’s 10% policy is fully consistent with this aim.

There are a more cross-sector approaches that are effectively encouraged by Government policy (including within the National Planning Policy Framework), such as **heat networks** and **smart grids**. Our understanding is that Central Bedfordshire Council sees little likelihood that developments in its area will include such infrastructure initiatives, but nevertheless the Council should consider whether it wishes to include mention of them within the local plan.

BREEAM Communities, a development of BRE’s earlier ‘Sustainability Checklist for Developments’, is a methodology to measure and improve the sustainability of mixed, large-scale developments. This holistic standard assesses environmental, social and economic sustainability, providing a framework for collaborating on key masterplanning issues. It is designed to be used by developers, planners and communities, and according to BRE can be applied through planning policy. BREEAM Communities is worthy of consideration by Central Bedfordshire Council.

6. Recommendations

6.1 Dwellings

1. Local planning authorities may still set mandatory standards for a reasonable amount of regulated energy to be provided from renewable or low-carbon sources. We are confident that the calculations which underpinned the Council's 10% policy in 2014 are still valid today, and we therefore recommend that this policy remains in place.

2. Central Bedfordshire Council is minded to include selected approaches to sustainability and energy efficiency within its list of aspirations for housing developments. The Council might request that planning applicants include a description of their intended approaches to the following:

- fabric improvements (and the Council could also clarify that it would not object if the mandated 10% energy reduction were achieved, at the applicant's discretion, via fabric improvements rather than renewable or low-carbon energy sources)
- resident comfort (indoor air quality, peak temperature control, daylighting)
- overall building quality and the environmental impact of the construction materials
- adaptation/resilience to climate change (eg. sustainable urban drainage systems)
- provision of home-working facilities
- ensuring as-built performance (although the Council cannot realistically expect to receive evidence of as-built performance, as discussed in section 5.1).

3. The Council could also include a discussion of the concept of consequential improvements, and offer to signpost interested planning applicants accordingly. The Council might consider if it should allow the mandated 10% energy reduction to be achieved, at the applicant's discretion, via consequential improvements to the same or another property – although there could be significant 'policing' implications.

4. Self-builders are often at the 'enthusiastic' end of the energy/sustainability spectrum, yet may not always have the necessary knowledge or skills to put their aspirations into practice. The Council might therefore offer a service to put such applicants in touch with like-minded architects/designers and builders.

5. We recommend that the Council includes within its Design Guide a suitable level of detail on the following approaches that have been discussed in Chapter 5:

- Passivhaus
- AECB Silver
- Home Quality Mark (HQM)
- mitigation of summertime overheating¹⁷
- design versus as-built performance.

¹⁷ The SAP contains a simple procedure which indicates the risk of overheating, and models such as Passivhaus Planning Package include more detailed overheating calculations. The Council may wish to state, for example, that for dwellings it would expect the SAP-based risk to be "not significant", but in order to avoid possible liability issues the Council should avoid setting more detailed, quantified targets.

The actual details that should be incorporated will be different for each of the approaches that the Council ultimately chooses to include, so cannot be specified here.

6.2 Non-domestic buildings

1. We understand that Central Bedfordshire Council already sets standards for non-domestic buildings in terms of BREEAM levels. In 2012 Cutland Consulting Ltd contributed energy expertise to a viability study carried out for the Council by Three Dragons. We believe that Three Dragons study included the viability of setting BREEAM standards, and the Council may wish to re-visit that work to bring it up to date.

2. The Council could also consider focusing on energy rather than the wider standard that is BREEAM. The effective abolition of the energy efficiency clause of the Planning and Energy Act applied only to dwellings, so a local planning authority is still free to set overall energy consumption standards for non-domestic buildings (even though the zero-carbon newbuild standard for non-domestic buildings was abolished along with that of housing).

No modelling of non-domestic energy scenarios was carried out for our 2014 report, but in principle Central Bedfordshire Council should be able to set quantitative standards for energy performance using the BER/TER emissions methodology of Approved Document L2A¹⁸. For consistency with the previous housing policy, for example, a reduction of 10% in the BER might be mandated.

Detailed modelling of non-domestic buildings is outside the scope of this report, but we have carried out an approximate exercise for a variety of buildings using energy benchmarks and other data that is in the public domain. The results are presented in Appendix B; the broad conclusion is that 10% of the fossil-thermal energy of the buildings can be provided by PVs at a cost between £21-75 per m² of floor area depending upon building type. *These figures are helpful as indicators, but full modelling must be carried out using a recognised software package, for different technological scenarios, before they can be considered robust enough to defend policy.*

Regarding the extra capital cost of a 10% policy for non-domestic buildings, the Council may feel comfortable in arguing that the extra cost per m² of its 10% RE/LCE housing policy will be no higher in non-domestic buildings due (for example) to the economies of scale when larger roof areas are clad with PVs. Another source of capital costs is the 2009 DCLG consultation on policy options for zero-carbon for new non-domestic buildings, which included some information on extra-over costs using Approved Document L 2006 as the starting point (but at 2010 prices) to achieve 54% efficiency improvements; it may however be too challenging to work these costs back to a 10% improvement. It is also unlikely that the work has been updated since 2009.

Central Bedfordshire Council may also have appropriate cost figures at its disposal in the 2012 Three Dragons report.

¹⁸ AD L2A mandates that the BER/TER calculation is carried out using the Simplified Building Energy Model (SBEM) where possible, otherwise another software tool approved by Government.

Upon consideration, it seems unwise for the Council to argue simply that housing viability implies non-domestic viability. It would be considerably more robust to undertake an explicit modelling and costing exercise for a variety of new non-domestic buildings, on which a more defensible viability decision could be based.

3. The Council could state its in-principle support for the UK Solar Strategy, and work with developers to ease the inclusion of building-mounted PVs via its planning process.

4. The Council could request that planning applications include a description by the applicants of their intended approaches to the following:

- Fabric improvements
- Health and wellbeing
- Overall building quality and the environmental impact of the construction materials
- Climate change adaptation/resilience
- Post-occupancy evaluation (POE).

(Arguably the first four bullet points would already be covered if a BREEAM certificate were issued.)

5. We recommend that the Council includes within its Design Guide a suitable level of detail on the following approaches that have been discussed in Chapter 5:

- Passivhaus (non-domestic)
- The differences between BREEAM and LEED
- The WELL standard

The actual detail that should be incorporated will be different for each of the approaches that the Council ultimately chooses to include, so cannot be specified here.

6.3 Cross-sector

1. The Council could encourage mixed development planning applicants to consider the provision of low- or zero-carbon infrastructure (district heating, CHP, etc). Such projects often run into technical or financial issues associated with the phasing of the development, and LPAs can play a significant role in coordinating and helping to resolve the issues.

2. The Council could encourage (or possibly even require) mixed development planning applications to undergo a BREEAM Communities assessment.

3. The Council should consider a two-level approach to the evidence required from planning applicants. For example:

- at pre-application or outline planning stage the applicant might be required to provide descriptive evidence such as their intended approaches to sustainability or their design philosophies.
- At reserved matters or full application stage the Council might require firmer proof of their intent, such as assessment certificates, scheme membership details, written internal policies, CSR reports, case studies, etc.

Appendix A: 10% of what?

Extracts from Cutland Consulting report C/140, June 2014, concerning dwellings:

The base case dwelling type data was transcribed into NHER Plan Assessor v. 6.0 software, which contains a Government-approved implementation of SAP v. 9.92 (aka. 'SAP 2012').

We recorded the total regulated energy (known in SAP terms as "delivered" energy) with its breakdown by space heating, water heating, etc.

The calculation sequence was applied in a systematic way which enabled us to explore a variety of scenarios for providing *10% of the regulated energy* from renewable and low carbon energy.

Note that there is no 'official' method for calculating the percentage of renewable or low carbon energy; it is not displayed by any compliance tool in the way that, say, the SAP rating is, and different methods have been used by different local authorities under the Merton rule. The method that is used in this study is both technically sound and politically defensible.

When studying the figures ... it is important to realise that there are several complex interactions at work. For example, when solar technology is added until 10% of the regulated (delivered) energy is from renewables, this *in itself* reduces the delivered energy and the DER of the dwelling. Hence the calculations can become recursive, endlessly 'chasing their own tail' without converging on an answer. In order to avoid this complication we added the technologies until the delivered energy was reduced by 10% with respect to the *baseline* (ADL1A-compliant) dwelling.

This does not mean that the Council is specifying a DER lower than the TER (which would be against Government policy), even though that may appear to be the case from some of the figures. The method is nothing more than a technique which enables us to evaluate the amount of a technology that is needed to meet the 10% target.

Appendix B: outline non-domestic buildings calculations

The table overleaf shows approximate results that have been calculated using benchmark energy consumption figures and other public domain data. The sources and assumptions are shown in the table.

Note that electrical energy has been excluded, on the grounds that it is too sensitive to occupancy class to be meaningful at this level of analysis. For example, a single speculatively-built unit might be occupied over its lifetime by an office, a shop, a healthcare centre and a small manufacturing facility, all of which would have different process loads as well as heating loads¹⁹.

¹⁹ To alleviate this problem, ADL2A contains the concept of an assumed 'asset rating' as well as an in-use 'operational rating'; the Council could in principle adopt the same approach.

Building type	Fossil-thermal typical benchmark kWh/m2/yr	Typical floor area m2	Total fossil-thermal kWh/yr	10% of fossil thermal kWh/yr		kWp of PV needed to provide the 10%	Approx cost of PV £		Approx cost of PV per m2 floor area	m2 of PV	Assumed no. of storeys	Hence approx roof area m2	% of roof area occupied by PV
Source/ assumption:	'Energy demand benchmarks', DECC, Nov 2104 (based on CIBSE TM46, 2008)	'(AJ) Metric Handbook' 3rd ed., Littlefield, 2008				875 (kWh/yr)/kWp (EST website)	1,500	£/kWp (CBC 2013, 2014 and 2016 reports)		0.70 m2/kWp (CBC 2014 report)			
General office	120	3,000	360,000		36,000	41	£ 61,714	£ 21		29	3	1,000	2.9%
Large non-food shop	170	12,500	2,125,000		212,500	243	£ 364,286	£ 29		170	1	12,500	1.4%
Small food store	170	140	23,800		2,380	3	£ 4,080	£ 29		2	1	140	1.4%
Hotel	330	13,500	4,455,000		445,500	509	£ 763,714	£ 57		356	5	2,700	13.2%
Fitness / health centre	440	6,500	2,860,000		286,000	327	£ 490,286	£ 75		229	1	6,500	3.5%
School	150	12,000	1,800,000		180,000	206	£ 308,571	£ 26		144	2	6,000	2.4%
Workshops / light industry / warehouse / distribution	180	20,000	3,600,000		360,000	411	£ 617,143	£ 31		288	1	20,000	1.4%

Note: these figures are indicative only. Detailed modelling must be carried out, for a range of technological scenarios, before the figures can be considered robust enough to defend policy.