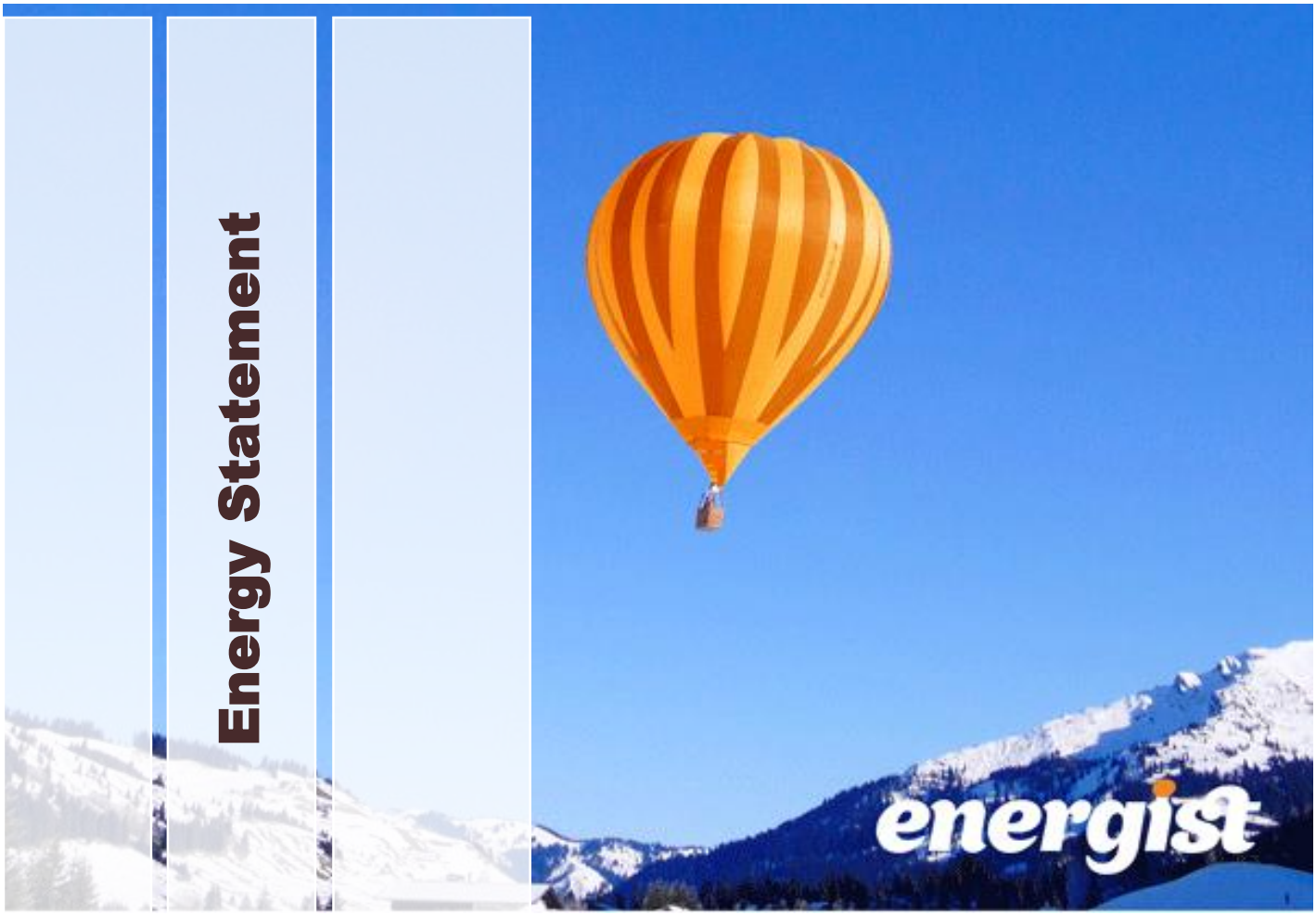


# Mushroom Farm
# Trimley St Martin
# IP11

*from Energist UK*

*Version 2*

*November 2014*

**Head office**: Energist House, Kemble Enterprise Park, Glos. GL7 6BQ
**Tel**: 08458 386 387
**Fax**: 08456 432 232
info@energistuk.co.uk
www.energistuk.co.uk

# PAGE 2 CONCLUSIONS

***Outcome of Calculations***

The following statement shows how the proposed development by Taylor Wimpey (East Anglia) at the site Mushroom Farm, Trimley St Martin can meet the planning requirement of the local authority by showing:

- A carbon emissions reduction over Part L 2010 using a Fabric First approach

This is in line with the requirements of the Section 106 agreement (Schedule 4, Part 2, Paragraph 3.1.1)

Following a review of the most feasible options available in this case, the developer proposes to reduce the site wide reduction in energy use by building to an enhanced construction method.

The use of lower U-Values and building fabric specifications, as well as high efficiency lighting, heating and ventilation systems will all play their part in reducing the expected energy use, thereby cutting carbon emissions and running costs.

## CONTENTS



*Individual Part L SAP reports can be made available on request.*

| (see box 272 of SAP Worksheets) | ENERGY kWh | ENERGY % | EMISSIONS kgCO2 | EMISSIONS % |
|---|---|---|---|---|
| Building Regulations Part L Compliance | 583,053.0 | 0.0% | 111,209.0 | 0.0% |
| Proposed scheme after Fabric Energy Savings | 533,181.5 | 8.6% | 101,386.1 | 8.8% |
| Proposed scheme after onsite renewables, low carbon technology and CHP | 533,181.5 | 0.0% | 101,386.1 | 0.0% |
| Proposed scheme offset for financial contribution | 533,181.5 | 0.0% | 101,386.1 | 0.0% |
| Savings shown from all above measures | 49,871.5 | 8.6% | 9,822.9 | 8.8% |

# INTRODUCTION

***Executive Summary***

Taylor Wimpey (East Anglia) has appointed Energist UK to create this report, which examines the potential feasibility of a carbon emissions reduction over Part L 2010 using a Fabric First approach.

This requirement applies to the 65 dwellings (a mix of dwellings from two to five bedroom homes) at:

**Mushroom Farm,**
**Trimley St Martin**

The development should be constructed in line with the emission rates outlined in Approved Document Part L 2010, and all plots should be designed to use less than 105 litres of water per person per day.

This Energy Statement has been written in accordance with the planning requirements of Suffolk Coastal District Council.

More information about planning requirements and restrictions can be found on the councils own website:

**www.suffolkcoastal.gov.uk**

This document will use the latest Part L approved calculation methods to compare the available savings in carbon emissions, kilowatt hours and fuel bills through the use of a selection of fabric improvements, and changes to the building services.

A step-by-step approach has been taken to ensure clarity within this study, and plot-by-plot conclusions have been produced to show detailed accuracy of how the authority's anticipated reduction is being adhered to.

***Smallprint***

All calculations in this document are based on the Standard Assessment Procedure (SAP) version 9.90 as used for the 2010 Building Regulations.

It is important to realize this document is not a design tool and should be used for guidance only. The content is intended for the use of our client and the council planning department only, bearing in mind the advice contained therein is based on Government approved methodology which is itself only a design tool. Results should not be taken as a definite answer.

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***Amendments***

Where Energist UK has made alterations, inclusions or amendments to this document, a brief summary of all changes will be lodged here:

**Version 1: Original document.**

**Version 2: Updated site layout**

# CONTEXT

***The Need for Energy Statements***

Energy Statements - or Feasibility Studies – are becoming ever more popular with planning departments throughout the United Kingdom, as Government targets ensure energy saving and carbon emission reductions are considered in all parts of the country.

This requirement works alongside current mandatory Building Regulations (Part L) which can show large improvements on a dwellings SAP Calculation and Energy Performance Certificate (EPC) rating.

Many larger developments are also required to comply with the Code for Sustainable Homes (CSH) – again this is a requirement which varies from region to region. The introduction of some types of renewable and low carbon technologies can meet a higher number of CSH Credits, giving a better overall rating.

There is an additional argument to suggest the enforcement of renewable technology is not the only answer, as improved building design and fabric can reduce the overall energy demand without the need of using such technology.

Most planning departments will encourage the use of both techniques, and suggest enhanced building fabric is considered BEFORE the energy reduction is required.

This was known in the London Plan as '**Be Lean, Be Clean, Be Green'**.

***Be Lean, Be Clean, Be Green***

In order to reach these challenging, yet achievable, energy reduction targets, *an 'Energy Hierarchy'* has been defined to help developers, building designers and property owners contribute towards sustainable dwellings.

**BE LEAN - Use less energy**

A dwelling can be designed to use less energy through enhanced construction fabric, better heating controls and optimizing solar gains.

**BE CLEAN – Supply energy efficiently**

It is possible to receive energy for a building which is seen to be a cleaner alternative than standard means. For example: the use of Combined Heat and Power systems (CHP) or the use of renewably-focused electricity tariffs.

**BE GREEN – Use renewable technology**

It should be encouraged that as much energy as practically and financially possible should come from zero and low carbon sources.

This Energy Statement will be covering these three areas in more detail as the calculations and feasibilities are measured.

### *Legitimate Calculations*

There are several ways and interpretations of the best approach to take in order to show the conclusions of an Energy Statement, and there is currently no nationally approved method or accreditation body managing the content produced.

It is the responsibility of the individual planning departments to confirm the calculations shown in reports such as this are legitimately assessed.

Energist UK has based both the baseline assessment of the sample plot and all energy-saving calculations on the Standard Assessment Procedure (SAP) Methodology for domestic builds.

This is the only Government sanctioned way of ensuring the calculation techniques used are based on information as approved by the Secretary of State.

Energist UK confirms that all calculations in this document have been completed to the best of the assessor's ability.

If you have any queries or comments regarding this document, you can contact the creators directly:

Authors of this report:
**Rhiannon Edwards**

Energist UK contact details:
**Telephone: 08458 386 387**
**Fax: 08456 432 232**

**Address: Energist UK, Building 11, Kemble Enterprise Park, Kemble, Glos, GL7 6BQ**
**RhiannonE@energistuk.co.uk**

## CONTEXT

### *The Future*

The future of Energy Statements is likely to be always one step ahead of the current Part L Building Regulations.

As the UK moves closer to achieving a zero carbon standard, the variance between Building Regulations and Energy Statements is likely to decrease.

From April 2014, Approved Document Part L has been revised for all new development in England.

This update includes a lower Target Emission Rate, a new, mandatory Target Fabric Energy Efficiency, and additional requirements concerning raising awareness of how to make the most out of efficient systems once they are installed in a building.

A further re-write is scheduled in 2016, when regulations will start to come into force requiring new build developments to be built to a zero-carbon standard.

In 2018 all newly constructed Government owned buildings will also need to meet this zero standard. Finally, all remaining new buildings will need to achieve this requirement from 2019 onwards.

With such steep targets in place, additional ways of improving efficiency of buildings in the current day are seen as a vital approach to getting builders, developers and the end home-users more familiar with the latest energy efficiency technology.

# REGULATED vs UNREGUALTED ENERGY

***Definitions and Changes***

Sometimes, an Energy Statement is required to show 'unregulated' energy savings, as well as 'regulated'. The only other instance where an 'unregulated' calculation is completed is for assessing whether a particular dwelling is truly 'Zero Carbon' by current definitions.

**What Is Regulated Energy?**

This is exactly what it sounds like: it is the energy used by systems governed by Building Regulations. These include space heating, water heating, ventilation and lighting – the basics of a modern house.

All SAP and SBEM assessments, as well as EPC certificates, are calculated using regulated energy use only.

**What Is Unregulated Energy?**

This is everything that falls outside of Building Regulations. Televisions, kettles, hairdryers, ovens – all the appliances and devices the occupier adds themselves.

In the interest of practicality, these appliances don't fall under Building Regulations.

**Is there a future for Unregulated Calculations?**

In the current definition of Zero Carbon homes, both types of energy consumption need to be offset by renewable sources; while in the Zero Carbon Hub's 2016 proposals, unregulated energy is being taken out of the requirements.

There are two main reasons for this:

Firstly, the unregulated energy calculation can only provide a ballpark figure based on the average household. There is no simple way of taking into account the human aspect of living in a house, and knowing how efficiently the occupants behave. Because of this, there have always been doubts around the accuracy of the unregulated calculation.

Also, as the unregulated assessment can typically increase expected energy use of a dwelling by 40%, developers are required to significantly alter their specifications, which in the majority of cases leads to concerns over economical feasibilities of new dwellings.

As the Government is committed to building to a Zero Carbon Homes standard by 2016, a workable definition is required moving forward. As part of this review, it appears that unregulated energy calculations will not be required moving forward.

# THE SITE

***Description and sample rate***

This proposed development in Trimley St Martin is for 65 new build dwellings.

The site will need to exceed Part L 2010 target emission rates, each plot should use no more than 105 litres of water per person per day, and ensure the application of a Fabric First Approach.

A site plan is shown below.

# BASELINE BUILDING

***Construction Compliance***

The first calculation is based upon how the sample dwellings can show full compliance with Part L 2010 based on a notional specification.

This is called the ***'Baseline'***, and all further steps of the calculation will use these results as an initial reference point.

The following list (right) summarises the key details which have been used in the SAP to create this Baseline assessment.

This is **NOT** the agreed specification. The actual details will show an improvement against this information, and are looked at in more detail on the following pages.

It can be confirmed that all elements show compliance with the relevant Approved Document Part L1A using the Baseline assessment.

The Baseline SAP matches the 2010 Target Emission Rate

Typical Dwelling Emission Rate:
17.27 $kgCO^2/m^2/year$
Typical Target Emission Rate:
17.27 $kgCO^2/m^2/year$

**Baseline specification details:**

***Fabric:***

**Heat loss floor areas:** Ground floors / heat loss floors to achieve a U-Value no higher than 0.18
**Heat loss wall areas:** External walls / heat loss walls to achieve a U-Value no higher than 0.28. Party walls assumed to have no heat loss.
**Roof areas:** To achieve a U-Value no higher than 0.15.
**Openings:** All windows should meet a U-Value of 1.4. External doors to have a U-Value of 1.0.
**Thermal bridging:** Accredited Construction Details (or a similar scheme) should be adopted.

***Ventilation:***

**Air Permeability:** The baseline was been created using an air permeability rate of 7
**Ventilation:** Intermittent extraction fans (System 1) have been assumed.

***Heating:***

Condensing mains gas boilers have been assumed with an efficiency of 89%.

***Hot Water:***

Combi heating systems to smaller plots, larger plots to be fitted with 210 litre cylinders, suitably insulated and installed.

***Lighting:***

95% of internal light bulbs will be low energy.

# ENERGY SAVING MEASURES

***Additional Improvements – BE GREEN!***

So far we have shown how the developer can build to a minimum standard for Part L compliance, and we have assessed the feasibility of including low and zero carbon technologies to reduce energy use.

This section looks at how the building fabric and services can be improved to reduce the energy demand before other options are considered.

This is called the 'Fabric First' approach.

There are seven key areas which can make significant improvements to the overall expected energy demand of a development:

***1. U-Values of Building Fabric:***

As shown on Page 8, the current U-Values are sufficient to comply with Building Regulations; however the following improvements can be shown to further enhance the expected demand of the site.

**FLOORS:** The current ground floor U-Value is set to 0.18 which far exceeds the current Building Regulations of 0.25.

*The developer will improve on this value by typically achieving a U-Value of 0.15. Depending on building shape and size, this U-Value could be achieved using 120mm PU foam board.*

**WALLS:** The current external wall U-Value is set to 0.28 which is within current Building Regulations of 0.30.

*Again, the developer will improve on this value for all heat loss walls, and will aim to achieve a U-Value around 0.26.*
*One approach is to construct a brick and block wall with a 100mm cavity, and install a minimum of 55mm PU foam board insulation.*

All party walls should be adequately insulated and suitably sealed to minimize heat loss.

**ROOF:** All heat loss roof U-Values will have a U-Value no worse than 0.15. Current Building Regulations require roofs to have a U-Value no higher than 0.2.

*As with the floors and walls, the developer is willing to construct to a higher standard. A U-Value of 0.11 can be met using 400mm mineral wool quilt in the loftspace.*

**THERMAL BRIDGING:** For the Baseline, Accredited Construction Details have been adopted to ensure a best practice approach to thermal bridging, and to avoid cold spots within the junctions of the building.

*Taylor Wimpey has commissioned its own set of thermal bridging details, which are available for use on all developments.*

*The set of psi-values shows a great improvement when compared to the standard set of Accredited Construction Details, as they are seen to reduce the chance of heat escaping through non-repeating thermal bridges.*

**OPENINGS:** The developer will install windows to reach a typical U-Value of 1.4, and external doors with a value of 1.0. This matches the values as used in the Baseline, and are much lower than the minimum requirement of Part L (2.0).

*The developer will ensure the openings on this development will reach a U-Value of 1.40 or lower.*

Increasing the values further would likely involve moving to triple glazing, which would be a substantial difference in cost when looking at a development of this size.

# ENERGY SAVING MEASURES

***Additional Improvements – BE GREEN!***

### *2. Orientation and Natural Light*

**SOLAR GAINS:** It is an important feature to make sure each dwelling has a sufficient amount of natural daylight available.

When looking at larger developments such as this, it is inevitable that a proportion of dwellings will not be positioned to make full use of the solar gains which are naturally available.

This is most common in plots where the majority of windows face north, and where no windows face south.

By far the majority of plots on this site will benefit from south facing windows – there are only a small number of dwellings with no south facing openings.

This shows the developer is mindful of using solar gains where possible, as this technique means the dwellings will require less energy for heating and lighting.

**OVERHEATING:** Summer overheating is a possibility on dwellings which feature large amounts of south facing glazing.

Appendix P of SAP2009 provides a basic measurement for Summer Overheating, and shows the risk to the sampled plot is:

**Not Significant / Slight**

This is acceptable under Building Regulations and does not need to be improved.

### *3. Air Tightness and Ventilation*

**AIR TIGHTNESS:** Under Part L 2010, the highest air test value allowed for a single dwelling development is 10 – the Baseline assessment has been created using a value of 7 – this is well within current Regulations.

*The developer is proposing to exceed this value; and will aim for all plots to be tested to below 7. This will be achieved by constructing to a better overall standard.*

It is worth noting that any plots which are not tested will have their As Built documents based on an air test average, plus two. This is known as a 'confidence factor', and should be taken into consideration when air testing is being completed on the site.

**VENTILATION:** The Baseline assessment has been created using System 1 ventilation (intermittent extraction fans) to all plots.

Refer to Approved Document Part F for more information in relation to the different ventilation systems available.

*The developer is proposing to use a System 3 ventilation system instead. The calculations have been based on the Greenwood CV2GIP system – this has a typical Specific Fan Power of 0.16 which is much lower than a standard intermittent extraction fan.*

# ENERGY SAVING MEASURES

***Additional Improvements – BE GREEN!***

### *4. Electrics*

**INTERNAL LIGHTING:** Recent technological enhancement in low energy lighting, and changes to UK law regarding the production and importing of non-efficient light bulbs has led to a surge of new energy efficient light bulbs onto our shelves.

*The current plan for this development is to ensure all internal lighting is low energy: that is to say each lamp will produce at least 45 lumens for every watt of power consumed, or the bulb will use no more than five watts.*

This proposal exceeds the current Part L limit of 75%, and also the figure of 95% which was used in the Baseline assessment.

Low energy bulbs are:

• All fluorescent tubes and circular lamps
• Energy saving bulbs or CFLs (These are now available in classic pearl and candle shapes as well as the more well-known stalk design)
• LED bulbs (These require no power-up time, use half the energy of a conventional energy saving bulb and can be used on dimmer switches). LED lamps are available to replace standard bayonet and screw-cap lamps, halogen down lighters and even capsule bulbs.

**SUPPLY:** *It is recommended the dwellings are signed up to a green electricity tariff where money from fuel bills is invested into offsite wind, solar and hydro farms.*

### *5. Heating and Hot Water*

**MAIN HEATING:** The amount of energy which is required to provide heating and hot water for a property can be higher than typical occupancy rates, lighting and cooking combined, so it is essential that an efficient system is used with suitable controls.

The Baseline assessment has been created using a standard mains gas combi system for most plots. Larger plots have been assumed to use a hot water cylinder.

*The developer is proposing to install boilers from the Ideal ES Combi and Ideal Icos ranges to all plots.*

*This boiler has been tested by SEDBUK to achieve higher hot water efficiencies with lower heat losses. As such, the use of this boiler will have a positive impact on the overall SAP assessment.*

**HEATING CONTROLS:** The Baseline assessments have been created using standard heating controls to all plots.

The developer will improve on this requirement by including delayed start thermostats to all plots and time and temperature zone controls where dwellings have a floor area greater than 150sqm.

Heating definitions:

**Delayed Start Thermostat:** This device over-rides the dwelling timer if the internal temperature does not require heating at the set time.

# ENERGY SAVING MEASURES

***Additional Improvements – BE GREEN!***

**Time and Temperature Zone Control:** Two separate heating circuits are installed within the dwelling (usually separated by storey), to allow the occupants to control the temperature and programmer of the main heating system in different zones. This is mandatory on dwellings greater than 150sqm in total floor area.)

**SECONDARY HEATING:** No secondary heating systems have been used in the SAP assessments for this site.

It has been assumed the main heating system will be sufficient to meet 100% of the dwelling's heating and hot water demands.

**6. Supply Energy Efficiently**

As part of the Code for Sustainable Homes assessment, the developer will consider a number of techniques which work towards the supply of energy efficiently to dwellings.

This includes the use of Display Energy Devices, and smart meters.

It would also be possible to connect new dwellings into a green energy tariff, and consider the use of voltage optimisation, although these techniques are not covered in the Code.

This section is not covered by the SAP assessment, so although ways of supplying energy efficiently are recommended, it will make no improvements to the calculations used in this document.

**7. Water Use**

The local authority has requested that all plots are designed to use less than 105 litres of potable water per person per day. This is 20 litres lower than current Building Regulations.

One way of meeting this requirement would be to use the following flow rates – this is an example only, and actual specifications may change:

- Bath tubs to hold 160 litres max
- Showers to run a 7 litres a minute max
- Toilets to be dual flush (6 / 4)
- Kitchen taps to run at 7 litres a minute
- Basin taps to run at 5 litres a minute

Further guidance on water use will be covered in the separate sample Part G assessment report which has been provided alongside this document.

# ENERGY SAVING MEASURES

***Construction Compliance***

The following summary lists the changes which have been described in the previous pages, before renewable and low carbon technologies are considered for this site.

These amendments are expected to reduce the annual emission rate of the dwellings when compared to the baseline construction and services within the buildings.

These improvements have been created using fabric and building services enhancements only.

Low carbon and renewable options have not been added at this stage – they will be considered on the following pages.

The Improved SAP result shows a comfortable reduction against the 2010 Target Emission Rate

Typical Dwelling Emission Rate:
15.82 $kgCO^2/m^2/year$
Typical Target Emission Rate:
17.27 $kgCO^2/m^2/year$

**Proposed specification details:**

***Fabric:***

**Heat loss floor areas:** Ground floor areas to achieve a U-Value no higher than 0.15
**Heat loss wall areas:** External walls to achieve a U-Value no higher than 0.26. Party walls assumed to have no heat loss.
**Roof areas:** To achieve a U-Value no higher than 0.11.
**Openings:** All windows should meet a U-Value of 1.4. External doors at 1.0.

**Thermal bridging:** Taylor Wimpey bespoke thermal bridging details will be adopted.

**Ventilation:**

**Air Permeability:** An air permeability rate of 7.0 to all plots.

**Ventilation:** Decentralised whole house extraction (System 3) will be used on all plots.

**Heating:**

Ideal ES combi mains gas boilers to be installed to all plots. Ideal Icos boilers to larger plots.
Delayed start thermostats to all plots.
Dual zone control to plots >150sqm.

**Hot Water:**

Cylinders only required where Icos boilers have been modelled.

**Lighting:**

100% of internal light bulbs will be low energy.

# FINAL CONCLUSIONS

***Site wide energy savings***

The developer is proposing to proceed with the following:

- **FABRIC:** The developer's proposed specification shows a 4.0% reduction over Part L emission rate targets before low carbon / renewable options are considered.
- This will include a building fabric which far exceeds Part L limiting U-Values, plus higher efficiency boiler, lighting and ventilation systems.

- **FURTHER ENHANCEMENTS:** Additional details in relation to water use, drainage, health and wellbeing etc. will be covered as part of the Code for Sustainable Homes assessment which is being completed for this development as a separate document.

In carrying out these improvements to the site, this development is expected to reduce the total regulated energy use by nearly 50,000 kWh annually across all 65 plots – that is a combined saving of 6.0%.

| (see box 272 of SAP Worksheets) | ENERGY kWh | ENERGY % | EMISSIONS kgCO2 | EMISSIONS % |
|---|---|---|---|---|
| Building Regulations Part L Compliance | 583,053.0 | 0.0% | 111,209.0 | 0.0% |
| Proposed scheme after Fabric Energy Savings | 533,181.5 | 8.6% | 101,386.1 | 8.8% |
| Proposed scheme after onsite renewables, low carbon technology and CHP | 533,181.5 | 0.0% | 101,386.1 | 0.0% |
| Proposed scheme offset for financial contribution | 533,181.5 | 0.0% | 101,386.1 | 0.0% |
| Savings shown from all above measures | 49,871.5 | 8.6% | 9,822.9 | 8.8% |

*Note: The Energy (kWh) figures include BRE's Energy Factors. Information on 'raw' energy usage can be made available on request.*

# FINAL CONCLUSIONS

***For Fabric First Approach***

Once planning approval has been granted for these dwellings, using the agreed specification, the final Design SAP Calculations will be issued to demonstrate full compliance with current Part L Building Regulations (2010).

After construction, air leakage tests will be carried out on the dwellings, and this will be followed by the issuing of the As Built SAP Calculation and Energy Performance Certificate.

These documents will take into account any alterations to the building during the construction process which may affect the overall energy requirement of the site.

**How To Check Our Data**

Data shown in this table can be checked by referencing the accompanying SAP Worksheet details. Box 282 in Section 13a shows the total expected regulated energy uses (kWh) for each dwelling.

As only sample SAP assessments have been completed for the moment, the totals from the Worksheets have been extrapolated to more accurately reflect the expected energy requirements of all plots in this phase.

There are three SAP worksheets per tested plot. These show the total energy use based on:
- The baseline results (Page 9)
- The Fabric First enhancements (Page 14)
- Option 1: Fabric with (Page 16)

The sample SAP plots are based on:
An end or semi terrace AA23: x8
An end or semi terrace AA31: x2
A detached PA48: x17
A mid-terrace PB52: x12
An end or semi terrace PT36: x5
A detached PT43: x9
A mid terrace AA11: x12

By taking the figures shown in box 282 of the series of SAP Worksheets, and multiplying each value by the multiple listed above, you can check the data shown in the Table on the previous page to ensure the 4% reduction has been met.