



Sainsbury's

## Barnsley



### *Renewable Energy & Energy Efficiency Assessment*

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A Submission by



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## Executive Summary

The existing B&Q DIY Store on the Stairfoot Business Park, Beachcroft Way, Barnsley is proposed to be redeveloped to accommodate a new Sainsbury's Food Store.

The net sales area of the new store is circa 75,750 ft<sup>2</sup>.

This report demonstrates how Sainsbury's propose to respond to national and local policy and develop a more sustainable store at Barnsley. Evident throughout this report is Sainsbury's strong commitment and continued investment to sustainability which manifests itself into the design of a low energy, more sustainable development.

The anticipated Energy consumption for all elements of the proposed site is assessed, using Historical and Benchmark Data, from a number of recognised sources, including operational stores.

The anticipated increase in overall energy consumption for the proposed new Sainsbury's Food Store over the existing B&Q DIY store is **2,321,266 kWh** per year.

**The Barnsley Metropolitan Borough Council's Adopted Core Strategy guide target of 15% of the increase in energy consumption to be met by renewable sources equates to a requirement of 348,190 kWh per year.**

It is demonstrated that this target can be satisfied (and considerably exceeded) by the proposed use of a Ground Source Heat Pumps and Air Source Heat Pumps to serve the heating and hot water demand of the proposed new store.

**As detailed in Section 6.0, it has been assessed that using Ground Source Heat Pumps and Air Source Heat Pumps would generate/offset 1,269,669 kWh per annum of the anticipated energy consumption which far exceeds this requirement and will in fact result in 31.3 % of the overall anticipated overall energy consumption being met by the use of recognised on-site renewable sources.**

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## 1.0 Introduction

This report has been produced on behalf of Sainsbury's Supermarkets Limited by Sustainable Design Solutions Ltd.

The report detail was completed by David van Der Walt who is employed by Sustainable Design Solutions who has over 30 years experience of Building Services engineering and sustainability. He has no professional connection with any particular renewable technology or manufacturer.

This report sets out Sainsbury's approach to sustainability at a national level as well as how sustainable measures will be integrated into the proposed new Sainsbury's Food Store, at Barnsley.

Sainsbury's development teams understand the need to consider energy efficiency and to incorporate renewable technologies from the outset.

The aim of this report is to provide guidance for consideration of the design team in their decisions regarding the selection of technologies that may be installed at the proposed new Sainsbury's Food Store, Barnsley.

## 2.0 Policy Review

The Local Planning Authority for this site is the Barnsley Metropolitan Borough Council.

The Planning Consultant has advised that the Barnsley Metropolitan Borough Council has an Adopted Core Strategy setting out their energy policy. The policy seeks a reduction in energy consumption compared to 2010 Building Regulations. Although not an adopted figure, Barnsley Metropolitan Borough Council use 15% reduction in energy consumption as a guide.

The relevant details, extracted from the above document, are as below:

### Barnsley Core Strategy 2009

#### **CSP 1 Climate Change**

Development will be expected to:

Reduce and mitigate the impact of growth on the environment and carbon emissions

Ensure existing and new communities are resilient to climate change

Harness the opportunities that growth, and its associated energy demands, brings to increase the efficient use of resources through sustainable construction techniques and the use of renewable energy

We will take action to adapt to climate change by:

Giving preference to development of previously developed land in sustainable locations

Locating and designing development to reduce the risk of flooding

Promoting the use of sustainable drainage systems

Encouraging environments that promote biodiversity and improve the Borough's green infrastructure

#### **CSP 2 Sustainable Construction**

All development will be expected to demonstrate how it minimises resource and energy consumption, compared to the minimum required under current Building Regulations legislation, and how it is located and designed to withstand the longer term impacts of climate change.

All new dwellings will be expected to achieve at least a three star rating under the Code for Sustainable Homes or BREEAM standard 'very good' or equivalent. This requirement will rise over the plan period and by 2013 new dwellings will achieve at least a four star rating and Code Level 6 by 2016. These standards require consideration of issues such as:

Reduction of use of natural resources

Orientation to maximise solar gain

Use of low water volume fittings, rainwater harvesting and grey water recycling

High levels of insulation

Adequate provision for separation and storage of waste for recycling

Designing buildings flexibly from the outset to allow a wide variety of possible future uses

Using sustainable materials wherever possible and making the most sustainable use of other materials

Minimising waste and promoting recycling, during both construction and occupation re-using existing buildings and vacant floors wherever possible

#### **Demonstrating Policy Compliance at Sainsbury's Supermarket Barnsley.**

Sainsbury's Supermarkets Limited have a robust and challenging Corporate Responsibility Strategy which has embarked on implementing many of the policies referred to above in store development and operational activities.

This document will demonstrate where this policy has been implemented.

### 3.0 Sainsbury's Commitment and Approach

With around 21 million customer transactions every week, 150,000 colleagues and over 2000 suppliers, Sainsbury's is ideally placed to make a positive impact on the economy, the environment and society.

Throughout their history, they have always worked to be a leader in sustainability and ethics. Sainsbury's are proud of the contributions they have made over the past decade, for example to grow the market for Fairtrade products, sustainable seafood, to improve animal husbandry, provide healthier choices for customers as well as all the work on running their operations efficiently. Being efficient with energy, water and waste is important as well as looking to a greater use of natural resources. They have championed community investment not least through their support for Comic and Sport Relief and the Paralympic Games.

Everyone at Sainsbury's works to a set of overriding guiding principles - their five values. These values are at the heart of everything they do, ensuring they run their business in an honest, ethical and sustainable way. **They are:-**

- Best for food and health
- Sourcing with integrity
- Respect for the environment
- Making a positive difference to the community
- A great place to work

These principles apply equally to all aspects of their business including property developments and construction projects where sustainability is considered a priority.

In October 2011 Sainsbury's launched their "20 by 20" Sustainability Plan which sets out 20 sustainability targets to be achieved by 2020. This is a £1 billion plan which aims to ensure the company remains at the forefront of sustainability.



For more information:- <http://www.j-sainsbury.co.uk/responsibility/20-by-20-commitments/>

Families' budgets are under more and more pressure and people are working harder to make their money go further. But while disposable income may have fallen, people's aspirations have not.

Sainsbury's customers still want products and services that they can trust, without compromising on standards or quality. They are responding by helping customers **Live Well**, with better quality, more nutritious and sustainable products, **For Less** – less money than they expect and with less impact on the environment.



Over the coming years, it's clear that shopping habits and therefore business practices need to change further. They need to provide jobs and skills for people in a tough economic climate. They need to treat suppliers fairly; both here and in the developing world and they need to help their customers make more environmentally sustainable and healthier choices.

It is not enough to simply reduce their environmental impact each year. They

must actively restore biodiversity, natural resources and the habitats on which we all depend. Through their 20 commitments they want to change the retail industry so that it can sustain the natural world, meet their customer's demands and promote health and well being. On a planet with limited resources, a retail business must be resilient enough to build supply chains that are fit for purpose in the longer term. That means putting sustainability at the heart of every single business decision.

**"20 by 20"** is the roadmap towards making this vision a reality, and through scale and these commitments, they will make a positive difference.

## **"20 by 20" Environmental Targets**

### **Climate change**

Climate change is real, is happening now, and the overwhelming body of scientific evidence points to increased volatility in weather patterns in the coming years. The challenge is not just to comply with increased regulation of greenhouse gas emissions but also to decarbonise the economy and adapt business practices accordingly. Couple this with increasing energy prices and the argument for change is made. Sainsbury's are seeking to build greater resilience through a gradual shift away from reliance upon the national grid, towards greater use of on-site and decentralised approaches.

It is a huge global challenge, and tackling the issue involves addressing factors that affect the environment both directly and indirectly. This is particularly true in retail, as they need to improve the environmental performance of not only:-

- their stores, regional distribution centres (RDCs) and offices

*but also*

- their supply chain, how they source, grow, make and package their products

*and*

- how they can help their customers make more sustainable choices

## **Sainsbury's "20 by 20" commitments for stores and regional distribution centres**



### **"20 by 20" target – Operational Carbon Emissions**

**By 2020, Sainsbury's will have reduced their operational carbon emissions by 30% ABSOLUTE and 65% relative compared with 2005.**

**(This is part of a broader target of an ABSOLUTE carbon reduction of 50%**

**by 2030**

This is underpinned by 4 delivery goals:-

**They will....**

- build new stores that produce zero carbon
- continue to introduce proven and next generation renewable technologies in all new and existing stores (including biomass, solar, natural light, heat pumps, geothermal, biofuels and wind)
- use renewable heat in the majority of stores by 2030

- have converted their refrigeration systems to natural refrigerants (e.g. CO<sub>2</sub>) in all stores by 2030

## Progress to date on their own operations

### Current Carbon target

Prior to their new “20 by 20” target Sainsbury’s was working towards a relative target: -*“We will reduce our CO<sub>2</sub> emissions per m<sup>2</sup> by 30% by March 2020, against a 2005/06 baseline.*

This has now been replaced with an ABSOLUTE carbon target as part of the “20 by 20” plan. As Sainsbury’s grows its sales so it has to plan to reduce carbon emissions as a higher priority – it’s not just a case of becoming more efficient. It means separating carbon emissions from any growth of the business. When it was launched it was the most ambitious target of the supermarket sector.

### Energy consumption

Energy is Sainsbury’s biggest source of direct carbon emissions, as energy is used to power every aspect of their store operations from lights to refrigeration. As a result, achieving energy efficiency in their new and existing stores is a top priority in reducing their carbon footprint. Sainsbury’s have a two pronged strategy:-

|                                                           |                                                                                                        |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>Energy efficiency in existing stores</b>               | Delivered through energy efficiency programme called <b>“RESET”</b> , now in its 6 <sup>th</sup> year. |
| <b>Designing more efficient new stores and extensions</b> | Delivered through <b>“Carbon step change stores”</b> programme                                         |

### Energy efficiency in existing stores

Sainsbury’s “Reset” programme, now in its 6<sup>th</sup> year looks at stores at an individual level, identifying the best energy savings suitable for each one. Energy saving measures are installed and the whole store monitored carefully to ensure expected performance is achieved and sustained.

Since 2007, Sainsbury’s have implemented over 10,000 energy initiatives in their supermarkets making energy savings equivalent to running 90 supermarkets for a year with an average energy saving of 17.5% per store.

All existing supermarkets have now been invested in at least once and some twice so ensuring an ongoing reduction in energy consumption.

The “Reset” principle has been extended to help reduce energy in their small Local stores. The benefits have been successfully introduced to 250 convenience stores making average energy savings of 14%. The energy saving across the last two years is equivalent to running 40 locals for a year.

“Reset” does not only focus on electricity but has also been working to reduce gas consumption by installing automated gas meter readers in a number of stores. By improving their knowledge of how they use gas, they can determine where energy reduction projects would be most effective and provide better data to enable stores to manage their gas consumption.

An important part of “Reset” is their store colleague training programme, where they work closely with their facilities management team to ensure they maintain the energy savings achieved. Store colleagues get involved with energy efficiency in their stores by having access to a dedicated website, which has information about their local environmental performance.

### Designing more efficient new stores and extensions

Each successive new store is designed to be better than those that went before and in this way Sainsbury's continually improve the specification of what they design, build, operate and maintain as a supermarket. All the learning from the trials they run, such as how to require less energy to begin and make best use of natural light and renewable energy all become incorporated into the next store.

Over the last 6 years they have trialled the following and added them into their standard store specifications.

| Innovation added to Standard specification                                                            | Benefit                                                                                                     |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>LED lights</b> in car park and all external signage as well as all cold stores                     | Energy saving and longer life                                                                               |
| <b>Natural light</b> – increased use through windows, ribbon glazing and roof lights                  | Better quality of light for customers and colleagues as well as reduces amount of electric lighting needed. |
| <b>Natural refrigeration</b> – use of Carbon Dioxide, a natural refrigerant in chillers and freezers. | Reduction in a stores' carbon footprint.                                                                    |
| <b>Water saving devices</b> – Self-stopping taps, low flush toilets and water-less urinals.           | Save water in customer and colleague toilets                                                                |
| <b>Insulation</b> – higher standards throughout the building                                          | Less energy required for heating                                                                            |
| <b>Air tightness</b> – target half of that set in UK regulations                                      | Less draughts and so less energy needed for heating                                                         |
| <b>Entrance lobbies</b>                                                                               | Less draughts and reduces energy for heating.                                                               |

They have trialled some ambitious innovations and have reduced the energy used by a **new store by 41% and an extension by 43%** in the 5 years between 2005/06 and 2010/11.

### On- Site Renewable Energy

Generating energy from renewable sources is an increasingly important part of achieving their “20 by 20” operational carbon target.

It reduces their dependence on fossil fuels and contributes to providing secure energy for the future. A number of stores now generate their own on-site renewable energy, using a range of technologies which have been trialled and refined.

Sainsbury's have trialled a number of different types of renewable energy technologies and have successfully implemented the following:

| On-site Renewable Technology | Comments & Benefits                                                                                                                                                          | Future Plans                                                                                                                                                                                                                   |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biomass boilers              | Their most successful initiative, powered by wood pellets made from waste wood, provides heat for the store and hot water. Avoids the need to install fossil fuel based gas. | By March 2013, 65 biomass boilers installed and plan to double this number by the end of 2015.                                                                                                                                 |
| Solar PV                     | Generates electricity on a supermarket's extensive flat roof without being visible.                                                                                          | In March 2013 became the UK's largest multi site solar PV panel operator generating a total of 18MW through 75,000 solar panels on 200 stores. Generates enough electricity to power the equivalent of 4,000 homes for a year. |
| Solar Thermal                | Generates hot water                                                                                                                                                          | Currently investigating options for further use. No benefit for stores with Biomass or GSHP.                                                                                                                                   |
| Geothermal                   | The innovative Geo-Exchange system installed at Crayford in 2010 links waste heat from refrigeration plus geothermal energy to supply on demand heating and cooling.         | A further 11 Geo-exchange systems have been installed making 12 in total with plans to continue this rollout each year.                                                                                                        |

### **Optimising Natural Light**

Sainsbury's sets out to optimise the use of natural light through using high specification windows at the store front and also ribbon lighting along the store sides.

The use of artificial lighting is further reduced by installing high efficiency roof lights which provide natural light into the sales area making a great environment for customers to shop and colleagues to work.

Sensors check the level of natural light and are linked to the artificial lighting system which is automatically adjusted to save energy.



### **Purchase of Electricity**

Across the business, Sainsbury's now purchase 12% of their total needs electricity directly from renewable sources through power purchase agreements rather than from a green energy tariff. The target is to increase this to 20 per cent by 2020.

They source the energy from an onshore wind farm in Scotland, together with biomass and anaerobic digestion plants located throughout the country.

It is proposed that this strategy can be implanted to provide benefit to the overall development.

## Refrigeration

Sainsbury's will always need effective fridges to ensure their products are kept fresh, from field to fork – and in turn, this helps reduce unnecessary food waste. However, refrigeration is a big contributor to their direct carbon footprint, and in 2009 they were proud to be the first UK retailer to commit voluntarily to switch all their fridges to natural refrigerants (e.g. carbon dioxide) by 2030. When complete, this will help to reduce their carbon footprint by more than a third.

In February 2012 they achieved a major milestone with the 100<sup>th</sup> installation of CO<sub>2</sub> refrigeration system at the new store in Ely. They now have nearly 17,000 chillers and freezers linked to natural refrigeration and nearly 3 million customers happily shopping from them. They have set an interim target of 250 stores to be converted to natural refrigeration by the end of 2014. All their new stores have been built with CO<sub>2</sub> refrigeration as standard since summer 2010.

## Sainsbury's partnership with Grantham Institute and Imperial College



In 2011 Sainsbury's entered into a 5 year partnership with the Grantham Institute and Imperial College to further develop their ambitious plans for "future stores". Together they are researching and creating practical ways to reduce their operational carbon footprint and achieving tangible results.

This partnership has helped deliver:-

**Smart Grid Ready concept store at Hythe** – understanding where and when energy is used across a 24 hour period and learning to shift demand in real time and so reduce the use of the national grid at time of peak demand so reducing carbon intensity of energy used.

**An "energy saving hot house" at Hythe** that is challenging the way they traditionally run their stores and identifying real energy savings as a result. These are being rolled back across their estate.

**Low energy lighting at stores in Ely and Leek** in collaboration with "GE Ecomagination" that has made a step change in energy savings.

## Carbon Trust Standard

Sainsbury's have been successfully certified for a second time against the independent Carbon Trust Standard, this recognises companies which make systematic and consistent energy reductions.



## Carbon Reduction Commitment Energy Efficiency Scheme

Their carbon management framework enables them to comply with the new requirements of the Carbon Reduction Commitment Energy Efficiency Scheme, while ensuring their operations are as low in emissions, and as cost effective, as possible.

## External Engagement



Sainsbury's are active members of organisations such as the UK Green Building Council where they contribute to raising awareness of the need and business case for a more sustainable built environment.

Sainsbury's Property Board Director, Neil Sachdev has been appointed to the Green Construction Board.

## **Logistics – their operations**

To make their logistics operations as efficient as possible, Sainsbury's ensure that they link the right stores geographically to the right depots, reducing transport miles. They have also introduced double-decker lorries, which transport more goods in a single journey.

In their primary operations, they use empty trucks to collect goods from suppliers on their way back from store deliveries. The number of these collections has now reached over 140,000 per year.

In their secondary operations, a focused project on vehicle fill has led to improvements of more than 1.5 per cent across the entire store delivery fleet. CO<sub>2</sub> per 1,000 cases transported has decreased to 120.5kg this year. This is a reduction of 1 per cent on the year and almost 17 per cent over the last five years, which means they have already reached their 2012 target early. They have also achieved a reduction of over 1,800,000 vehicle kilometres in 2011, by using both their own and their suppliers' fleets more efficiently.



## **"20 by 20" Target – Water**

**By 2020, through robust water stewardship Sainsbury's will ensure that their supply chain approach is sustainable in areas of water vulnerability.**

This is underpinned by 7 delivery goals:-

### **They will....**

- Improve the efficiency of water use in their operations and supply chain
- Endeavour to have a positive impact in areas of water vulnerability
- Work collaboratively with other water users and local authorities to protect river basins and promote integrated water management
- Share information and best practice through grower groups and collaborative forums
- Map water use for their top 30 commodities and introduce supply risk management where necessary
- Develop plans to monitor water use in the most sensitive sourcing zones in collaboration with other stakeholders
- Introduce rainwater harvesting in all new supermarket stores.

## **Progress to date on their stores**

### **Water – Their operations**

In March 2013 Sainsbury's set a sector leading target to use less water by cutting usage by 50% per m<sup>2</sup> of sales area. This has led to accreditation to the Carbon Trust Water Standard and become the first retailer to obtain independent certification in respect of the measurement, management and reduction in water usage year on year.

Over the past year, they have audited more than 300 of their stores to understand better how they use water. By working through the "Reset" programme they have been able to target initiatives to areas in the worst performing stores that generate the biggest water savings.

They have introduced automated water meters that provide real-time data from their stores. They have used the results of these water audits, and the lessons learned from improvements in data management, to introduce a programme of water-reduction projects. These include, in 300 stores, initiatives such as rainwater harvesting and reclaiming the water used in car washes.

Through rainwater harvesting alone they have saved a total of 42,640 litres in the past year, which is equivalent to 8.3 Olympic sized swimming pools. They also fit water-efficient taps, low-flush toilets and waterless urinals in all stores as standard.

Since 2005 Sainsbury's have achieved

- a 50% reduction relative to sales **and**
- a 16% absolute reduction despite building more stores and increasing sales area by 25%.

They have saved a further 543,951 cubic meters of water per annum – an annual cost saving of £1,735,204. This is enough water to fill 218 Olympic-sized swimming pools.

This saving equates to 405 tonnes of CO<sub>2</sub> for both the supply and treatment of this water - approximately enough carbon to fill 81 hot air balloons.

Sainsbury's are proud of their achievements to date and have an aggressive strategy in place to make significant savings over the next year. Savings to date far outshine those of other main UK retailers who have much more conservative targets in place.



## **"20 by 20" target – Waste**

**By 2020, they will put all waste to positive use.**

Landfill space is becoming ever more scarce and expensive. At the same time the idea of waste being thrown away is changing. Sainsbury's is updating its approach and now regards it as a valuable resource to be re-used. They are moving beyond waste reduction to actively eliminating waste as such from their stores and putting it to good use. This approach is being replicated within their supply chain.

This is underpinned by 8 delivery goals:-

### **They will....**

- work with colleagues, suppliers and customers to rethink waste, reducing it and designing it out from the business
- embed a waste prevention plan throughout the business
- send no waste at all to landfill
- use anaerobic digestion as the preferred disposal route for food waste from stores that is not suitable for charitable donation
- continue to develop customer campaigns to help them reduce their wastes and use their waste e.g. "Love your leftovers".
- Ensure all stores take part in a customer food donation programme
- Endeavour to collect more waste through recycling facilities than the waste they generate from operations.
- Provide the most comprehensive recycling facilities, making it easy for customers to recycle.

## **Progress to date on their stores**

Sainsbury's works to a clear waste hierarchy – reduce, reuse, recycle – and their main objective is always to minimise waste throughout their operations.

They endeavour to limit the volume of food waste they produce through good stock control and accurate sales forecasting. This ensures their stores stock the right amount of food to satisfy customer demand at any one time.

They donate any surplus food they do not sell (but is still fit for consumption) to local charities and organisations such as Fare Share, who redistribute the supplies. This not only has a huge social benefit, but also supports their environmental commitment to zero waste to landfill.

All supermarket colleagues take a really proactive approach to reducing food waste and then putting it to a positive use: waste is now viewed as a company asset in the same way as trolleys and roll cages.

The waste they cannot prevent is still a valuable resource, and they put it to a number of alternative uses – including generating energy. Anaerobic digestion is the preferred treatment for food waste, as it produces a biogas which can be used to generate renewable electricity to help power the National Grid. This is a more environmentally sustainable method of waste management than pyrolysis, gasification.

All their supermarkets have been connected to their **zero food waste to landfill programme** since 2009, and since December 2011 all bread waste is sent to animal feed and all other food waste to Anaerobic Digestion.

Every year colleagues recycle nearly 140,000 tonnes of cardboard and over 9,500 tonnes of plastic film, as well as all their point-of-sale materials and office paper. They continue to recover and recycle cooking oil from their stores, working in partnership with biofuel suppliers.

In June 2013 Sainsbury's stores achieved their **zero waste to landfill** target across all operations which addresses waste such as broken and returned electrical goods and house-wares as well as returned clothing. All their convenience stores achieved this 18 months earlier in January 2012.

Sainsbury's have also joined a variety of clothing banks to donate clothes which have not been sold to Oxfam so that they can be re-marketed both on-line and in their network of stores.

They currently divert nearly 85 per cent of their waste from landfill. This means reusing or recycling not just food waste, but operational and construction waste as well.

### **Recycling waste – their customers**

In 2010, Sainsbury's became the first retailer in the UK to offer customers battery recycling at every store, along with general recycling facilities. Since starting this scheme, they have recycled over 15 million batteries - more than any of their competitors. They now recycle 5 million batteries each quarter, which is 34% more than last year. Customers can also recycle their mobile phones, satellite navigation devices, printer cartridges and clothing.

As well as providing the facilities to encourage their customers to recycle more, they also use the widely recognised on-pack recycling logos on most of our own-brand products. They were the first UK supermarket to offer recycling facilities for polythene packaging, like grape and cereal bags and plastic carrier bags.

### **Working with the community**

For Sainsbury's, retailing is about more than quality products and great service. It's also about supporting and helping the communities where they operate and being a good neighbour. They aim for their stores to be at the heart of the communities they serve.

As well as the charitable aspects of their community approach, there are practical and economic considerations too. They provide local jobs for local people, and buy from local suppliers. They also help protect the local environment, and make it safer.

Their colleagues like to give something back to their community, which is why they run their Local Charity of the Year now in its 5<sup>th</sup> year and Local Heroes schemes to help them to support local good causes.

Since the beginning of the scheme, customers and colleagues have raised over £5 million for local charities, with 110,000 nominations received in 2013.

There has been much talk of the government's 'Big Society' over the past year. As responsible retailers they believe that they have been doing 'Big Society' for years - if not decades.

In December 2010 the Prime Minister introduced 'Every Business Commits', which asks business to pledge to a five-point charter as part of Big Society:

At Sainsbury's they found that the five pledges under 'Every Business Commits' mirrored their company values and therefore they are already doing this.

Sainsbury's also has a part to play in the wider community. Their longstanding partnership with Comic Relief is growing every year and they were the official supermarket partner of the London 2012 Paralympic Games. As part of their ongoing support for British athletics and the Paralympics legacy

programme Sainsbury's is sponsoring the Sainsbury's Summer Series culminating in the Anniversary Games at The Queen Elizabeth Olympic Park in late July.

Sainsbury's support for the Paralympics was recognised at the Marketing Society Awards for Excellence 2013, winning both the Cause Related Marketing award and the overall Grand Prix award.

## **Featured Awards**

### **Sustain Magazine -- 2012 Winner of Sustainable Retail Development of the Year**

Presented in February 2012 for Sainsbury's Dawlish, which opened August 2011, for the innovative use of a timber frame and setting a step change in standards for thermal insulation and air tightness, so reducing need for thermal (heat) energy.



**The Guardian Sustainable Business Awards:** Sainsbury's were presented with both the Carbon and Energy Awards at the Guardian Sustainable Business Awards 2012.



### **Dow Jones Sustainability Index:**



Gold Class and Sector leader. Sainsbury's are proud to be recognised as the global industry leader in the Dow Jones Sustainability Index 2012 for the 6<sup>th</sup> Year running.

### **FTSE4Good Index:**

Sector Leader 2012. Sainsbury's continue to be included in the FTSE4Good Index, in recognition of the management of environmental, social and ethical issues.



### **Forest Footprint Disclosure league table:**

Sainsbury's has topped its category in the Forest Footprint Disclosure league table, which seeks to show investors which companies do the most to minimise the effect their supply chains have on the world's forests. Sainsbury's is joint top of the 'food and drug retailer' category in recognition of the work it has done to minimise the impact of its operations on forests across the world.



### **Continued Investment**

Looking ahead, Sainsbury's are committed to addressing sustainability across the whole estate and will continue with their programme of building stores that have a low impact on their environment and will do this through intelligent design, sustainable sourcing of materials, efficient use of energy and resources and site waste reduction programmes.

A continued focus will be maintained on the need to reduce the energy use of their stores through energy efficiency measures which is widely considered best practice and the most sustainable approach to carbon reduction.

## 4.0 Sustainable Design



Sainsbury's are committed to reducing the environmental impact of the proposed new store at **Barnsley**, in both its design and construction. This will be through intelligent design, sustainable sourcing of materials, reuse of redundant materials from the existing site, efficient use of energy and resources and site waste reduction programmes.

Modern off-site construction techniques will be incorporated where possible. Any components that can be assembled in a factory will be, this will significantly cut down the build time on site. The main benefit of this will be minimising the disruption to nearby businesses and community; whilst simultaneously reducing carbon emissions, vehicle movements and waste.

Sainsbury's will encourage an environmentally aware supply chain and aim to use construction suppliers that have accreditation to a recognised Environmental Management System, such as ISO14001.

This section identifies those sustainable design measures that will be incorporated as part of Sainsbury's overall commitment to sustainable construction and in response to specific site requirements at **Barnsley**.

Any issues associated with energy efficiency and renewable energy will be addressed within sections 5.0 and 6.0.

### Sustainable drainage including water use



Sainsbury's will ensure that the rate of runoff of surface water from the site will be no worse than the original conditions before the development, taking into account predicted climate change impacts over the lifetime of the development.

The major water consuming appliances in the building will be taps, water closets (w.c's) and urinals. To minimise water consumption Sainsbury's will install percussion taps, waterless urinals and low flush w.c's.

It is also the intention to install rainwater harvesting at the store subject to detailed design.

A quarterly systems audit is carried out by the stores, which includes checks on taps and system leakages to minimise wastage. Plans are in place to make further improvements to water metering to help identify additional improvements.

### Carbon based energy



Sainsbury's adopt a proactive strategy of understanding climate change and implementing programmes to reduce direct environmental impact. Sainsbury's goal is to reduce their carbon dioxide emissions by:

- **Sourcing energy responsibly**
- **Minimising energy demand**
- **Promoting efficient consumption**

Sainsbury's now buy 5% of electricity directly from renewable sources through power purchase agreements rather than from a green energy tariff. They hope to increase this to 20 per cent by 2020.

They source the energy from an onshore wind farm in Scotland, biomass and anaerobic digestion plants.

Sections 5.0 and 6.0 of this report will clearly demonstrate Sainsbury's approach to reducing the carbon emissions of the proposed new Food Store at Barnsley through a combination of Lean, Clean and Green measures.

- 1. Be Lean – Energy Efficiency Measures**
- 2. Be Clean – Obtain cleaner forms of energy (e.g. CHP)**
- 3. Be Green – Renewable Technologies**

The first step in this process (Section 5.0) quantifies the estimated carbon savings as a result of the extensive energy efficiency measures utilised by Sainsbury's.

Section 6.0 then assesses the commercial and technical viability of a range of Clean and Green measures to further reduce the carbon emissions if possible.

## 5.0 Site Energy Use and Emissions

### Introduction

By continual monitoring of its substantial store and property portfolio, Sainsbury's have gathered a large volume of data on the operational energy use of its stores and buildings which clearly demonstrate the value of its investment in energy efficiency measures.

To determine the most appropriate mechanisms for reducing the energy consumption at the proposed new Sainsbury's Food Store at Barnsley, as well as the increase in energy consumption over the existing B&Q DIY Store, the anticipated energy use must be identified. The anticipated energy use can be calculated through the following means:

- London Toolkit 2004
- Historical data from Sainsbury's Records

To carry out the SBEM calculations with a degree of accuracy requires levels of design information which are not available at this early stage of the project and is discounted on that basis.

The most appropriate mechanism therefore for establishing the predicted energy use of the proposed new Sainsbury's Food Store at Barnsley is to use the available historical data.

The actual annual electricity and gas consumption figures as provided by B&Q have been used below to demonstrate the difference in energy consumption between the existing DIY store and the proposed Food Store.

#### 5.1 Energy Consumption of the existing B&Q DIY Store

|                                        |          |                                |
|----------------------------------------|----------|--------------------------------|
| • Electricity:                         | =        | 1,038,947 kWh per annum        |
| • Gas:                                 | =        | 699,031 kWh per annum          |
| <b>Total Annual Energy Consumption</b> | <b>=</b> | <b>1,737,978 kWh per annum</b> |

Converting to CO<sub>2</sub> Emissions – this is done utilising the factors for electricity and gas detailed in Building Research Establishment (BRE) National Calculation Methodology Modelling Guide 2010:

The existing B&Q DIY store's CO<sub>2</sub> annual emissions from Gas and Electrical consumption equates to:

|                                       |                                               |          |                                            |
|---------------------------------------|-----------------------------------------------|----------|--------------------------------------------|
| • Electricity:                        | 1,038,947 kWh x 0.517 kgCO <sub>2</sub> / kWh | =        | 537,136 kg CO <sub>2</sub> per annum       |
| • Gas:                                | 699,031 kWh x 0.198 kgCO <sub>2</sub> / kWh   | =        | 138,408 kg CO <sub>2</sub> per annum       |
| <b>Total CO<sub>2</sub> Emissions</b> |                                               | <b>=</b> | <b>675,544 kg CO<sub>2</sub> per annum</b> |

#### 5.2 Energy Consumption of the proposed new Sainsbury's Store

Utilising historical energy usage figures, available from Sainsbury's records, it can be demonstrated that in the absence of any energy efficiency measures the estimated total annual consumptions for a Store with net sales area of 75,750 ft<sup>2</sup> are as follows:

|                                 |                                |
|---------------------------------|--------------------------------|
| • Electricity                   | 6,715,828 kWh per annum        |
| • Gas                           | 2,086,799 kWh per annum        |
| <b>Total Energy Consumption</b> | <b>8,802,627 kWh per annum</b> |

Converting to CO<sub>2</sub> Emissions – this is done utilising the factors for electricity and gas detailed in Building Research Establishment (BRE) National Calculation Methodology Modelling Guide 2010:

The proposed new Store's CO<sub>2</sub> annual emissions from Gas and Electrical consumption without the use of any energy efficiency measures equates to:

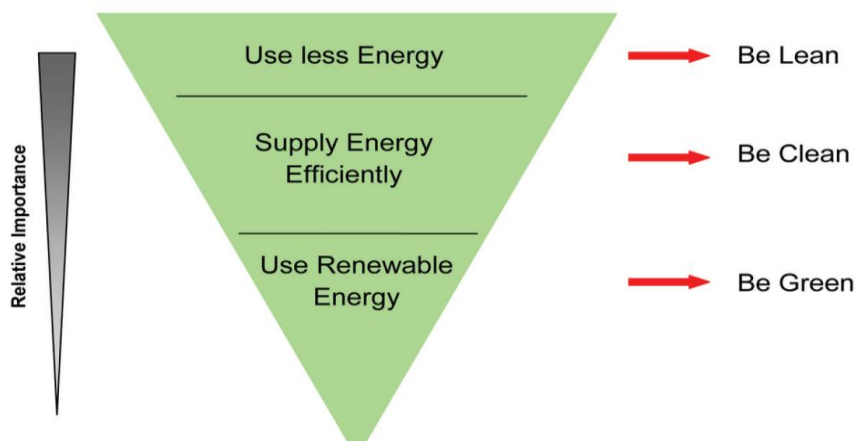
- Electricity: 6,715,828 kWh x 0.517 kgCO<sub>2</sub> / kWh = 3,472,083 kg CO<sub>2</sub> per annum
  - Gas: 2,086,799 kWh x 0.198 kgCO<sub>2</sub> / kWh = 413,186 kg CO<sub>2</sub> per annum
- Total CO<sub>2</sub> Emissions = 3,885,269 kg CO<sub>2</sub> per annum**

### 5.2.1 Investment in Energy Efficiency Measures

As discussed earlier, Sainsbury's policy to reduce carbon emissions from their national property portfolio has been to focus on the installation of energy efficiency measures to continually drive down energy demand and use. Such an approach achieves the greatest reduction in carbon savings and is in line with best practice and local and national policy.

To minimise the use of energy at the proposed new Barnsley Food Store a number of energy efficiency measures from the range of initiatives listed below will be reviewed during detail design and incorporated where possible.

This report will clearly demonstrate Sainsbury's approach to reducing the carbon emissions of the proposed new Food Store at Barnsley through a combination of Lean, Clean and Green measures.



The first step in this process quantifies the estimated carbon savings as a result of the extensive energy efficiency measures (Be Lean) utilised by Sainsbury's.

Section 6.0 then assesses the commercial and technical viability of a range of Clean and Green measures to further reduce the carbon emissions if possible

### 5.2.2 Be Lean - Energy Efficiency Measures

To minimise the onsite energy demand the proposed new Food Store at Barnsley is anticipated to include the following design features.

The implementation of these energy efficiency measures have been shown to reduce the carbon emissions of the SSL stores by 40% based on the 2005/06 baseline figures.

| <b>BE LEAN</b>                                                                                              |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>Item</u></b>                                                                                          | <b><u>Included<br/>or<br/>Excluded</u></b> | <b><u>Comments</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <u>Roof Lights</u><br><br> | <b>Excluded</b>                            | <p><i>Standard Sainsbury's specification</i></p> <p><i>The Roof Lights capture the natural sunlight and transmit via a prismatic lens where the light is diffused into the space below. The level of light obviously varies throughout the year depending upon the sun light intensity which is dependent upon time of day and year and the cloud cover. During the summer on a clear day the light transmitted is much higher compared with an overcast winter's day.</i></p> <p><i>Whilst this is not considered to be a Low or Zero Carbon technology it is considered a strong sustainable design feature as it utilizes a natural resource to offset some artificial lighting within the store throughout the year.</i></p> |
| Building shell Air Leakage rates in excess of Building Regulations requirements.                            | <b>Included</b>                            | <i>Sainsbury's current specification to achieve 3m<sup>3</sup>/hr/m<sup>2</sup> at 50 Pascals – with a target to improve on this even further.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Use of daylight linked (via Shopfront glazing) dimming control systems to the main sales area.              | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| High Efficiency lighting exceeding Building Regulation requirements for both ambient and display lighting.  | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Night Time / Out of Hours lighting levels reduced to 20% in lieu of 30%, as previously required.            | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LED Car Park and External lighting with efficiency exceeding Building Regulation requirements               | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Presence detector and Daylight Sensor operated lighting in staff facilities area.                           | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LED external 'Sainsbury's' signage                                                                          | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| LED Frozen Case and Cold Room lighting                                                                      | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Bakery equipment is sourced in agreement with DEFRA                                                         | <b>Included</b>                            | <i>Standard Sainsbury's specification</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| <b>BE LEAN (Continued)</b>                                                                                                                        |                                            |                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------------|
| <b><u>Item</u></b>                                                                                                                                | <b><u>Included<br/>or<br/>Excluded</u></b> | <b><u>Comments</u></b>                            |
| Cold air is removed from the chilled aisles and utilised to cool certain areas of the store specifically the checkout and GM areas of sales floor | Included                                   | Standard Sainsbury's specification                |
| Induction type extract canopies to the bakery, prep rooms, staff and customer kitchens optimise fresh air intake.                                 | Included                                   | Standard Sainsbury's specification                |
| Inverter Drives on HVAC Plant, with Economy Settings                                                                                              | Included                                   | Standard Sainsbury's specification                |
| CO <sub>2</sub> Air Quality Sensors to optimise the fresh air supply to the Sales Floor                                                           | Included                                   | Standard Sainsbury's specification                |
| Compliant or better Specific Fan Powers for mechanical plant                                                                                      | Included                                   | Standard Sainsbury's specification                |
| Use of weir screens on refrigeration to improve their efficiency                                                                                  | Included                                   | Standard Sainsbury's specification                |
| Use of Night Blinds on all Sales Area Refrigerated Cabinets                                                                                       | Included                                   | Standard Sainsbury's specification                |
| A full store Building Management System (BMS) that pre authorises all use of energy in the building removing the chance of human error            | Included                                   | Standard Sainsbury's specification                |
| A comprehensive building control strategy that reflects the different building usages throughout the day                                          | Included                                   | Standard Sainsbury's specification                |
| Web –Based Sub-metering on all major energy loads to manage usage and future maintenance                                                          | Included                                   | Standard Sainsbury's specification                |
| Rainwater harvesting system to flush public and staff toilets – subject to further on site appraisal during detailed design phase                 | Included                                   | Standard Sainsbury's specification for new stores |

### 5.2.3 Predicted energy use for the new Food Store with the above energy efficiency measures included

With the energy efficiency measures used above Sainsbury's estimate (using data from operational stores) that these measures will result in a reduction in their Carbon Footprint (per ft<sup>2</sup>) of 40% over the baseline data and therefore the following adjustments can be made to determine the Building Emission Rate (BER):

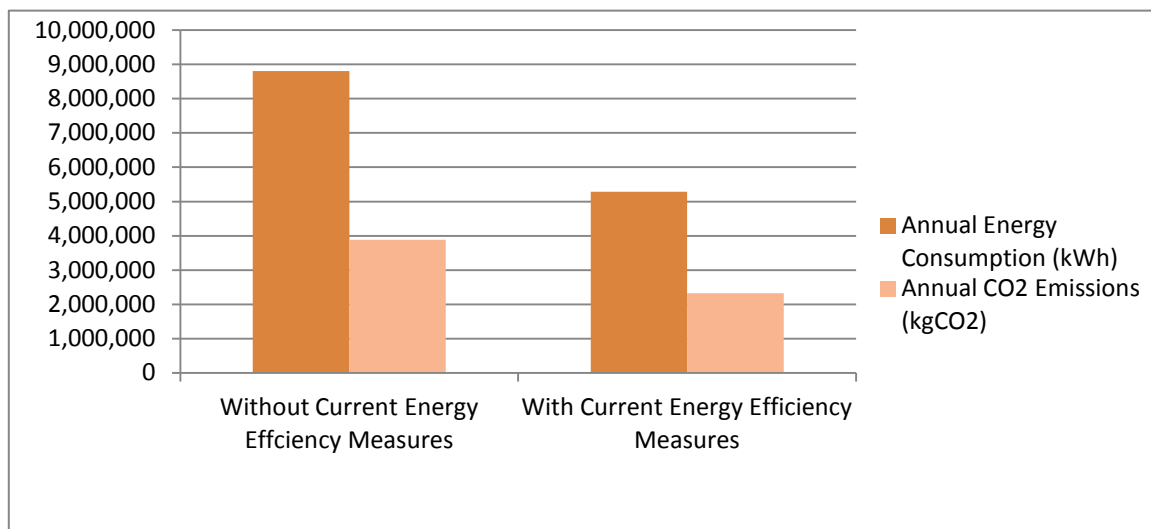
|                                                 |                                    |   |                                              |
|-------------------------------------------------|------------------------------------|---|----------------------------------------------|
| Electricity:                                    | 3,472,083 kg CO <sub>2</sub> x 60% | = | 2,083,250 kg CO <sub>2</sub> per annum       |
| Gas:                                            | 413,186 kg CO <sub>2</sub> x 60%   | = | 247,912 kg CO <sub>2</sub> per annum         |
| <b>Total Predicted CO<sub>2</sub> Emissions</b> |                                    | = | <b>2,331,162 kg CO<sub>2</sub> per annum</b> |

The above predicted Part L 2010 carbon emissions can be converted back to energy consumption using the factors for electricity and gas detailed in Building Research Establishment (BRE) National Calculation Methodology Modelling Guide 2010:

|                                           |                                      |   |                                |
|-------------------------------------------|--------------------------------------|---|--------------------------------|
| Electricity:                              | 2,083,250 kg CO <sub>2</sub> / 0.517 | = | 4,029,497 kWh per annum        |
| Gas:                                      | 247,912 kg CO <sub>2</sub> / 0.198   | = | 1,252,081 kWh per annum        |
| <b>Total predicted Energy Consumption</b> |                                      | = | <b>5,281,578 kWh per annum</b> |

### 5.2.4 Comparison of Energy Consumption and Carbon Emissions for the new Food Store

|                                                   | Energy Consumption per Annum (kWh) | CO <sub>2</sub> Emissions per Annum (kg CO <sub>2</sub> ) |
|---------------------------------------------------|------------------------------------|-----------------------------------------------------------|
| <b>Without current energy efficiency measures</b> | <b>8,802,627</b>                   | <b>3,885,269</b>                                          |
| <b>With current energy efficiency measures</b>    | <b>5,281,578</b>                   | <b>2,331,162</b>                                          |



### 5.2.5 Proposed On-site de-centralised and renewable or low carbon Energy

The Barnsley Metropolitan Borough Council's Adopted Core Strategy guide target of 15% of the increase in energy consumption to be met by renewable sources.

The technologies considered to achieve this are detailed in Section 6.0 (below).

## 6.0 Consideration of Available Technologies

### 6.1 Low and Zero Carbon Technologies

Sainsbury's are committed to the principal of investment in energy efficiency and reduction in Carbon emissions from their stores. Investment in energy efficiency measures is the most commercially and technically viable approach to achieving significant reductions in carbon emissions and this has therefore been the focus.

Any further reductions in energy use from that gained through energy efficiency measure alone must be obtained through the use of renewable and/ or low carbon technologies. Sainsbury's have researched a range of these technologies as part of their store specification and are trialling a number of advanced technologies in stores where site conditions and resources allow. Many renewable technologies are expensive and do not deliver significant carbon reductions based on investment value. Regardless, Sainsbury's have considered a range of renewable and low carbon technologies for the proposed new Food Store at Barnsley with a view of utilising those where commercially and technically viable.

### 6.2 Be Clean

'Clean' measures are defined as obtaining energy from cleaner sources and can include the provision of on-site Combined Heat and Power (CHP) Units or connecting to an off-site CHP system.

| <b><u>BE CLEAN</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>Item</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b><u>Included or Excluded</u></b> | <b><u>Comments</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><u>Combined Heat &amp; Power – CHP</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Excluded</b>                    | <p>Not suitable for energy profile of stand-alone Sainsbury's store – excess heat produced would be wasted. Only considered on mixed use developments with centralised Energy Centre solution.</p> <p>Gas turbines and internal combustion engines can be utilised to generate both electricity and heat.</p> <p>Both of these energy types can be used within a business to make best use of the fossil fuel input.</p> <p>Combined Heat and Power (CHP) is a fuel-efficient energy technology that, unlike conventional forms of power generation, puts to use the by-product heat that is normally wasted to the environment.</p> <p>Furthermore, because it often supplies electricity locally, CHP can also avoid transmission and distribution losses - typically estimated at around 6%.</p> |
| <p><u>Technical and Financial Review</u></p> <p>The mixed use nature of the project could, potentially, support a CHP scheme however this has been discounted given the preference for renewable energy technologies.</p> <p><b>Noise:</b> The location of the plant and acoustic detailing of it enclosure / plant room, cooling air route and exhaust systems, will all need to be within acceptable limits imposed by Planning and be in line with the Acoustic Specialists recommendations, for this technology to be adopted.</p> <p><b>Land Use:</b> Site plan drawings indicate that there is sufficient land available for this technology.</p> |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| <b>BE CLEAN (Continued)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>Item</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b><u>Included<br/>or<br/>Excluded</u></b> | <b><u>Comments</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <u>Biomass CHP</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Excluded</b>                            | <p>Not suitable for energy profile of stand-alone Sainsbury's store – excess heat produced would be wasted.</p> <p>Only considered on mixed use developments with centralised Energy Centre solution.</p> <p>The use of a specially designed boiler that uses biologically derived products such as wood, straw or sewage sludge as the fuel to generate both electricity and heat.</p> <p>Both of these energy types can be used within the store to make best use of the sustainable fuel input.</p> <p>Conventional gas or oil fired CHP can be found in many industry sectors such as paper and chemicals, alternative sustainable fuel CHP units are an emerging technology without much data available at present.</p> |
| <p><u>Technical Review</u></p> <p>Biomass CHP has potential air quality and significant space requirements. This technology has been discounted in favour of renewable energy technologies.</p> <p><b>Noise:</b> The location of the plant and acoustic detailing of its enclosure / plant room, cooling air route and exhaust systems, will all need to be within acceptable limits imposed by Planning and be in line with the Acoustic Specialists recommendations, for this technology to be adopted.</p> <p><b>Land Use:</b> Site plan drawings indicate that there is sufficient land available for this technology.</p> |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| <b>BE CLEAN (Continued)</b>                                                                                                                                                                                                                                                                                                                              |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Item</u>                                                                                                                                                                                                                                                                                                                                              | <u>Included or Excluded</u> | <u>Comments</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Off-Site CHP                                                                                                                                                                                                                                                                                                                                             | <b>Excluded</b>             | To our knowledge there are no suitable off site local CHP schemes into which the proposed store can connect.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <u>Technical Review</u>                                                                                                                                                                                                                                                                                                                                  |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Tri-generation                                                                                                                                                                                                                                                                                                                                           | <b>Excluded</b>             | <p>Not suitable for energy profile of stand-alone Sainsbury's store – excess heating / cooling produced would be wasted.</p> <p>Only considered on mixed use developments with centralised Energy Centre solution</p> <p>Tri-generation is a combination of CHP and absorption chilling. The process of co-generation (CHP) produces heat and power.</p> <p>However, during the summer months the heat generated may not be fully utilised on site.</p> <p>It is during this time that the demand for cooling often reaches its maximum.</p> <p>The solution is to use the excess heat to operate an absorption chiller which is linked to the cogeneration unit providing chilled water.</p> |
| <u>Technical Review</u> <p>Tri-generation is possible for a retail situation however the cooling aspect of the system is utilized for the commercial refrigeration rather than just the air conditioning systems.</p> <p>This is still under review with regard to its application within a Sainsbury's store and has been discounted at this stage.</p> |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### 6.3 Be Green

The green measures defined as renewable energy technologies of which a range are presented below and assessments undertaken to determine the suitability for reducing the carbon emissions.

The renewable technologies to be considered are:

| <u>Heating / Cooling</u> | <u>Electricity / Heating</u> | <u>Electricity</u> |
|--------------------------|------------------------------|--------------------|
| Air Source Heat Pumps    | Hydrogen Fuel Cell           | Photo-voltaics     |
|                          |                              |                    |
| Biomass Heating          | Solar Thermal                | Wind Turbines      |
|                          |                              |                    |
| Ground Source Heat Pumps |                              |                    |
|                          |                              |                    |

## BE GREEN

| <u>Item</u>                                                                                                           | <u>Included or Excluded</u> | <u>Comments</u>                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Air Source Heat Pumps</u><br><br> | <b>Included</b>             | Air Source Heat Pump VRF Units provided to serve Heating and cooling requirements to designated Sainsbury's Colleague areas and Customer Restaurant. |

### Technical review

Air Source Heat Pumps will be installed to provide heating and cooling to the customer restaurant and staff areas of the supermarket.

Substantiation of selection of Air Source Heat Pumps as preferred technology is based upon the EU Directive.

Cooling **cannot** be included as de-centralised and renewable or low carbon sources under the dictates of the EU Directive and is therefore discounted from this calculation.

### VRV System Air Source Heat Pumps

Annual energy consumption attributable to Air Source Heat Pumps which is allowable as renewable is for Heating only:

Therefore, Heating demand has been calculated on the following basis,

Heating Season: 38 weeks

Opening Hours per week: 90 hours

### Customer Restaurant VRF System Air Source Heat Pumps

This is based upon the Mitsubishi PUHY-P500YSHM-A VRF System Outdoor unit

Anticipated Annual Heating Demand = **1,705 kWh**

Only the element of energy produced in excess of the electricity used to generate it may be considered renewable. (Typically for every kW of electrical energy used an efficient Heat Pump can generate up to 4 kW of heat)

This calculation for this element is detailed in Annex VIIB of the EU Climate Change legislative Package dated 11 Dec 2008 by the following formula:

$(1 - 1/SPF)$ , where SPF is Seasonal Performance Factor for the specified Heat Pump.

SPF – as advised by Mitsubishi for this VRF System Heat Pump is **3.94**.

Therefore allowable heating energy produced by the VRV Heat Pump which can be considered renewable, based upon the annual heating demand is:

$(1 - 1/3.94) \times 1,705 \text{ kWh} = \mathbf{1,272 \text{ kWh per annum}}$

### **Back of House VRF System Air Source Heat Pumps**

This is based upon the Mitsubishi PURY-P500YHM-A VRF System Outdoor unit

Anticipated Annual Heating Demand = **21,350kWh**

Only the element of energy produced in excess of the electricity used to generate it may be considered renewable. (Typically for every kW of electrical energy used an efficient Heat Pump can generate up to 4 kW of heat)

This calculation for this element is detailed in Annex VIIB of the EU Climate Change legislative Package dated 11 Dec 2008 by the following formula:

$(1-1/SPF)$ , where SPF is Seasonal Performance Factor for the specified Heat Pump.

SPF – as advised by Mitsubishi for this VRF System Heat Pump is **4.24**.

Therefore allowable heating energy produced by the VRF Heat Pump System, which can be considered renewable, based upon the annual heating demand is:

$(1-1/4.24) \times 21,350 \text{ kWh} = \mathbf{16,315 \text{ kWh per annum}}$

### **Total Heating Demand for VRF System ASHP's**

JSR Heating Demand = 1,272 kWh per annum

Back of House Heating Demand = 16,315 kWh per annum

**TOTAL**  $\equiv$  **17,588 kWh per annum**

Expressing as a percentage of the total anticipated energy consumption this equates to

$17,588/4,059,244 \times 100 = \mathbf{0.4 \% \text{ of the overall energy consumption}}$

The total anticipated Heating Demand can also be converted to CO<sub>2</sub> Emissions utilising the factors for electricity detailed in Building Research Establishment (BRE) National Calculation Methodology Modelling Guide 2010:

$17,588 \text{ kWh} \times 0.517 = 9,093 \text{ kg CO}_2 \text{ per annum}$

**Total anticipated CO<sub>2</sub> emissions for the VRF system Air Source Heat Pumps expressed as a percentage of the overall anticipated CO<sub>2</sub> emissions:**

$9,093/2,098,629 \times 100 = \mathbf{0.4\% \text{ of the overall CO}_2 \text{ emissions}}$

## BE GREEN (Continued)

| Item                                                                                                                                                                                                                          | Included or Excluded | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b><u>Ground Source Heating &amp; Cooling</u></b></p>   | <p>Included</p>      | <p>Sainsbury's are currently installing a number of closed circuit Ground Source Systems in line with that provided at their Crayford Store.</p> <p>Following trials at other Sainsbury's stores this system has however been found to only be commercially viable for Food Stores with net sales areas &gt; 60,000 ft<sup>2</sup></p> <p>GSHP System will reduce Electrical Energy consumed by Refrigeration system by around 30%.</p> <p>GSHP will cater for all hot water and heating demands for the store thus replacing any gas supply consumption.</p> <p>A Closed circuit ground source heat pump system has been considered.</p> <p>This captures natural energy through boreholes hundreds of metres beneath the ground, providing the store with on-demand heating, hot water and cooling from renewable sources.</p> <p>Connecting both the sales area refrigeration system and the stores heating system to the water loop will increase the efficiency of the systems as one system rejects heat to the water loop and the other would be drawing heat from the water loop.</p> |

### **Technical Review**

This technology is therefore proposed to be incorporated into the scheme using a closed loop system.

Trials have been carried out on other Sainsbury's stores and this system has been found to be commercially viable for a store the size of the proposed new Barnsley store.

### **Energy Consumption**

The overall anticipated energy consumption for the new Barnsley store following the introduction of the energy efficiency measures is **5,281,578 kWh per annum**.

Historical data also indicates that the refrigeration electrical load is 40% of the store electrical load and that 30% of this energy can be saved by the installation of Ground Source Heat Pumps.

The refrigeration electrical consumption that can be saved by the introduction of Ground Source Heat Pumps can therefore be calculated as

$$4,029,497 \times 0.4 \times 0.3 = 483,540 \text{ kWh per annum.}$$

The overall anticipated energy consumption excluding the Ground Source Heat Pumps can therefore be reduced as follows:

$$5,281,578 - 483,540 = 4,798,038 \text{ kWh per annum.}$$

The gas component, which will be off-set by the Ground Source Heat Pumps, is **1,252,081 kWh** per annum.

This will reduce the overall energy consumption to:-

$$4,798,038 - 1,252,081 = 3,545,957 \text{ kWh per annum}$$

Based on the data available from the Sainsbury's trial installations, the anticipated electricity energy consumption attributable to the Ground Source Heat Pumps is circa **513,287 kWh per annum**. This needs to be added to the above overall anticipated energy consumption, indicated above.

Therefore the overall anticipated energy consumption including the Ground Source Heat Pumps is

$$3,545,957 + 513,287 = 4,059,244 \text{ kWh per annum.}$$

Expressing the gas component which will be off-set by the Ground Source heat Pumps as a percentage of the total anticipated energy consumption of the proposed development, this equates to

$$1,252,081 / 4,059,244 \times 100 = 30.8\%$$

#### **CO<sub>2</sub> Emissions**

The overall anticipated CO<sub>2</sub> Emissions for the development following the introduction of the energy efficiency measures is **2,331,162 kg CO<sub>2</sub> per annum**.

The reduction in CO<sub>2</sub> as a result of the reduced refrigeration load is

$$483,540 \text{ kWh per annum} \times 0.517 \text{ kgCO}_2 / \text{kWh} = 249,990 \text{ kg CO}_2 \text{ per annum}$$

The overall anticipated CO<sub>2</sub> Emissions excluding the Ground Source Heat Pumps can therefore be reduced as follows:

$$2,331,162 - 249,990 = 2,081,172 \text{ kg CO}_2 \text{ per annum}$$

The anticipated gas component, which will be off-set by the Ground Source Heat Pump, is **247,912 kg CO<sub>2</sub> per annum**. This will reduce the overall anticipated CO<sub>2</sub> emissions to:

$$2,081,172 - 247,912 = 1,833,260 \text{ kg CO}_2 \text{ per annum}$$

The anticipated electricity energy consumption for the Ground Source Heat Pumps can be converted to CO<sub>2</sub> Emissions utilising the factor for electricity detailed in Building Research Establishment (BRE) National Calculation Methodology Modelling Guide 2010:

$$513,287 \text{ kWh per annum} \times 0.517 \text{ kgCO}_2 / \text{kWh} = 265,369 \text{ kg CO}_2 \text{ per annum}$$

This figure needs to be added to the above overall anticipated CO<sub>2</sub> emissions.

Therefore the overall anticipated CO<sub>2</sub> Emissions including the Ground Source Heat Pumps is

$$1,833,260 + 265,369 = 2,098,629 \text{ kg CO}_2 \text{ per annum}$$

Expressed the gas component which will be off-set by the Ground Source Heat Pumps as a percentage of the total anticipated overall store carbon emissions of the proposed development, the reduction in anticipated CO<sub>2</sub> Emissions equates to:

$$247,912 / 2,098,629 \times 100 = 11.8 \%$$

The requirement for standby electrical immersion heaters for the hot water system will be retained for Health and Safety reasons.

**Noise:** There is no noise issue associated with the use of this technology.

**Land Use:** Site plan drawings indicate that there is sufficient land available for this technology.

## BE GREEN (Continued)

| <u>Item</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <u>Included<br/>or<br/>Excluded</u> | <u>Comments</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <p><u>Biomass Heating</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p><b>Excluded</b></p>              | <p>Sainsbury's standard specification for all new Food Stores with net sales area <math>\leq 60,000</math> ft<sup>2</sup>.</p> <p>The practicality of biomass heating utilising wood chips or pellets is part driven by the availability of a local source.</p> <p>The nature of burning wood based material will require that the plant will only run 95% of the time due to maintenance and down time and that a standby source of heating is provided for the remaining 5%.</p> <p>This is achieved by using limited electrical immersion heater for domestic hot water only whilst the boiler is being serviced.</p> <p>In reality the boilers that Sainsbury's have installed so far are very successful with the number of deliveries of Biomass Fuel being a maximum of 1 per month so there is no material impact on local transport routes.</p> <p>Sainsbury's are aware of the need to provide a sustainable source of fuel for the Biomass Boiler and have embarked on a programme to set up a regional network of suppliers throughout the UK.</p> <p>This inclusion of a biomass boiler will require storage area for the wood supply plus a boiler house to accommodate the additional plant; this is normally provided as an acoustic container which sits neatly alongside the store.</p> <p><b>Positive Considerations</b></p> <ul style="list-style-type: none"> <li>• Proven track record throughout Europe</li> <li>• No Climate Change levy</li> <li>• Comparatively low capital cost</li> <li>• Modular off-site construction</li> <li>• Integral Fuel hoppers</li> </ul> |
| <p><u>Technical Review</u></p> <p>If the proposed GSHP scheme is not technically or commercially viable a Biomass Boiler will be installed to provide the heating and hot water requirements to the new Food Store only.</p> <p>A biomass boiler would provide approximately 26.1 % of the overall anticipated energy consumption (61.2 % of the increase in anticipated overall energy consumption).</p> <p>On this basis the store would have no permanent Gas supply connection and therefore there will be no natural gas consumption attributable to this store.</p> |                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## BE GREEN (Continued)

| <u>Item</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <u>Included or Excluded</u> | <u>Comments</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b><u>Wind turbines</u></b></p> <div style="display: flex; justify-content: space-around;">   </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Excluded</b></p>      | <p>Modern wind turbines generate electricity through the action of the wind on aerofoil blades.</p> <p>Most of these are land-based and can either be connected to an electricity grid or be non-grid connected, with or without some form of back up or storage.</p> <p>Wind energy can also be used to generate heat and mechanical power.</p> <p><b><u>Positive Considerations</u></b></p> <ul style="list-style-type: none"> <li>• Latest Vertical Axis turbines have very low noise impact.</li> <li>• Proven track record</li> <li>• Failure will not affect operation of store trading</li> <li>• Wind is not dependant on manual delivery by truck of a fuel source</li> <li>• The cost of the fuel source will not increase</li> </ul> <p><b><u>Negative Considerations</u></b></p> <ul style="list-style-type: none"> <li>• Wind electricity generators will require on-going maintenance</li> <li>• Not all sites will be suitable for location of the wind turbines</li> <li>• Wind source is not guaranteed and can be highly variable in an urban environment</li> <li>• Adverse wind speed and high wind speed can halt power production</li> <li>• Wind turbine requires noise and vibration consideration</li> <li>• Highly visible</li> </ul> |
| <p><b><u>Technical and Financial Review</u></b></p> <p>Whilst wind technology works on a large scale the profile for small-scale wind technology wind is often unsatisfactory and as such this technology does not deliver meaningful energy savings. This technology has therefore been discounted for this particular project.</p> <p><b>Noise:</b> The location of the turbines will need to be chosen to suit both operation and minimisation of noise to neighbouring properties and into the served premises. Noise is likely to be variable with wind speed. Noise at all wind speeds and directions will need to be within acceptable limits imposed by Planning and be in line with the Acoustic Specialists recommendations, for this technology to be adopted.</p> <p><b>Land Use:</b> Site plan drawings indicate that there is sufficient land available for this technology.</p> |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## BE GREEN (Continued)

| <u>Item</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <u>Included or Excluded</u> | <u>Comments</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <p><b><u>Photo-voltaic Panels</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                          | <p><b>Excluded</b></p>      | <p>There are sometimes limitations with regards to the overall building design and available Roof space on which to mount PV Panels.</p> <p>Also Consider Inclusion Glass / Glass PV panels built into any glazed elevations.</p> <p>These photovoltaic (or PV) systems can be used for large scale centralised power generation, for de-centralised grid-connected power supply and as a remote power source when there is no grid-supplied electricity available.</p> <p>The energy in sunlight can also be concentrated sufficiently to achieve temperatures suitable for thermal power generation</p> <p><b><u>Positive Considerations</u></b></p> <ul style="list-style-type: none"> <li>• Photovoltaics have a proven track record</li> <li>• one of the first UK installations from 50 years ago is still operating today.</li> <li>• Photovoltaics require very little on-going maintenance</li> <li>• Failure of operation will not affect operation of store trading</li> <li>• Photovoltaics could be hidden from view, incorporated as part of the building fabric or in part installed in a highly visual location to make a public statement as is required</li> <li>• Photovoltaics do not emit noise or vibration</li> <li>• Photovoltaics are not dependant on manual delivery by truck of a fuel source.</li> <li>• The cost of the fuel source will not increase.</li> </ul> |
| <p><b><u>Technical and Financial Review</u></b></p> <p>The use of PV panels has been considered and discounted on this particular scheme.</p> <p>Following a detailed review of the associated costs and payback periods it has been decided that this technology is not financially viable for the Sainsbury store at this time.</p> <p><b>Noise:</b> There is no noise issue associated with the use of this technology.</p> <p><b>Land Use:</b> Roof mounted solution there is no land use issue associated with the use of this technology.</p> |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## BE GREEN (Continued)

| <u>Item</u>                                                                                                                               | <u>Included or Excluded</u> | <u>Comments</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b><u>Solar Thermal Water Heating Panels</u></b></p>  | <p><b>Excluded</b></p>      | <p>Solar Thermal Water Heating Panels are supported by Sainsbury's as a viable method of renewable energy generation for inclusion for their stores in principle.</p> <p>There are sometimes limitations on this particular scheme with regards to the overall building design and available Roof space on which to mount Solar Thermal Panels.</p> <p>Energy from sunlight in the form of heat can be captured by devices that circulate a fluid for delivery elsewhere. Through the use of climate-sensitive building design, solar energy can be used for space heating.</p> <p>Utilising roof collection panels to generate hot water will reduce gas consumption and this could be used for domestic hot water or pre-heated LTHW. Domestic hot water use</p> <p><b><u>Positive Considerations</u></b></p> <ul style="list-style-type: none"> <li>• Has a proven track record.</li> <li>• Require very little ongoing maintenance</li> <li>• Failure of operation will not affect operation of store trading</li> <li>• Could be hidden from view or installed in a highly visual location to make a public statement as is required</li> <li>• Do not emit noise or vibration</li> <li>• Easy to incorporate into DHWS system</li> </ul> <p><b><u>Negative Considerations</u></b></p> <ul style="list-style-type: none"> <li>• Comparatively high capital cost</li> <li>• May add weight to structure</li> <li>• Poor impact on Carbon Footprint</li> </ul> |

### **Technical Review**

The use of Solar Thermal water heating has been discounted on this particular scheme. The hot water requirements of the Food Store will be met by the proposed Ground Source Heat Pumps.

**Noise:** There is no noise issue associated with the use of this technology.

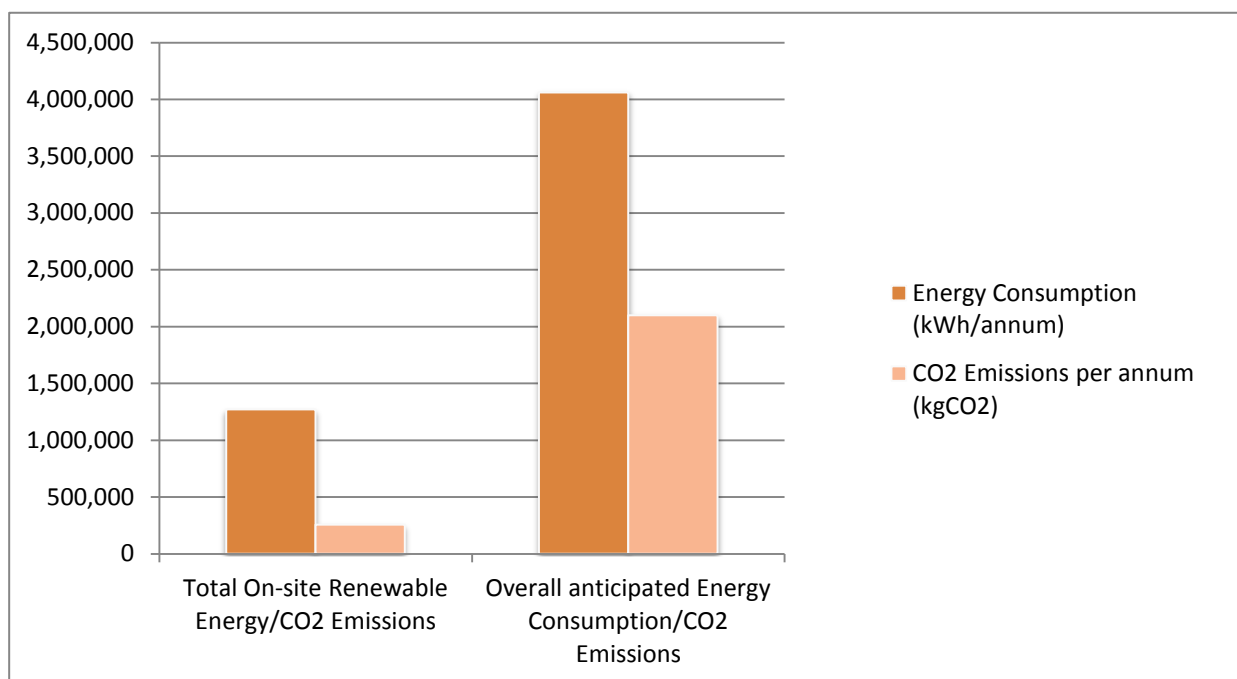
**Land Use:** Roof mounted solution - no land use issue associated with the use of this technology.

| <b>BE GREEN (Continued)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>Item</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b><u>Included or Excluded</u></b> | <b><u>Comments</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <u>Hydrogen Fuel Cell</u>                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Excluded</b>                    | <p>Fuel cells work like conventional batteries but without running down or needing to be recharged.</p> <p>They produce energy in the form of heat and fuel.</p> <p>They consist of two electrodes sandwiched around an electrolyte.</p> <p>Oxygen passes over one electrode and hydrogen over the other generating electricity, water and heat.</p> <p>A fuel cell system can utilise hydrogen from a number of sources including any hydrocarbon fuel or from renewable energy such as hydro power, biomass or wind.</p> <p>When using renewable energy, emissions of greenhouse gases are virtually zero.</p> |
| <p><b><u>Technical Review</u></b></p> <p>This is still an emerging technology and the Hydrogen infrastructure is not in place which means the units would run on gas which results in the system being low carbon rather than zero carbon.</p> <p>The cost for a fuel cell system is significantly more expensive than other technologies, which makes it uneconomical for this project. Other factors include longevity and physical special constraints.</p> |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 6.4 Conclusion

### 6.4.1 Comparison of the Energy Consumption and Carbon Emissions generated by the on-site Renewable Energy Technologies and the overall Energy Consumption and Carbon Emissions for the new Food Store

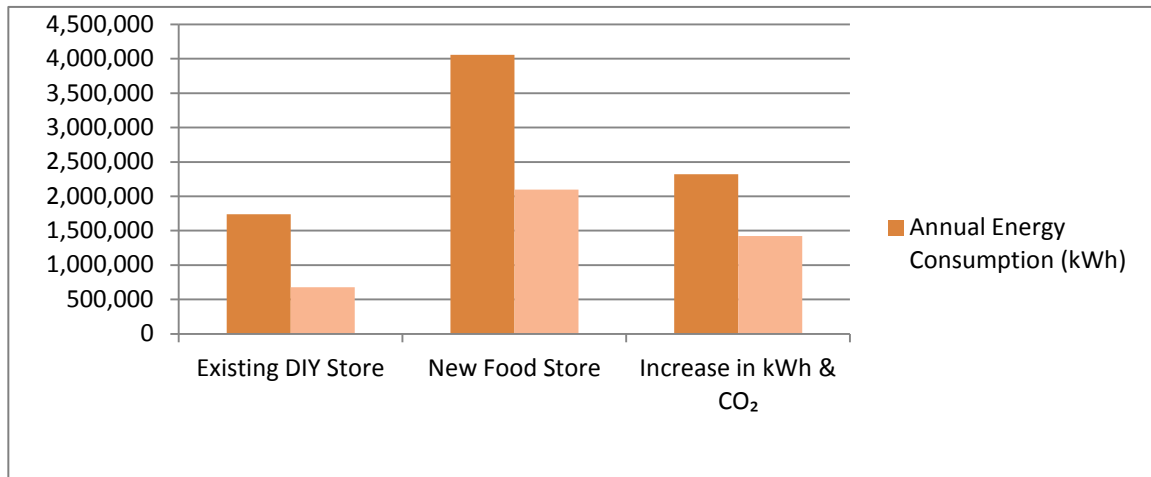
|                                                          | Energy consumption (kWh/annum) | CO <sub>2</sub> emissions (kgCO <sub>2</sub> / annum) |
|----------------------------------------------------------|--------------------------------|-------------------------------------------------------|
| Ground Source Heat Pumps                                 | 1,252,081                      | 247,912                                               |
| ASHP's                                                   | 17,588                         | 9,093                                                 |
| Total On-site Renewable Technologies                     | 1,269,669                      | 257,005                                               |
| Overall energy consumption and CO <sub>2</sub> emissions | 4,059,244                      | 2,098,629                                             |



The data demonstrates that with the inclusion of Ground and Air Source Heat Pumps the Sainsbury's store is estimated to reduce its energy consumption and carbon emissions by 31.3% and 12.2% respectively.

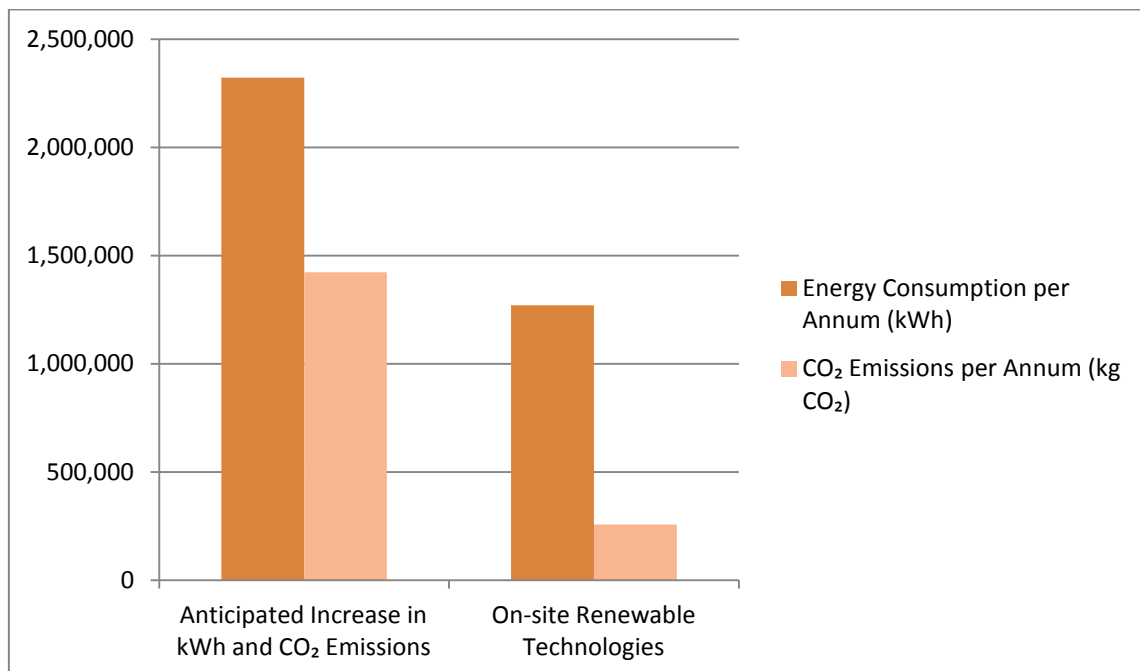
### 6.4.2 Comparison of the overall Energy Consumption and Carbon Emissions of the existing DIY Store and the new Food Store

|                                                     | Energy Consumption per Annum (kWh) | CO <sub>2</sub> Emissions per Annum (kg CO <sub>2</sub> ) |
|-----------------------------------------------------|------------------------------------|-----------------------------------------------------------|
| Existing DIY store                                  | 1,737,978                          | 675,544                                                   |
| New Food Store                                      | 4,059,244                          | 2,098,629                                                 |
| Increase in Energy Consumption and Carbon Emissions | 2,321,266                          | 1,423,085                                                 |



#### 6.4.3 Comparison of the anticipated increase in Energy Consumption and Carbon Emissions with the Energy Consumption and Carbon Emissions generated/offset by the proposed on-site Renewable Technologies

|                                                                 | Energy Consumption per Annum (kWh) | CO <sub>2</sub> Emissions per Annum (kg CO <sub>2</sub> ) |
|-----------------------------------------------------------------|------------------------------------|-----------------------------------------------------------|
| <b>Anticipated Increase in kWh and CO<sub>2</sub> Emissions</b> | <b>2,321,266</b>                   | <b>1,423,085</b>                                          |
| <b>On-site Renewable Technologies</b>                           | <b>1,269,669</b>                   | <b>257,005</b>                                            |



It is reasonable to apply the above figures to the following calculations where the de-centralised and renewable or low carbon energy sources element of the proposed development is determined. Only during the detailed design process will a full SBEM calculation be carried out and the actual BER can be determined and therefore the final figures can be adjusted accordingly.

The Barnsley Metropolitan Borough Council's Adopted Core Strategy guide target of 15% of the increase in energy consumption to be met by renewable sources.

On this basis, the target for On-Site Renewable energy generation would be:

$$2,321,266 \text{ kWh per annum} \times 15\% = 348,190 \text{ kWh per annum}$$

The **1,269,669 kWh per annum** anticipated energy consumption generated/offset by the on-site renewable technologies will far exceed this requirement and will in fact generate/offset **31.3 %** of the anticipated overall energy consumption.

## 7.0 Summary

In adopting the approach set out in this document, Sainsbury's clearly demonstrate their continued commitment to building sustainability into each development they undertake. This document outlines Sainsbury's commitment to the development of a new store at Barnsley that consumes significantly less energy and emits less CO<sub>2</sub> by specifying High Efficiency Plant and Equipment and providing on-site renewable energy sources in the form of Ground Source Heat Pumps and Air Source Heat Pumps (ASHP) to provide all of the space heating and hot water requirements in the store.

During the detailed design phase the project team will determine the predicted annual energy profile for the new Barnsley store, taking account of all incorporated energy efficiency measures and renewable technologies.

The team will maintain a dialogue with the Barnsley Metropolitan Borough Council and review the proposals for achieving the sustainability target as the design progresses.