

# Understanding how the Clear Heater System Saves you Money in Winter

A summary of associated running costs of using a  
conventional gas central heating system in the average  
UK home

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## 1. Introduction

The Clear Heater System (CHS) is designed to save energy and money on your heating bills using clever patented technology. Unlike other heating systems the CHS has a control panel in your home that displays precise real-time energy usage and costs. This allows you to see and control the exact heating costs instantaneously on a daily, weekly, monthly or annual basis.

Traditional heating systems don't have this useful ability to view real time costs. For this reason it is often difficult to compare the cost of your previous conventional heating system to the savings made by using a new CHS. This is particularly the case for new CHS users going through their first winter when heating requirements are at their highest. For this reason, a large part of this report focuses on the winter heating costs.

This report aims to help you compare the cost and energy readings on your CHS control panel at home with typical costs of using a conventional gas central heating system. We have tried to explain this often complex subject as clearly and simply as possible.

## 2. Summary of our findings

A summary of the main points is listed in section 2.1 on page 4.

This shows typical energy and heating costs for an average UK home, based on using a conventional gas central heating system.

Section 2.2 on page 5 has a quick reference guide showing typical running costs of a conventional gas central heating system.

If you want to see our calculations in more detail please read on through to section 3, page 5, 'The proof and methodology used'.

It is important to note that with a conventional heating system the high winter running costs are normally spread out equally across the whole year by paying in regular instalments. In summer you will be paying exactly the same as in winter, even if you don't use your heating system in summer!

With the Clear Heater System you only pay for what you use, and this is displayed in real-time on your control panel. On a cold winter's day the real-time cost of running your Clear Heater System should therefore not be multiplied across 365 days of a full year. In summer you will be heating much less energy than in winter and therefore pay much less.

## 2.1 *Typical running costs associated with gas central heating systems*

The following cost and energy use values are based on using a conventional gas central heating system in an average sized UK home.

This is intended to help CHS customers compare conventional heating system costs during the winter to their Clear Heater System running costs in winter.

Note: Figures assume that all living rooms are heated to 21°C whilst all other rooms are heated to 18°C and does not include heating hallways, porches or conservatories.

### **What is the average UK home?**

The average UK home is a terraced or semi-detached property with 5 rooms of 88 square meters (floor area) in size.

### **How much are average annual energy bills?**

The average UK home spends £1,188.08 a year on a combined energy bills (gas and electric).

### **What proportion of energy bills are spent on space heating?**

On average, 66% of the average UK home energy spend goes on space heating.

### **How much are winter energy bills and heating costs?**

The average UK home spends 81.56% of its entire annual energy spend during the winter months (Dec to Feb). During winter, the average UK home spends £969.00 on combined gas and electric bills and of this, £639.54 goes on space heating costs.

### **How much are monthly energy bills and heating costs in winter?**

This equates to £323 per month on combined energy bills and £213.18 per month on heating costs.

### **What does it cost to heat per room in winter?**

It costs the average UK home £42.63 per month to heat each room over the winter period. This is equal to £1.42 per day to heat each room over the winter period.

## 2.2 Overview of running costs associated with gas central heating systems

The table below shows typical costs of using a Gas Central Heating System in an average UK home of five rooms, 88 sq m size.

You can find the costs of a larger or smaller property by reading the values above or below the average home costs.

Use this as a quick reference guide to compare with the readings on your CHS control panel.

			Total Cost of Combined Gas & Electricity Bills		Total Cost of Space Heating in Winter (Dec, Jan, Feb ) <sup>3</sup>		
Percentage adjustment	Rooms	Average Size sq.m	Annual Spend <sup>1</sup>	Winter Spend <sup>2</sup>	Winter Dec - Feb	Monthly	Daily
75%	3.75	66	£891.06	£726.75	£479.66	£159.89	£5.33
Average UK Home	5	88	£1188.08	£969.00	£639.54	£213.18	£7.11
120%	6	105.6	£1425.70	£1162.80	£767.45	£255.82	£8.53
150%	7.5	132	£1782.12	£1453.50	£959.31	£319.77	£10.67
175%	8.75	154	£2079.14	£1695.75	£1119.20	£373.07	£12.44
200%	10	176	£2376.16	£1938.00	£1279.08	£426.36	£14.22

**Figure 1. Associated running costs of a conventional gas central heating system**

*Note:*

1) Combined gas and electricity bills includes heating rooms but also lighting, electric appliances and hot water etc.

2) Winter spend during the months December, January and February is 81.56% of total energy costs.  
(see Percentage of total energy costs used during winter, Page 14)

3) The cost of space heating is taken as 66% of total energy used.  
(see Percentage of annual energy spend on space heating, page 10)

### 3. The proof and methodology used

#### 3.1 *Definition of the 'average UK home'*

The starting point for all our calculations is the average UK home. According to the Department of Energy and Climate Change (DECC), semi-detached and terraced houses are the most common UK housing types.

##### Type profile of homes

'House type' refers to whether dwellings are semi-detached, terraced houses, detached houses, flats or bungalows. Unsurprisingly, the housing mix changes slowly over time – due to new house building and some demolition of dwellings.

However, over nearly 40 years the change is quite pronounced (see graph below\*). While semi-detached and terraced houses have always been the most common house types (each representing just under a third of the housing stock throughout the period), flats and detached houses have become more common. (Flats are now 19% of the housing stock, and detached houses are 17%.)

**Figure 2. The average UK home house type**

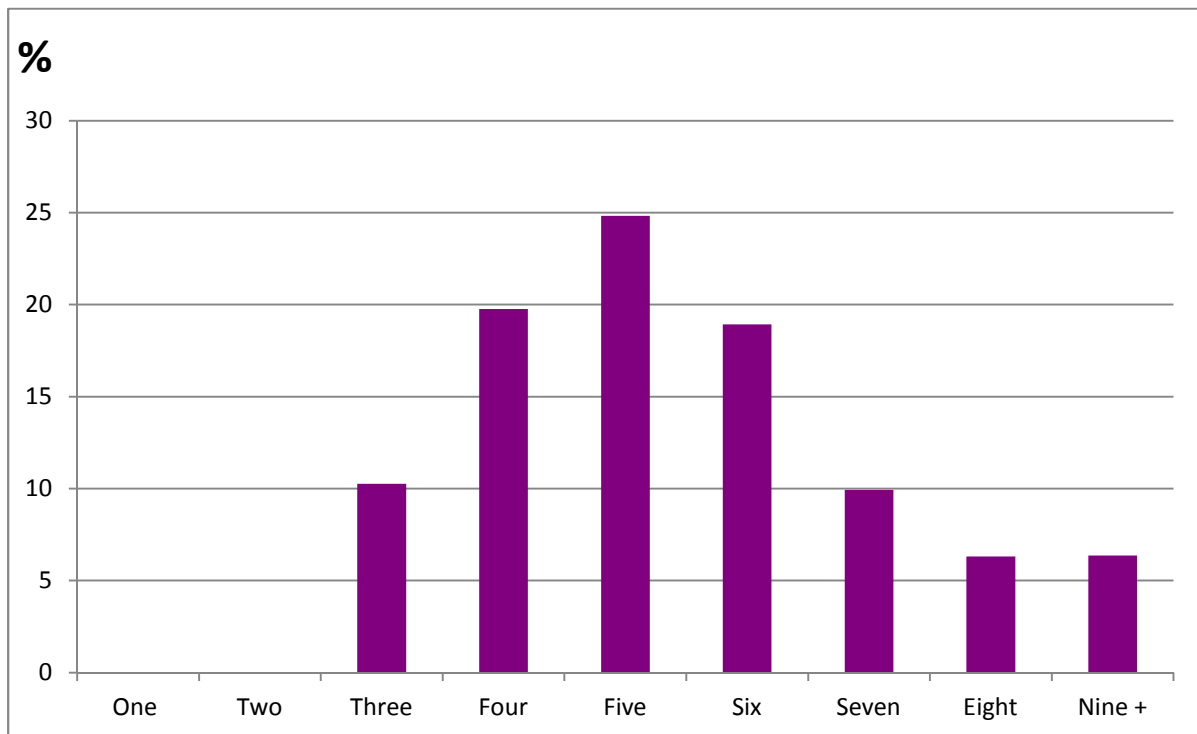
*Source: Department of Energy and Climate Change (2011), Great Britain's Housing Energy Fact File.*

*Available at:*

*[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48195/3224-great-britains-housing-energy-fact-file-2011.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48195/3224-great-britains-housing-energy-fact-file-2011.pdf) (Accessed: 22 December 2014).*

From this we can ascertain the DECC uses a semi detached or terraced house as their typical UK household. In order to find the number of rooms present in each of the housing types we can turn to the Office of National Statistics (ONS) 2011 census data as it is not apparent in the DECC report.

The ONS data states that the most common number of rooms in UK homes is between four to six and that represents 63.4% of all UK homes. The data is summarised in the following graph:



**Figure 3: Number of rooms in UK housing stock**

Source: Office of National Statistics (2011), 2011 Census: QS407UK Number of rooms, local authorities in the United Kingdom 23-Jan-2014. Available at: <http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Housing+Stock#tab-data-tables> (Accessed: 22 December 2014).

Combining the ONS information with the DECC's data above, we can conclude that the average UK home is a semi-detached or terraced house of between four to six rooms.

### 3.2 *Size of home in relation to heating costs*

Another important factor to consider is the size of a home. When looking to establish what the average floor area of a UK home is we chose to seek input from the Royal Institute of British Architects or RIBA. They have produced a report which states that the size of the average UK home is 88 square meters.

Below is an extract from the report.

**The average three bedroom home from our sample of 3,418 homes across 71 sites is 88 sqm.** It is **8 sqm** short of the recommended minimum for a two storey, three bedroom home for five residents.

*Source: The Case for Space: the size of England's new homes. (September 2011), Royal Institute of British Architects . Available at:*  
*<http://www.architecture.com/Files/RIBAHoldings/PolicyAndInternationalRelations/HomeWise/CaseforSpace.pdf> (Accessed: 22 December 2014).*

The house size factor needs to be considered when calculating energy costs and a straight linear prediction can be used for this purpose. For example a house that is twice the average size (176 square meters) will use twice as much energy to heat it as one that is 88 square meters regardless of the fact they may both have three bedrooms.



### 3.3 *Total annual energy bills for the average UK home*

To calculate the total energy spend per year for an average UK home we can again turn to DECC. The unit of measure used to record household energy use is the kilowatt hour. The DECC data has been reproduced in the screen grab below for easy reading.

*Source: DECC, ECUK Tables 3.07*

The average unadjusted electricity consumption per household in 2013 was 4,192 kilowatt hours (kWh), which adjusts very slightly to 4,170 kWh once a temperature factor has been applied to the data. Average unadjusted gas consumption per customer in 2013 was 15,462 kWh; this adjusts to 14,829 kWh once a temperature factor has been applied to the data, which takes into consideration that 2013 was slightly colder than average, specifically in the early months of the year.

*Source: Department of Energy and Climate Change (2014), Energy Consumption in the UK. Available at:*

*[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/338662/ecuk\\_chapter\\_3\\_domestic\\_factsheet.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/338662/ecuk_chapter_3_domestic_factsheet.pdf) (Accessed: 22 December 2014).*

What this is telling us is that the average UK home uses the following:

- 14,829 kWh of gas per year
- 4,170 kWh of electricity per year

The cost for gas and electricity prices are based on data from the Energy Saving Trust website who in turn source the DECC statistics from 2013.

- Gas 4.21p / kWh\*
- Electricity 13.52p / kWh\*

*\*Source: Energy Saving Trust website. Available at:*

*<http://www.energysavingtrust.org.uk/content/our-calculations> (Accessed: 22 December 2014).*

This equates to £563.78 in electricity and £624.30 in gas used per year. The combined total gives us £1,188.08 a year on a combined energy bills.

#### **CALCULATIONS:**

Gas price 4.21p / kWh

14,829 kWh x 4.21p = £624.30 annual gas cost

Electric price 13.52 p / kWh

4,170 kWh x 13.52p = £563.78 annual electricity cost

£563.78 + £624.30 = £1188.08 combined annual energy costs

*(Note: These figures are exclusive of fixed charges for these fuels)*

### 3.4 *Percentage of annual energy spend on space heating*

In order to ascertain what percentage of a household's annual energy spend goes on heating we looked again to the DECC to supply that answer. From this we could see that DECC estimates the average home uses 66% of its entire energy spend to heat their homes.

Surprisingly, given the improvements in energy efficiency, heating's share of total energy use in homes has also grown: from 58% to 66%. This may indicate that the rise of central heating made more difference to energy use than better energy efficiency – by allowing people to heat the whole of their homes rather than just individual rooms.

This figure of 66% is very useful because it clearly gives us an idea of what exactly is going on, in terms of our heating spend. For example we very often forget that even though we may have gas fired central heating system, we must also include the pumps, clocks, timers, boiler electronics, etc. etc. all of which are electrically powered. We cannot simply look at one type of fuel costs in isolation when considering our energy spend on heating.

66% of our total energy spend is used to heat our home.

### 3.5 *Average annual cost of space heating*

We know from section 3.4 that 66% of our total energy spend goes on space heating.

This equates to a spend of £784.13 on space heating in a 4-6 room terraced or semi-detached property per year.

#### **CALCULATIONS:**

£ 1188.08 (combined annual energy bill) x 66% = £784.13 annual spend on space heating

### 3.6 *Effect of winter weather on total energy spend*

Clearly, heating costs will always increase when the outside temperature gets colder in winter and this is heightened further if there is a lot of moisture in the air. This is mentioned too by The Department of Energy and Climate Change (DECC):

#### Energy use and weather

The difference in temperature between outside and inside homes in winter is the single most important factor shaping energy use at home. If it is very cold outside and householders choose to heat their home to 25°C, their home will inevitably use much more heating energy than if it were mild outside and the home were only heated to 18°C.

*Source: Department of Energy and Climate Change (2011), Great Britain's housing energy fact file.*

*Available at:*

*[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48195/3224-great-britains-housing-energy-fact-file-2011.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48195/3224-great-britains-housing-energy-fact-file-2011.pdf) (Accessed: 22 December 2014).*

The DECC gives us one further very important piece of information i.e. you cannot simply compare what you spend in one winter with another. They state that what households spend reflects the weather. That is true of the CHS system as much as it is for any other.

Here is an extract from DECC's report:

#### Energy consumption in winter 2011/12 compared with winter 2012/13<sup>5</sup>

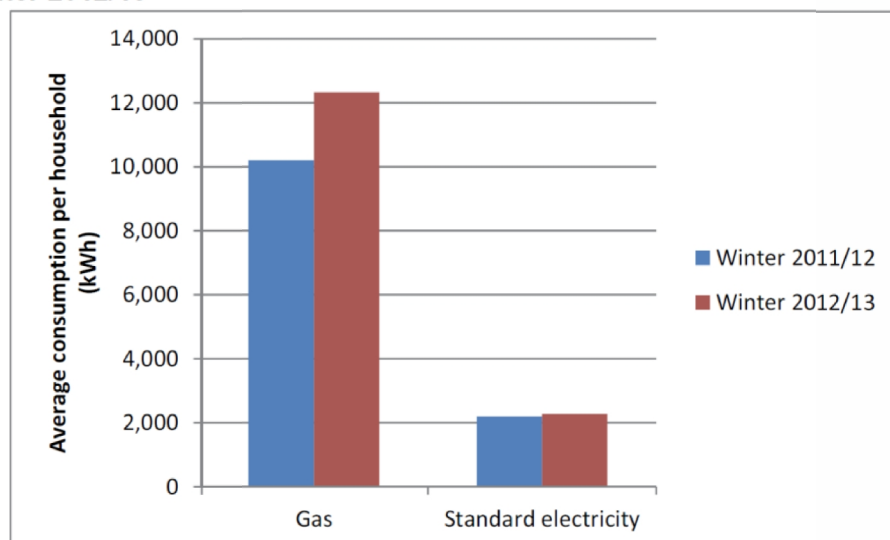
Over time, the amount of energy consumed by households tends to closely reflect weather patterns. This is particularly true for gas, as this is the fuel used by most households for space heating. Chart 2 shows that the average gas consumption per household (of those that use gas) was considerably higher in the colder winter of 2012/13 than the milder winter of 2011/12. Standard electricity (excluding time of use tariffs), on the other hand, which is seldom used for heating, only saw slightly increased consumption in this period.

*Source: Department of Energy and Climate Change (2013), The effect of the cold 2012/13 winter on energy bills. Available at:*

*[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/208610/the\\_effect\\_of\\_the\\_cold\\_2012\\_13\\_winter\\_on\\_energy\\_bills.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208610/the_effect_of_the_cold_2012_13_winter_on_energy_bills.pdf) (Accessed: 22 December 2014).*

To emphasize this point, the DECC encapsulated the 2012 and 2013 winter spends in both electricity and gas. You can clearly see in the diagram below the differences in winter months are considerably more noticeable for gas as opposed to electricity.

**Chart 2: Average gas and electricity consumption per household, winter 2011/12 and winter 2012/13<sup>6</sup>**



**Table 1: Average gas bills in winter 2011/12 and winter 2012/13, under scenarios where energy prices, energy consumption, or both change<sup>8</sup>**

	Average gas bill (£)	Average standard electricity bill (£)	Average dual fuel bill (£)
Actual bill for winter 2011/ 12	502	342	844
Bill for winter 2012/ 13 if energy consumption had not changed	522	352	875
Bill for winter 2012/ 13 if energy prices had not changed	583	351	934
Actual bill for winter 2012/ 13	607	362	969

This table shows that increasing energy consumption, largely due to the cold weather, caused average dual fuel energy bills to increase by approximately £90 between the winters of 2011/12 and 2012/13. Meanwhile, increasing energy prices caused bills to increase by approximately £31.

Source: Department of Energy and Climate Change (2013), *The effect of the cold 2012/13 winter on energy bills*. Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/208610/the\\_effect\\_of\\_the\\_cold\\_2012\\_13\\_winter\\_on\\_energy\\_bills.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208610/the_effect_of_the_cold_2012_13_winter_on_energy_bills.pdf) (Accessed: 22 December 2014).

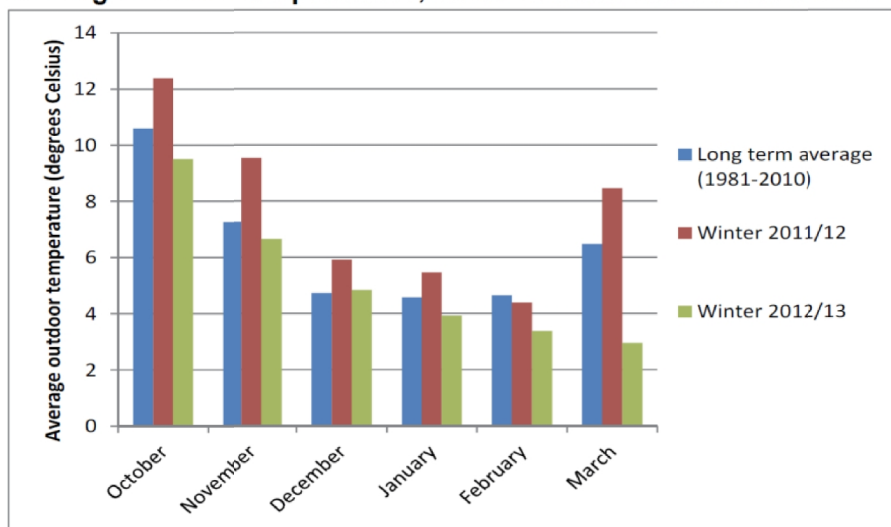
Gas bills between the winter of 2012 and the colder winter of 2013 were £90 more in 2013 as a direct result of the temperature difference.

### 3.7 Definition of winter months

Winter is often defined by meteorologists to be the three calendar months with the lowest average temperatures and in the UK this is accepted to be the months December through to February inclusive.

This is clear when you look at the long term data on the DECC website and see that the long term lowest average temperatures in the UK are from December, January and February.

*Special feature – effect of cold 2012/13 winter on energy bills*  
**Chart 1: Average outdoor temperatures, winter 2011/12 and winter 2012/13**



Source: Department of Energy and Climate Change (2013), *The effect of the cold 2012/13 winter on energy bills*. Available at:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/208610/the\\_effect\\_of\\_the\\_cold\\_2012\\_13\\_winter\\_on\\_energy\\_bills.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208610/the_effect_of_the_cold_2012_13_winter_on_energy_bills.pdf) (Accessed: 22 December 2014).

### 3.8 *Percentage of total energy costs used during winter*

To help us calculate the proportion of our annual energy bills that we use to heat our homes in winter we can again seek DECC's input. Below is an extract reproduced from DECC's report at this link:

**Table 1: Average gas bills in winter 2011/12 and winter 2012/13, under scenarios where energy prices, energy consumption, or both change<sup>8</sup>**

	Average gas bill (£)	Average standard electricity bill (£)	Average dual fuel bill (£)
Actual bill for winter 2011/12	502	342	844
Bill for winter 2012/13 if energy consumption had not changed	522	352	875
Bill for winter 2012/13 if energy prices had not changed	583	351	934
Actual bill for winter 2012/13	607	362	969

This table shows that increasing energy consumption, largely due to the cold weather, caused average dual fuel energy bills to increase by approximately £90 between the winters of 2011/12 and 2012/13. Meanwhile, increasing energy prices caused bills to increase by approximately £31.

Source: Department of Energy and Climate Change (2013), *The effect of the cold 2012/13 winter on energy bills*. Available at:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/208610/the\\_effect\\_of\\_the\\_cold\\_2012\\_13\\_winter\\_on\\_energy\\_bills.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208610/the_effect_of_the_cold_2012_13_winter_on_energy_bills.pdf) (Accessed: 22 December 2014).

That says that during the winter of 2013 the average terraced or semi-detached home containing between 4-6 rooms and heated by gas, spent £969 over the winter alone. That equates to over £323/month.

We know from section 3.3 that the average annual energy spend is £1188.08.

Therefore the total energy spend in winter represents 81.56% of the entire annual energy spend in the average UK home.

This leaves 18.44% spend in the remaining nine months of the year.

#### **CALCULATIONS:**

$$(\text{combined winter energy cost}) / (\text{combined annual energy cost}) = \text{percentage of annual cost}$$
$$£969 / £1188.08 = 81.56\% \text{ of annual energy costs}$$

### 3.9 *Average winter heating costs*

We saw in section 3.5 that the average annual spend on space heating in the UK is £784.13 and we know from section 3.8 that 81.56% of our total energy spend is used in the winter months.

Therefore a typical semi-detached or terraced 4-6 roomed property will spend £639.54 in the winter months on space heating.

This equates to:

£213.18 per month

£7.11 per day

#### **CALCULATIONS:**

TOTAL ACROSS ALL WINTER MONTHS:

(annual spend on space heating) x (proportion spent during winter) = winter heating costs  
 $£784.13 \times 81.56\% = £639.54$  spent on space heating in winter months Dec to Feb.

TOTAL PER WINTER MONTH:

$£639.54 / 3 = £213.18$  spent per winter month on space heating

TOTAL PER WINTER DAY:

$£213.18 / 30 = £7.11$  spent per winter day on space heating

An important baseline assumption is that all living rooms are set to 21°C and all other rooms are set to 18°C.

### 3.10 *Average non-winter heating costs*

We saw in section 3.5 that the average annual spend on space heating in the UK is £784.13 and in winter we spend £639.54 on heating.

The remaining £144.59 of annual heating costs are spent across the remaining three seasons or nine months of the year which equates to £16.07/month.



**CALCULATIONS:**

TOTAL ACROSS ALL NON-WINTER MONTHS:

(annual spend on space heating) - (winter spend on space heating) = remaining spend

£784.13 - £639.54 = £144.59 spent across remaining nine months

TOTAL PER MONTH:

(remaining non-winter spend) / (nine months) = cost per non-winter month

£144.59 / 9 = £16.07 per month (non winter) spent on space heating

### 3.11 *Average winter heating cost per room*

We are able to assume that the £639.54 cost per winter on space heating (section 3.9 ) represents an average of 5 rooms as this is the mean of the two extremes 4 and 6.

Therefore the cost to heat each room during winter is £127.91.

This equates to £42.64 per month per room or £1.42 per day per room over the winter period.

**CALCULATIONS:**

£639.54 (winter spend on heating) / 5 rooms = £127.91 per room to heat in winter

£127.91 / 3 months = £42.64 per month per room in winter

£42.64 / 30 days = £1.42 per day per room in winter

These figures can now be used to estimate the actual costs to heat any UK home during the winter months using a conventional gas central heating system. This assumes all rooms are at 18°C with only the living room being 21°C. This figure also takes into account that most gas fired central heating systems are run on a timer and are not on 24 hours a day.