

## **RESTRICTED – COMMERCIAL**

### **Assessment Of Energy Saving Opportunities For Information Commissioner's Office.**

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# Executive Summary

The Carbon Trust is grant funded by the Department for Environment, Food and Rural Affairs, the Department for Business, Enterprise and Regulatory Reform, the Scottish Executive, the Welsh Assembly Government and Invest Northern Ireland.

This report presents the results of an Opportunity Assessment survey of Information Commissioners office (ICO), carried out by Energy Management Consultancy Limited.

The agreed objectives of the Assessment were:

1. To identify and prioritise up to fifteen energy savings opportunities with no specified limit on capital investment that can be taken by the company to save carbon emissions.
2. To identify the carbon footprint of Wycliffe House and Town House gas and electrical emissions, Company Van and their staff business travel.

The ICO is the UK's independent public body set up to promote public access to official information and protect personal information.

The surveyed sites use gas and electricity as mediums of energy sources. At Wycliffe House gas is consumed for space heating and Hot Water Services (HWS) and electricity is used for the day to day operation of lighting, office equipment and canteen equipment. The sole energy source for Town House is electricity. Electricity, at Town House, is used for heating, cooling, ventilation, lighting, office equipment and other small electrical equipment.

This survey therefore focuses on the operation of the heating and cooling systems, light fittings technology and office equipment.

We have identified carbon reduction measures in all of the above energy consumers such as: Air-conditioning, boilers, insulation of hot water pipe work, reduction of hot water boiler operational hours and the replacement of light fittings.

None of this can be actively managed without having policies and systems in place to facilitate this. This policy must be adopted by the company and set its targets based on the report findings.

It is therefore suggested that the Energy Policy is adopted taking into account the site's operations and that an Energy Information System is instigated and adequate training and communication method are implemented.

The total energy consumed by ICO for both buildings in the twelve months covered (March 2007 to February 2008), sums to a total estimated energy consumption of 873,495kWh, costing £79,113 (including CCL and excluding VAT).

Utility	Energy Consumption		Cost	
	kWh/year	%	£/year	%
Electricity	691,425	79%	75,787	96%
Gas	182,070	21%	3,326	4%
Total Energy	873,495	100	79,113	100

The estimated basic carbon footprint for the ICO is 513 tCO<sub>2</sub>e p.a. 1.47tCO<sub>2</sub> per employee or 0.17tCO<sub>2</sub> per m<sup>2</sup> of Treated Floor Area (TFA). This footprint is based on the boundary conditions and emissions types detailed in chapter 2. If all the recommendations in your action plan were implemented your basic carbon footprint could be reduced by approximately 12%.

A summary of the fourteen point Action Plan is presented in the table below.

If all the prioritised measures are implemented, the aggregated savings from the measures identified represent a 15.1% reduction in energy consumption and a 15.2% reduction in cost or £11,992 which translates into direct cost savings. The site Carbon Emission reduction is estimated at 60 tonnes annually, which is equivalent to saving approximately 90 trees annually or removing 70 cars off the road.

Risks – None

## Action Plan

The recommendations listed below are prioritised, according to the priority criteria of maximum carbon emissions savings, with energy management the first three priorities.

Priority	Recommendations	Estimated annual savings					Timescale for implementation and by whom	May be eligible for ECA*	May be eligible for loan*
		Estimated annual savings			Estimated cost (£)	Payback period (years)			
		(£)	CO <sub>2</sub> (tonnes)	(kWh)					
1	Develop and Use an Energy Policy	791	4.0	8,735	500	0.6			
2	Appoint Energy Managers, Staff Training and Communication	791	4.0	8,735	500	0.6			
3	Develop an Energy Information System	1,582	8.0	17,470	4,800	3.0			
4	Wycliffe House - replace inefficient Compact and T12/T8 switch-start fluorescent lighting with energy efficient High Frequency Light Fittings	4,087	14.5	27,092	13,118	3.2			
5	Wycliffe House - Lighting occupancy and daylight control	1,635	11.5	21,495	3,510	2.1			
6	Town House - Air Conditioning system temperature set point adjustment	1,281	6.3	11,691	0	immediate			
7	Town House - Lighting occupancy and daylight control	560	3.9	7,195	2,025	3.6			
8	Personal Computers and monitors	411	2	3,750	0	immediate			
9	Wycliffe House - Boilers control system with an Outside Temperature Sensor	173	1.7	9,457	800	4.6			

Priority	Recommendations						Timescale for implementation and by whom	May be eligible for ECA*	May be eligible for loan*
		Estimated annual savings			Estimated cost (£)	Payback period (years)			
		(£)	CO <sub>2</sub> (tonnes)	(kWh)					
10	Photocopiers	329	1.6	3,000	60	0.2			
11	Wycliffe House - Radiators and Thermostatic Radiator Valves	123	1.2	6,755	500	4.1			
12	Vending machines	115	0.6	1,052	20	0.2			
13	Wycliffe House - Reduction of HWS operational hours	63	0.52	2,449	150	2.4			
14	Wycliffe House - Insulation of hot water pipe work	51	0.51	2,786	250	4.9			
TOTAL		11,992	60.34	131,662	26,233	2.2			

\* Please refer to the Site Survey Publication for eligibility details or visit [www.carbontrust.co.uk/loans](http://www.carbontrust.co.uk/loans) and [www.eca.gov.uk/etl](http://www.eca.gov.uk/etl)

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# 1. Introduction

This report presents the results of an Assessment of Energy Opportunities Survey conducted on the 12th of May 2008 by Nathan Kedem representing Energy Management Consultancy Ltd. The report includes an analysis of the organisation carbon footprinting analysis, the sites current energy consumption profile; identified opportunities and their potential savings, as well as cost effectiveness analysis and financial solutions.

As well as cost benefits, the report includes the potential reduction in carbon dioxide emissions that will directly benefit current and future generations.

## 1.1. Objectives for the Visit

The objective of the report is to advise Information Commissioner's Office (ICO), on the most important activities that it needs to undertake to save carbon, energy and money.

The site's specific objectives were discussed with the External Communications Manager Ms. Angela Nonis and the Facilities Manager Mr. Paul Wilson. The organisation is interested in receiving advice on how to improve their lighting, heating, heating controls, targeting and monitoring.

The objectives for the visit included identifying energy consumption savings in both buildings, improve the facility financial position by reducing operating costs, maintain or enhance comfort conditions within the buildings, and make a positive contribution to environmental improvement by reducing the emission of pollutants.

It was agreed that the survey should examine up to fifteen energy savings opportunities to meet the commercial criteria (maximum payback of eight years) that can be taken by the site to save carbon emissions.

## 1.2. Site details

The ICO's main offices are located in Wilmslow, Cheshire.

The main offices include two facilities. The main offices are in Wycliffe House.

Wycliffe House is a three level structure (ground floor, first floor and upper floor). The building was built in the 1970's and is constructed with of bricks and concrete. The building is in an urban surrounding with a 50% ratio of east facing length to north facing length. An estimated 50% of the building façade is glass windows, of which are double glazed with a PVC frame.

The building has a total floor area of 2380m<sup>2</sup> with a net Treated Floor Area (TFA) of 2,023m<sup>2</sup>.

The ground includes the reception, canteen and offices, most of which are of an open-space type.

The first and upper floors include offices, again most of which are of open-space type and a large server room in the upper floor. The building roof holds the main plant room (Boilers system, lift plant room and DX units).

Town House is a three level structure (ground floor, first floor and upper floor). The ICO occupies the two first floors (ground and first floors). The building was built in the 1960's and was recently refurbished to modern standards. The building is in an urban surrounding with a 100% ratio of north facing length to east facing length. An estimated 70% of the building façade is glass windows, of which are double glazed with a PVC frame.

The offices, occupied by the ICO, have a total floor area of 1050m<sup>2</sup> with a net Treated Floor Area (TFA) of 945m<sup>2</sup>.

The ground and first floors include canteen, server/communications rooms and offices, most of which are of an open-space type.

Both buildings are occupied from 7:00 to 19:00 (Monday to Friday) and 8:00 to 15:00 (Saturday) by office staff of approximately 270 personnel.

The site's main energy consumers are lighting and air-conditioning, representing more than 55% of the site total electrical energy consumption.

## 2. Carbon Footprint Analysis

**The estimated basic carbon footprint for the ICO is 513 tCO<sub>2</sub>e p.a. 1.47tCO<sub>2</sub> per employee or 0.17tCO<sub>2</sub> per m<sup>2</sup> of Treated Floor Area (TFA). This footprint is based on the boundary conditions and emissions types detailed below. If all the recommendations in your action plan were implemented your basic carbon footprint could be reduced by approximately 12%.**

### 2.1. Boundary Conditions

This site survey covers the organisation two HQ buildings (Wycliffe House and Town House), owned van and associated business train and air travel. As such the calculated footprint excludes the emissions of the other organisation sites such as: regional offices and warehouse.

### 2.2. Carbon Footprint Scope Coverage

The table below provides a breakdown of this estimated basic carbon footprint, broken down by emissions type and source. Refer to *appendix 2* for more information relating to carbon footprint scopes and a comprehensive list of all emission types covered in this survey.

### 2.3. Carbon Footprint Quantified Emissions Breakdown

Emissions Source	Emissions	Purchased Energy		Cost	
	tCO <sub>2</sub> e	kWh/yr	%	£/yr	%
Gas	34	182,070	100	3,326	100
Owned Van	1				
<b>Sub-Total</b>	<b>35</b>	<b>182,070</b>	<b>100</b>	<b>3,326</b>	<b>100</b>
Emissions from purchase of electricity	371	691,425	100	75,787	100
<b>Sub-Total</b>	<b>371</b>	<b>691,425</b>	<b>100</b>	<b>75,787</b>	<b>100</b>
Employee Travel - Train	30				
Employee Travel - Aeroplane	78				
<b>Sub-Total</b>	<b>107</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total</b>	<b>513</b>	<b>873,495</b>	<b>100</b>	<b>79,113</b>	<b>100</b>

*The data presented in this document represents an estimate of the basic carbon footprint of your [site(s), organisation] covering major greenhouse gas emissions sources for which data were available. Emissions have been quantified based on the data provided to us using the Carbon Trust Basic Carbon Footprinting Methodology. No guarantee is given as to the accuracy or completeness of the calculations and no verification of the source data has been undertaken. This estimated basic carbon footprint is not compliant with the requirements of ISO14064 or with the GHG Protocol for Corporate Emissions Reporting developed by WRI and WBSCD and should not, explicitly or implicitly, be represented as such or as an endorsement by the Carbon Trust of your organisation or its activities.*

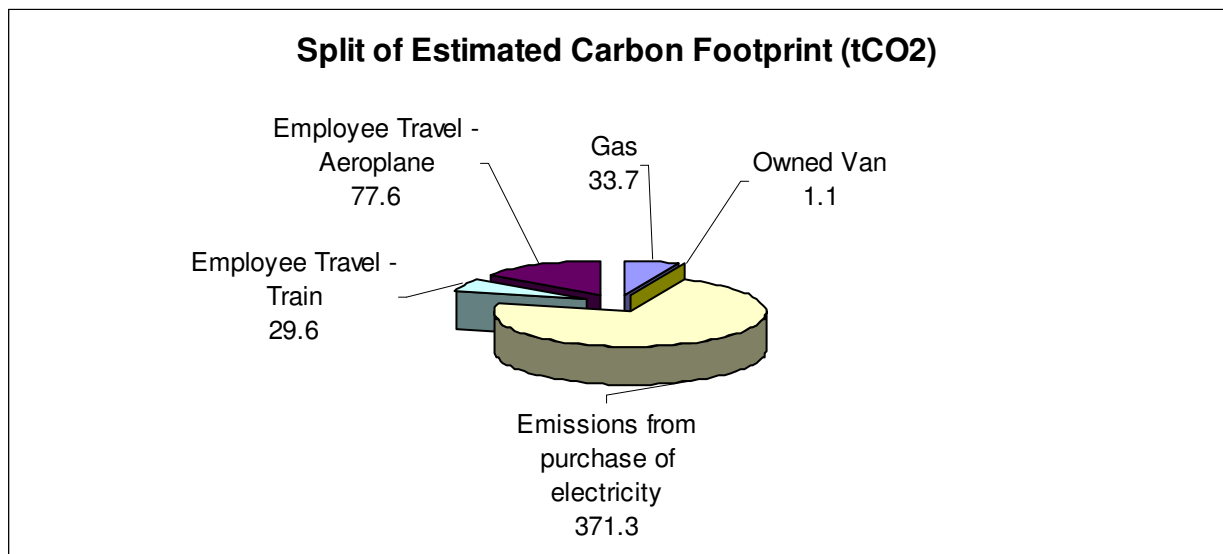
## 2.4. 'Not quantified' Site Emissions

Emissions Source	Description
Commuting – Car (not owned by company), Bus, Taxi or other public transport	Emissions from the cars and public transport used by employees for travel from their place of residence to the organisation offices and back, have not been included in the estimated basic footprint because the ICO does not currently have enough information to quantify the distance travelled or quantity of fuel consumed. It is recommended to record the above personal mileage and type of transport in monthly report.
Business Travel – Car (not owned by company), Bus, Taxi or other public transport	Emissions from the cars and public transport used by employees for travel from the organisation offices to places of business meetings and back, have not been included in the estimated basic footprint because the ICO does not currently have enough information to quantify the distance travelled or quantity of fuel consumed. It is recommended to record the above business travel mileage and type of transport in monthly report.
Fugitive emissions – Refrigeration Gas	Emissions from the usage of refrigerant gas provided for the operation of air-conditioning units , have not been included in the estimated basic footprint because the ICO does not currently have enough information to quantify the amount of gas and the type of gas in use. It is recommended to record the type of refrigerant gas used for each A/C system in the systems maintenance records.

These qualitative emissions could in future be included in your carbon footprint if sufficient information were to be made available to the consultant. It is recommended that the ICO agrees a formal policy to record the mileage and type of transport used by employees for transportation from and to the site and record the type and amount of annual refrigerant gas used for the A/C system.

## 2.5. Profile of Estimated Carbon Footprint

The following figure represents the split profile of the organisation estimated carbon footprinting:



## 2.6. Carbon Emissions Reduction

Carbon Trust works with businesses to reduce carbon emissions from their direct on-site fuel and electricity consumption. The recommendations listed in the *Executive Summary*, and detailed in *Section 5* of this report therefore focus on savings in these areas.

For carbon saving recommendations from fleet transport please refer to the Energy Savings Trust (EST). <http://www.energysavingtrust.org.uk/fleet/>

For carbon savings from haulage transport please refer to the Department for Transport (DfT). <http://www.dft.gov.uk/ActOnCO2/>

The Carbon Trust methodology is designed for production of a basic footprint. For complex organisational structures this approach is unlikely to be appropriate and the company is likely to require a 'full footprint' calculated in accordance with GHG Protocol or ISO 14064 methodologies. See the Carbon Footprinting Appendix

### 3. Energy Management Information

#### 3.1. Benchmarks

Energy performance indicators give a measure of activity based energy use, which can be compared with equivalent benchmarks. Energy consumption benchmarks are published in Good Practice Guides for different buildings and some processes. For a particular site, the performance indices are modified to take into account building occupancy, size, activities, location and weather (degree days). The lower value indicates best practice.

The surveyed ICO sites are two office buildings. Good Practice Guide 19 (Energy use in offices) describes four types of offices benchmarks. The most relevant offices type for Town House, as described in ECG19, is office type 3 (Air Conditioned Standard). The Wycliffe House office type is between office type 2 (Naturally Ventilated Open Plan) and office type 3. The two following tables present the published benchmarks for office buildings of type 2 and type 3.

#### Office building type 2 (Naturally Ventilated Open Plan) Benchmark Values

Energy Source	Office Type 2 Benchmarks, kWh/m <sup>2</sup>	
	Good Practice	Typical
Gas	79	151
Electricity	54	85

Source & Further Reading: Energy Consumption Guide 19

#### Office building type 3 (Air Conditioned Standard) Benchmark Values

Energy Source	Office Type 3 Benchmarks, kWh/m <sup>2</sup>	
	Good Practice	Typical
Gas	97	178
Electricity	128	226

Source & Further Reading: Energy Consumption Guide 19

#### Comparison of Wycliffe House Energy Consumption with the combined Benchmark Information.

As Wycliffe House office type is between benchmarks offices types 2 and 3, we have created a combined benchmark based on the existing above benchmarks, our survey findings and the estimated annual consumption. The total treated floor area of this building is estimated at 2,023m<sup>2</sup>. The following table is the Wycliffe House consumption compared to the site specific benchmarks

Energy Source	Site Value, kWh/m <sup>2</sup>	Site Specific Benchmarks, kWh/m <sup>2</sup>	
		Good Practice	Typical
Electricity	225	103	180
Gas	90	79	151

As can be seen from the above benchmarking table, the performance of energy from electricity is above the typical value and energy from gas value good but above the BP value. This can be explained by the following reasons:

1. Lighting forms one of the largest energy from electricity consumers while all of the light fitting are not energy efficient and most areas have no lighting controls (occupancy and daylight) ;
2. The use of Air-conditioning in open-space areas;
3. and the potential for improvement in the heating system controls (both boiler system and radiators).

## Comparison of Town House Energy Consumption with the combined Benchmark Information.

Although Town House offices fit to the type 3 benchmark is has only one energy source (electricity), we have created a combined benchmark based on the sum of the benchmarked electricity and gas values. The estimated site value is based on our survey findings and the estimated annual consumption. The total treated floor area of this building is estimated at 945m<sup>2</sup>. The following table is the Town House consumption compared to the site specific benchmarks

Energy Source	Site Value, kWh/m <sup>2</sup>	Office Type 3 Benchmarks, kWh/m <sup>2</sup>	
		Good Practice	Typical
Electricity	250	225	404

As can be seen from the above benchmarking table, the performance of energy from electricity is good but yet allows room for potential improvements. This can be explained by the following reasons:

1. Lighting forms one of the largest energy from electricity consumers while all of the light fitting **are** energy efficient. Potential improvements lie in areas that will benefit from lighting controls (occupancy and daylight);
2. Recently refurbished building with good level of building fabric insulation;
3. and the room for improvement in the adjustments to the air-conditioning temperature settings.

## 3.2. Energy Management Practices

### Energy Management Matrix

This matrix shows an overall appreciation of energy management for the survey site. The shaded cells represent current achievement levels indicating key areas where improvement can be made.

Level	Policy	Organizing	Training	Performance Measurement	Communicating	Investment
4	Energy policy, Action Plan and regular review have active commitment of top management	Fully integrated into management structure with clear accountability for energy consumption	Appropriate and comprehensive staff training tailored to identified needs, with evaluation	Comprehensive performance measurement against targets with effective management reporting	Extensive communication of energy issues within and outside of organisation	Resources routinely committed to energy efficiency in support of business objectives
3	Formal policy but no active commitment from top management	Clear line management accountability for consumption and responsibility for improvement	Energy training targeted at major users following training needs analysis	Weekly performance measurement for each process, unit, or building	Regular staff briefings, performance reporting and energy promotion	Same appraisal criteria used as for other cost reduction projects
2	Un-adopted Policy	Some delegation of responsibility but line management and authority unclear	Ad-Hoc internal training for selected people as required	Monthly monitoring by fuel type	Some use of company communication mechanisms to promote energy efficiency	Low or medium cost measures considered if short payback period
1	An unwritten set of guidelines	Informal, mostly focused on energy supply	Technical staff occasionally attend specialist courses	Invoice checking only	Ad-Hoc informal contacts used to promote energy efficiency	Only low or no cost measures taken
0	No explicit energy Policy	No delegation of responsibility for managing energy	No energy related staff training provided	No measurement of energy costs or consumptions	No communication or promotion of energy issues	No investment in improving energy efficiency

Source & Further Reading: Good Practice Guide 367

The existing energy management practices outlined in the Energy Management Matrix found in are as follows:

#### Policy

Score = 0-1

The Ministry of Justice (MoJ) has published, on February 2008, a Sustainable Development Action Plan. This document includes in parts energy saving related subjects, actions and targets.

The ICO have not adopted yet the published document. This survey and report is one of the first steps toward the adoption of the published action plan.

#### Organizing

Score = 1-2

The ICO has created a "Green Group" that deals with environmental issues. Energy is one of the subjects involved within discussions of the team. The team consists of a group of volunteers representing various departments of the ICO. There is no delegation of responsibility of managing energy within the group or on site in general.

### Training

Score = 0

The organization induction for new employees and training program does not include energy related items.

### Performance Measurement

Score = 1

Due to the estimated readings and the low frequency of on site actual meter readings (both by the client and the utility company), there has been no measurement and analysis of energy performance.

### Communicating

Score= 2

Energy efficiency and the promotion of energy awareness are being communicated within the "Green Group" and by periodically promoting energy awareness by using other communication techniques such as: Intranet, emails and newsletters.

### Investment

Score = 1

Up to date, the ICO had no pre-budgeted investment in energy efficiency projects. The refurbishment of the Town house includes an investment in high efficiency light fittings, lamps and occupancy control sensors.

## 4. Carbon Reduction Opportunities

The key assumptions and detailed calculations supporting the following recommendations are included in appendix 3.

### 4.1. Energy Management Improvements

<b>Priority no. 1</b>	Develop and Use an Energy Policy			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
791	4.0	8,735	500	0.6
<b>Detail</b>	<p>The Ministry of Justice (MoJ) has published, on February 2008, a Sustainable Development Action Plan. This Action Plan sets out how the Ministry of Justice and its agencies (ICO) will improve their performance under the Government's sustainability agenda and meet targets for Sustainable Operations on the Government Estate.</p> <p>This document includes in parts energy saving related subjects, actions and targets. This is a significant first step towards an ICO Energy Policy. Currently ICO have no specific Energy Policy.</p> <p>Look at the major areas of energy use (i.e. lighting and heating, ventilation, air conditioning and office equipment), and determine a policy which will allow all site staff and site occupants to successfully contribute to the improvement of energy usage. This should save 1% of overall energy costs.</p> <p>The policy should include short and long term targets.</p> <p>Include in this both management actions e.g. policy on buying energy, policy on monitoring energy and operational actions such as Lighting policy, policy on staff awareness/ training and policy on the efficient use of lighting, heating, etc.</p>			
<b>Rationale</b>	Without an overall guidance as to how this can be done, which is agreed by both management and operatives, there will be no cohesiveness in any energy saving initiatives that are made in the future.			
<b>Risks</b>	None			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Establish an energy policy and produce an energy action plan. Cost the action plan and estimate savings;</li> <li>2. Incorporate energy efficiency into purchasing;</li> <li>3. Confirm the energy savings and payback period.</li> </ol>			
<b>Relevant Publications</b>	<p>GIL136 – Energy Management Fact Sheet</p> <p>GIR012 – Organisational Aspects of Energy Management</p> <p>GPG376 – A strategic approach to energy and environmental management</p>			

<b>Priority no. 2</b>	Appoint Energy Managers, Staff Training and Communication			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
791	4.0	8,735	500	0.6
<b>Detail</b>	<p>Although the site, by creating the "Green Group", has started to look at how it uses energy and is in the very early stages of this, there is no formalised official structure of Energy Managers and Department Energy Champions, which would assist in focusing minds to control energy use on an operational basis.</p> <p>Appoint a Group Energy Manager and Energy Department Champions, who will be responsible for monitoring wastage and improving usage.</p> <p>The existing staff training program and the induction process of new employees does not include energy related issues. Ensure they have sufficient training to engage the workforce and visitors to the site.</p> <p>Develop productive communication techniques, such as the use of internet/intranet, stickers and posters (available free of charge from the Carbon Trust) and the publication of site historic and current performances.</p>			
<b>Rationale</b>	<p>Without eyes and ears on the ground new policies will not provide improvement. Productive training and communication techniques will allow staff to better understand the efficient use of energy and its benefits. Achieving this level of understanding will contribute to the raised awareness and co-operation between Energy Managers/Champions and workforce.</p>			
<b>Risks</b>	None			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Review suitable candidates and appoint as quickly as possible. Then train them to undertake their new role;</li> <li>2. Include energy related issues in the induction procedure of new employees;</li> <li>3. Engage and share the energy issues with company staff at all stages of the process by using different methods of productive communication.</li> </ol>			
<b>Relevant Publications</b>	<p>CTG001 – Creating an awareness campaign  GPG085 – Energy Management Training  GPG235 – Managing People, Managing Energy</p>			

<b>Priority no. 3</b>	Develop an Energy Information System			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
1,582	8.0	17,470	4,800	3.0
<b>Detail</b>	<p>Wycliffe House has eight electrical meters and one gas meter. There is no analysis of the utility bills other than checking of the bills prior to payment. Unfortunately there is nothing to accurately check these against, as most invoices are based on estimated consumption.</p> <p>Town House has no electrical metering and the ICO is billed twice a year as part of their offices leasing contract. No accurate information regarding the electrical consumption is available and as such no analysis is done.</p> <p>For sites such as the two ICO surveyed buildings and for the estimated annual consumption, it is recommended to implement an aM&amp;T (automatic Metering and Targeting) system.</p> <p>An aM&amp;T is an automated system that gathers the energy consumption data in very short intervals (down to seconds), stores it in a database and presents the data in text and graphs. This is a very important tool for energy managers in order to help them identify the trends and understand what the energy consumption profiles are.</p> <p>It is recommended that this system will be implemented on all main gas and electricity meters.</p>			
<b>Rationale</b>	<p>"If you cannot measure it, you can not control it and therefore you cannot save it"</p> <p>In order to identify the usage of energy and the ways to control energy consumption, it is important to monitor it appropriately. Once the data has been collected it is possible to analyse it and set achievable targets.</p> <p>Understanding the monthly costs of energy against monthly overhead costs will make management of energy spend easier to budget and target for future reductions. You cannot manage without measurement.</p>			
<b>Risks</b>	None			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Obtain quotations for aM&amp;T</li> <li>2. Assess quotations and proceed with best option</li> </ol>			
<b>Relevant Publications</b>	<p>CTL001 Understanding your Energy Consumption.</p> <p>GIL157 How to Monitor your Energy Use.</p> <p>CTV027 Metering – Introducing the techniques and technology for energy data management</p>			

## 4.2. Lighting

Lighting forms one of the largest consumers of energy from electricity, with an estimated total of 142,046kWh and costing a total of £15,570 per annum. The use of efficient lighting product and technology, combined with raised residence and staff awareness to the cost of lighting, can reduce the cost of energy from electricity and maintenance by up to 40.3%.

A comprehensive lighting survey has been performed for both facilities and the results of this survey include the detailed existing light fittings, power consumed by each fitting, estimated working hours, total annual consumption & cost and their impact on maintenance (lamp life time and it estimated lamps to be replaced annually). The lighting survey results of consumption and potential savings can be found in Appendix 4.

Note: Within our lighting recommendation we have not included the replacement of light fittings in Town House, as the site has already been recently refurbished with High Efficiency T5 (4x14W) linear Fluorescent Lamps with High Frequency ballasts. Although the Town House site has efficient light fittings, we have identified a significant potential for energy saving from lighting controls (occupancy and daylight). The lighting controls potential savings is also applicable for the Wycliffe House site.

<b>Priority no 4</b>	Wycliffe House - replace inefficient Compact and T12/T8 switch-start fluorescent lighting with energy efficient High Frequency Light Fittings			
<b>Cost Saving** £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
4,087	14.5	27,092	13,118	3.2
<b>Detail</b>	<p>The Wycliffe House site has several types of light fittings. Most of the fittings are Switch Start (sw/st) T8 halophosphate Fluorescent lamps with various types of reflectors and 2D Compact Fluorescent Lamps (CFL).</p> <p>It is recommended that Compact and Linear Fluorescent halophosphate lamps and fittings will be refurbished with energy efficient triphosphor lamps with high frequency ballasts. In order to maintain the initial light level, it is important to include the cleaning of lamps and fitting as part of the site preventative maintenance programme.</p>			
<b>Rationale</b>	<p>The High Frequency electronic ballasts are 80%-85% more efficient than the electric switch start ballasts. The replacement of old halophosphate lamps with triphosphor lamps will increase light quality, lamp lumens and lamp life. Increase in the lamp life also will reduce maintenance costs. These fittings have a very long lamp life of 20,000 hrs, compared to 9,000 hrs with sw/st halophosphate T8s.</p>			
<b>Risks</b>	Minimum safe levels of light need to be maintained at all times.			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Obtain quotations for new lighting</li> <li>2. Assess quotations and proceed with best option</li> <li>3. Monitor energy consumption following changes to assess impact</li> </ol>			
<b>Relevant Publications</b>	<p>CTV021 – Lighting technology overview            GIL154 – How to refurbish your lighting            GIL126 - Lighting fact sheet</p>			

<b>Priority no. 5</b>	Wycliffe House – Lighting occupancy and daylight control			
<b>Cost Saving** £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
1,635	11.5	21,495	3,510	2.1
<b>Detail</b>	<p>During our survey some off the unoccupied areas had the lights switched on and in other places where sufficient daylight was available lights were on. For example:</p> <ol style="list-style-type: none"> <li>1. Some of the offices have full exposure to daylight and yet all the lights are kept on throughout the day.</li> <li>2. The back stairways lights were on and sufficient daylight was available.</li> </ol> <p>Lighting control can be implemented with basic PIR, installed in corridors and other randomly occupied spaces, and daylight lighting controls installed in the entrance halls and stairways and in the ICO case even in the open space offices.</p> <p>** The cost of savings includes materials (sensors) and the proportional reduction in maintenance cost.</p>			
<b>Rationale</b>	Lighting occupancy and daylight control, in most cases, is a good solution for areas with poor access to light switches and/or lack of staff awareness to the waste of energy for unnecessary operations of lighting.			
<b>Risks</b>	Minimum safe levels of light need to be maintained at all times.			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Monitor power consumption prior to any changes</li> <li>2. Obtain quotations for new lighting controls</li> <li>3. Assess quotations and proceed with best option</li> <li>4. Monitor energy consumption following changes to assess impact</li> </ol>			
<b>Relevant Publications</b>	GIL153 – How to install lighting controls GPG300 – Installers guide to lighting controls			

<b>Priority no. 7</b>	Town House – Lighting occupancy and daylight control			
<b>Cost Saving** £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
560	3.9	7,195	2,025	3.6
<b>Detail</b>	<p>The situation in the Town House offices is similar to the one at Wycliffe House. Again some off the non-occupied offices and areas with sufficient daylight available had their lights switched on.</p> <p>Lighting control can be implemented with basic PIR, installed in corridors and other randomly occupied spaces, and daylight lighting controls installed in the entrance halls and stairways and in the ICO case even in the open space offices. .</p> <p>** The cost of savings includes materials (sensors) and the proportional reduction in maintenance cost.</p>			
<b>Rationale</b>	Lighting occupancy and daylight control, in most cases, is a good solution for areas with poor access to light switches and/or lack of staff awareness to the waste of energy for unnecessary operations of lighting.			
<b>Risks</b>	Minimum safe levels of light need to be maintained at all times.			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Monitor power consumption prior to any changes</li> <li>2. Obtain quotations for new lighting controls</li> <li>3. Assess quotations and proceed with best option</li> <li>4. Monitor energy consumption following changes to assess impact</li> </ol>			
<b>Relevant Publications</b>	<p>GIL153 – How to install lighting controls</p> <p>GPG300 – Installers guide to lighting controls</p>			

### 4.3. Heating, Ventilation and Air Conditioning (HVAC)

Wycliffe House heating and air conditioning are provided from one plant room located on the building roof. Central Heating is provided by a Low Temperature Hot Water (LPHW) system which is controlled by seven day optimiser (model - Satchwell SVT). The LPHW is generated by a set of two atmospheric boilers (74kW each) and a Constant Temperature pump (0.85kW). The hot water is then delivered to local radiators.

Hot Water Services (HWS) are provided by a separate heating system. The HWS heating system consists of a gas fired atmospheric boiler, rated at 33.1kW, and a hot water tank. The hot water is then distributed to the building floors via a 150W circulation pump.

Some of the Wycliffe House offices are air-conditioned (cooling only) by several castes DX split units (mainly the open-space areas and the server room).

The Town House open-space offices heating and cooling are provided by several castes DX split units, rated at 3 kW. In other smaller offices heating and cooling is provided by individual DX split units rated at 1.5kW.

<b>Priority no. 13</b>	Wycliffe - Reduction of HWS operational hours			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
63	0.522	2,449	150	2.4
<b>Detail</b>	<p>The HWS system (boiler and pump) is left operational 24/7 (8760 hrs per year).</p> <p>The operational hours of the company are five days a week with Saturday work of 7 hours (3,500 hrs).</p> <p>During the un-occupied period, it is recommended to install a seven day timer on the HWS system.</p>			
<b>Rationale</b>	<p>Hot water services are required only when the site is open. The site is open 3,500 hrs per year. By switching off the HWS, during most of the un-occupied period, will save an estimated 74 operational hours (actual operational hours of the boiler and pump)</p>			
<b>Risks</b>	<p>Installation should be done by a certified electrician</p>			
<b>Next Step</b>	<p>Install a seven day timer on HWS electrical supply</p>			
<b>Relevant Publications</b>	<p>GIL124 – Heating Fact Sheet GIL155 – How to control heating costs at work</p>			

<b>Priority no. 14</b>	Wycliffe - Insulation of hot water pipe work			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
51	0.515	2,786	250	4.9
<b>Detail</b>	<p>The majority of hot water pipes in the plant room are not fully insulated. All of the valves and joints are without insulation and heat is generated from them.</p> <p>All hot water pipes, valves and flanges should be insulated by permanent covers and removable covers for the valves</p>			
<b>Rationale</b>	<p>It is wrongly accepted that a boiler room environment would be always hot. This heat is generated from heat loss radiated from hot water equipment and pipes. All of this heat is energy wasted. By properly insulating those elements, energy loss from non-insulated objects can be reduced by approximately eighty percent (80%).</p>			
<b>Risks</b>	None			
<b>Next Step</b>	<p>Obtain quotations for plant room insulation Assess quotations and proceed with best option</p>			
<b>Relevant Publications</b>	GIL151 – How to fit pipe work insulation			

<b>Priority no. 11</b>	Wycliffe - Radiators and Thermostatic Radiator Valves			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
123	1.2	6,755	500	4.1
<b>Detail</b>	Space heating, in most of the areas, is provided by hot water radiators. The majority of the radiators are equipped with thermostatic radiator valves (TRVs). Many of TRVs on the site are covers/ blocked (books, desks, cupboards...) and some are set to Max. All radiators TRVs should be clear of obstructions and set to 2/3 (out of a scale of 0 to 5). Where possible radiators (not the TRVs) should be covers and a reflective aluminium sheet should be place at the back side wall of the radiator. Radiators that are not equipped with TRVs should have them installed.			
<b>Rationale</b>	<p>A TRV has an internal thermostat that regulates a valve, providing hot water into the radiator according to the heating requirements of the room set by the TRV "set point". The TRV "set point" is set from at *, 0-5 and Max.</p> <p>Where as * is valve closed regardless to the room temperature, 0-5 valve regulates according to the room heating requirements and Max is valve fully open regardless to the room heating requirements.</p> <p>When the TRV is set at Max the rooms eventually will over heat and in most cases (as found in some office), staff tend to open doors and window to cool the area. Setting the TRV at 2/3 will keep a comfortable space temperature of 20-21 degrees Celsius by regulating the valve automatically.</p> <p>If the TRV is covered the thermostat (located in the TRV) will not represent a correct space temperature as it is in a small "micro climate". What happens then is that the "micro climate" temperature rises fast to the required temperature and then the valve will close. What tends to happen then is that staff turns the TRV to Max and the effect of that was explained previously.</p> <p>Remember - Each degree Celsius over the required temperature will increase your energy bill by 7%.</p> <p>Radiators, by the nature of their name, radiate heat. That heat is radiated to front (space area) and back (wall area). Keeping the wall warm is a waste of energy. By fitting a reflective surface (such as aluminium foil) on the wall behind the radiator, the heat will be radiated back to the space.</p>			
<b>Risks</b>	None			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Install TRVs on radiators that do not include TRVs</li> <li>2. Set TRVs to 2/3</li> <li>3. Remove objects covering the TRVs</li> <li>4. Where possible, fit reflecting foils at the back wall of the radiator.</li> <li>5. Keep doors and windows closed.</li> </ol>			
<b>Relevant Publications</b>	<p>GIL124 – Heating Fact Sheet  GIL155 – How to control heating costs at work  GIL156 – How to maintain your heating system  CTV032 – Building controls</p>			

<b>Priority no. 9</b>	Wycliffe - Boilers control system with an Outside Temperature Sensor			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
173	1.7	9,457	800	4.6
<b>Detail</b>	<p>The boiler operation is currently controlled by a stand-alone controller without an Outside Temperature Sensor (OTS). The current boiler controller is a seven day optimiser Type SVT (Satchwell). This controller takes into account the internal temperature of the heated zone but does not takes into account the outside temperature.</p> <p>The OTS is very important for the general and energy efficient functionality of the system as a whole. The OTS is crucial for the optimum start/close functionality and the control of flow/return hot water temperature.</p> <p>The OTS should be installed in a northern facing wall, where there is no direct sunlight exposure or any other source of heat.</p>			
<b>Rationale</b>	<p>As mentioned a boiler control system with an OTS has many energy saving functionalities.</p> <p>Summer inhibit – above a pre-defined outside air temperature, the controller will disable the operation of the boilers for space heating.</p> <p>Optimum start/stop – The controller will start the boilers exactly at the required time prior to the area occupancy time. During mild days the pre-heating period is much shorter then the cold season. The same logic applies to stop times, but in reverse. The boilers could be stopped earlier during mild days when compared to cold days.</p> <p>Boiler flow trim – Boiler flow temperature can be reduced to the minimum required (condensing boilers can work at a very low return/ flow temperature) proportionally to the measured outside temperature.</p>			
<b>Risks</b>	Keep minimum boiler flow temperatures as advised by manufacturer's specification.			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Obtain quotations for OTS's and boiler controllers with optimization functionality.</li> <li>2. Assess quotations and proceed with best options.</li> </ol>			
<b>Relevant Publications</b>	<p>CTV008 – Low temperature hot water boilers</p> <p>CTV032 – Building controls</p>			

<b>Priority no. 6</b>	Town House - Air Conditioning system temperature set point adjustment			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
1,281	6.3	11,691	0	immediate
<b>Detail</b>	<p>Town House offices are equipped with 15 sets of A/C caste DX split units. The A/C units are controlled by temperature control panels with integrated room temperature sensors. Some of the controllers/ sensors have wrong set point.</p> <p>For example at the first floor we have notice that one of the controllers set point was on 17c° and the temperature as we measured was 22c° . The maximum temperature recommended for heating is 22c° and cooling areas need not to be cooler then 24c° . By setting a gap between 22-24c° we are creating a comfortable "dead band" were no heating or cooling will operate.</p> <p>It is recommended to set the set points as describe above.</p>			
<b>Rationale</b>	<p>By setting the correct required temperature setpoint (22c° - winter; 24c° - summer), the A/C will operate to achieve exact level of comfort required. During mid-season, when normally ambient temperatures are within the "Dead band" zone, no heating or cooling will be required. This will result in significant energy savings.</p> <p>A reduction of 1°c could reduce the A/C system energy consumption by 7%.</p>			
<b>Risks</b>	None			
<b>Next Step</b>	<ol style="list-style-type: none"> <li>1. Set the A/C control panel setpoint to the recommended value.</li> <li>2. Raise the awareness of staff to the cost of A/C and the effect of incorrect temperature setpoints on the A/C energy consumption</li> </ol>			
<b>Relevant Publications</b>	<p>CTV003 – Heating, Ventilation and Air-Conditioning CTV032 – Building controls</p>			

#### 4.4. Office Equipment and Small Power

<b>Priority no. 10</b>	Printers and Photocopiers			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
329	1.6	3,000	60	0.2
<b>Detail</b>	The ICO in both buildings has six photocopiers. Photocopiers are left on 24/7. Although the photocopiers have their standby functionality enabled, when they do get into standby mode, the machines still consume 70% their nominal energy consumption rate (the machines lamps and printer cartridge drums have to be kept warm). We recommend the installation of a 7 day timer on all Photocopiers			
<b>Rationale</b>	During out of working hours there is no need to keep the printer cartridge drum and photocopier lamp warm. This will save 100-200w/hour of energy per photocopier.			
<b>Risks</b>	None			
<b>Next Step</b>	1. Purchase a 7 day timers and implement as suggested.			
<b>Relevant Publications</b>	GIL127 – Office Equipment Fact Sheet GIL142 – Office Fact Sheet CTV005 - Office equipment – Technical Overview CTL006 - How to operate your office equipment efficiently ECG19 – Energy use in offices			

<b>Priority no. 8</b>	Personal Computers and monitors			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
411	2	3,750	0	immediate
<b>Detail</b>	<p>Personal computers are used in most of the building areas, where these are likely to remain unused for any period, for example during a lunch break. During this period we have noticed that PCs and Monitors are set with a Screen Saver function. The PC stations should be set to shut off after an appropriate time (screen savers do not save energy).</p> <p>The site has 300 stations; most of them are flat screens. A typical PC processor has a power load of 40W, a standard PC monitor has a power load of 80W, and flat-screen LCD monitors have a power consumption of around 5-10W.</p> <p>It is recommended to switch PC monitors to auto switch off mode (do not use screen savers).</p>			
<b>Rationale</b>	<p>The amount of energy used by a computer with a "screen saver" in operation is about the same as normal working mode. "screen savers" do not save energy. It is estimated that on average a computer screen will be switched to a "screen saver" for one hour per day.</p> <p>By setting the PC to auto switch off will save approximately 250 PC working hours per year.</p>			
<b>Risks</b>	None			
<b>Next Step</b>	1. Implement as described with the advice of your IT department.			
<b>Relevant Publications</b>	<p>GIL127 – Office Equipment Fact Sheet  GIL142 – Office Fact Sheet  CTV005 - Office equipment – Technical Overview  CTL006 - How to operate your office equipment efficiently  ECG19 – Energy use in offices</p>			

<b>Priority no. 12</b>	Vending machines			
<b>Cost Saving £ per year</b>	<b>CO<sub>2</sub> Savings Tonnes/year</b>	<b>Energy Savings kWh/year</b>	<b>Cost £</b>	<b>Payback Years</b>
115	0.6	1,052	20	0.2
<b>Detail</b>	<p>Vending machines can contain heating or cooling elements for drinks and/or food. Running the vending machines out of hours when not needed, the use of higher light levels that are not required, and too high or low temperature settings will create over spend in cost and energy.</p> <p>The site has two cold drinks vending machines rated at 1kW, which are operating 24 hours a day, 365 days a year.</p> <p>We recommend the Installation of a 7 day timer on vending machine.</p>			
<b>Rationale</b>	During un-occupied times there is no need to keep the cans of drinks cold. It is sufficient start the chilling process of the cans a few hours prior to occupancy			
<b>Risks</b>	None			
<b>Next Step</b>	1. Purchase a 7 day timer and implement as suggested.			
<b>Relevant Publications</b>	GIL127 – Office Equipment Fact Sheet GIL142 – Office Fact Sheet			

In addition the following measures are recommended for further investigation in other sites of the group, but are not graded as a priority for action at the present time:

<b>Item No</b>	<b>Description of Recommendation</b>
1	Building fabric – The building fabric (insulation, building envelop, windows...) of this site are in a good condition. Openings and holes in the roof and walls should be insulated to prevent heat loss. Most of the building windows are double glazed.
2	<p>Condensing Boilers - The Wycliffe House has two old (over 15 years old) atmospheric gas-fired boilers, providing Low Pressure Hot Water (LPHW) for space heating (via a Constant Temperature circuit).</p> <p>The existing boilers, in are rated at 74kW input and 58kW output. This gives a maximum efficiency rate of 78%, when well serviced and in new condition. Once exact gas consumption is clarified. It is recommended to consider the replacement of the old boilers with energy efficient condensing boilers (up to 95% efficiency). Using a condensing boiler will also allow for the reduction in the boiler flow temperature to the minimum required during mild days.</p>

## 5. Next Steps after Your Survey

As part of the survey delivery process you will receive a supplement containing additional generic information. This is intended to complement your survey report and provide further information to enable you to implement the opportunities identified.

The supplement is divided into four sections;

- The Survey Process
- Implementation: Advice and Support
- Implementation: Financial Support
- Further Offering from External Organisations

Please contact your account manager if you do not receive your site survey supplement.

### **IMPORTANT NOTICE**

Nothing in this OA Report is intended to be or should be interpreted as an endorsement of, or recommendation for, any supplier, service or product.

Whilst reasonable steps have been taken to ensure that the information contained within this OA Report is correct, you should be aware that the information contained within it may be incomplete, inaccurate or may have become out of date. Accordingly, Energy Management Consultancy Ltd, the Carbon Trust, its agents, contractors and sub-contractors and the Government make no warranties or representations of any kind as to the content of this OA Report or its accuracy and, to the maximum extent permitted by law, accept no liability whatsoever for the same including without limit, for direct, indirect or consequential loss, business interruption, loss of profits, production, contracts, goodwill or anticipated savings. Any person making use of this OA Report does so at their own risk.

# Appendices

## Appendix 1 Supplementary Site Information

The leasing contract of both building is due to expire in the next few years and it is un-clear whether the ICO will continue to occupy the buildings. As a result it was decided to limit the commercial criteria up to 8 years.

In addition to the ICO main offices, located in Wilmslow, the organisation operates additional regional offices throughout the UK. The regional offices are small offices. Also, the ICO has a warehouse facility.

### Site Energy Consumption and Spend

The total energy consumed by ICO in both sites, for the twelve months covered (March 2007 to February 2008), sums to a total estimated energy consumption of 873,495kWh, costing £79,113 (including CCL and excluding VAT).

#### This comprises

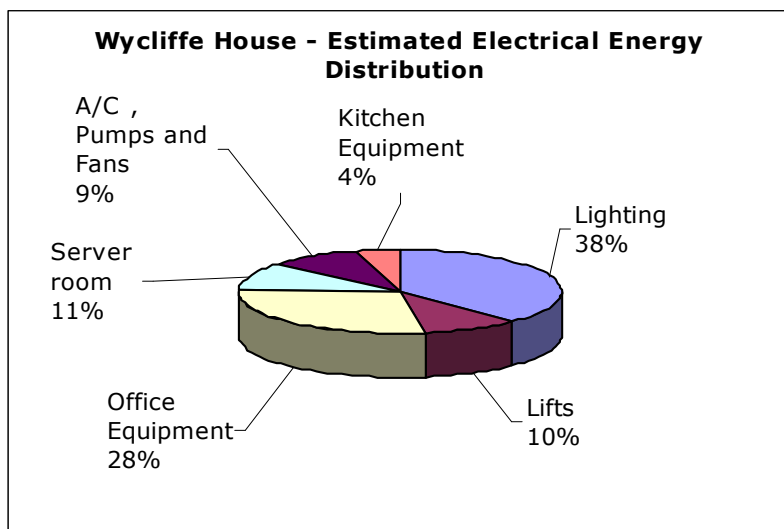
Utility	Energy Consumption		Cost	
	kWh/year	%	£/year	%
Electricity	691,425	79%	75,787	96%
Gas	182,070	21%	3,326	4%
Total Energy	873,495	100	79,113	100

The unit costs for electricity and gas used in calculating savings are 11 and 1.83 p/kWh respectively (excluding VAT and standing charges where the data provided allows for this). These values are average costs. The gas and electricity costs above include the Climate Change Levy.

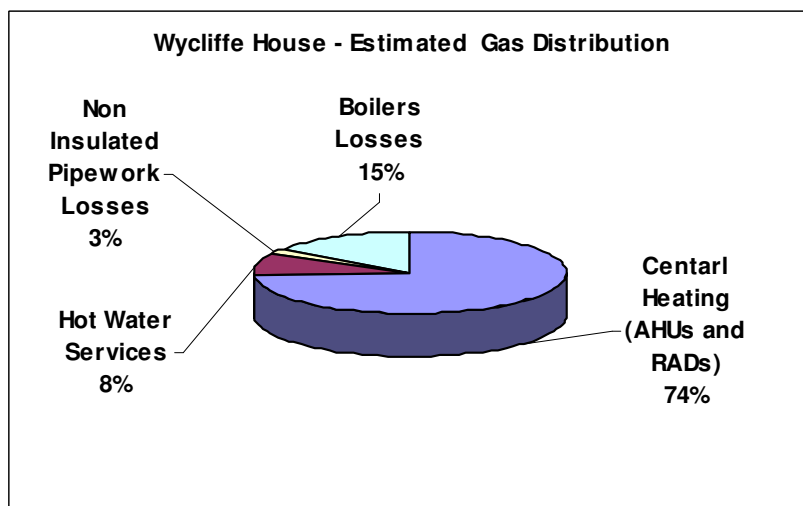
The estimated annual energy consumption for electricity and gas is based on estimated utility bills; know benchmarks and our survey findings. The energy sources for the Wycliffe House are electricity and Gas. The sole energy source for Town House is electricity

The figures below present the energy distribution between energy consumers, for electricity and gas.

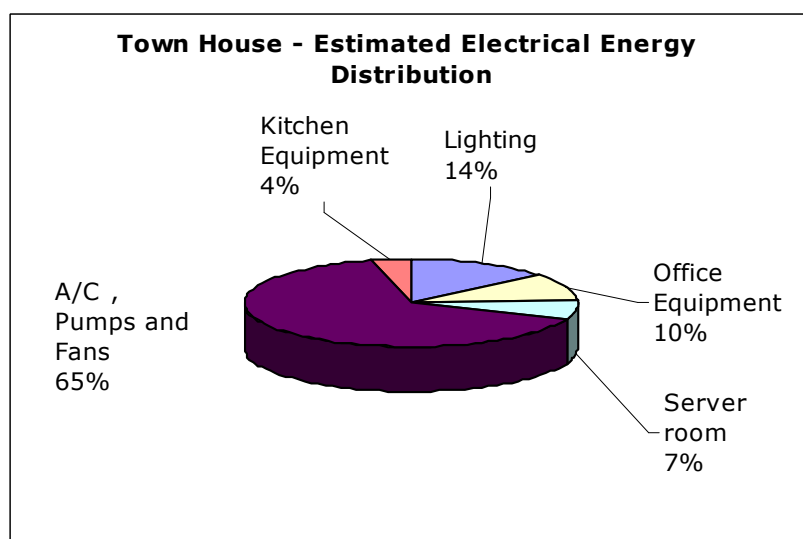
**Figures 1 – Wycliffe House Estimated Electrical Energy Distribution.**



**Figure 2 – Wycliffe House Estimated Gas Energy Distribution.**



**Figure 3 – Town House Estimated Electrical Energy Distribution.**



The table below summarises the equipment with highest energy consumption at the site and their condition.

<b>Equipment</b>	<b>Age</b>	<b>General condition</b>	<b>Est. date for next upgrade</b>
Two Atmospheric Gas fired Boilers rated at 74kW (Central Heating)	15 years	Average	2012
One Atmospheric Gas fired Boiler rated at 33kW (Hot Water Services)	15 years	Average	2012

# Appendix 2 carbon Footprinting Additional Information

## Introduction to Carbon Footprinting Methodology

This report uses a Carbon Trust methodology for calculation of a 'basic carbon footprint' for an organisation. The methodology provides a structured approach to quantifying the key greenhouse gas emissions sources in a consistent manner. It is based on a simplified version of the concepts developed by WRI<sup>1</sup> and WBCSD<sup>2</sup> in the GHG Protocol<sup>3</sup> for Corporate Emissions reporting.

The carbon footprint provides a profile of the total set of greenhouse gas emissions caused by an organisation, expressed in an annual carbon dioxide equivalent (CO<sub>2</sub>e) unit. Some organisations use a footprint as a first step towards taking actions to reduce it. Others are keen to have an accurate figure that they can disclose in marketing material, CSR reports, or use as the basis for a carbon offsetting strategy.

## Carbon Footprint Boundary Conditions

A fundamental methodology consideration in producing a carbon footprint is to decide what the footprint should cover - i.e. which part(s) of a site, organisation or group of companies are to have their emissions quantified. This decision is commonly referred to as determining the organisational boundary. The boundary used to establish your carbon footprint is detailed in the *Carbon Footprint Analysis* section of your report.

The boundary definition will have been decided between you (the customer), the consultant, and the Carbon Trust account manager. In most cases a simple decision making process can be followed – outlined below.

For a single site the following approach should be used:

- If the organisation is a single site organisation then an organisation footprint should be undertaken. However, all subsidiaries should be excluded, unless they also operate from the same site exclusively.
- If the organisation has more than one site then a site footprint should be undertaken for this site only.

For surveys across multiple sites the following approach should be used:

- If the site survey covers a subset of the sites of the organisation then individual footprints should be prepared for each site surveyed.
- If the site survey covers the complete set of sites managed by the organisation then a full organisation footprint should be prepared. However, again all subsidiaries should be excluded unless they also operate from the same sites exclusively.

## Emission Types (Scopes)

Generally accepted reporting standards such as the GHG Protocol group emissions by the level of control that an organisation has over them. A 3 part classification is used:

- Scope 1: Direct emissions. Direct emissions cover all emissions that an organisation directly causes and controls.
- Scope 2: Indirect emissions from imported utilities. Most commonly Scope 2 covers emissions from purchased electricity. Electricity emissions cover all emissions from power stations that

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<sup>1</sup> World Resources Institute, [www.wri.org](http://www.wri.org)

<sup>2</sup> World Business Council for Sustainable Development, [www.wbcsd.org](http://www.wbcsd.org)

<sup>3</sup> GHG Protocol is available from [www.ghgprotocol.org](http://www.ghgprotocol.org)

have generated the electricity. Other emissions that are covered under scope 2 are emissions elsewhere that arise from the import of heat or steam.

- Scope 3: Indirect emissions. Indirect emissions are all other emissions that an organisation causes to occur but which it does not control. Common types of indirect emissions include emissions from transport in vehicles owned by other organisations or emissions from outsourced activities or the supply chain.

For basic footprinting purposes not all these emissions are usually covered. In most cases the focus is on common emissions sources from Scope 1 and Scope 2 which can be readily and consistently quantified. Coverage of other emissions is optional and dependent on the scale and complexity of a given site/operation and customer data being readily available for consideration. Below is a list of common emissions sources, then site specific detail on which emissions are applicable to this site, how they are captured i.e. whether they are quantified or not.

## Emission Types Coverage at the Information Commissioners Office

### Scope 1 – Direct Emissions

Emissions Source	Applicable	Capture
Gas	Yes	Estimated
Oil	No	No
Owned car	Yes	Estimated
Owned bus	No	No
Owned lorry	No	No
Process emissions	No	No
Fugitive emissions	Yes	No Data

### Scope 2 – Imported Power/Utilities

Emissions Source	Applicable	Capture
Emissions from purchase of electricity	Yes	Estimated
Emissions from import of heat or steam	No	No

### Scope 3 – Other Indirect Emissions (i.e. not owned)

<b>Emissions Source</b>	<b>Applicable</b>	<b>Capture</b>
Employee Travel - Car	Yes	No Data
Employee Travel - Bus	Yes	No Data
Employee Travel - Train	Yes	Quantified
Employee Travel - Aeroplane	Yes	Quantified
Commuting	Yes	No Data
Other	No	No

## **Appendix 3 Detail of Carbon Reduction Opportunities and Carbon Footprinting: Assumptions and Calculations**

### **Carbon Footprinting**

The carbon emissions used in this report are according to the DEFRA's GHG conversion factors published 2008.

#### **Gas and Electricity consumption –**

The emission factors, per kWh of electricity and gas are 0.537 tCO<sub>2</sub>/kWh (electricity) and 0.185 tCO<sub>2</sub>/kWh (natural gas). The total estimated annual energy (kWh) consumption calculations are detailed in sector 3 (Energy use profile) of the report.

Company Van –

<b>Passenger Road Transport Conversion Factors: Vans (Light Commercial Vehicles)</b>					
Type of van	Total units travelled	Units	x	kg CO <sub>2</sub> per unit	Total kg CO <sub>2</sub>
Petrol van up to 1.25 tonne		miles	x	0.3611	
		km	x	0.2244	
Diesel van up to 3.5 tonne Renault Traffic		miles	x	0.4371	
	4000	km	x	0.2716	1086.4
LPG or CNG van up to 3.5 tonne		miles	x	0.4375	
		km	x	0.2718	
Average van up to 3.5 tonne		miles	x	0.4283	
		km	x	0.2661	
<b>Total for vans</b>					<b>1086.4</b>

Sources

Factors developed by AEA Energy & Environment and agreed with Department for Transport (2008)

Notes

New emission factors for light good vehicles (vans up to 3.5 tonnes) were calculated based on revisions to the diesel emission factors used in the National Atmospheric Emissions Inventory (NAEI) proposed to DfT by AEA (2005). These test cycle based emission factors were then uplifted by 15% to represent 'real-world' emissions, consistent with the approach used for cars agreed with DfT. Emission factors for petrol vehicles were calculated from the relative emissions and vkm of petrol and diesel LGVs in the NAEI. Emission factors for LPG and CNG vans were estimated to be similar to diesel vehicles, as indicated by EST for cars. The average van emission factor was calculated on the basis of the relative NAEI vehicle km for petrol and diesel LGVs for 2005.

Business Train Travel –

Taxi, Bus, Rail and Ferry Passenger Transport Conversion Factors					
Method of travel		Passenger kms travelled (pkm)	x	kg CO <sub>2</sub> per pkm	Total kg CO <sub>2</sub>
Taxi <sup>4</sup>	Regular taxi	0	x	0.1593	0
	Black cab	0	x	0.1720	0
Bus	Local bus <sup>5</sup>	0	x	0.1158	0
	London bus <sup>6</sup>	0	x	0.0818	0
	<b>Average bus</b>	0	x	0.1073	0
	Coach <sup>7</sup>	0	x	0.0290	0
	<b>Average bus and coach</b>	0	x	0.0686	0
Rail	National rail <sup>8</sup>	492419	x	0.0602	29643.624
	International rail (Eurostar) <sup>9</sup>	0	x	0.0177	0
	Light rail and tram <sup>10</sup>	0	x	0.0780	0
	London Underground <sup>11</sup>	0	x	0.0650	0
Ferry (Large RoPax) <sup>12</sup>	Passengers and Vehicles	0	x	0.1152	0
<b>Total</b>					<b>29643.62</b>

Sources  
Notes

Department for Transport, Transport for London and AEA Energy & Environment, 2008

- <sup>4</sup> New emission factors for taxis were estimated on the basis of an average of the emission factors of medium and large cars from Table 6c and occupancy of 1.4 (CfIT, 2002). The emission factors for black cabs are based on the large car emission factor (consistent with the VCA dataset for London Taxis International vehicles) and an average passenger occupancy of 1.5 (average 2.5 people per cab from LTI website, 2008).
- <sup>5</sup> The factor for local buses was calculated based on data publicly available from the major bus service operators including Stagecoach, First Group, Arriva, National Express, Go-Ahead and from Transport for London, supplemented in some cases by average bus occupancy factors from national statistics.
- <sup>6</sup> The London bus factor is from the Transport for London 2007 environmental report (p16) available at: <http://www.tfl.gov.uk/assets/downloads/corporate/TfL-environment-report-2007.pdf>
- <sup>7</sup> The emission factor for coach transport is the figure from the National Express Group's Corporate Responsibility Report, available at: [http://www.nationalexpressgroup.com/nx/cr/cr\\_reports/csr2006/csr2006.pdf](http://www.nationalexpressgroup.com/nx/cr/cr_reports/csr2006/csr2006.pdf). National Express are responsible for the majority of long-distance coach services in the UK, so this figure is expected to be broadly representative of the overall average.
- <sup>8</sup> The national rail factor refers to an average emission per passenger kilometre for diesel and electric trains in 2005. The calculation of the factor is based on the total electricity and diesel consumed by the railways in 2005/06 from the DfT National Modelling Framework Environment Module, and DfT transport statistics on the total number of passenger kilometres for 2005/06. The factor for conversion of units of diesel and electricity into CO<sub>2</sub> are based on the factors in Table 1 for diesel and the 2005 grid electricity factor in Table 2.
- <sup>9</sup> The emission factor for international rail is based on an average of the figures provided on the Eurostar website for the London-Brussels and London-Paris Eurostar routes, available at: [http://www.eurostar.com/UK/uk/leisure/travel\\_information/before\\_you\\_go/Green\\_Eurostar.jsp](http://www.eurostar.com/UK/uk/leisure/travel_information/before_you_go/Green_Eurostar.jsp)
- <sup>10</sup> The light rail and tram factors were based on an average of factors for the Docklands Light Rail (DLR) service, the Manchester Metrolink, Tyne and Wear Metro and the Croydon Tramlink. The factors for the Tyne and Wear and Manchester Metrolink tram and light rail systems were based on annual electricity consumption and passenger km data provided by the network operators in 2005 (referring to consumption in 2003/04) and a CO<sub>2</sub> emission factor for electricity generation on the national grid from the UK Greenhouse Gas Inventory. DLR and Croydon Tramlink figures are available in the Transport for London 2007 environmental report (p16) available at: <http://www.tfl.gov.uk/assets/downloads/corporate/TfL-environment-report-2007.pdf>
- <sup>11</sup> The London Underground rail factor is from the Transport for London 2007 environmental report (p16) available at: <http://www.tfl.gov.uk/assets/downloads/corporate/TfL-environment-report-2007.pdf>
- <sup>12</sup> The factor for RoPax ferries (Roll-on Roll-off ferries with additional passenger capacity) was provided by Best Foot Forward based on work for the Passenger Shipping Association (PSA) carried out in 2007/8. The calculated figure is based on ferry service operator provided data on fuel consumption and passengers transported, but does not include any data for passenger only ferry services, which would be expected to have significantly higher emission factors per passenger km.

## Business Air Travel –

Air Passenger Transport Conversion Factors							
Method of travel		Passenger kms travelled (pkm)	x	kg CO <sub>2</sub> per pkm <sup>13</sup>	x	km uplift factor <sup>14</sup>	Total kg CO <sub>2</sub>
<i>Flight type<sup>15</sup></i>	<i>Cabin class<sup>16</sup></i>						
<b>Domestic</b>	<b>Average</b>	136537	x	0.1753	x	109%	26089.08
<b>Short-haul international</b>	<b>Average</b>	165584	x	0.0983	x	109%	17741.829
	Economy class		x	0.0937	x	109%	
	Business class		x	0.1405	x	109%	
<b>Long-haul international</b>	<b>Average</b>	280011	x	0.1106	x	109%	33756.446
	Economy class		x	0.0807	x	109%	
	Premium economy class		x	0.1291	x	109%	
	Business class		x	0.2340	x	109%	
	First class		x	0.3228	x	109%	
<b>Total</b>							<b>77587.36</b>

Source Developed by AEA Energy & Environment in discussion with the Department for Transport and the airline industry, 2008

Notes These emissions factors are intended to be an aggregate representation of the typical emissions per passenger km from illustrative types of aircraft for the 3 types of air services. Actual emissions will vary significantly according to the type of aircraft in use, the load, cabin class, specific conditions of the flight route, etc.

<sup>13</sup> The emission factors refer to aviation's carbon dioxide emissions only. There is currently uncertainty over the non-CO<sub>2</sub> climate change effects of aviation (including water vapour, contrails, Nox etc) which may indicatively be accounted for by applying a multiplier. The appropriate factor to apply is subject to uncertainty but was estimated by the IPCC in 1999 to be in the range 2-4, with current best scientific evidence suggesting a factor of 1.9.

<sup>14</sup> The 9% uplift factor comes from the IPCC Aviation and the global Atmosphere 8.2.2.3, which states that 9-10% should be added to take into account non-direct routes (i.e. not along the straight line great circle distances between destinations) and delays/circling. Airline industry representatives have indicated that the percentage uplift for short-haul flights will be higher and for long-haul flights will be lower, however specific data is not currently available to provide separate factors. This is under investigation for future versions of these

<sup>15</sup> The emissions factors are based on typical aircraft fuel burn over illustrative trip distances listed in the EMEP/CORINAIR Emissions Inventory Guidebook (EIG 2007) – available at the EEA website at: <http://reports.eea.europa.eu/EMEP/CORINAIR5/en/B851vs2.4.pdf> and [http://reports.eea.europa.eu/EMEP/CORINAIR5/en/B851\\_annex.zip](http://reports.eea.europa.eu/EMEP/CORINAIR5/en/B851_annex.zip). This information is combined with data from the Civil Aviation Authority (CAA) on average aircraft seating capacity, loading factors, and annual passenger-km and aircraft-km for 2006 (most recent full-year data available). The provisional evidence to date suggests an uplift in the region of 10-12% to climb/cruise/descent factors derived by the CORINAIR approach is appropriate in order to ensure consistency with estimated UK aviation emissions as reported in line with the UN Framework on Climate Change, covering UK domestic flights and departing international flights.

These emissions are based on bunker fuel consumption and are closely related to fuel on departing flights. This uplift is therefore based on comparisons of national aviation fuel consumption from this reported inventory, with detailed bottom up calculations in DfT modelling along with the similar NAEI approach, which both use detailed UK activity data (by aircraft and route) from CAA, and the CORINAIR fuel consumption approach. Therefore for this version of the Defra CO<sub>2</sub> emission factors an uplift of 10% is applied based on provisional evidence. The Corinair uplift is in addition to the assumption that Great Circle Distances are increased by 9% to allow for sub-optimal routing and stacking at airports during periods of heavy congestion. It should be noted that work will continue to determine a more robust reconciliation and this will be accounted for in future versions of these factors.

The long haul estimate is based on a flight length from the Guidebook of 6482 km, short haul 1108km and domestic 463km. Actual flight distances do however vary significantly, as demonstrated in the examples in the following tables. Domestic flights are between UK airports, short haul international flights are typically to Europe (up to 3700km distance), and long haul international flights are typically to non-European destinations (or all other international flights over 3700km distance).

<sup>16</sup> The indicative emissions factors by passenger seating class have been produced to allow passengers to build an understanding of how emissions per passenger km are affected by load factors and seat configurations. This is in response to feedback on the previous version of the Act on CO<sub>2</sub> calculator.

Emission factors by passenger seating class were developed on the basis of detailed analysis of the seating configurations of 24 aircraft model variants from 16 major airlines providing services within/to/from the UK. Indicative emission factors were calculated via the relative area on the aircraft occupied by different seating classes compared to an economy class equivalent per passenger. Figures are only indicative averages and will vary considerably between different specific airline and aircraft configurations.

These indicative factors will be updated as further evidence comes to light on how these factors could more accurately be estimated. There are several ways in which these factors could be estimated, which will be kept under review.

## Carbon Reduction Opportunities

Priority 1 – Energy Policy: Preparing a company energy policy and sub-section policies is based on 1% saving of an estimated total energy consumption of the company. The estimated savings sums to 8,735kWh (1% x 873,495kWh =8,735kWh).

Priority 2 – Energy Managers, Staff Training and Communication: Appointing a Company Energy manager and Site Energy Champions, training and a good awareness campaign will take time and effort. However, depending on the company and the effort that is put in, savings between 1 % and 10 % can be achieved. The savings quoted above are based on a 1% saving (1% x 873,495kWh =8,735kWh). Cost of implementation is based on internal time efforts, consultancy and training cost. The total consultancy and training cost is estimated at one consultancy/training day rated @ £500 per day.

Priority 3 – Energy Information System: Development of an Energy Information System, based on an aM&T system, will contribute between 2% to 5% savings. The savings quoted above are based on a 2% saving. (2% x 873,495kWh =17,470kWh). Cost of implementation is based on the following: £300 per local meters and RF transmitters, £800 for PC RF receiver and graphical software and £400 allocated for installation cost. In total it is recommended to automatically monitor two main meters. (10x£300+1x£800+1x£1000=£4,800)

Priority 4 – Wycliffe House - replace inefficient Compact and T12/T8 switch-start fluorescent lighting with energy efficient High Frequency Light Fittings: The savings quoted above are based on the lighting survey detailed in Appendix 4. The implementation cost is estimated as follows: Replacement of faulty florescent T8 sw/st lamps and fittings is estimated at an average of £35 per fitting (price difference between HF and sw/st) and an install cost of £7 per fitting (estimated install of 4 fitting per hour, rated at an electrician& laborer rate of £28 per hour).The cost of a good quality L.E.D lamp is estimated at £30 and an install cost of £2 per fitting. In total cost for 301 fluorescent fittings and 13 L.E.D / 12 P.L lamps, (£7+£35) x301+ (£30+£2) x13 + (£3+£2) X12 =£13,118.

Priority 5 – Wycliffe House – Lighting occupancy and daylight control:

The savings quoted above are based the lighting survey conducted and the areas for potential savings from daylight and occupancy controls are available. The implementation cost is estimated as follows:

1. Occupancy sensor cost (including installation) is estimated at £45 per sensor, £45\*26=£1,170
  2. Daylight sensor cost (including installation) is estimated at £90 per sensor, £90\*26=£2,340
- Total cost for lighting controls is estimated at £3,510.

Priority 6 – Town House - Air Conditioning system temperature set point adjustment:

The savings quoted above are based on a 7% saving from the estimated electrical energy spent on space air conditioning. (7% \* 167,016KWh =11,691kWh). As the implementation of this measure requires a simple adjustment to the A/C settings, no cost is related to this measure.

Priority 7 – Town House – Lighting occupancy and daylight control:

The savings quoted above are based the lighting survey conducted and the areas for potential savings from daylight and occupancy controls are available. The implementation cost is estimated as follows:

1. Occupancy sensor cost (including installation) is estimated at £45 per sensor, £45\*13=£585
  2. Daylight sensor cost (including installation) is estimated at £90 per sensor, £90\*16=£1,440
- Total cost for lighting controls is estimated at £2,025.

Priority 8 - Computers and monitors: The savings quoted above are based on an average of 1hrs per day saving from the PC usage of energy from electricity. In total there are 300 PCs on site. Potential savings in Electricity consumption – 250 annual hours x 50W/1000 x 300 stations = 3,750kWh. As the implementation of this measure requires a simple adjustment to the PC power saving settings, no cost is related to this measure.

Priority 9 – Wycliffe House - Boilers control system with an Outside Temperature Sensor: It is recommended to install a boiler plant room controller/Optimiser with an OTS. The total current

annual consumption of the boilers is estimated at 135,105kWh. It is estimated that the boiler controller (combined with the OTS) will reduce the boilers operational hours by approximately 64 hours, saving 9,457kWh ( $64 \times 2 \times 74 \text{kWh} = 9,457 \text{kWh}$ ). Cost (including installation and commissioning) for the boilers controller and OTS is estimated at £800.

Priority 10 – Photocopier machines: It is estimated that the photocopier machines consumes 100w while in “power save mode” during out of working hours.  $(100\text{W} \times 6) \times 5000 \text{hrs}$  (annual saved hours) = 3,000kWh. The estimated cost of a 7 day timer is £10.  $£10 \times 6 = £60$ .

Priority 11 – Wycliffe House - Radiators and Thermostatic Radiator Valves: It is recommended to install TRVs on radiators that are not equipped with TRVs and adjust the TRVs as recommended. The total current annual consumption of the central heating boilers is estimated at 135,105kWh. It is estimated that the TRVs control and adjustment will reduce the boilers operational hours by approximately 46 hours, saving 6,755kWh ( $46 \times 2 \times 74 \text{kWh} = 6,755 \text{kWh}$ ). Cost for an estimated 10 additional TRVs is estimated at £500.

Priority 12 - Vending machine 7 day timer: The two vending machines are rated at 1kW. Currently the machine is switched on 24/7 (8760 annual hours). During its non occupied time it is estimated that the machines consume 10% of their nominal rate. The machine should be operated only during site operational hours (3500 hrs). Saving calculation:  $(8760 - 3500) \times 1 \text{kW} \times 2 \times 10\% = 1,052 \text{kWh}$ . Estimated cost of a 7 day timer is £10. Total cost estimated at £20 ( $2 \times £10$ ).

Priority 13 – Wycliffe House - Reduction of HWS operational hours: Currently the HWS boiler system is operational 24/7 (8760 annual hours). It is recommended to install a 7 day timer on the HWS boiler system. The total current annual consumption of the HWS boiler is estimated at 15,012kWh. It is estimated that the 7 day timer will reduce the boiler operational hours by approximately 68 hours, saving 2,449kWh ( $68 \times 33.1 \text{kWh} = 2,252 \text{kWh}$ ) and will reduce the HWS pumps operation by an estimated 300 hours, saving 197kWh ( $300 \times 0.65 \text{kWh} = 197 \text{kWh}$ ). Cost for the boiler 7 day timer (including installation) is estimated at £150.

Priority 14 – Wycliffe House - Insulation of hot water pipe work: Heat loss as a result of non-insulated hot water pipework is estimated at 3% of the energy used for heating ( $3\% \times 150,117 \text{kWh} = 4,643 \text{kWh}$ ). The savings quoted above are based on 60% saving from the total energy loss due to lack of pipework insulation ( $60\% \times 4,643 \text{kWh} = 2,786 \text{kWh}$ ). Cost of plant room insulation is estimated at £250.

## Appendix 4 Lighting Survey, Recommendations and Savings Calculations

Wycliffe House - Current Status										
Area	Type of fittings and lamps	Total power per fitting	No of fittings	Annual working hrs	Total kW	Total kWh	Total energy cost £	Lamp life hrs	Number of lamps per fitting	No of lamps to be replaced in a year
Reception <b>Wycliffe House</b>	Incandescent 1x25w	25	3	3500	0.1	262.5	£18.87	3000	1	4
	Incandescent 1x25w	25	9	3500	0.2	787.5	£56.62	3000	1	11
Ground floor stairwell	SW/ST CFL 20/20 (1x28w) 2D	36	6	3500	0.2	756.0	£54.36	10000	1	3
Disabled toilets	SW/ST T8 4x18w	91	1	700	0.1	63.7	£4.58	9000	4	1
Toilets	SW/ST T8 4x18w	91	8	1050	0.7	764.4	£54.96	9000	4	4
Corridor	SW/ST T8 4x18w	91	10	3500	0.9	3185.0	£229.00	9000	4	16
Facilities office	SW/ST T8 4x18w	91	6	3500	0.5	1911.0	£137.40	9000	4	10
Office desk 1	SW/ST T8 4x18w	91	4	3500	0.4	1274.0	£91.60	9000	4	7
Post room	SW/ST T8 4x18w	91	4	3500	0.4	1274.0	£91.60	9000	4	7
Conference room	SW/ST T8 3x36w	136	10	3500	1.4	4760.0	£342.24	9000	3	12
	Halogen spots 1x50w	50	13	3500	0.7	2275.0	£163.57	4000	1	12
Kitchen	SW/ST T8 3x36w	136	11	3500	1.5	5236.0	£376.47	9000	3	13
Storage room	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Amits room	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
First aid room	SW/ST T8 3x18w	73	2	3500	0.1	511.0	£36.74	9000	3	3
Open space office area	SW/ST T8 3x36w	136	18	3500	2.4	8568.0	£616.04	9000	3	21
	SW/ST T8 3x18w	73	11	3500	0.8	2810.5	£202.07	9000	3	13
Office	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Office desk 26	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Office desk 37	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Stairwell	SW/ST CFL 20/20 (1x28w) 2D	36	5	3500	0.2	630.0	£45.30	10000	1	2
First floor - Office desk 71	SW/ST T8 3x36w	136	4	3500	0.5	1904.0	£136.90	9000	3	5
Office desk 44	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Office desk 69	SW/ST T8 3x36w	136	4	3500	0.5	1904.0	£136.90	9000	3	5
Office desk 68	SW/ST T8 3x36w	136	4	3500	0.5	1904.0	£136.90	9000	3	5
Apollo	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Corridor	SW/ST T8 3x18w	73	6	3500	0.4	1533.0	£110.22	9000	3	7
Office desk 67	SW/ST T8 3x36w	136	6	3500	0.8	2856.0	£205.35	9000	3	7
Open space office area	SW/ST T8 3x18w	73	8	3500	0.6	2044.0	£146.96	9000	3	10
	SW/ST T8 3x36w	136	46	3500	6.3	21896.0	£1,574.32	9000	3	54
Office desk 70	SW/ST T8 3x36w	136	4	3500	0.5	1904.0	£136.90	9000	3	5
Potocopy room	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Office desk 23	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Office desk 48	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Stairwell corridor	SW/ST CFL 20/20 (1x28w) 2D	36	6	3500	0.2	756.0	£54.36	10000	1	3
Toilets	SW/ST T8 3x18w	73	9	1050	0.7	689.9	£49.60	9000	3	4
Second floor -Stairwell corridor	SW/ST CFL 20/20 (1x28w) 2D	36	6	3500	0.2	756.0	£54.36	10000	1	3
Toilets	SW/ST T8 4x18w	91	8	1050	0.7	764.4	£54.96	9000	4	4
Open space office area	SW/ST T8 3x18w	73	11	3500	0.8	2810.5	£202.07	9000	3	13
	SW/ST T8 3x36w	136	41	3500	5.6	19516.0	£1,403.20	9000	3	48
Office desk 29	SW/ST T8 3x36w	136	3	3500	0.4	1428.0	£102.67	9000	3	4
Office desk 88	SW/ST T8 3x36w	136	2	3500	0.3	952.0	£68.45	9000	3	3
Server room	SW/ST T8 3x36w	136	4	1050	0.5	571.2	£41.07	9000	3	2
B.T room	SW/ST T8 3x36w	136	2	1050	0.3	285.6	£20.53	9000	3	1
Office	SW/ST T8 3x36w	136	3	3500	0.4	1428.0	£102.67	9000	3	4
Stairwell	SW/ST CFL 20/20 (1x28w) 2D	36	5	3500	0.2	630.0	£45.30	9000	1	2
Plant room	SW/ST T8 2x58w	144	2	1400	0.3	403.2	£28.99	9000	2	1
	SW/ST T12 1x65w	79	1	1400	0.1	110.6	£7.95	9000	1	1
<b>Total:</b>			326		34.24	111635.0	£8,026.55	419000	132	360

Wycliffe House - Recommended lighting													
Area	Type of fittings and lamps	Total power per fitting	No of fittings	Annual working hrs	Total kW	Total kWh	% of savings from occu. control	% of savings from daylight control	Final Total kWh	Total energy cost £	Lamp life hrs	Number of lamps per fitting	No of lamps to be replaced in a year
Reception Wycliffe House	PL 1x9w	9	3	3500	0.0	94.5			94.5	£6.8	10000	1	2
	PL 1x9w	9	9	3500	0.1	283.5			283.5	£20.4	10000	1	4
Ground floor stairwell	HF CFL 20/20 (1x28w) 2D	28.5	6	3500	0.2	598.5			598.5	£43.0	20000	1	2
Disabled toilets	HF T8 4x18w	72	1	700	0.1	50.4			50.4	£3.6	20000	4	1
Toilets	HF T8 4x18w	72	8	1050	0.6	604.8			604.8	£43.5	20000	4	2
Corridor	HF T8 4x18w	72	10	3500	0.7	2520.0			2520.0	£181.2	20000	4	7
Facilities office	HF T8 4x18w	72	6	3500	0.4	1512.0	20%		1209.6	£87.0	20000	4	4
Office desk 1	HF T8 4x18w	72	4	3500	0.3	1008.0	20%		806.4	£58.0	20000	4	3
Post room	HF T8 4x18w	72	4	3500	0.3	1008.0	20%		806.4	£58.0	20000	4	3
Conference room	HF T8 3x36w	105	10	3500	1.1	3675.0	20%		2940.0	£211.4	20000	3	5
	L.E.D 4.5w	4.5	13	3500	0.1	204.8	20%		163.8	£11.8	35000	1	2
Kitchen	HF T8 3x36w	105	11	3500	1.2	4042.5		30%	2829.8	£203.5	20000	3	6
Storage room	HF T8 3x36w	105	2	3500	0.2	735.0	70%		220.5	£15.9	20000	3	1
Amits room	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
First aid room	HF T8 3x18w	57	2	3500	0.1	399.0	20%		319.2	£23.0	20000	3	1
Open space office area	HF T8 3x36w	105	18	3500	1.9	6615.0		30%	4630.5	£332.9	20000	3	10
	HF T8 3x18w	57	11	3500	0.6	2194.5		30%	1536.2	£110.4	20000	3	6
Office	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Office desk 26	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Office desk 37	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Stairwell	HF CFL 20/20 (1x28w) 2D	28.5	5	3500	0.1	498.8	20%	70%	119.7	£8.6	20000	1	1
First floor - Office desk 71	HF T8 3x36w	105	4	3500	0.4	1470.0	20%		1176.0	£84.6	20000	3	2
Office desk 44	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Office desk 69	HF T8 3x36w	105	4	3500	0.4	1470.0	20%		1176.0	£84.6	20000	3	2
Office desk 68	HF T8 3x36w	105	4	3500	0.4	1470.0	20%		1176.0	£84.6	20000	3	2
Apollo	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Corridor	HF T8 3x18w	57	6	3500	0.3	1197.0			1197.0	£86.1	20000	3	4
Office desk 67	HF T8 3x36w	105	6	3500	0.6	2205.0	20%		1764.0	£126.8	20000	3	3
Open space office area	HF T8 3x18w	57	8	3500	0.5	1596.0		30%	1117.2	£80.3	20000	3	5
	HF T8 3x36w	105	46	3500	4.8	16905.0		30%	11833.5	£850.8	20000	3	25
Office desk 70	HF T8 3x36w	105	4	3500	0.4	1470.0	20%		1176.0	£84.6	20000	3	2
Potocopy room	HF T8 3x36w	105	2	3500	0.2	735.0	40%		441.0	£31.7	20000	3	1
Office desk 23	HF T8 3x36w	105	2	3500	0.2	735.0			735.0	£52.8	20000	3	2
Office desk 48	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Stairwell corridor	HF CFL 20/20 (1x28w) 2D	28.5	6	3500	0.2	598.5			598.5	£43.0	20000	1	2
Toilets	HF T8 3x18w	57	9	1050	0.5	538.7			538.7	£38.7	20000	3	2
Second floor -Stairwell corridor	HF CFL 20/20 (1x28w) 2D	28.5	6	3500	0.2	598.5			598.5	£43.0	20000	1	2
Toilets	HF T8 4x18w	72	8	1050	0.6	604.8			604.8	£43.5	20000	4	2
Open space office area	HF T8 3x18w	57	11	3500	0.6	2194.5		30%	1536.2	£110.4	20000	3	6
	HF T8 3x36w	105	41	3500	4.3	15067.5		30%	10547.3	£758.3	20000	3	22
Office desk 29	HF T8 3x36w	105	3	3500	0.3	1102.5	20%		882.0	£63.4	20000	3	2
Office desk 88	HF T8 3x36w	105	2	3500	0.2	735.0	20%		588.0	£42.3	20000	3	1
Server room	HF T8 3x36w	105	4	1050	0.4	441.0	40%		264.6	£19.0	20000	3	1
B.T room	HF T8 3x36w	105	2	1050	0.2	220.5	40%		132.3	£9.5	20000	3	1
Office	HF T8 3x36w	105	3	3500	0.3	1102.5	20%		882.0	£63.4	20000	3	2
Stairwell	HF CFL 20/20 (1x28w) 2D	28.5	5	3500	0.1	498.8		70%	149.6	£10.8	20000	1	1
Plant room	HF T8 2x58w	107	2	1400	0.2	299.6	70%		89.9	£6.5	20000	2	1
	HF T8 1x58w	70	1	1400	0.1	98.0	70%		29.4	£2.1	20000	1	1
<b>Total:</b>			326		25.99	84542.5			63083.1	£4,535.7	955000	132	161

Town House - Current Status										
Area	Type of fittings and lamps	Total power per fitting	No of fittings	Annual working hrs	Total kW	Total kWh	Total energy cost £	Lamp life hrs	Number of lamps per fitting	No of lamps to be replaced in a year
<b>Twon House - Training room</b>	HF T5 4x14w	63	8	3500	0.5	1764.0	£126.83	20000	4	6
Office desk 19	HF T5 4x14w	63	9	3500	0.6	1984.5	£142.69	20000	4	7
Open space office area	HF T5 4x14w	63	50	3500	3.2	11025.0	£792.70	20000	4	35
Toilets	HF CFL 20/20 (1x28w) 2D	28.5	13	1400	0.4	518.7	£37.29	20000	1	1
Office desk 58	HF T5 4x14w	63	2	3500	0.1	441.0	£31.71	20000	4	2
Office desk 63	HF T5 4x14w	63	4	3500	0.3	882.0	£63.42	20000	4	3
Office desk 62	HF T5 4x14w	63	2	2450	0.1	308.7	£22.20	20000	4	1
Office desk 61	HF T5 4x14w	63	2	2100	0.1	264.6	£19.02	20000	4	1
Office desk 60	HF T5 4x14w	63	2	2100	0.1	264.6	£19.02	20000	4	1
Office desk 59	HF T5 4x14w	63	2	2100	0.1	264.6	£19.02	20000	4	1
Server room	HF T5 4x14w	63	2	1750	0.1	220.5	£15.85	20000	4	1
Ground floor- Conference room	HF T5 4x14w	63	6	3500	0.4	1323.0	£95.12	20000	4	5
Corridor	HF T5 4x14w	63	1	3500	0.1	220.5	£15.85	20000	4	1
	HF T8 1x70w	72	1	3500	0.1	252.0	£18.12	20000	1	1
Open space office area	HF T5 4x14w	63	41	3500	2.6	9040.5	£650.01	20000	4	29
Potocopy room	HF T5 4x14w	63	2	3500	0.1	441.0	£31.71	20000	4	2
Meeting room	HF T5 4x14w	63	2	3500	0.1	441.0	£31.71	20000	4	2
Toilets	HF CFL 20/20 (1x28w) 2D	28.5	9	1400	0.3	359.1	£25.82	20000	1	1
Kitchen	HF T8 1x58w	56.5	2	3500	0.1	395.5	£28.44	20000	1	1
<b>Total:</b>			160		9.32	30410.8	£2,186.54	380000	64	101

Town House - Recommended lighting													
Area	Type of fittings and lamps	Total power per fitting	No of fittings	Annual working hrs	Total kW	Total kWh	% of savings from occu. control	% of savings from daylight control	Final Total kWh	Total energy cost £	Lamp life hrs	Number of lamps per fitting	No of lamps to be replaced in a year
<b>Twon House - Training room</b>	HF T5 4x14w	63	8	3500	0.5	1764.0	20%		1411.2	£101.5	20000	4	5
Office desk 19	HF T5 4x14w	63	9	3500	0.6	1984.5	20%	20%	1270.1	£91.3	20000	4	6
Open space office area	HF T5 4x14w	63	50	3500	3.2	11025.0		20%	8820.0	£634.2	20000	4	35
Toilets	HF CFL 20/20 (1x28w) 2D	28.5	13	1400	0.4	518.7			518.7	£37.3	20000	1	1
Office desk 58	HF T5 4x14w	63	2	3500	0.1	441.0	20%	30%	247.0	£17.8	20000	4	2
Office desk 63	HF T5 4x14w	63	4	3500	0.3	882.0	20%	30%	493.9	£35.5	20000	4	3
Office desk 62	HF T5 4x14w	63	2	2450	0.1	308.7	20%	30%	172.9	£12.4	20000	4	1
Office desk 61	HF T5 4x14w	63	2	2100	0.1	264.6	20%	30%	148.2	£10.7	20000	4	1
Office desk 60	HF T5 4x14w	63	2	2100	0.1	264.6	20%	30%	148.2	£10.7	20000	4	1
Office desk 59	HF T5 4x14w	63	2	2100	0.1	264.6	20%	30%	148.2	£10.7	20000	4	1
Server room	HF T5 4x14w	63	2	1750	0.1	220.5	20%		176.4	£12.7	20000	4	1
Ground floor- Conference room	HF T5 4x14w	63	6	3500	0.4	1323.0	20%	20%	846.7	£60.9	20000	4	4
Corridor	HF T5 4x14w	63	1	3500	0.1	220.5			220.5	£15.9	20000	4	1
	HF T8 1x70w	72	1	3500	0.1	252.0			252.0	£18.1	20000	1	1
Open space office area	HF T5 4x14w	63	41	3500	2.6	9040.5		20%	7232.4	£520.0	20000	4	29
Potocopy room	HF T5 4x14w	63	2	3500	0.1	441.0	60%		176.4	£12.7	20000	4	1
Meeting room	HF T5 4x14w	63	2	3500	0.1	441.0	20%		352.8	£25.4	20000	4	2
Toilets	HF CFL 20/20 (1x28w) 2D	28.5	9	1400	0.3	359.1			359.1	£25.8	20000	1	1
Kitchen	HF T8 1x58w	56.5	2	3500	0.1	395.5	20%	30%	221.5	£15.9	20000	1	1
<b>Total:</b>			160		9.32	30410.8			23216.1	£1,669.2	380000	64	97

## Appendix 5 Summary of Areas Covered

This is a checklist of items that could be covered by an opportunities assessment visit. The purpose of this form is to advise the report review process as to why certain areas have been covered and why others have not.

Main area	Sub topics	Key area?	Yes, covered	Not covered	Reason for exclusion (e.g. customer already familiar, not relevant at this site, etc.)
<b>Energy Management and Reporting System</b>					
	Policy and Strategy	YES	√		
	Energy Management responsibility	YES	√		
	Use of meters	YES	√		
	Data collection and analysis	YES	√		
	Publicising Energy Performance				
	Workforce engagement	YES	√		
	Use of the Standards for Managing Energy				
	Buildings Energy Management Systems				
<b>Energy Performance</b>					
	Space Heating	YES	√		
	Boiler house/ plant room/ boilers	YES	√		
	HVAC systems and plant	YES	√		
	Compressed Air	YES			Not relevant at this site
	Combustion processes	YES		√	Not relevant at this site
	Lighting	YES	√		
	Motors and drives	YES	√		
	Building Fabric	YES	√		
	Refrigeration/ Cooling Systems	YES	√		
	Hot water systems		√		
	Steam distribution			√	Not relevant at this site

Main area	Sub topics	Key area?	Yes, covered	Not covered	Reason for exclusion (e.g. customer already familiar, not relevant at this site, etc.)
	Heat recovery			√	Not relevant at this site
	Process	YES		√	Not relevant at this site
	Pumps and fans		√		
<b>Energy Supply</b>	Opportunities for Renewables			√	Where appropriate, this sub-section should explore the options for renewables, as they might fit the image of the organisation. It is accepted that renewable technology is unlikely to be economic, but there may be other environmental advantages. Reference should be made to DTI support, grants and other initiatives such as Clear Skies and the Scottish Executive programme.
	Opportunities for CHP			√	Where appropriate, this sub-section should discuss the relevance of CHP to the site in question. It is accepted that the economic situation is discouraging at present but, where heat and power profiles are such that a CHP plant would / could qualify for Good Quality CCL exemption, this point should be stressed. Reference should be made to the CHP Club and the Contract Energy Management route.

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