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RESTRICTED – COMMERCIAL

ENERGY MANAGEMENT AND OPPORTUNITIES ASSESSMENT

FOR

NORTH WILTSHIRE DISTRICT COUNCIL

Prepared for: Mr Graham Jones
Energy Manager
North Wiltshire District Council
Monkton Park
Chippenham, Wiltshire
SN15 1ER
Tel: 01249 706317
E-mail grahamjones@northwilts.gov.uk

Prepared by: Julian Edmonds
Upton Energy Ltd
40 Hencroft Street South
Slough
SL1 1RE
Tel: 01753 824886
E-mail jedmonds@uptonenergy.com

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Executive Summary

This report presents the results of an Energy Management and Opportunities Assessment for North Wiltshire District Council. This assessment and report are provided by Upton Energy Ltd. and have been funded by the Carbon Trust.

The agreed objectives of the assessment were:

- to identify and prioritise up to 5 actions that can be taken by the organisation to improve its energy management effectiveness.
- to identify and prioritise up to 10 actions that can be taken by the organisation at site level to reduce energy costs and save carbon.

With its activities distributed across 8 large and approximately 25 small sites, North Wiltshire District Council faces particular challenges in the management of energy and implementation of energy saving projects. Whilst they have made good progress in procuring an energy-efficient design for their main council offices, they have requested support to reduce the electricity consumption which is higher than intended, and to manage energy across their leisure centre sites.

North Wiltshire District Council provides local government services to a population of 126,000. Currently the council spends £407,000 /year on energy on its larger sites, and approximately £500,000 once the smaller sites are taken into account. To put this figure into perspective, this represents 1.06% of the council's total expenditure and 5.42% of Council Tax paid by residents within the district.

Priority actions are recommended in three main areas:

- Energy Management systems and procedures;
- Energy saving opportunities that are applicable across all the sites;
- Energy saving opportunities that are specific to the sites assessed.

These priority actions have been selected based on the assessment of current practices within the organisation and at the sites. They address key areas where work is needed to improve the overall balance of the energy management practices, and consequently the impact on the organisation's energy saving capability.

Taken together, once implemented, the actions should lead to a reduction of 36.4% in the overall energy consumption and a 33.6% reduction in cost which translates into additional money that can be spent on council services. This represents £139,000 per year on an on-going basis. The cost of implementing the package of measures is estimated to be £284,000 giving a simple payback period of 2.04 years.

Risks and Uncertainties

The estimates of savings opportunities have been based on assumptions about the sites that were not visited, based on what is known about the age of the buildings and the types of facilities. Complete technical specifications of some plant items were not available at the time of the visit.

Action Plan

Energy Management Improvements

Energy management improvements set the framework within which the existing buildings and energy-using equipment are operated, and physical measures to save energy are planned, funded and managed. The following energy management improvements have been identified, and are explained more fully in Section 3.

Priority	Recommendation and key actions	Estimated annual savings			ESTIMATED COST (£)	Payback period (years)	Timescale for implementation and by whom
		(£)	CO_2 (tonnes)	(kWh)			
1	Revise and Expand Energy Policy	6,060	50.0	193,162	5,000	0.83	
2	Monitoring and Targeting Software	9,090	76.0	289,743	5,000	0.55	
3	Integrate Energy Saving into FM Contracts	2,700	20.0	58,000	1,000	0.37	
4	Design Specification for New Build / Refurb	6,060	50.0	193,162	5,000	0.83	
5	Automatic Meter Reading	9,090	76.0	289,743	24,500	2.70	
	Total Savings from Energy Management Improvements	33,000	272	1,023,810	£40,500	1.23	

Opportunities that are Generally Applicable to Sites

The recommendations listed below are those that are applicable to all sites or facilities of a particular type, including some of those that were not visited. They are prioritised, reflecting a balance between the time to implement, estimated cost to implement and savings expected. Recommendations scoring favourably on all 3 criteria are highest priority, 2 out of 3 medium priority, 1 out of 3 lowest priority. The recommendations are explained in Section 4, and detailed calculations to support the costs and savings are provided in Appendix 3.

Priority	Recommendation and key actions	Figures below assume implementation across all sites					Timescale for implementation and by whom
		Estimated annual savings			ESTIMATED COST (£)	Payback period (years)	
		(£)	CO_2 (tonnes)	(kWh)			
1	Inverter drives on pool air handling plant	11,800	129.0	338,250	39,000	3.31	
2	Extend BEMS control to all major sites	31,000	207.0	1,090,000	59,000	1.90	
3	Heat and moisture recovery in pool halls	26,700	265.0	1,225,000	40,000	1.50	
4	Lighting controls in squash courts	1,794	15.2	35,454	2,400	1.34	
5	Timers on vending machines	1,450	19.3	45,000	4,500	3.10	
6	Remove electric heating from Jacuzzi baths & connect to central plant	2,148	13.0	0	7,500	3.49	
7	Address remaining lighting issues	2,200	18.0	42,000	3,600	1.64	
8	Solar water heating in swimming pools	15,800	158.0	652,000	70,000	4.43	
TOTAL		92,892	824.5	3,427,704	226,000	2.43	

Opportunities that are Site Specific

The recommendations listed below are those that are applicable only to the sites that were visited. They are prioritised, reflecting a balance between the time to implement, estimated cost to implement and savings expected. Recommendations scoring favourably on all 3 criteria are highest priority, 2 out of 3 medium priority, 1 out of 3 lowest priority. The recommendations are explained in Section 4, and detailed calculations to support the costs and savings are provided in Appendix 3.

Priority	Recommendation and key actions	Estimated annual savings			ESTIMATED COST (£)	Payback period (years)	Timescale for implementation and by whom
		(£)	CO_2 (tonnes)	(kWh)			
1	Pool cover at Olympiad	9,150	64.7	460,000	12,750	1.39	
2	Daylight / new lighting at White Horse sports hall	1,525	12.3	26,000	4,800	3.15	
3	TRVs in NWLL company offices	202	1.4	6,400	200	0.99	
4	Review standby generator at Monkton	206	1.9	4,380	0	-	
5	Waterless urinals at White Horse	2,644	0.6	0	720	0.27	
TOTAL		13,727	80.9	496,780	18,470	1.34	

1. Introduction

North Wiltshire District Council have requested this Multi Site Assessment and Energy Management Assessment to help them to reduce the impact of the large increases in market prices for energy, and meet the council's environmental objectives. Overall energy expenditure in fiscal year 2004-5 was £387,500, and they wish to prevent it increasing beyond £500,000 this year.

1.1 Assessment Objectives

The organisation's specific objectives for the assessment were discussed with Graham Jones and Bee Lewis. Graham Jones is responsible for utilities and environment in the council's premises, and Bee Lewis is responsible for leisure and community services. The objectives for this assessment included identifying energy saving measures in leisure centres which are particularly intensive users.

1.2 Organisation Background

North Wiltshire District covers an area of 300 square miles and has 126,000 inhabitants. The main services for which North Wiltshire District Council is responsible for are:-

- Cleansing and Amenities – Refuse collection and maintenance of open green spaces are conducted in house,
- Housing – the council no longer owns any housing stock, but oversees the work of housing associations and Registered Social Landlords in its area and administers housing benefit,
- Environmental Health
- Leisure and Community Services – six leisure centres owned by the council are operated by the non profit making trust North Wiltshire Leisure Limited.
- Planning and Building Control

The council employs 400 people directly, and North Wiltshire Leisure Limited employs a further 300. The main office building at Monkton Park in Chippenham, where most directly employed staff are based, is owned and operated by Jarvis Facilities Management under a Private Finance Initiative (PFI) contract.

2. Current Energy Use

2.1 Organisational Energy Consumption and Spend

The total energy spend for North Wiltshire District Council was stated as £387,500 for the 2004/5 financial year, however this is before a significant increase in prices. Consumption figures were provided for nine of the sites, and these totalled 13,582,622 and £406,976 at current contract rates. Consumption for the remaining 25 smaller sites is not known.

The total for the sites for which consumption figures were provided for the 2004/5 financial year comprises:-

Utility	Energy Consumption		Cost	
	kWh/year	%	£/year	%
Electricity	3,174,780	23	£193,496	48
Gas	9,156,291	67	£171,811	42
Oil	1,251,551	9	£41,670	10
Total Energy	13,582,622		£406,976	

Percentage figures may not add up to 100 due to decimal rounding.

Data for 2003/4 was provided for the three sites that were visited, but was not available for any of the others.

The unit costs in p/kWh used in calculating savings are:-

Day rate electricity	5.23
Night rate electricity	3.21
CHP generated electricity	4.23
CHP generated heat	1.47
Gas	1.83
Gasoil	2.83

These values exclude VAT and standing charges, but include Climate Change Levy where appropriate.

Electricity for the Monkton Park offices is procured under a green tariff from Scottish and Southern Energy and is exempt from Climate Change Levy. North Wiltshire Leisure Limited have their own supply contracts for the leisure centres and these are with Scottish and Southern for electricity and gas, and Exxon Mobil for oil.

For a full explanation of the values applied to CHP generated electricity and heat, see Appendix 3

2.2 Benchmarks

Information on the individual sites' energy consumption and spend is provided in Appendix 2.

Energy performance indicators give a measure of activity based energy use, which can be compared between sites within an organisation and with equivalent benchmarks. Energy consumption benchmarks are given in Energy Consumption Guide 19 (ECG019) for offices, and Energy Consumption Guide 78 (ECG078) for sports and leisure centres. For a particular site, the performance indices need to be modified to take into account building occupancy, size, activities, location and weather (degree days). The lower value indicates best practice.

Benchmark Information for Sector

The following standard benchmarks were used for the different properties:-

Benchmark for Naturally Ventilated Open Plan Offices			
	Typical Value (kWh/m^2)*	Good Practice Value (kWh/m^2)*	
Electricity	85	54	
Fossil Fuel	151	79	
Total	236	133	

Source: Energy Consumption Guide 019

Benchmark for Mixed Leisure Centre			
	Typical Value (kWh/m^2)*	Good Practice Value (kWh/m^2)*	
Electricity	152	96	
Fossil Fuel	598	264	
Total	750	360	

Source: Energy Consumption Guide 078

Benchmark Information for Sites

The following tables show the annual consumption per kWh for each of the sites compared with the "typical" benchmarks above.

Benchmark Information for Office Sites

	Elec	Fossil	sq.m.	Elec kWh/sq.m.	Fossil kWh/sq.m.	Total kWh/sq.m.
Parsonage Way Depot	242,204		493	491	0	491
Monkton Park Offices	724,798	440,074	4053	179	109	287
Citadel	29,453	55,365	299	99	185	284
Typical benchmark				85	151	236

Benchmarking Information for Leisure Centres

	Elec	Fossil	sq.m.	Elec kWh/sq.m.	Fossil kWh/sq.m.	Total kWh/sq.m.
Cricklade	259,841	1,021,903	1611	161	634	796
Lime Kiln	329,736	1,374,933	2252	146	611	757
Typical benchmark				152	598	750
Springfield	372,115	1,513,310	2511	148	603	751
Activity Zone	251,518	906,540	1653	152	548	701
Olympiad Leisure Centre	519,890	3,844,166	6782	77	567	643
White Horse Leisure Centre	445,225	1,251,551	3006	148	416	564

As can be seen from the above benchmarking tables, the consumption of all of the office sites is above the typical value for the sector. The Monkton Park office building shows a good performance on fossil fuel, however its electricity consumption is significantly over what is "typical". This is due to a large air-conditioned server suite leading to overnight consumption in excess of 50kW.

The majority of the leisure centres consume less than the "typical" benchmarks but still have some way to go to achieve "good practice".

2.3 Current Energy Management Practices

An Energy Policy and Water Policy were passed by the council more than three years ago, and as a result energy-saving qualities featured strongly in the brief for the construction of the new Monkton Park offices, opened in 2002. However, the policy appears to have been kept "on the shelf" since.

Currently there is very little officer time devoted to energy management. Tony Weekes has the responsibility, but has "little if any" time to devote to it. Graham Jones assists by validating bills, collecting consumption data on spreadsheets, and managing some of the external contractors. Most action on energy saving appears to be taken by engineering staff at site level.

The leisure centres, which account for the majority of energy consumption, are owned by the council but operated and managed by North Wiltshire Leisure Limited (NWLL) under a ten year contract. NWLL pay the energy bills and are responsible for day to day maintenance of the buildings and control of the energy-related plant. However, the council are responsible for funding significant enhancements to the buildings.

The council's main offices in Chippenham were procured under a PFI contract with Jarvis Construction Ltd., and are managed by Jarvis Facilities Management (JFM). JFM are responsible for day to day control of the energy-related plant and pay the energy bills, but then pass the bills through to the council at cost. JFM have carried out a number of energy-saving measures in the building under the instruction of Graham Jones.

2.4 Organisational Issues Affecting Energy Use

The main issues affecting energy consumption at the sites are:

- Fragmentation of ownership and responsibility. The Monkton Park offices are owned and managed by a PFI operator, the council has no direct control over the energy-related plant, and the private operator "passes through" the energy bills and therefore has no financial incentive to reduce them.
- Leisure sites owned and operated by a private trust resulting in "grey area" with regard to funding.
- Smaller sites where it is difficult to obtain timely and accurate consumption information, but where significant avoidable waste could be occurring.

3. Assessment of Energy Management Practices

This section provides a descriptive overview analysis of the energy management assessment – where the strengths and weaknesses have been identified in the four major categories. The detailed scoring is provided in Appendix 2.

The table summarises the results of the Energy Management Assessment at North Wiltshire District Council. It gives a picture of the balance of energy management in your organisation, and its associated strengths and weaknesses.

	Score	
	Actual	Maximum
Management Commitment	10	25
Energy policy	6	10
Organisational structure	4	15
Energy Information Systems	11	25
Procedures for monitoring and analysing energy use	8	15
Target setting	3	10
Staff Involvement	10	25
Involvement and training of staff	4	13
Operating procedures for the efficient use of energy	6	12
Procurement and Investment	13	25
Incorporating energy efficiency into procurement policy	4	12
Investment procedures for energy efficiency	9	13
TOTAL	44	100

3.1 Overall Evaluation of Performance

Energy management at North Wiltshire District Council made a good start with the procurement of an office building with many energy-efficient features. Many staff appear to be motivated to "do their bit" to help the environment, and this has resulted in a reasonable standard of day to day housekeeping.

However the policy has since suffered from lack of involvement at senior level, relying on engineering staff to keep it going. Fragmentation of ownership and management responsibility across the estate means that the financial benefits of taking action do not always accrue to the parties that take it. There is a need to clarify responsibilities and put new incentives in place.

3.1.1 Management Commitment

A copy of the Energy Policy was provided, and is included in Appendix 4. However it is only one page long, which is very brief for a document that seeks to address both the Council's own energy use and consumption in the community which it serves. The policy is not widely known about among the staff.

The Head of Community and Environment is detailed as having responsibility for energy, but has little time to devote to it, and neither does the officer whose job description includes the duties of Energy Manager.

3.1.2 Energy Information Systems

For the larger sites, monthly meter readings are taken and entered on spreadsheets. Bills are checked against the meter readings, and challenged if inaccurate. Benchmarks are calculated with the appropriate degree-day adjustment factors. 2 years of good quality data was provided for the sites surveyed for this report.

However, there are approximately 25 smaller sites including park buildings, public toilets and unmanned sewage pumping stations, where meter readings are not taken and the bills are nearly always estimated. Bill checking is limited to a cursory check to see if the billed amount is in line with previous bills for that site.

3.1.3 Staff Involvement

Annual staff seminars are held which cover the need to save energy in general and the good housekeeping actions that all staff can take. These do appear to have resulted in a good standard of housekeeping. However they only cover staff directly employed by the council, and more and more functions are being carried out by private operators.

3.1.4 Procurement and Investment

The Monkton Park offices were designed and built under a brief to produce a "state of the art", "green" building and this has been followed through, largely avoiding the use of mechanical air conditioning. Many smaller energy-efficiency projects have been funded, both in the council offices and in the leisure centres. These are funded out of general maintenance and refurbishment budgets rather than a specific budget for energy efficiency, and projects with a payback of under 5 years are generally considered favourably.

However it is not clearly written into the energy policy that energy consumption should be considered in all procurement. As a result, capital spend projects are not automatically vetted for their energy impact, and this can result in increases in consumption without the necessary revenue budgets being made available. An example of this is the increase in overnight consumption by the computer servers at the Monkton Park offices.

3.2 Energy Management Improvements

The above analysis suggests the following priority actions for improvement of the organisation's energy management practices.

Priority Number 1	Revise and update Energy Policy	
Type: Energy Policy		Target completion: January 2006

Detail:	The present Energy Policy needs updating and expanding, to address as a minimum the following:- • A target to reduce energy consumption, based on analysis of what is achievable, • Reporting of consumption against target in line with the EU Building Performance Directive, • Promulgation of the policy to all staff and contractors, • Regular reports and feedback to staff and contractors on the energy consumption of the building in which they work, • A contract of employment for the Energy Manager that ensures sufficient time to carry out energy-related duties, • A specific budget for energy efficiency, set as a percentage of the annual energy bill, • Energy and environmental criteria against which all capital project proposals and third party finance and management contracts should be assessed, • Specific procurement policies for catering, IT and other regular purchases of equipment and supplies, • IT policy covering energy consumption by IT equipment and the use of IT in energy management, • Green energy procurement, • Use of renewable energy in council buildings. A date should be set for reviewing the policy, preferably one year after the council meeting that approves it. Energy use in the wider community (which is beyond the scope of this report) should be the subject of a separate policy document and should be pursued in conjunction with Wiltshire County Council.
Rationale:	An agreed written policy can help to ensure that an energy management strategy is put in place and the necessary resources are allocated.
Risks:	Policy could sit on the shelf after being debated. Appropriate follow-through action is necessary
Next steps:	Energy Manager to draft the policy, and place on agenda of next full council meeting
Relevant publications:	GPCS362 Energy Management – a strategic approach

Priority 2 Type: Information systems	Purchase a proprietary monitoring and targeting package Target completion: January 2006
Detail:	An energy monitoring and targeting (M&T) software package is a purpose-designed database system that acts as a "one stop shop" for all energy consumption information. It holds all meter readings, invoice data and details of the metered supplies and buildings. The package automates many of the routine tasks facing a busy energy manager, freeing up his time for more investigative work leading to energy savings. Among its functions are:- • Validation of bills against the consumer's own meter readings, • Setting targets related to degree days or other energy cost drivers, • Reporting actual consumption against targets, • Benchmarking comparisons between sites, • Tariff comparison for procurement, • Standard reports and returns e.g. BVPI 180 All monthly meter readings and invoice data should be entered on the M&T package instead of the spreadsheets currently in use. In addition, the 25 smaller sites should have their meters read at least annually, and their meter readings entered on the system. The package chosen should be one that is capable of later accepting half hourly data from an automatic meter reading system – see priority number 5.
Rationale:	Government figures show that effective monitoring and targeting can reduce consumption by between 5 and 10% even when only monthly manual meter readings are collected. This is achieved by:- • Detection and correction of increases in consumption over the expected level (avoidable waste) • Benchmarking to identify which buildings are the least efficient in their class and where energy-saving effort should be concentrated • Identification of poor control where there is a poor relationship between consumption and the factors that drive it (e.g. degree days) • "before and after" comparison where energy saving measures are carried out, to verify the savings achieved,
Risks:	
Next steps:	Evaluate the packages on the market and choose one. Ensure that the package chosen is ready to receive data from automatic meter reading systems, as well as manual meter reading and invoice data.
Relevant publications:	GPG231 – Introducing Information Systems for Energy Management

Priority 3	Integrate energy-efficiency into third party management arrangements
Type: Procurement	Target completion: March 2006
Detail:	The facilities management contract for the Monkton Park offices should be altered to give JFM a direct financial incentive to save energy. This could be in the form of a fixed fee charged to NWDC (i.e. JFM keep all savings), or a shared savings agreement.
Rationale:	When the operation and maintenance of a building and its energy-related plant are handed over to a third party, the client loses much control over the energy consumption of the building. The management contract should therefore be structured in such a way that the operator is required and incentivised to operate the building in the most energy-efficient manner.
Risks:	This can be tricky to negotiate, as there are aspects of energy consumption that an FM operator can reasonably say are not under its control e.g. IT and personal small power consumption. The charges paid by NWDC would also need adjusting annually to reflect unit energy prices. However, sub-metering, automatic meter reading, and monitoring and targeting software can be used to allocate different areas of consumption, and define the baseline against which savings and/or excess consumption should be assessed.
Next steps:	Begin negotiations with JFM over what arrangements should be adopted for the 2006-7 financial year
Relevant publications:	

Priority 4	Develop energy-efficient specification for all new build and refurbishment projects.
Type: Procurement / Investment	Target completion: June 2006
Detail:	A standard specification for energy-efficient new build needs drawing up and including in the tender brief for all new build and refurbishment projects. As a minimum it should include:- • Building fabric insulation exceeding minimum Building Regulation requirements, • Maximum use of natural lighting and ventilation, and minimum need for mechanical comfort cooling, • Energy-efficient boiler plant, • All lighting to be high frequency fluorescents, with occupancy / daylight control and dimmable fittings where appropriate, • Building Energy Management Systems to be compatible with the system already installed at the Monkton Park offices, All metering to be capable of being automatically read, and sub metering to be installed in larger buildings.

Rationale:	Decisions made when procuring a new building will influence consumption for many years to come, and if poorly performing buildings are built then it will be more expensive to upgrade them later on than if best practice technology is built in at the outset. "Good practice" as opposed to "typical" consumption in new builds can reduce ongoing consumption by 30%, and if 10% of the building stock is due to be replaced then this equates to a saving of 3% of ongoing energy costs. A standard specification for energy-efficient new build could be included in the client's requirements when letting PFI / Design and Build contracts, where the client often has little influence once the contract has been let.
Risks:	None. The cost shown is to cover professional fees for drawing up the specification.
Next steps:	Identify all potential new build or refurbishment projects over next 5 years. If totalling over 10,000 square metres, apply to Carbon Trust for Specification Advice.
Relevant publications:	GPG258 – A developer's guide to environmentally smart buildings GPG362 – Procuring smart energy-efficient office buildings

Priority 5 Type: Information Systems	Install automatic meter reading systems in major buildings Target completion: December 2006
Detail:	An automatic meter reading system collects data continuously, typically every 30 minutes, from all the energy and water meters on a site and relays it to a central PC running automatic analysis software. The software then provides near-real time analysis of consumption and also energy cost drivers such as degree days. Reports of out-of-limits consumption can then be automatically sent to the building occupants by email. The most advanced system of this type in the UK is operated by Leicester City Council, and uses a radio based system to collect meter readings from any location in the city. The system covers every council building, and also local businesses to whom the council offers an energy management service. Similar radio-based technology is in use at Salisbury District Hospital, Wessex Water and local MoD sites. The Carbon Trust is carrying out trials of automatic meter reading in smaller premises, and many local authority buildings are included in the trial. It is due to produce its final report on the trials in 2006.

Rationale:	Automatic meter reading is a powerful tool for generating energy savings that builds on the capabilities of monitoring and targeting software (see priority 2). Additional savings are identified because:- • Long-standing, out of hours usage is immediately apparent from the profiles, • The onset of avoidable waste is detected immediately, instead of waiting until the next bill or meter reading round, • Consumption can be related more closely to actual energy cost driver, e.g. opening times, instead of crude monthly degree days, • When presented with information collected through the system, building occupants know that "big brother is watching them" and change their behaviour accordingly. Useful savings can also be achieved by not having to read meters manually, and having more comprehensive consumption data with which to challenge dubious invoices. The cost is typically £2,000 to £5,000 per building, so it will generally be cost effective in any building where total utility consumption (including water) is more than £25,000 per annum. This would include the Monkton Park offices and all six leisure sites. However, it could also be effective in some premises where the actual consumption is small but the potential for avoidable waste is considerable. Examples of this are park buildings where there is a long underground pipe run between the water meter and the building, leading to the possibility of high losses through underground leaks.
Risks:	Automatic meter reading is not a "fire and forget" technology, and requires considerable technical knowledge to operate and keep in good working order. There are examples of systems that have fallen into disrepair. However, these risks can be mitigated by collaborating with other neighbouring authorities, or by utilising outside expertise to operate and maintain the system.
Next steps:	• Evaluate systems on the market, including those at nearby sites, • During the site surveys of key buildings, collect information on the meters to be monitored and the cost of enabling them to be read automatically • Investigate the possibility of forming a joint bureau monitoring service with neighbouring authorities
Relevant publications:	GPG231 – Introducing Information Systems for Energy Management GIL049 – Low cost automatic meter reading system using low power radio

3.3 Savings and Costs

The estimated savings from adopting the five point energy management improvement plan are:-

	Cost £	Savings £/a	Simple payback yrs	Carbon savings T/a
1 – Revise and Expand Energy Policy	£5,000	£6,060	0.8	50
2 – Monitoring and Targeting Software	£5,000	£9,090	0.6	76
3 – Integrate Energy Saving into FM Contracts	£1,000	£2,700	0.4	20
4 – Design Specification for New Build / Refurb	£5,000	£6.060	0.8	50
5 – Automatic Meter Reading	£24,500	£9,090	2.7	76
Total	£40,500	£33,000	1.2	272

The total is approximately 10.5% of the consumption on major sites.

The costs and savings are based on the following assumptions:-

1 – Energy Policy – The cost shown is for officer time to draft the policy and then time and materials to promulgate it to all council staff. Saving is 2% of the consumption in major buildings. This is based on the main impact of the policy being an improvement in staff awareness as the policy is spread to all staff and contractors, and this figure is backed by impact assessment studies conducted for Building Research Establishment in 2002. However the policy is a necessary precursor to many of the other measures being adopted.

2 – Monitoring and Targeting Software – The cost stated allows for the purchase of the software licence, software support, transfer of data from the existing spreadsheets, and training for the energy manager. Saving is 3% of the consumption in major buildings, based on rules of thumb quoted in Action Energy publications.

3 – Integrate Energy Saving into FM Contracts – The cost is for officer time to conduct the necessary negotiations. Saving is based on 5% of the consumption of the Monkton Park offices only.

4 – Design Specification for New Build / Refurbishments – The cost is for consultancy fees to draft a specification, and could be funded by the Carbon Trust under the expanded Design Advice scheme. Saving is 2% of consumption in major buildings, and would only develop as the refurbishment projects are carried out.

5 – Automatic Meter Reading – The cost is for a system covering the Monkton Park Offices and the six leisure centres at an average of £3,500 per site, including pulse output interfaces and pulse counting devices on each incoming electricity, gas and water meter, a data logger on each site, and onward communication through the council's IT network to the monitoring and targeting software package. Saving is 3% of the consumption in major buildings, based on rules of thumb quoted in Action Energy publications.

4. Site Level Energy Saving Opportunities

4.1 Sites Visited

As part of the service provided, a total of 3 sites were visited:

- Monkton Park Offices – main office building housing most council departments
- Olympiad Leisure Centre – mixed sports centre including a leisure pool
- White Horse Leisure Centre – mixed sports centre including a 25 metre pool

These sites were selected by the organisation as being representative of the activities where the bulk of the energy consumption occurs. The sites not surveyed were four other mixed sports centres, a smaller office building, a vehicle depot and 25 very small users such as park buildings, public toilets and sewage pump stations.

The objective of these visits was the identification of energy saving opportunities:

- Of general application to the whole organisation, or to all sites of a particular type
- Specific to the sites visited

The key assumptions and detailed calculations supporting the following recommendation are included in Appendix 3.

4.2 General Opportunities

Priority 1	Inverter drives on pool air handling plant			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£5,771	48	150,000	£13,000	2.25

Detail:	Variable speed drives should be fitted to all pool hall ventilation plants, along with time controllers or additions / modification to existing BEMS controls It is assumed that insulating covers are fitted to all pools and used every night.
Rationale:	The requirement for ventilation air will vary according to outside air temperature, pool hall occupancy and evaporation rate. It is especially low if pool covers are fitted overnight. A variable speed drive allows the control system to reduce the volume of ventilation air and hence fan power consumption in line with demand.
Risks:	None
Replication Potential:	There are six sites in the organisation with swimming pools, with total pool surface area 2,250 sq.m. Based on the cost being the same at each site, and the savings being proportional to pool surface area, the total potential is 338,250 kWh saving, £11,800 cost saving and 129tCO2 saving for £39,000 capital investment.
Next Step:	Seek funding for this measure
Relevant Publications:	ECG078 Energy Use in Sports Centres

Priority 2	Extend BEMS controls to main plant rooms on all sites			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£7,962	69	367,467	£15,000	1.9
Detail:	A Trend BEMS is in use at the Monkton Park offices and is providing effective control of the heating and ventilation systems. A partial system is installed at Olympiad and controls the main boiler plant and pool vent plant. It is due to be extended to cover the dry sports supply and extract systems. Similar controls should be fitted in boiler plant rooms and larger ventilation plant rooms in all the other sites.			
Rationale:	Extending the Trend system will enable all six sites to be controlled from a single PC, without the need to visit plant rooms to reset controls. This will achieve much tighter control of plant operation times and space temperatures in line with demand. The Trend system will also make more effective use of the variable speed drives to be fitted on to			
Risks:	BEMS is not a "fire and forget" technology, and requires ongoing attention from an appropriately trained operator. Systems that are not maintained and used properly can fall into disrepair and fail to generate the expected savings.			
Replication Potential:	It is assumed none of the sites that were not visited already have Trend equipment, this gives four other leisure sites requiring Trend equipment from scratch. Based on a cost of £11,000 per site (£4,000 for the remaining part of Olympiad), and 15% thermal energy saving, this gives 367000 kWh, £31,154 and 207 tCO2 for a capital outlay of £59,000.			
Next Step:	Prepare a specification and invite one or more Trend installers to prepare quotes. Further Carbon Trust funding may be available for a Detailed Survey to prepare the specification.			
Relevant Publications:	GPG144 Sports and recreation buildings technology review GPG246 Energy Management systems			

Priority 3	Heat recovery in pool halls			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£10,626	97.5	375,000	£10,000	1.0
Detail:	It was noted that while Olympiad has a recirculation and heat recovery system on its pool vent plant, White Horse has a full fresh air system that results in a much higher heat loss. Runaround coils for heat recovery should be fitted to all pool ventilation plants not already fitted with any heat recovery equipment.			
Rationale:	The air in swimming pool halls is heated to a much higher temperature than most normal rooms, typically 30°C or more, and also carries a large amount of latent heat due to the high humidity. Allowing this air to escape without attempting some form of heat recovery results in extremely high energy loss. Systems for recovering heat in swimming pools range from simple			

	runaround coils that transfer heat from the extract duct to the supply duct using circulating water, to sophisticated dehumidification heat pumps that recover heat to the pool water and pool hall air. The runaround coil option is relatively cheap and is practical to retrofit in most existing plant configurations. It will recover 50 to 70% of the lost heat.
Risks:	None
Replication Potential:	The recently constructed pool at Malmesbury Activity Zone is assumed to have a heat recovery system. Springfield, Cricklade and Lime Kiln are older and it is assumed that they also lack heat recovery systems. Based on savings in proportion to pool surface area, this gives total savings of 1,225,000 kWh, £26,700 and 265 tCO2 for total investment of £40,000. The paybacks are longer at the other sites than at White Horse because cheaper gas or CHP heat is used, giving overall payback time of 1.5 years
Next Step:	Review HVAC plant at other sites and prepare specifications to put in place appropriate heat recovery arrangements. Further Carbon Trust funding may be available for a Detailed Survey to prepare the specification.
Relevant Publications:	GPG056 Refurbishment of School Swimming Pools

Priority 4		Lighting controls in squash courts		
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£598	5.1	11,818	£800	1.3
Detail:	The lighting in all squash courts should be controlled by a presence sensor of suitable range, which turns them off if no movement is detected for a period. Passive infra red sensors usually do not have sufficient range for this application, so microwave or ultrasonic sensors should be more suitable. Alternatively, the lights could be linked to a slot machine through which customers pay for the use of the courts. When the time paid for is expired, the lighting drops to an emergency background level allowing for a safe exit.			
Rationale:	The squash courts at both Olympiad and White Horse were empty and had lights on when visited. It is likely that the courts are little used during office hours, and the same happens at the other leisure sites.			
Risks:	Possible Health and Safety issues relating to lights suddenly going off in the middle of a game of squash make passive infra red sensors the better option.			
Replication Potential:	All six leisure sites have squash courts and could benefit from this measure. Assuming two courts at each site, total saving is 35,454 kWh, £1,794, and 15.2 tCO2 for investment of £2,400			
Next Step:	Implement the measure			
Relevant Publications:	GPG160 Electric lighting controls			

Priority 5	Fit timers on vending machines			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£462	6.2	14,400	£1,440	3.1

Detail:	During the site surveys 8 vending machines were counted at Olympiad and another 8 at White Horse. These are a mixture of hot drinks machines and refrigerated machines selling bottles/cans of drink and sealed packages of confectionery. None were selling perishable items. It is thought that there are approximately 50 such machines across the estate. Installation of time switches would allow the machines to be switched off at night with no detriment to their contents. The cost shown is £90 per machine, and is for fitting replacement wall sockets with in-built timers (MK Masterseal 56485 GRY or similar) to overcome any possible tampering problems. However, if tampering is not thought to be a problem, suitable plug-in timers can be purchased from most electrical suppliers for as little as £20.
Rationale:	Non-perishable items in the vending machines will not deteriorate due to the refrigeration being switched off, and hot water only needs to be hot when a drink is required. Installing a timer will ensure that the machines are off overnight and at weekends.
Risks:	None
Replication Potential:	All sites have vending machines and could benefit from this measure. Assuming a total of 50 machines across the estate, total saving is 45,000 kWh, £1,450, and 19.3 tCIO2 for capital outlay of £4,500.
Next Step:	Check other sites to determine exact number of vending machines and purchase an appropriate number of timers.
Relevant Publications:	GIL147 Energy saving factsheet for schools

Priority 6	Remove electric heaters from Jacuzzi baths and connect to main site heat source			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£708	3.6	0	£2,500	3.5

Detail:	Replace the electric heaters for the hydrotherapy pool with a suitable heat exchanger fed off the pool area boiler plant.
Rationale:	Heating by gas is cheaper and lower in CO2 emissions than electric heating.
Risks:	Cost is subject to a specific quote from installers.
Replication Potential:	Electrically heated Jacuzzi baths were seen at White Horse and Olympiad. Jacuzzis are also fitted at Lime Kiln and Springfield. This measure is recommended particularly for Olympiad to provide additional heat load for the CHP plant (which some of the other measures proposed in this report will reduce), and is also economic for Lime Kiln and Springfield assuming similar electric heaters are fitted. Total saving for the three sites is £2,148 and 13 tCO2 for capital cost of £2,500. This measure is not recommended for White Horse because the boiler plant

	uses more expensive (and higher carbon) oil, so the savings are smaller.
Next Step:	Obtain quotes from installers.
Relevant Publications:	GPG056 – Saving Energy in School Swimming Pools – A Guide to Refurbishment and New Design

Priority 7		Address remaining lighting issues		
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£733	6	14,000	£1,200	1.6
Detail:	During the site surveys it was noted that the two leisure sites have a number of older switchstart fluorescent fittings with T12 tubes. Replacing these with T8 tubes as they need replacing would reduce consumption for no discernable extra cost. Also there were a number of areas where lighting was left permanently on despite good daylighting or lack of occupancy. Specifically these areas were halls, landings, stairwells, bar, and an office with good natural daylight.			
Rationale:	A T12 tube has a luminous efficacy of 67 lumens/watt. A T8 tube has a luminous efficacy of 77 lumens/watt and a longer life at no extra cost. There are many areas where lighting is switched on and left on regardless of need. Installing presence or daylight controls, as appropriate to the type of area, will result in savings.			
Risks:	Actual cost and savings achievable will depend on what is found on the other sites.			
Replication Potential:	It is assumed that all six leisure sites have similar lighting issues to the two that were surveyed. This gives a total potential saving of 42,000 kWh, 18 tCO2 and £2,200 across all six sites, for total spend on controls of £3,600. Monkton Park has modern lighting with good controls throughout. However the Citadel and Parsonage were not visited and may also have lighting issues.			
Next Step:	Compile a list of areas on the other sites where lights are on unnecessarily, then Implement this measure			
Relevant Publications:	GPG160 Electric lighting controls			

Priority 8		Solar heating of swimming pools		
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£5,000	45.9	150,000	£16,000	3.2
Detail:	Install solar water heating panels at each of the leisure sites, sized at up to 50% of the pool surface area.			
Rationale:	Swimming pools represent a continuous year round demand for low grade heat, which can be supplied by a basic, low-cost design of solar panel even in the UK climate. Provided that all of the output from the panels can be used, they can meet a 5 year payback criterion at today's energy prices. Solar panels working in buildings that are visited by large numbers of the			

	public would assist the council's wider policy of promoting the use of renewable energy in the community.
Risks:	A suitable location needs identifying where the panels will be safe from vandalism.
Replication Potential:	The cost and saving shown is for a 187 sq.m. system at White Horse, where solar heat would displace relatively expensive oil heating. At the other sites where gas boilers are used, the payback on an equivalent system is 5 years, and at Olympiad where it displace lower cost heat from the CHP plant, the payback is 7.7 years. Solar heating is therefore recommended for all of the swimming pools, except for Olympiad. A system comprising 50% of pool area at each site would cost £70,000 in total, saving 652,000 kWh, £15,800 and 158 tCO2 p.a.
Next Step:	Investigate Clear Skies and other grant aid for renewable energy installations. Identify suitable locations for the panels at each of the sites.
Relevant Publications:	

4.3 Site Specific Opportunities

Priority 1	Install and use pool cover at Olympiad			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£9,150	64.7	460,000	£12,750	£1.4
Detail:	Insulating covers should be fitted to all pools and used regularly. Currently the Olympiad does not have a cover. The pool is irregularly shaped so standard off-the-shelf covers cannot be used. A bespoke cover should be made, and probably some small areas of the pool will remain uncovered, but even at the higher cost a cover should still give a good payback.			
Rationale:	An insulating cover will eliminate most evaporative heat loss from the pool out of hours, saving approximately 175 kWh p.a. per sq.m. of pool area. However the major saving comes from reduced ventilation and dehumidification consumption. The controls at Olympiad are capable of responding to the reduced evaporation to reduce consumption by the ventilation plant, so total saving approximately 800 kWh per sq.m. of pool surface is achievable.			
Risks:	Health and safety issues when using pool covers. It is important that the public do not have access to the pool when the cover is in place, and staff cannot become trapped if they accidentally fall into the pool.			
Next Step:	Seek funding for this measure			
Relevant Publications:	ECG078 Energy Use in Sports Centres GPG056 Refurbishment of School Swimming Pools			

Priority 2	Incorporate daylight into new roof at White Horse, and replace lighting			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£1,525	12.3	26000	£4,800	3.1
Detail:	When the roof is replaced on the White Horse sports hall, polycarbonate roof lights should be incorporated to give a good light level in the hall from natural daylight. 24 off 2 sq.m. lights should be sufficient. The high bay SON light fittings should be replaced with advanced fluorescent fittings using slimline T5 tubes, dimmable ballasts and occupancy and daylight control.			
Rationale:	Natural daylight should be used wherever possible, and combined with lighting controls to minimise lighting consumption. If a new roof is being fitted anyway, roof lights can be incorporated at no extra cost. High bay discharge lamps were fitted to many larger spaces because they were significantly more efficient than first-generation fluorescent lamps, and required replacing less frequently. However, because of their long restrike time they tend to get left on for long periods, so they are now not the most efficient option. The latest T5 fluorescent fittings can give a luminous efficacy better than 100 lumens/watt, which is equal to SON lamps.			

Risks:	None
Next Step:	Implement this measure
Relevant Publications:	GPG272 Lighting for people, energy efficiency and architecture

Priority 3	TRVs in NWLL office at Olympiad			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£202	1.4	6400	£200	1.0

Detail:	The NWLL company offices at Olympiad are fitted with air conditioning split units that are often run in opposition to the heating. The reason is that the office is on the same heating circuit as the reception area below which received cold outside air every time the door is opened. Thermostatic radiator valves should be fitted to the radiators in the office, and set to heat the office to 19°C. The controls on the split units should be set so that they will only come on to maintain a maximum temperature of 22°C
Rationale:	When heating and comfort cooling are installed in the same space and not linked to a common control, there is a risk that the two will fight each other. If it is too costly to link them on a common control, the controls should be set carefully with the set point temperature of the cooling system some way above that of the heating. Because the heating zone is controlled according to the needs of a colder space below, the radiators in this office need their own control devices.
Risks:	None
Next Step:	Implement this measure
Relevant Publications:	

Priority 4	Review need for standby generator at Monkton			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£206	1.9	4380	0	0

Detail:	A small standby generator is fitted to the Monkton Park offices, just to power the disabled / fireman's lift. It is continually consuming electricity just to keep the jacket water hot. The generator manufacturer recommends 85°C jacket temperature to ensure reliable startup. The requirement for the generator could be reviewed to see if the lift could instead be connected to the uninterruptible power supply system (UPS) that supports the IT server room.

Rationale:	It is very unusual for a standby generator to be provided and kept heated just to power one piece of equipment. The UPS has no moving parts and would be more reliable in an emergency. The lift's power demand is well within the power supply capabilities of the UPS, and would only need to operate for a few seconds while the UPS is designed to support its load for several hours. The generator requires regular inspection, maintenance and testing which costs money.
Risks:	Statutory requirements should be checked.
Next Step:	The Fire Officer should be consulted to see if this is an acceptable solution.
Relevant Publications:	

Priority 5	Waterless urinals at White Horse			
Cost Saving £ or £k per year	CO_2 Savings Tonnes/year	Energy Savings kWh/year	Cost £ or £k	Payback Years
£2,644	0.6	0	£720	0.3

Detail:	The White Horse centre contains 12 self-flushing urinals, with no control systems to prevent them continually refilling and flushing. During the site visit, water was seen continually trickling through three of the bowls in between flushes. A waterless urinal consists of a capsule containing disinfectant chemical, fitted into the outlet of an existing urinal bowl. Each time someone urinates, a small amount of disinfectant is washed out and keeps the bowl clean and fresh. The disinfectant needs replacing approximately once in 3 months, and otherwise the usual cleaning regime and frequency is continued.
Rationale:	Waterless urinals are an established technology for reducing water consumption, which also saves carbon. They have been proven in especially demanding application such as student bars and motorway service stations.
Risks:	None
Next Step:	Implement this measure
Relevant Publications:	

5. Where Next

5.1 Following the survey

The purpose of the Action Plan described in this report is to help your organisation save energy. These savings will obviously only be achieved if the measures detailed in this report are properly implemented. The Carbon Trust offers a range of support to assist you implement your Action Plan. This section details the next steps that should be taken on receipt of the Action Plan, and further support that is available.

Following receipt of the report the person responsible for commissioning the survey should discuss the results with relevant colleagues and managers to agree who will be responsible for overseeing the implementation of the plan and individuals responsible for each action (if this is different). A timetable should be agreed to monitor progress and establish firm dates by which specific actions should be completed. The table in Executive Summary provides a convenient column to identify responsible individuals and the timetable.

This report provides specific advice on how to take forward each of the activities and publications which will provide more detailed information. Listed publications will be sent to you. Additional publications can be obtained from either:

- Calling the Carbon Trust Energy Helpline – 0800 58 57 94 or
- The Programme web-site www.thecarbontrust.co.uk/energy

If you are unclear how to proceed with specific activities the Helpline team will also provide further advice.

5.2 Executive Briefing

As part of our follow-up support we encourage the senior management within the organisation to receive a briefing from our consultant. The briefing provides an ideal opportunity to explain the benefits of implementing the plan and respond to any concerns raised. If you are not scheduled to receive an Executive Briefing as part of follow-up support please contact your client manager or the Helpline to determine if you are eligible for a visit.

5.3 Providing Feedback

Following receipt of the final report we will email you a Feedback Form to complete about your experiences of working with the Carbon Trust and our consultant. The Carbon Trust values all feedback obtained. Part of this form provides you with an area in which you can request areas of further support if applicable. Please complete and return this web form using the link provided.

5.4 Follow up support

At some time after the survey has been completed most clients are contacted by their Client Manager to discuss the progress being made in implementing the Action Plan. For sites that demonstrate they have made progress, and have a commitment to implementing further actions, the Carbon Trust has a range of products to provide further assistance. Follow-up support can take a variety of forms including:

- Helpline advice – either from the Helpline or a consultant, this is designed to assist you overcome a specific technical issue that is hindering progress. You may call the Helpline at anytime to receive telephone advice.

- Implementation advice – Provides more extensive advice on how to implement a specific recommendation (or recommendations) within the Action Plan. A consultant will visit your site to provide both technical and practical project management advice. The consultants are not able to recommend specific suppliers but will provide guidance on the options available to you and how to make an informed decision about which to appoint.

- Technical training – Either delivered directly on your site or through an organised event, we can provide training to individuals or teams about specific aspects of energy efficiency.

- Staff awareness training – Delivered either by enabling you to attend a training event run by the Carbon Trust; or through "training a trainer" support provided by a consultant on your site. The Carbon Trust also has a range of self-help guides and electronic toolkits to assist with staff awareness training.

- Energy management assessment – For sites that have made good progress in implementing their Action Plan and are now examining ways to embed good practice in energy efficiency into everyday management of their business. A consultant will visit your site and complete a questionnaire to identify areas of strength and weakness in the energy management practices operated by the organisation. Your organisation will be scored in 8 dimensions of energy management and a series of actions recommended strengthening current procedures.

- Detailed Survey – To investigate the feasibility and potential savings from a specific energy saving opportunity, such as replacement of equipment with significant energy consumption, the Carbon Trust will fund two-free days plus 50% of the costs of a detailed survey to examine the practicality and benefits of proceeding with significant capital investment.

- CHP advice - Specific advice to organisations interested in use of CHP (Combined Heat and Power). Advice ranges from initial feasibility studies, design and project implementation advice for both new developments and refurbishments.

- Design advice – For organisations engaged in new build or major refurbishment projects the Carbon Trust will provide design advice to ensure appropriate energy efficiency measures are incorporated into the design and lifetime energy costs reduced. Both fully and part funded advice is available.

- Next steps advice – For sites that have implemented most actions in their plan we will send the consultant back to your site to identify areas of potential further improvement. As part of this visit we will obtain information to enable your organisation to be included amongst our examples of best-practice (if this is acceptable to you).

If you are interested in receiving follow up support to assist in implementing your Action Plan please contact the Carbon Trust Energy Helpline at anytime. Before receiving follow-up advice we do however expect the site to demonstrate good commitment to implementing the action(s) for which they will receive the support.

5.5 Impact Assessment

Six to twelve months after completing the survey a client manager will contact you to discuss how successful you have been in implementing the Action Plan and the level of energy savings you have achieved overall in order that we can evaluate the effectiveness of our programme. We would be grateful if you could make time to take this call and provide the information we are seeking.

5.6 Enhanced Capital Allowances

The Enhanced Capital Allowance (ECA) scheme was established to encourage UK businesses to invest in energy efficient equipment. The scheme provides 100% first-year allowances for spending on equipment that meets published energy-saving criteria in Energy Technology List (ETL) managed by the Carbon Trust. Through claiming an ECA, businesses can claim a reduction on their business's taxable profit by the full cost of spending in the year the investment is made. This provides a helpful cashflow boost and a shortened payback period in addition to cost savings from reduced energy bills.

The Energy Technology List was set up to identify those products qualifying for ECA tax relief and which offer energy efficiency savings. The Energy Technology List currently features over 6,000 products. To claim an ECA:

- Identify equipment that appears on the Energy Technology List by visiting www.eca.gov.uk or calling the Helpline on 0800 58 57 94
- Purchase the qualifying product and retain a supplier's invoice as documentation for your records
- Complete the ECA box on your business' tax return.

5.7 ENVIROWISE

This report focuses upon energy efficiency but making optimum use of other resources such as water and raw materials, and waste minimisation, also offers cost savings for your organisation. The Envirowise programme (funded by the Department of Trade & Industry and the Department for Environment, Food and Rural Affairs) provides a helpline service on environmental issues and publications on waste minimisation, clean technology, water and effluent savings, and more. Further information can be obtained from the Envirowise website http://www.envirowise.gov.uk or from the Environment & Energy Helpline 0800 58 57 94 and selecting the Environment option.

Appendix 1 – Supplementary Information

Sites Energy Consumption and Spend

Site Name	Consumption kWh/year				Cost £/year				Production Measure	Specific Energy Consumption
	Electricity	Gas	Other	Total	Electricity	Gas	Other	Total	Sq.m.	KWh/sq.m.
Monkton Park Offices	724,798	440,074		1,164,872	£44,964	£9,463		£54,427	4053	287
Olympiad Leisure Centre	519,890	3,844,166		4,364,056	£33,080	£56,222		£89,302	6782	643
White Horse Leisure Centre	445,225		1,251,551	1,696,776	£25,414		£41,670	£67,084	3006	564
Parsonage Way Depot	242,204			242,204	£13,140			£13,140	493	491
Citadel	29,453	55,365		84,818	£1,526	£858		£2,383	299	284
Activity Zone	251,518	906,540		1,158,058	£15,676	£19,812		£35,488	1653	701
Springfield	372,115	1,513,310		1,885,425	£23,720	£33,073		£56,793	2511	751
Cricklade	259,841	1,021,903		1,281,744	£15,507	£22,334		£37,841	1611	796
Lime Kiln	329,736	1,374,933		1,704,669	£20,469	£30,049		£50,518	2252	757
Totals	3,174,780	9,156,291	1,251,551	13,582,622	£193,496	£171,811	£41,670	£406,976		

Appendix 2 – Energy Management Assessment

This appendix details the findings of the Energy Management Assessment that has formed the basis of the recommendations made in the body of this report.

Management Commitment

This section identifies if there is a clear statement of policy that shows the commitment of management to the efficient use of energy, and whether there are suitable allocations of responsibility for energy and adequate resources are assigned.

Energy Policy

Characteristic	Score		Comment
	Actual	Maximum	
A written Energy Policy	2	2	Copy of written policy supplied – see Appendix
Agreed with Senior Management	2	2	Passed by elected councillors
Promulgated to all employees	0	1	Does not appear to have been widely promulgated
Been written recently (within 3 years)	0	1	Refers to legislation passed in 1995
Contains commitment to the development / deployment of quantitative improvement targets	2	2	20% reduction in 5 years
Commitment to annual reporting (public or to all employees)	0	1	Commitment to reporting every 6 months, but reports not available
Date for revision	0	1	None
Total Score	6	of 10 maximum	

Organisational Structure

Characteristic	Score		Comment
	Actual	Maximum	
A manager at board (or equivalent) level with responsibility for energy	2	5	Head of Community and Environment is named as being responsible, but does not appear to be actively involved.
Appointment of person with designated responsibility for energy	1	5	An officer is designated as Energy Manager but has "very little if any" time.
Job description and assigned adequate resources for designated person	0	3	No written statement of duties relating to energy
Regular management meetings to review energy use	0	1	No regular meetings
Local energy responsibles appointed	1	1	Managers and maintenance engineers at leisure centres – one at each centre

Total Score	4	of 15 maximum

Assessors opinion: The Energy Policy was agreed some years ago, and responsibility for following it through has been lost through a wider restructuring of the council. Most of the responsibility for following it through is being taken by engineering staff, with little apparent involvement from elected councillors, senior officers or the wider staff body.

Energy Information Systems

This section identifies if there are systematic procedures for monitoring and understanding energy consumption, and for setting suitable improvement targets.

Procedures for Monitoring and Analysing Energy Use

Characteristic	Score		Comment
	Actual	Maximum	
Regular collection of energy consumption data	3	4	Regular monthly meter readings are taken at larger sites and collected on spreadsheets.
Analysis of consumption against energy drivers (production, temperature, etc.)	1	4	Only analysed against building floor area in accordance with BVPI 180 reporting requirements.
Analysis of consumption patterns (vs. time)	2	3	Reports of monthly consumption are prepared. Some half-hourly electricity data is also analysed.
Recent site energy survey undertaken	0	2	None
Comparison of energy data with utility bills	1	1	Utility bills are checked against own meter readings and challenged if inaccurate.
CO_2 emissions calculated/analysed	1	1	CO_2 emissions calculated from nationally published emissions factors
Total Score	8	of 15 maximum	

Target Setting

Characteristic	Score		Comment
	Actual	Maximum	
Energy saving targets based on analysis	0	5	20% target simply reflects a desire to fall into line with national government CO2 targets and is not based on any study of what is possible.
Targets challenging, but achievable*	1	3	20% is definitely "challenging", but before this report was produced the Client had no idea how "achievable" it really was.
Performance compared with appropriate benchmarks (internal or external)	2	2	BVPI 180 reporting requires comparison with nationally

			published benchmarks for local authority buildings
Total Score	3	of 10 maximum	

** if an earlier Opportunity Assessment has been conducted, use this as a guide for "challenging but achievable", otherwise ask client to justify target. If no rationale with low estimate or unachievable, mark down score to 1 only.*

Assessors opinion:
The data collection and analysis system was useful in providing the necessary information to prepare this report, but only allows simple monitoring and comparison of annual consumption against national benchmarks. A proprietary monitoring and targeting package could be used to calculate site-specific targets and give a better idea of total potential savings.

Staff Involvement

This section identifies if the opportunities afforded through involving staff in energy efficiency are being taken advantage of.

Involvement and Training of Staff

Characteristic	Score Actual	Score Maximum	Comment
Energy specific training for staff key to energy, e.g. maintenance, boiler-house, caretakers, security, etc.	1	4	One staff member attended a one day course "8 or 9 years ago"
Wider active staff involvement initiatives (e.g. via Total Quality)	01	4	None at present, actively being considered
Awareness campaigns held regularly	2	3	Staff seminars held annually
Use of Standards for Managing Energy and/or NVQ training	0	1	None
Energy included in staff induction training	0	1	None
Total Score	4	of 13 maximum	

Operational Procedures for the Efficient use of Energy

Characteristic	Score Actual	Score Maximum	Comment
Active reporting systems for energy waste and suggestions (lights on, doors open, steam leaks etc.)	1	4	Informal contacts between engineering and other staff
Job/Priority sheets for reducing energy waste (e.g. repair compressed air leak)	3	3	List of 13 measures carried out in Monkton Park offices to November 2004
Maintenance schedules which include reducing energy wastage	0	3	Maintenance schedules operated through Jarvis PPM system, no specific priority to reducing energy wastage

Operating instructions which include energy use issues (e.g. close down lists)	2	2	Lights and PCs are closed down at the end of each day
Total Score	6	of 12 maximum	

Assessors opinion:
The annual staff seminars to raise awareness of energy use have resulted in reasonably good housekeeping. Operational procedures can be improved by building the right incentives into facilities management contracts.

Procurement and Investment

This section identifies if the organisation's procurement and investment policies and procedures provide active support for improvements to energy efficiency.

Incorporating Efficiency into Procurement Policy

Characteristic	Score Actual	Score Maximum	Comment
General policy to include consideration of energy consumption in all procurement.	0	6	No specific reference in energy policy.
Energy performance specified in new buildings, IT projects, process plant etc	1	3	Energy performance was a key part of the brief for Monkton Park offices, but no general specification
Specific procurement policies for particular efficient products, e.g. lighting, motors etc.	3	3	Lighting required to be high frequency. PCs required to have flat screens and be Energy Star compliant.
Total Score	4	of 12 maximum	

Investment Procedures for Energy Efficiency

Characteristic	Score Actual	Score Maximum	Comment
Is there a capital investment procedure to obtain funding for energy efficiency	3	5	Vague commitment in energy policy – "prepare for each budget cycle bids to achieve the target set and give these bids a high priority…"
Is there a payback (or other) investment threshold for energy efficiency*	3	3	5 year payback threshold
Does the person with responsibility for energy vet all capital requests to assess energy impact	0	3	No
Do maintenance budgets include repairs to save energy	3	2	List of 13 measures referred to above was funded out of general maintenance budgets

Total Score	9	of 13 maximum

**if criteria are too restricting, acting as a major barrier for energy efficiency investment, mark down.*

Assessors opinion:

Energy efficiency is being considered in major capital investment projects, and this has resulted in procurement of an energy-efficient flagship office building and installation of CHP in one of the sports centres. This needs formalising and applying more consistently.

Appendix 3 – Information Supporting Recommendations

Generally Applicable Opportunities

Priority Number 1 – Inverter Drives on Pool Air Handling Plant

ECG078 Energy use in sports and recreation facilities gives the electrical saving from variable ventilation as 28 kWh p.a. per sq.m. of total building area, which works out at 150 kWh per sq.m. of pool surface area.

Pool sizes assumed at the six leisure sites are:-

	Length	Width	Area
TAZ	25	15	375
Olympiad	25	25	625
Springfield	25	15	375
White Horse	25	15	375
Cricklade	13	10	130
Lime Kiln	25	15	375

The cost of £6,500 per site is based on a quote obtained by the client for a variable speed drive on an 18kW pump motor at Olympiad, although most of the sites would require a lower-rated and therefore cheaper unit.

Priority Number 2 – Roll-out Trend Controls Across All Sites

Saving is based on 15% of total fossil fuel consumption, quoted in a number of good practice case studies.

The cost of the existing Trend system controlling the pool vent plant at Olympiad was £7,000 and the cost of extending to the plant serving the dry sports areas has been quoted at £4,000. Therefore a cost of £11,000 has been assumed for extending the Trend to the other five sites, although these mostly have smaller, less sophisticated plant to control. Furthermore, the latest generation of Trend equipment can be plugged directly into the council's Ethernet network and so does not need its own dedicated network wiring or telephone modems.

Priority Number 3 – Pool Heat Recovery Systems

GPG056 Refurbishment of school swimming pools gives the saving from a run-around coil as 1,000 kWh per sq.m. of pool area per year. For the four pools affected this comes to 1,225,000 kWh.

Priority Number 4 – Lighting Controls in Squash Courts

Assumptions made in this calculation are:-

- 6 double 1800mm T8 fittings / court, total installed capacity 864 watts
- 2 courts at each site
- Opening hours 5,700 hours / year, lights on constantly
- Courts in use 30% of the time, use of presence sensor reduces on-time to 40% to allow for cleaning etc.,
- Approximate cost of fitting presence sensors is £200 per court.

Priority Number 5 – Get Spa Bath Heating on Main Boiler Plant

Both Olympiad and White Horse use electric heating for their Jacuzzi baths. The heaters are rated at 9kW and 8kW respectively. Assuming that the bath is heated throughout opening hours, and the heater operates on its thermostatic control 50% of the time, consumption is 22000 to 25000 kWh p.a.

In calculating the amount of boiler fuel that would be used instead of electricity, marginal boiler efficiency is assumed to be 85%. However, for Olympiad the heat would come from the CHP plant and its marginal value is calculated below.

Cost of Pipework and heat exchanger to connect to central heat source is £2,500.

The simple payback period for Olympiad is 3.5 years. If other sites with grid electricity supply and gas boilers have similar heaters the payback also works out at 3.5 years

Priority Number 6 – Install automatic controls to vending machines

The figures quoted represent a purchase price of £42 per timer socket and £48 labour cost of fitting it. This gives a total of 50 x £90, £4500 as the cost of installation.
The average nameplate rating of the machines inspected was 4.5A, giving power consumption of just over 1kW. However this is a peak value, and GIL147 (Energy Saving Fact Sheet for Schools) gives an average actual power consumption closer to 300W.
The sites are closed for around 3000 hours per year, so switching the machines off out of hours can save 0.3 x 3000 kWh, 900 kWh per machine. Assuming this is all night rate electricity at 3.21 p/kWh, annual saving per machine is £29.89

Priority Number 7 – Address remaining lighting issues

A total of 88 T12 tubes were found across the two leisure sites, and the others that were not visited are assumed to have a similar number. Each T12 tube is rated at 65W, and is assumed to be replaced with a T8 providing equal light output for 58W.

The following locations were found that could benefit from either daylight or occupancy controls:-

Olympiad Studio	2,160W
Olympiad gym spotlight	500W
Olympiad Level A foyer	195W
NWLL company office	260W
White Horse bar	240W
White Horse stairwell	288W

Assuming these are typical of other sites not visited, there are an average of 3 locations on each site where lighting controls should be fitted, at an average of 600 watts per location. Approximate cost of each controller is £200.

Priority Number 8 – Solar Heating for Swimming Pools

A properly mounted solar panel in the south of England can collect 800 to 900 kWh per sq.m. p.a.

Suncell (http://www.saferpools.co.uk/solar_panels.htm#system) quote £6,200 to install a complete system with 72 sq.m. collector area, giving an overall capital cost of £86 per sq.m. of collector area. The recommended size of system is 50% of the pool surface area.

Where gas boilers are used as the source of heat, assuming 85% efficiency, each kWh of heat delivered by the solar panel is worth 2.15p.

Site-Specific Opportunities

Priority Number 1 - Pool cover at Olympiad

GPG056 Refurbishment of School Swimming Pools quotes the following savings from fitting a pool cover:-

350kWh / sq.m. from evaporation loss alone
1,000 kWh sq.m. from reduction in dehumidification and ventilation energy consumption.

However, these figures are calculated for a school swimming pool which is not used for approximately 6,000 hours of the year. The pool at Olympiad is only closed for 3,000 hours, so 50% of the above savings have been assumed.

A basic, manually operated pool cover can cost from £5 per square metre. However, £20 per square metre has been allowed for producing a bespoke cover for the irregularly shaped pool. It has been assumed that some parts of the pool will remain uncovered, and therefore the cover is 90% of the total pool area.

Priority Number 2 – Daylight Roof and Relighting in White Horse Sports Hall

The hall currently has 24 off 400W SON high bay fittings.
New roof to incorporate 48 sq.m. of translucent polycarbonate sections at no additional cost. This is in 24 off 2 sq.m. openings, each providing as much light as a 400W fitting under overcast conditions.
Each light fitting to be replaced by a 4 x 80W T5 fitting with dimmable ballast at a cost of £200 per fitting.
Fully modulating daylight control and occupancy control achieves consumption 40% of fully on.

To calculate the additional heat loss from the glazed sections, assume new roof has U value of 0.3 and polycarbonate has U value of 2.8, and 2000 degree days per annum. This gives 5,760 kWh of additional heat loss through the roof. To convert this to boiler fuel, assume marginal boiler efficiency of 85%.

Priority number 3 – TRVs in NWLL Company Office

The office suite has 4 off split units, each with 2.5kW cooling capacity and a COP of 2.5, so 1kW electrical consumption. Therefore each hour the two operate in opposition, 10 kWh of heat and 4kWh of electricity are wasted.
Electricity and heat come from CHP plant (see below)
The heating and split units operate in opposition when the air temperature is between 12 and 18 degrees C during office hours. This occurs for four months of the year. Total 16 weeks x 5 days x 8 hours.
Cost to supply and fit each TRV is £50.

Priority number 4 - Review Standby Generator at Monkton

Jacket water heating element is sized at 1kW and cycles on 50% of the time.

Priority number 5 – Waterless urinals at White Horse

12 urinal bowls in groups of 3. Each group of 3 has a 10 litre header tank, filling and flushing once every 15 minutes.
Water consumption therefore 117 cubic metres p.a. per bowl.
Water cost £2.04 per cubic metre for water supply and sewerage.
Chemicals for waterless urinal cost £18 p.a. per bowl.
CO2 production by the water supply industry 0.44 kg per cubic metre.

Explanation of Values Applied to CHP Energy Output at Olympiad Leisure Centre

The CHP plant is an Ener-G 110kW unit, and is said to dump heat "very rarely", and is not permitted to export power. It is therefore assumed to turn down if either the electricity or the heat demand drops below its maximum output.

According to Ener-G's technical literature, the gas input to the engine is 360kW and the heat output is 181kW at full load.

Day time grid electricity costs 5.31 p/kWh, gas into the CHP costs 1.68p/kWh (CCL exempt), and gas into the boilers costs 1.83p/kWh (CCL applied).

Boilers operate at seasonal efficiency of 80%, marginal efficiency is 5% better i.e. 85%.

Therefore the consequence of reducing the electricity load on the CHP by one kWh is:-

Gas not fed into engine = 1.68p * 360/110	= 5.50p
Ener-G charges avoided	= 2.27p
Additional gas into boilers = 1.83p * 181/110 / 0.85	= - 3.54p
Net energy cost saving	= 4.23p

Gas not fed into engine = 0.19 * 360/110	= 0.622kg
Additional gas into boilers = 0.19 * 181/110 / 0.85	= - 0.368kg
Net carbon saving	= 0.254kg

The consequence of reducing the heat load on the CHP by one kWh is:-

Electricity not generated by CHP = 110/181 kWh = 0.61 kWh	
Gas not fed into CHP = 360/181 kWh = 1.98 kWh	
Reduction in CHP operating cost = 2.27*0.61 + 1.68*1.98	= 4.71p
Additional grid electricity imported = 0.61 * 5.31p	= - 3.24p
Net energy cost saving	= 1.47p

Reduction in CHP carbon output = 0.19*1.98	= 0.376kg
Additional grid electricity imported = 0.61 * 0.43kg	= - 0.262kg
Net carbon saving	= 0.114kg

Appendix 4 – Summary of Areas covered on Site

This is a checklist of items that could be covered during the site assessments as part of the Energy Management and Opportunities Assessment. 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. client already familiar, not relevant at this site, etc.)
Energy Management and Reporting System					
	Policy and Strategy	YES	YES		
	Energy Management responsibility	YES	YES		
	Use of meters	YES	YES		
	Data collection and analysis	YES	YES		
	Publicising Energy Performance		YES		
	Workforce engagement	YES	YES		
	Use of the Standards for Managing Energy			NO	Energy consumption in this organisation too small to support full time staff
	Energy procurement		YES		
	Buildings Energy Management Systems		YES		

Main area	Sub topics	Key area ?	Yes, covered	Not covered	Reason for exclusion (e.g. client already familiar, not relevant at this site, etc.)
Energy Performance					
	Space Heating	YES	YES		
	Boiler house/ plant room/ boilers	YES	YES		
	Controls	YES	YES		
	HVAC systems and plant	YES	YES		
	Compressed Air	YES		NO	Not used
	Combustion processes	YES			Briefly covered with respect to boilers
	Lighting	YES	YES		
	Motors and drives	YES	YES		
	Building Fabric	YES	YES		
	Refrigeration/ Cooling Systems	YES	YES		
	Hot water systems		YES		
	Steam distribution			NO	Not used
	Heat recovery		YES		
	Process	YES		NO	Not used
	Pumps and fans		YES		

Main area	Sub topics	Key area ?	Yes, covered	Not covered	Reason for exclusion (e.g. client already familiar, not relevant at this site, etc.)
Energy Supply	*Opportunities for Renewables*		YES		
	Opportunities for CHP			NO	CHP is already in use in the largest of the leisure centres. A basic assessment of the economics of installing CHP at the White Horse centre showed payback in excess of 10 years.