Eaga

ENERGY REPORT

Office Accommodation

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Eaga

Thank you for commissioning an EPODA Commercial Energy Assessment. We look forward to working with you to help lower your CO2 emissions and reduce your energy and water bills. Within this report you will find the recommendations that our assessor has made to improve the efficiency of your building. These recommendations, both physical and behavioural, will payback their capital investment from 3.2 years; a number of them will payback immediately.

The areas which your EPODA assessor will have looked at are wide ranging, reaching across your whole operation, and have the unique benefit of a holistic approach to energy efficiency. Many different measures will have been modelled using our auditing software, but only those which represent value for money and a good return on investment have been selected for your consideration. Your overall use of energy has been assessed and the results are closely based on your actual consumption figures. The assessor will have also taken into account the status of the building (if is it listed or in a conservation area), the tenure of the building, staff behaviour patterns and a number of other factors before arriving at this result.

Please study the results carefully and feel free to discuss the various savings opportunities identified with your assessor. He or she will be able to answer any initial questions you might have, including the option of applying for interest-free Carbon Trust funding to make this report a reality.

Thank you once again for your instructions.

BUILDING SYNOPSIS

This relatively modern office block completed in 2001 it is built to the 1995 Building Regulations and hence features cavity walls with some insulation built in, and has a metal clad system roof. All windows are double glazed. The total building area is stated at 4476m2.

Office accommodation is arranged over three floors in total and takes the form of two wings connected to a central atrium. The building is orientated broadly north east to south west. The ground floor north wing houses a range of staff facilities including a full canteen with catering kitchens, and a dry gym with changing rooms and showers. This area also houses a repair room for PCs, the main comms/server room plus storage and meeting room areas. The central section is split into two sections – the front area being a full height atrium, with the rear section housing male and female toilets and cleaners storage cupboards on all floors. The south wing on the ground floor offers large open plan offices with meeting rooms, staff locker space, a networked printer/copier and vending machines. This pattern is repeated with slight variations on the north and south wings on all floors above. There is a personnel lift in the centre of the atrium, which also affords access to the plant room which is located on the top floor above the full height section of the central atrium.

This plant room houses the main air handling plant which has a pair of modern condensing gas boilers which temper inlet air via the air handling unit's heating coil, and also supply radiators in the ground floor atrium area. There is a large chiller unit to the rear which feeds the cooling coil. A separate smaller chiller is believed to feed the hospitality suite. The AHU itself houses a constant volume supply and extract system and there is a Trend BMS controlling the functions of this plant. In addition, there are a number of relatively modern local split systems installed which provide additional cooling to the IT rooms, the PC repair room and an area of the top floor, (south wing) which has been sectioned off as a studio. The occupants of this top floor also had plug-in fans deployed and this area was a clear 2° warmer than the rest of the building at the time of the visit. This is likely due to solar heat gain being greatest during the afternoon in this area of roof. Main heating and cooling is delivered via ceiling mounted fan coil units fed from the main boilers and chiller. There is also a separate extraction system serving just the toilets.

Domestic hot water is supplied to all points by a large electrically heated hot water cylinder. The exceptions are the showers in the gym changing areas which are point of use and sinks in the first aid and hospitality kitchens which are served by a 10 litre electric multipoint heater.

Lighting is predominantly by quad-fitting 2' T8 fluorescent tubes with high frequency ballasts. There are a few standard ballast T8 tubes in the stairwell/fire exits areas attached to the extremities of the wings. There are also a number of tungsten halogen spot lamps, in the meeting rooms and scattered around the open plan offices and we were informed that these are low voltage.

The tungsten halogen lamps were off in the main during our visit, except for meeting rooms which were being manually switched according to demand.
The catering kitchens have a dishwasher which is currently cold water fed, and a selection of plug in fridges and freezers, plus chilled display/server units and a water dispenser (hot and cold) and a hot drinks machine.

LIMITATIONS AND ASSUMPTIONS

Hours of occupancy for this building were stated as 7am – 7pm. The number of occupants is 446.

We were able to visit all main areas of this building and interrogate the Trend BMS.

The building fabric itself, being of relatively modern design, has not been considered for upgrading in energy efficiency terms, beyond dealing with the over-heating problems in the south wing.

Actual consumption from June 2009 to May 2010

Existing Operations				Existing Costs
	£	Co2 T	KWh	Water m3
Electricity	£117.638.21	514,870.23	958,790	-
Gas	£10,011.84	52,165.824	268,896	-
Water	£7,150.97	1415.48	-	3217
Total	£134,801.02	568,451.534	1,227,686	3217

RECOMMENDATIONS IDENTIFIED WITH EPODA

Adjust ON times of HVAC plant as set in Trend BMS system

The Trend BMS was found to have the ON time as 5am. This system features optimum start stop controls which calculate the appropriate latest time the system needs to fire up in order to condition the building to the desired temperature at the start of the day (stated as 7am). This control takes into account the outside air temperature automatically. The start time should be re-set to 7.00am and the control left to do its' work. Savings for this adjustment are included in the section on the AHU below.

Lighting

Where HF fluorescent tubes are fitted these should be replaced with T5 plug in equivalents.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Lighting T5	£8658	43.397	80814	n/a	£24083	2.78	554.94

Main and Toilet supply and extract systems

It is suggested that variable speed drives be fitted to the supply and both extraction fan motors and linked to the Trend system. A fan motor running at 80% of capacity draws approximately half the energy of one running at full speed, so fans throttled back at set times of the day yield a significant energy saving.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Fit VSDs to AHU fan motors	£2242	1.042	24230	n/a	£4437	1.98	4258.15

Further, the above measure and the re-setting of the Trend system to correctly reflect opening hours will also yield savings in the boilers and chiller operating hours. These are shown below.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Heat savings – reduced boiler hours	£685	0.420	2117	n/a	£1355	1.98	3226.19

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Cooling savings – reduced chiller hours	£863	4.011	9327	n/a	£1708	1.98	425.82

Note: These figures include the correct operation of the Trend system. The capital cost of the VSDs is split between each savings table.

Thermally isolate floor from ceiling void

We recommend that in order to improve the comfort of the occupiers and reduce the energy expended in heating and cooling, a layer of mineral fibre insulation be installed above the suspended ceiling on the top floor of both wings of the building.

This will reduce heating demand in the winter months, but also limit solar heat gain into the occupied space. Care must be taken to ensure that the insulation is cut around all light fittings to enable dissipation of heat into the roof void above.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Reduce heat loss to roof void	£819	5.027	26459	n/a	£7460	9.10	1483.98
Reduce coolth loss to roof void	£71	0.409	762	n/a	£0	Immediate	0

Pipework and Distribution Insulation

It is noted that there is good insulation on the main pipe runs for the heating circuit. However a selection of valves and flanges within the plant room are exposed. We recommend that these be fitted with proprietary jackets to reduce heat loss.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Pipework and distribution insulation	£101	0.619	3259	n/a	£350	3.47	565.42

Enable standby facilities on PCs

All the monitors in use in the building have a standby facility built into them, which enables the monitor to 'go to sleep' after a pre-set period of time of inactivity. These should be activated in all cases, and new monitors introduced should be checked to ensure all are operational going forward

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Enable standby facilities on PCVs	£390	2.064	4213	n/a	0	Immediate	0

Other Electrical Savings

We recommend that variable speed drives also be fitted to the circulation pumps of both the heating and cooling circuits for the reasons already referred to.

We also suggest that the opportunities for virtualisation of existing PCs be examined. Modern computers rarely use or need all of their computing power, and it is possible to virtualise up to six desktops from one machine – eliminating the need for five machines with their attendant power consumption and associated costs

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Other electrical savings	2632	15.276	28446	n/a	12752	4.84	834.77

Domestic hot and cold water supply

It is recommended that the existing electric water heater be replaced with a direct gas fired storage calorifier which in addition to costing significantly less to run, also means the boilers can remain off during the warmer months. This should also be connected to all hot water outlets including the kitchens and the dishwashers. Connecting to the dishwasher specifically reduces the load on the electric heater within the appliance. Please note: the kwh demand in this instance increases due to the relative efficiencies of electricity and gas water heating.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Hot water measures	1995	11.185	3813	n/a	£4300	2.16	384.44

Fit Interflush devices to toilets

These devices can be retro-fitted to most toilets and reduce water consumption by up to 47%. Since water is paid for on entry to and exit from the building, savings can be considerable.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Interflush devices to toilets	2552	0.510	3813	n/a	600	0.24	1176.47

Install a roof top photo-voltaic array

The large area of available roof space, plus the high electrical demands of the building and the effects of the new feed-in tariff mean that the installation of a photovoltaic array is worthy of serious consideration. The array size suggested is 597m2 which is calculated to produce 66.31kwp when deploying monocrystalline silicate panels

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Install PV array	21018	35.944	66936	n/a	265244	12.62	7379.36

Hot water end use measures

It is recommended that Watersave shower heads be installed in all showers except those in the gym changing area (electric point of use). The Watersave heads have the capability to reduce the water throughput from around 15 litres per minute to 7.58 litres per minute, whilst maintaining a feeling of force and with no reduction in cleaning power.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Install watersave shower heads	840	1.729	8493	n/a	180	0.21	104.10

Voltage Optimisation

The National Grid delivers power in the UK at approximately 230 – 240v. All lighting and appliances sold in the EU are designed to run at 220v. If the supply voltage within the building can be stepped down this gives a drop in the amount of electrical energy demanded by the building. A full survey is required before specification can go ahead. The amount saved will be dependent on the lighting solution chosen – hence two alternative results are shown.

Recommendation	Estimated Annual Savings				Estimated Cost	Payback Period (years)	Cost per T Co2
	£	Co2 T	KWh	Water m3			
Install voltage optimisation	7256	42.108	78414	n/a	34093	4.70	809.65

Please note that there are models on the market which are little more than a transformer. Our recommended supplier provides Voltage Optimisation which also levels out fluctuations in the supply voltage, thus eliminating spikes prolonging equipment life still further

SUMMARY TABLE

Recommendations and Key Actions	Estimated annual savings				Est.cost	Payback period	Cost per tCO2
	£	CO2 (kg)	kWh	(m3)	£	years	£
Lighting	£8,658	43,397	80,814		£24,083	2.78	554.94
HVAC fan power savings	£2,242	1,042	24,230		£4,437	1.98	4258.15
HVAC heat savings	£685	4,202	22,117		£1,355	1.98	3226.19
HVAC cooling savings	£863	4,011	9,327		£1,708	1.98	425.82
Building Fabric Heat Loss	£819	5,027	26,459		£7,460	9.10	1483.98
Building Fabric Cooling Loss	£71	409	762		0	Immediate	0
Pipe & Distribution Insulation	£101	619	3,259		£350	3.47	565.42
Motor controllers on fridges & freezers	£243	1,411	2,628		£180	0.74	127.56
Enable standby facilities on PCs	£390	2,064	4,213		0	Immediate	0
Other electrical savings	£2,632	15,276	28,446		£12,752	4.84	834.77
Other heat savings	£1,995	11,185	-3,813		£4,300	2.16	384.44
Photovoltaics	£21,018	35,944	66,936		£265,244	12.62	7379.36
Hot water end use savings	£840	1,729	8,493	262	180	0.21	104.10
Other water savings	£2,552	510		1,159	600	0.24	1176.47
Voltage Optimisation	£7,256	42,108	78,414		34,093	4.70	809.65
TOTAL	**50,366**	**168,935**	**352,285**	**1,421**	**356,742**	**7.08**	

SUMMARY

The total potential annual savings identified as presenting a sound business case total £50366, which represents a 37% reduction in current spend. The investment required to achieve this revenue cost saving is £352742 which gives a simple payback of 7 years and 1 month. This is calculated at current energy prices, and current indicative capital costs, and as energy costs inexorably rise, so the potential return on investment increases commensurately.

Stripping out the effects of the photo voltaic array (which accounts for £265,244 of the capital costs) the potential annual savings are £29348 (21%) but the simple payback period drops to just 3 years and 2 months. The cost of delaying implementation in this case is £2445 per month. The five year return on investment, without the photo voltaic array, and assuming a 10% annual rise in energy costs is shown below

Year	Annual Savings	Cumulative Total	Cash Flow
1	£29,348	29348	-£62,150
2	£32,283	£61,631	-£29,867
3	£35,511	£97,142	£5,644
4	£39,062	£136,204	£44,706

5 YEAR RETURN ON INVESTMENT IS **195%**

GENERAL ADDITIONAL RECOMMENDATIONS/OBSERVATIONS

Your attention is also drawn to the existence of the Energy Technology List which features a wide range of energy efficiency technologies which have been designated as the most energy efficient of their type. Choosing models from this list offers the client 100% Capital Allowances against Corporation Tax in the year of purchase, thus strengthening the case for early action

BENCHMARKING AND DISPLAY ENERGY CERTIFICATE RATING

At present this building would achieve a rating of

169 G

If all the proposed improvements were actioned, the above improvements would render a rating of

123 E

WHAT TO DO NEXT

We recognise that to achieve a lower cost and lower carbon future requires time and investment. At Epoda we can offer a number of different financing options to help achieve the savings identified in this report. Please contact us if you would like to discuss these options further.

A number of the measures identified in this report may be deemed acceptable by the Carbon Trust for their interest free loan scheme. Our team of experts can help guide you through the process of applying for these loans and aid you in a successful application.