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Isleworth and Syon School for Boys

Energy Audit

Rev 0

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1. Introduction

The Isleworth and Syon School is a secondary boys school in the borough of Houslow with around 1000 pupils. The main school building is a brick construction completed in 1939. An arts and technology block was added in the 1970s, and some temporary hut-type classrooms were added as recently as about 18-months ago. In addition to the main site, there is also an off-site sports ground with changing rooms called Busch Corner.

In November 2010, Useful Simple Projects carried out an energy survey of the school, the findings of which are presented here. The basis of this survey is: drawings and historic energy data supplied by the school, a non-intrusive survey and anecdotal information received from staff. The Energy Audit follows work carried out by Useful Simple Projects to assess energy consumption and compare against benchmark data.

The Energy Audit report includes a discussion of the key findings of the survey and recommendations for the school to reduce its energy consumption. Specifically it sets out:

- findings from the survey and recommendations for energy reduction;
- cost benefit of each recommendation; and
- advice on implementation of the recommendations.

Annual savings of approximately £33,000 have been identified with associated carbon reduction of 194 tonnes of CO_2. We estimate that the first ten interventions will have payback periods of less than 3 years and associated annual cost savings of £20,000.

Figure 1 - Aerial Photo of the main school looking East

2. Summary and Recommendations

The following section sets out key observations from the survey and discusses recommendations for reducing energy use in the school.

2.1 Building fabric

2.1.1 Windows

Within the main school building most windows in classrooms had been fairly recently replaced with double glazing, funded by BAA. New windows, however, are hinged at the top, presumably to prevent rain ingress, but this is of little benefit in the summer when buoyant warm air is stratified at high level and has no natural 'inclination' to escape through the low-level opening. If the windows were hinged from the bottom, they would act like chimneys allowing warm and stale air to escape through them. In the winter this could result in excess ventilation with associated energy wastage as valuable heat escapes from the classroom. However, if coupled with a policy of staff and student engagement, this could be addressed by opening the windows by a lesser extent, or by opening fewer windows. Carbon dioxide sensors with audio-visual alerts could prompt teachers to keep the air quality within a healthy range.

If rain ingress through bottom-hinged windows is thought to be a problem, then window mechanisms that allow either opening can be used.

Future window replacements should consider the quality of ventilation and the degree of control.

2.1.2 Thermal Insulation to roof areas

The art and technology block construction has a flat roof which appears to have no thermal insulation, and rainwater leaks are evident in places. Applying thermal insulation to the underside of the flat roof should provide a significant saving. Clearly water leaks should be fixed prior to installation of any thermal insulation.

When insulation is applied to the interior of the building, the exterior building element will become colder. This can result in condensation forming between the insulating layer and the building structure. In extreme cases, this condensation can freeze causing structural damage. Careful detailing of the application of insulation can avoid this, hence further work is required before proceeding with this recommendation.

Thermal insulation to pitched roofs is usually very straightforward with extremely quick repayment periods.

2.1.3 Thermal Insulation to Renovated Shower Block

At the time of the survey, the shower block was being internally lined, providing an ideal opportunity to introduce a layer of thermal insulation. There are a number of products on the market that are very slim with good thermal qualities.

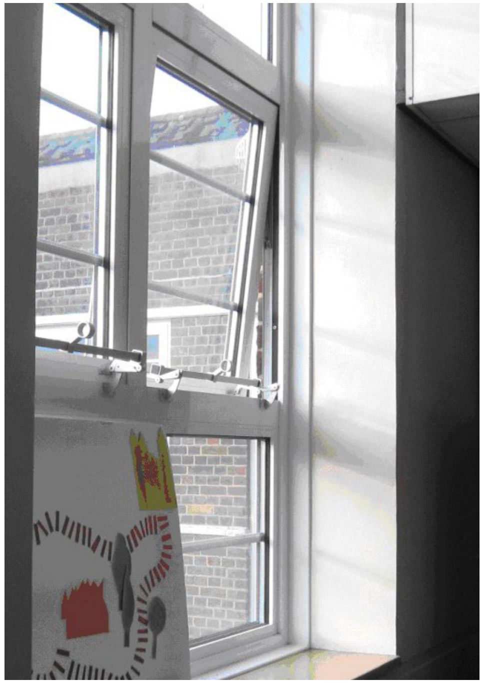

Figure 2.1 - Typical replacement double-glazed window, hinged at the top)

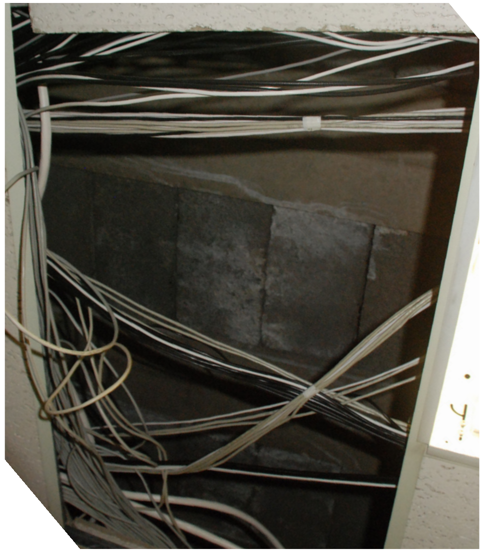

Figure 2.2 - Exposed roof construction in the IT room (no insulation)

2.1.4 Thermal Insulation Panels to Low Level Windows
Any glazing lower than about one metre from the floor is providing very little benefit in terms of daylighting, but contributes significantly to spatial heat losses, especially where it is behind a radiator. The adjacent figure shows this arrangement in the canteen area. In situations like this, the glazing should be insulated.

2.2 Space Heating

2.2.1 Single Pipe System
Space heating is provided by two sets of gas fired boilers. The main boilers in the plant-room near to the school hall distribute heat through an oversized Single-Pipe Heating Distribution circuit around the main school quadrant. Radiators draw hot water from this pipe in each of the teaching areas but few have individual thermostatic control. The very large pipework has been sized for gravity circulation pre-dating the use of pumps in heat systems.

This single-pipe heating distribution system is causing a very significant waste of heat. Close to the boiler room, the very large pipework is emitting vast amounts of heat, over which occupants can exert no control. As such, occupants have to open windows to maintain a comfortable teaching climate, losing heat in the process. Conversely further round the system, so much heat has been lost that occupants are using costly electric heaters in order to keep warm.

A complete replacement of the distribution system may be prohibitively expensive, but there are alternatives to this.

One option is to just replace the main distribution pipework with a highly insulated flow-and-return system, and then interface to the existing pipework through a distributed network of local heat stations. The optimum solution will depend upon a detailed network analysis.

Another option is to introduce thermostatic controls into the teaching areas. Very many rooms have no thermostatic control whatsoever, and those that do cannot control the heat being released from the large uninsulated distribution pipes.

2.2.2 Thermostatic and Manual Radiator Valves
All radiators should have, as a minimum, a manual regulating valve with a hand-wheel so that occupants can manually reduce the heat output. Alternatively, for similar cost (once labour is considered) this could be a thermostatically controlled valve which regulates the radiator output to suit the room temperature. The disadvantage with thermostatic valves is that they are much more easily damaged than a hand-wheel.

2.2.3 Room Thermostats
Thermostatic radiator valves are not very accurate and each must be adjusted individually

Figure 2.3 - Full-height single-glazing in the Canteen – the lower third contributes negligible daylight but suffers very high heat loss

Figure 2.4 - Typical radiator detail with no control, and very large diameter pipework for gravity circulation (loses lots of heat)

Figure 2.5 - Typical radiator detail with no control

– this can be quite inconvenient. A much better solution is room thermostats controlling motorised valves. If the pipework is zoned on a room-by-room basis, then each room could have its own thermostat controlling a motorised valve in the pipework serving that room only. However most of the radiators are served from the main distribution pipe, in which case motorised valves are needed on each radiator individually. The motorised valve is installed in place of the traditional radiator valve, as shown in figures 3.6 and 3.8.

2.2.4 Heating Controls - Optimum Start and Stop

The heating currently comes on at 3:00 AM. If this is the right time for the heating to start on a very cold day, then it must be much too early for a mild day. Self-learning optimum start software can automatically adjust the start time to suit the prevailing weather, thereby saving hundreds of operational hours each year.

2.2.5 Insulation to pipework

The heat being lost from the over-sized pipes in the single pipe system is causing some spaces to over-heat and forcing occupants to evacuate the heat by opening windows. Insulating the pipework would reduce this heat loss. Conventional pipework insulation however is not visually attractive and is easily damaged if left unprotected. Therefore more creative measures are required.

In the arts and technology block, heating is provided through high level fan coil units. The high level pipework to the fan-coil units is especially wasteful. In accordance with normal design practice, the heating pipework to the fan-coils is not weather-compensated, meaning in this instance that the heating water circulates to the fan-coil at 75 °C irrespective of the weather.

At 75 °C, the heat transfer from the distribution pipework to the surrounding space will be very high indeed. On a mild day during the heating season, the heat transfer from the

Figure 2.6 - A wireless control system allows any number of motorised radiator valves to be linked to a wall-mounted thermostat.

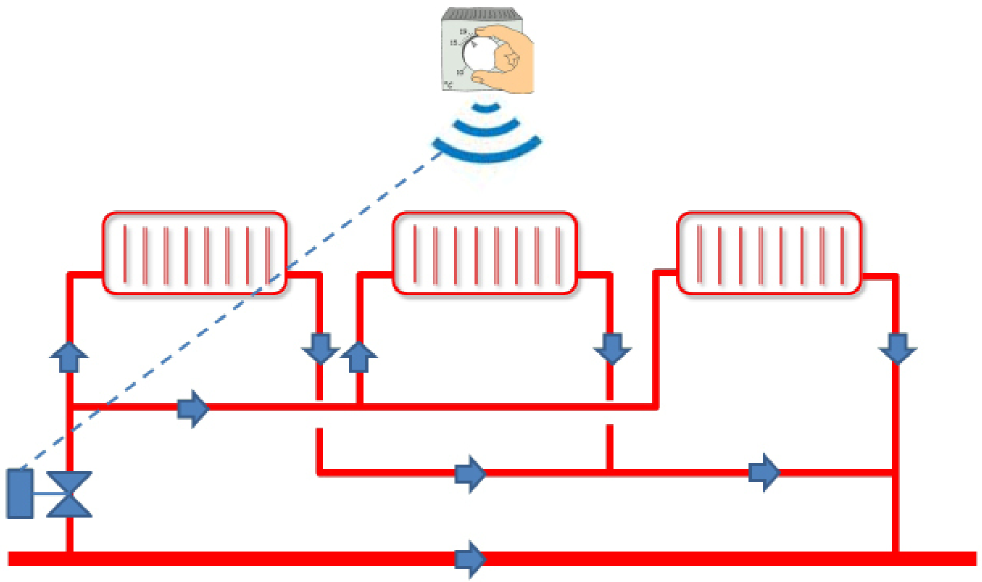

Figure 2.7 - Where pipework is zoned room-by-room, only one motorised valve is required per thermostat.

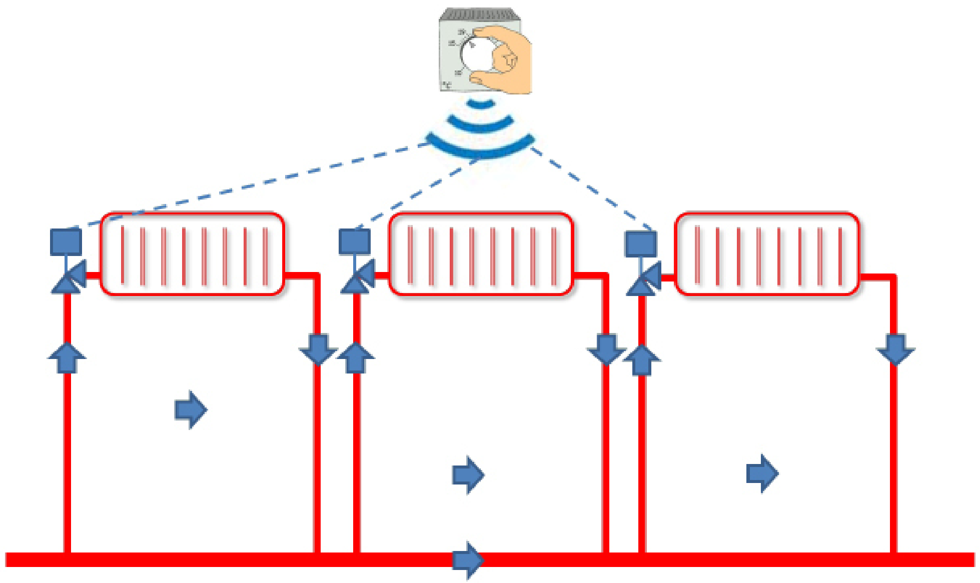

Figure 2.8 - Where radiators are served individually off the main ring main, then each radiator requires its own motorised valve.

pipework to the space will exceed the room heat loss causing the space to over-heat , even if the fan-coils are off completely.

Moreover, the pipework is well above the occupied zone, so the heat loss is having little benefit on the occupants.

It is likely that the insulation was left off for aesthetic reasons at a time when energy considerations were less crucial than today.

It is recommended that both the single pipe systems and fan-coil pipes are insulated.

2.2.6 Electric Resistance Heating

Electricity is the top of the energy hierarchy, and is valued above all others. In fact, societies exchange most other energy types for electricity at "poor exchange rates" (conversion efficiencies), such is the value placed upon it. Low grade heat is at the bottom of the energy hierarchy and is frequently discarded as a waste product and ejected from buildings and processes.

Therefore using electricity to heat a building is especially wasteful. For each unit of heat derived from an electric heater, about two units of similar low grade heat is dumped to atmosphere at a power station. For this reason, electricity is typically about three-times the cost and carbon-emissions of a gas-fired heating system.

Electric heaters were found to be used as a top up heating to teaching areas at the end of the single pipe system, in the portacabin teaching areas and in the sports hall.

Improvements to the single-pipe heating system and building fabric should be implemented at least to the extent that all electric heaters in the main building can be removed.

In the teaching huts, heaters inspected did not have thermostats or time-switch controls. A very low cost measure would be to install time switches and thermostats to these electric heaters. The capital cost might even be recovered as quickly as within one heating season.

High level heat recovery techniques can be used in lofty spaces such as the Sports Hall and Main Hall. Warm air being released into the Sports Hall and Main Hall will rise under natural buoyancy and stratify at high level above the occupied zone. This effect will be especially pronounced in the Sports Hall which is heated with fan-powered convectors. Slow-moving fans can be used to direct this heat back to the occupied zone through fabric air ducts. The advantage of fabric air ducts is that they collapse on impact and then reform afterwards. This would be especially beneficial in the Sports Hall. Alternatively, the air inlets can be ducted to the top of the space.

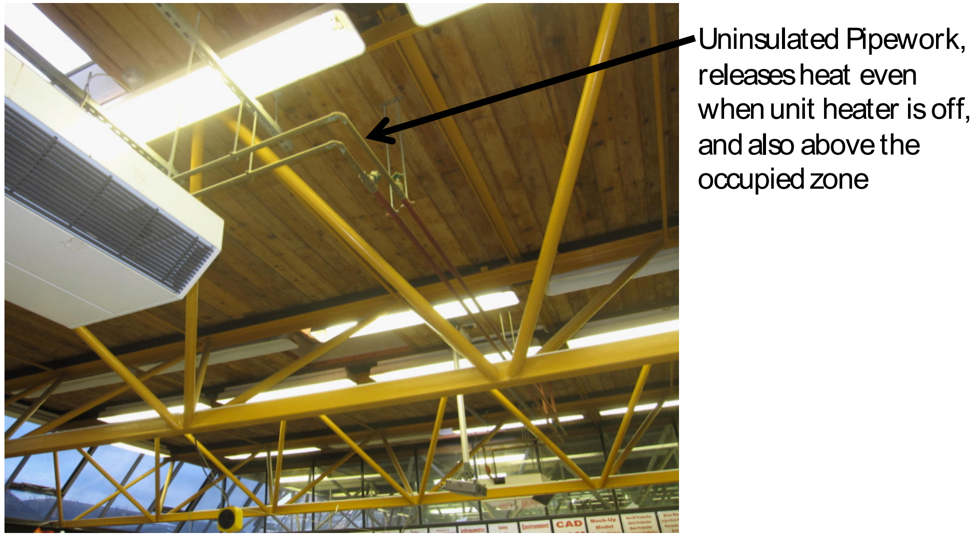

Figure 2.9 - Exposed heating pipework, releasing heat above the occupied zone and without control

Figure 2.10 - Resistance heaters

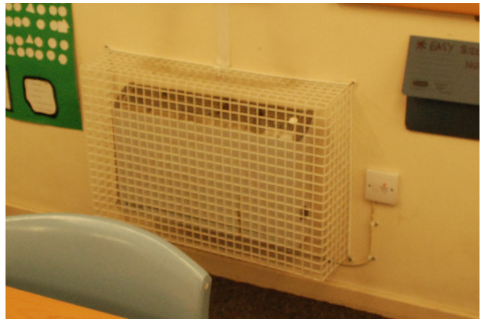

Figure 2.11 - Heating in huts

Figure 2.12 - Resistance heaters in Sports Hall

Figure 2.13 - Sport Hall

2.3 Cooling

2.3.1 The IT Room
There is very little cooling at the school, but the IT room is one area where energy can be saved whilst improving operational resilience.

Currently, a single air-conditioning unit is used to keep the main IT room cool. If it fails, then the room will over-heat – even on a cold day. As the temperature rises, the process speed slows and eventually fails altogether.

The air-conditioning unit supplies air at about 12 °C, all year, day and night. But the annual average outside air temperature is about 11 °C. This means that electricity is often being used to "manufacturer" cool air that is warmer than outside air.

Simply opening the window is unlikely to have adequate cooling effect, but a thermostatically-controlled fan could maintain a suitable temperature for about two-thirds of the year, during which time the energy consumption would be negligible and the risk of system failure would be substantially reduced.

Not only does the fan provide a standby cooling system for about two-thirds of the year, it is much less likely to fail than an air-conditioning unit. Because the air-conditioning unit operates less often, it is less likely to fail when called upon, and if it does fail when called upon, then the fan could be used to mitigate the consequences.

2.3.2 Double Storey Huts
These have heat pump units that provide efficient heating in winter and the potential for cooling in summer. Consideration should be given to disabling the cooling function, or at least restricting the minimum cooling set-point to say 27 °C. It is not normally necessary to cool a classroom.

2.4 Domestic Hot Water (DHW)

2.4.1 Shower Blocks
The existing showers on the main school block have a single on/off valve, which means that all showers are either on or off. Unless showering is extremely well-managed by the teachers, this is likely to result in significant wastage. Each shower should be fitted with a push-button that resets to off after about 30 seconds. It is noted that the new shower area will be fitted with individual controls.

2.4.2 Busch Corner
Water is constantly circulated between the shower area and the hot water generators at 60 °C – this is to kill any harmful bacteria. 60 °C is much to hot for showering, and so it is locally blended with cold water down to about 40 °C using a thermostatic mixing valve. All of this is common practice. However the circulation pipework is uninsulated, resulting in significant

Figure 2.14 - Manufactured 'cold air' to the left, and unused free cold air to the right.

Figure 2.15 - Extract fan and cooling unit in the teaching huts.

and uncontrolled heat loss to the changing room, even in summer. This pipework should be thermally insulated.

2.5 Lighting

2.5.1 T8 Lamps

Lighting throughout the school is mainly through T8 fluorescent tubes in relatively old fittings incorporating mechanical ballasts. Mechanical ballasts produce a flicker at mains frequency, causing eye-strain. This effect is more noticeable in some people than others, and some people suffer serious headaches as a result. For those suffering with epilepsy, these older fluorescents can induce episodes. Certainly they should not be used around rotating machinery, such as in the workshops, where a strobe effect can create the illusion of rotating equipment appearing to be stationary.

Modern fittings are usually specified with low energy T5 tubes and high frequency electronic ballasts. The frequency is too high to produce any noticeable flicker or strobe effect.

A gradual replacement of light fittings in line with maintenance replacements is recommended, delivering an anticipated energy saving of around 20 percent of the total lighting load.

2.5.2 Diffusers

Various types of Perspex screens have been placed over the fluorescent tubes; this is to prevent a direct view of the lamp which in turn can cause veiling reflections on VDTs and cause glare. The Perspex has photo-degraded (yellowed) over time to the extent that the output must now be very low.

Most modern light fittings shield the lamp using the geometry of the reflector giving a much better light output ratio.

These opaque diffusers are likely to be reducing light output, and therefore increasing energy by about 20 percent. Replacement of fittings with more effective diffusers, as identified above, is recommended.

2.5.3 Switching

Light switching in many rooms is poorly zoned. For instance, one light switch for a whole room or lights switched in strips running perpendicular to the window-wall.

The daylight contribution is greatest nearest the window, and steadily falls away to nothing at a distance of about six metres. Lighting should therefore be switched in strips running parallel to the windows. Those strips nearest to the window can be off more often than those further away.

Daylight penetration is of no energy benefit if all the lights have to stay on because those parts of the room benefiting from day-light are on the same switch-circuit as other parts that do not.

Figure 2.16 - Busch Corner changing room.

Figure 2.17 - Single Ball-o-Fix isolating valve serving all shower outlets

Figure 2.18 - Photo-degraded (yellowed) light diffuser (one of many)

Figure 2.19 - Linear fluorescents behind acrylic diffusers with poor light output (one of many)

Photocells can be used to either extinguish or continuously dim lights in response to daylight penetration. Switching is cheaper but, to avoid complaints, lights usually have to be switched off at three times the design illuminance, significantly reducing the energy saving.

Occupancy sensing using Passive Infra-Red (PIR) sensors has been installed to about 20 percent of classrooms, and this should be extended throughout the school. Health and safety considerations are paramount, and PIRs are not suitable in all spaces, such as boiler rooms and some staircases. Professional design advice should always be sought in respect to the location and installation of PIR devices to enusre an optimum solution is developed.

Further investigation into the installation of controls and zoning for lighting control is recommended.

2.6 Sub-metering, Targeting and Monitoring

2.6.1 Base electrical load

From the Benchmarking and Load Analysis it is clear that the school's electricity consumption is high (upper quartile nationally), and this is in no small part due to the high base load at night-time and weekends (c. 28 kW). However, without effective sub-metering it is only possible to speculate about the causes.

Sub-metering allows the utility bills to be itemised circuit-by-circuit. For instance, it should be possible to know how much is used by lighting and plug loads separately, and how much is used by each building.

2.6.2 Degree-day analysis

The gas consumption should obviously have a close correlation with the weather: when it is cold, more gas should be used to heat the school. In the summer the only gas used should be for Domestic Hot Water (DHW) and catering.

To help correlate gas consumption to the weather, degree-days are used. The concept of the degree-day requires first of all that a base temperature is established – this is the outside air temperature above which heating is considered unlikely. It is normal to choose 15.5 °C for this. Generally, if the outside temperature is 15.5 °C, then internally-generated heat gains and solar radiation are usually adequate to bring the space to a suitable temperature without requiring any additional heating.

One degree-day is 1.0°C below the base temperature sustained for one day. Two degree-days could be 2.0 °C below the base temperature sustained for one day, or equally it could be 1.0°C below the base temperature sustained for two days, and so on.

Usually the average daily temperature is used, so if the average temperature for a given day is 14.5°C, that day would be equal to one degree-day. However, calculations can be coarser and use monthly averages, or finer and aggregate hourly differences. Whichever method is used, degree-days is a method for estimating how cold a given month was.

Degree-day data can be downloaded on-line for a period of about three years at http://www.degreedays.net/?gclid=CPTo0sngkaUCFWr92Aod1S2lMA#generate.

There is already sufficient data to derive a relationship between degree-days and gas consumption, which could be used to set weather-corrected targets and provide early identification of prolific gas usage. The spreadsheet would make this highly automated.

2.6.3 Establish what is served off each gas meter

Currently it is not clear what is served off the kitchen gas meter. From the utility load assessment, this gas meter is clearly very sensitive to the weather, meaning that it is serving more than just catering gas. It is difficult to manage gas usage when it is not clear what is served off which meter.

2.6.4 Targeting and Monitoring

For each meter and sub-meter there should be a target. In some cases the target will vary only by the number of days in the measurement period (i.e. February lower than December), others may vary by the month (lighting meters would have lower targets in June than January), and others may vary by the prevailing weather (such as gas meters varying with degree-days). All of this information can be embedded into a spreadsheet.

Meters and sub-meters should then be read periodically (say monthly), and recorded on the spreadsheet. The spreadsheet will show alerts where measured values are out of the expected range and give advice on what action to take.

Targeting and monitoring is a very useful tool in energy management, and can quickly identify problems. Sometimes, very high energy use is indicative of even more serious problems that might otherwise go unnoticed – such as a broken window or leaking hot water pipe.

2.7 Awareness Raising and Behaviour Change

As indicated above, the achievement of significant reduction in energy consumption in the school will require the engagement of both staff and pupils on a number of fronts as described below.

2.7.1 Maintenance and Operations Staff

It is clear speaking to maintenance staff that there is ambition to reduce energy use as evidenced by reductions achieved over the past few years. Technical support to help resolve particular systematic issues described above would help to achieve ongoing reductions.

There is also an opportunity to establish a green revolving fund where savings are reinvested to improve the schools environment.

2.7.2 Pupil engagement

There is tremendous opportunity for engagement of pupils in achieving energy reductions.

Firstly through information and an awareness campaign designed to engage students both in how the school can reduce energy but also the context of why it is important to do so. This can be done through innovative workshops and presentation of the findings of this report, appropriately tailored.

Secondly by looking at opportunities to relate the curriculum to the measures being implemented in the school. For example, a really good project for a science club or as part of the curriculum would be to get the students to establish a monitoring and reporting system, investigating data to look for trends in energy reduction, the impact of particular interventions and comparison with weather data. For a media group or art class, this might include the development of a campaign and posters to support key messages about energy reduction, and reporting for the school's website.

Thirdly by using class environmental representatives and students to help the school to 'police' its energy reduction. This would be through ensuring doors and windows are used appropriately, lights are switched off when not in use, and maintenance defects are reported and further ideas for campaigns are generated.

Finally, building on the student's and school's competitive spirit, the students could develop a reporting system for all schools in the Borough with an end of year prize for the best performing school. It is likely that this sort of initiative could be funded through corporate sponsorship.

2.7.3 Teaching Staff

As a significant component of the building occupants and as the leadership of the school it is also vital that teaching staff are engaged with the process. Similar workshops and presentations focussed on the role of teachers in reduction of energy could be used. Anecdotal evidence from the survey appeared to indicate that improvements to the building operation will bring great benefits to the teaching environment.

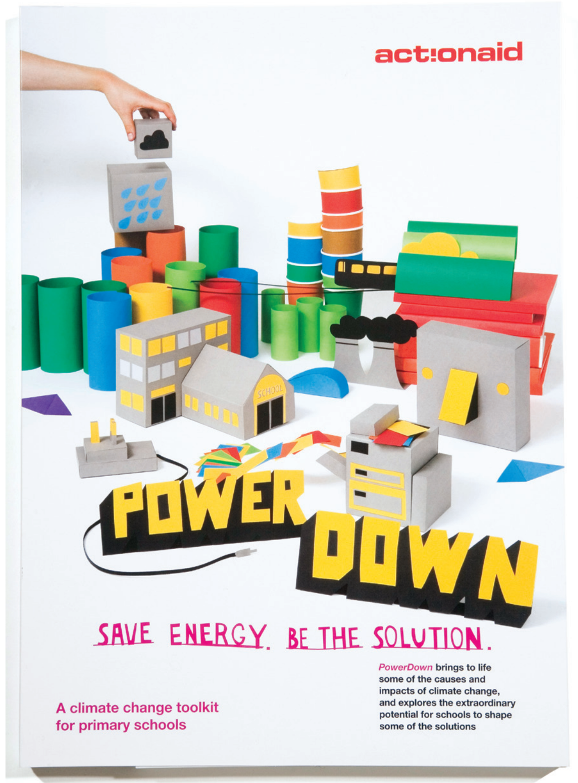

Figure 2.18 - Example of a Power Down campaign by Useful Simple.

3. Cost Benefit of Recommendations

A summary of the key recommendations is provided in Table 4.1 along with an estimate of the cost and associated pay-back period.

Not all savings are additive, one intervention to reduce heating load will reduce the opportunity for another intervention to achieve full savings. As such the total annual savings, making allowance for the diminishing returns of applying sequential improvements to the same loads, are estimated in Table 4.2.

The table only sets out changes from technical interventions. Results from behaviour change are far more difficult to assess. Rather than direct measurable interventions however, behaviour change and awareness help contribute to the successful implementation of such strategies, ensure that technologies are used correctly, and that savings are reported and celebrated.

Recommendation		Capital cost £	Annual savings gas £	gas kWh	elect £	elect kWh	total £	total t. CO_2	Simple repayment years
1	Find and eliminated the base electrical load	1,000			10,089	131,470	10,089	72	0.1
2	Optimum start and stop	1,000	5,000	162,127			5,000	30	0.2
3	Prohibit or limit cooling to double-storey huts	200			1,000	10,678	1,000	6	0.2
4	Thermostats and time-switches to single storey huts.	500			1,000	0	1,000	0	0.5
5	Mechanical ventilation to IT room.	200			400	5,212	400	3	0.5
6	Insulation to shower pipework	200	200	6,485			200	1	1.0
7	Push-buttons on showers	700	500	16,213			500	3	1.4
8	Pipework thermal insulation	4,000	2,276	73,792			2,276	14	1.8
9	Local and thermostatic control to all rooms	7,500	3,000	97,276			3,000	18	2.5
10	CO_2 sensors to help teachers monitor ventilation.	5,000	2,000	64,851			2,000	12	2.5
11	High-level heat recovery from sports hall	3,000	1,000	32,425			1,000	6	3.0
12	Energy sub-metering, targeting and monitoring	10,000			3,000	39,093	3,000	21	3.3
13	More efficient heat distribution	30,000	3,251	105,417	4,936	52,708	8,187	48	3.7
14	Insulate roof areas	44,750	8,000	259,403			8,000	48	5.6
15	Insulated spandrel panel below c.1 metre	500	53	1,719			53	0.3	9.4
16	Double-glazing	100,000	10,000	324,254			10,000	60	10.0
17	Replace all old light fittings fitted with mechanical ballasts and perspex diffusers. Re-zone the lighting for affective daylight control and fit occupancy sensores throughout. (SEE NOTE 3).	223,750			12,015	128,294	12,015	70	18.6

notes:
1. Capital costs and savings are approximate and based on rules-of-thumb, simplified calculations and intuitively-derived estimates.
2. Not all savings are additive. When a number of measures are applied to the same load, diminishing returns apply.
3. Much of the lighting is quite old and is likely to need replacing over the next few years. Therefore much of this cost is not additonal, but part of the schools on-going maintenance budget. This recommendation is about using existing budgets to introduce energy savings through careful planning.

Table 3.1 - Cost benefit of principal recommendations

Estimated total annual savings

	Cost (£)	Energy (kWh)	CO_2 (tonnes)
Gas	13,000	421,530	78
Electricity	20,000	213,561	116
Total	**33,000**	**635,092**	**194**

Capital cost (£)	431,800

Simple repayment period (years)	**13.1**	See note 3

Table 3.2 - Total estimated savings

4. Recommendations on Implementation

For a number of reasons, recommendations from energy audits are not always implemented and so it is important that the school identifies how these measures can be implemented, who will be responsible for ensuring that they are carried forward and the barriers (usually cost or time constraints) need to be overcome.

4.1 Order of implementation

In general, implementation should be in the following order:

- No cost and very low cost measures, such as behavioural changes.
- Measures for which grants are available, such as thermal insulation.
- Measures for which interest-free loans are available.
- Measures which have very short repayment periods.
- Higher cost measures with short repayment periods.
- Higher cost measures with longer repayment periods.

By generally following this hierarchy, a capital ‘green’ fund can be generated from quick wins to finance the more ambitious measures. As ever, there are exceptions, and the hierarchy should be used as a guide rather than followed rigidly.

4.2 Trialling interventions

Some measures are best rolled-out on a trial basis, such as modifications to the heat distribution pipework. It might be that simple insulation to key sections of pipework and adding basic thermostatic controls provides sufficient benefit that further measures cannot be justified.

Classroom CO_2 sensors is another measure that should be trialled so see how teachers respond to them, and what savings are thought to be achieved.

4.3 Developing a maintenance and replacement strategy

It is unlikely that the school will ever have c. £250,000 to improve the energy efficiency of the lighting; however the lighting will have to be replaced at some point. With thought and planning, the maintenance and replacement budget can be harnessed to bring about maximum efficiency gains. If replacement decisions are left until equipment is about to fail, or has failed, then it will usually be replaced in such a hurry that there is no time to consider any options. This leads to like-for-like replacements, so that over many replacement cycles, the building is nothing more than a new version of an old design. It is therefore useful to develop a maintenance and replacement strategy taking account of the long term desire to reduce energy consumption.

For example, on lighting, typically the fittings would be replaced with more efficient modern alternatives, but the switching and circuitry would remain the same. If however there is a long-term plan for the school lighting, then for little extra cost, each time a room is fitted with new lights, the circuits could be changed to allow for better daylight control: those near windows on different circuits to those further away. It is the school’s policy to add occupancy sensors, but perhaps it could also take the opportunity to incorporate daylight sensing photocell control.

Using this approach, the additional cost of evolving the lighting into something very efficient could be marginal, say £25,000. Although it might take a number of years to implement across the whole school, the room-by-room repayment period is likely to be around two years.

4.4 Seeking grants and support for capital investment

Some grants are available for implementing measures such as insulation. The Carbon Trust also has zero interest loads available for carbon reduction interventions. Some manufacturers also support schools in the implementation of energy saving devices, although care should be taken to ensure that the technology is appropriate. Energy companies such as EON and BP have in the past provided funding for initiatives to reduce energy in schools. Some councils have also funded additional metering of schools.

A further support may be through BAA, given the local impact of the airport on schools in Hounslow.

However, grants are notoriously time consuming to obtain and paperwork-heavy so they should be sought for the most capital intensive interventions.