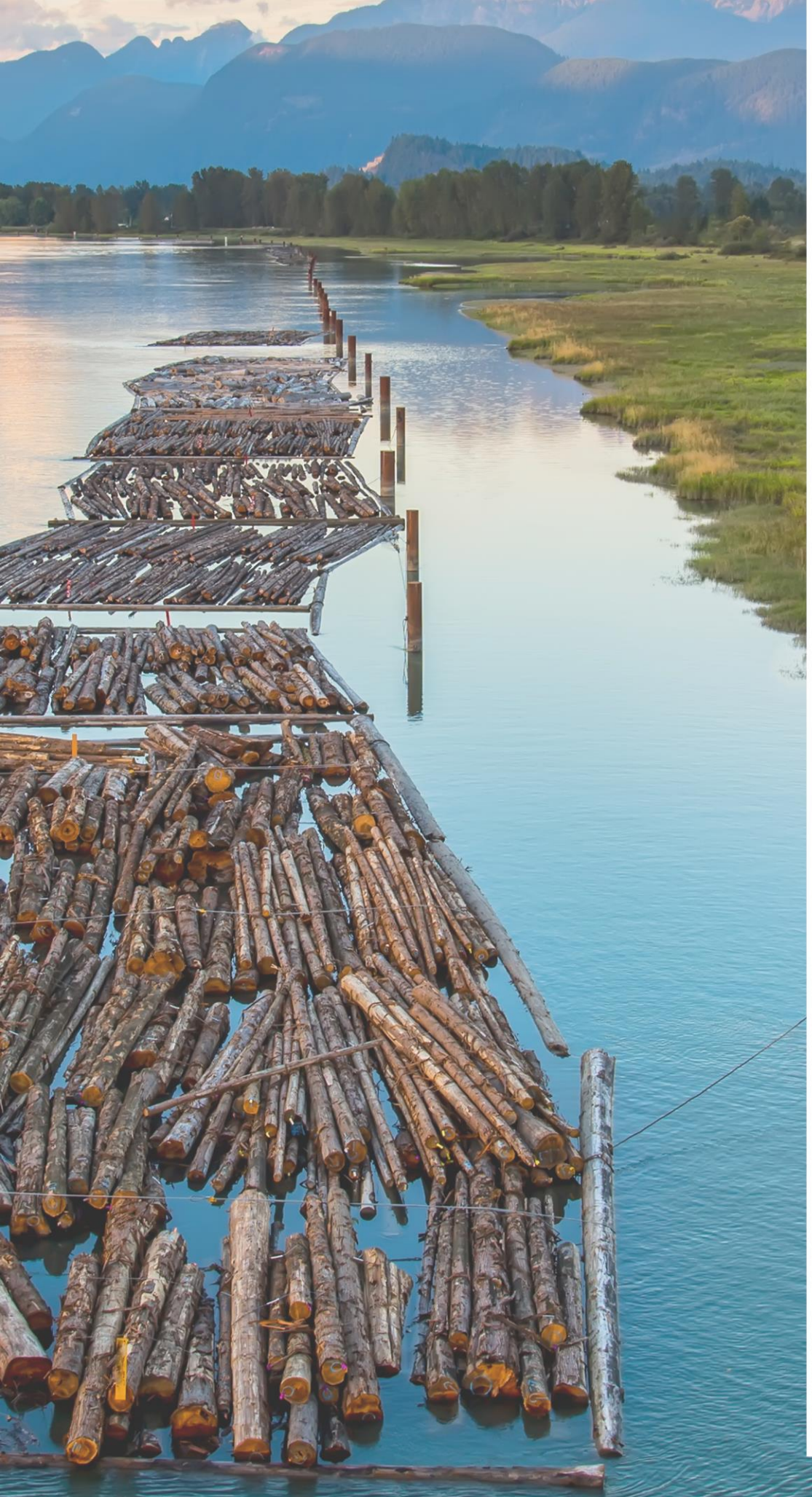

Schools' Guide To Energy Management Using DYNAMATlite

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Disclaimer

This publication is produced solely as a guidance document for Leicester BSF Phases 3 to 6 schools that are using DYNAMATlite for monitoring energy within their school buildings. While principles and fundamentals expressed in this document may apply to other schools that are using DYNAMATlite or any other energy monitoring systems, the authors (Leicester City Council and De Montfort University) take no responsibility for the accuracy of interpretation and/ or application of this document.

This document is based on the best knowledge available at the time of publication, however it is not intended to be exhaustive or definitive and it will be necessary for the users of this guidance document to exercise their own professional judgement when deciding on energy management actions for their schools. Users of this manual should be aware of all relevant building operational requirements that impact the warranties, health and safety, basic operational requirements and facility management of their school buildings before selecting any energy management actions. No responsibility of any kind for any injury, death, loss, damage or delay however caused resulting from the use of these recommendations can be accepted by Leicester City Council, De Montfort University and the authors or others involved in its publication.

This document is provided in conjunction with training and caution should be exercised when using this document in isolation. Users should contact the energy management team if they have any concerns about applying this guidance.

Authors

Charlotte Wood, Project Officer, Energy Management, Leicester City Council
Amrita Dasgupta, Strategy Lead Sustainability (BSF), Leicester City Council and Knowledge Exchange Partnership Associate, De Montfort University
Lee Jowett, Environmental Education Coordinator, Environment Team, Leicester City Council
Prakash Patel, Team Leader, Energy Management, Leicester City Council

For questions regarding DYNAMATlite and energy management please contact the energy team at energy.management@leicester.gov.uk
For questions regarding Eco-Schools, please contact Lee Jowett at Lee.Jowett@leicester.gov.uk

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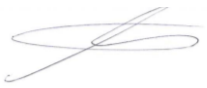
Foreword

Why is it important for schools to monitor and manage their energy consumption?

Energy costs in schools have a direct impact on education budgets. It can take revenue away from schools that could otherwise be used for educational purposes. Historically, the energy consumption in schools was dominated by heating and hot water demand. Modern schools are significantly better insulated and more airtight, as a result they have lower heating demand. However with the increasing amount of ICT, mechanical ventilation solutions and specialist lighting such as theatre and sports lighting; nationally there has been a trend of increasing electricity consumption in schools. The price of electricity is approximately 3 times higher than gas and as a result the effective energy costs are more.

In addition, school buildings can house a number of energy intensive spaces, such as kitchens and swimming pools. So, in effect while school buildings themselves are becoming more energy efficient, facilities and equipment being added to it means that there is an increase in total energy consumption and cost. Rising energy prices further exacerbate this issue.

By continuously monitoring and managing energy consumption, schools can reduce wastage and find savings that can positively contribute to their educational budgets. Further, schools have an ethical responsibility to instil an understanding and responsibility towards environmental issues within their students. Energy derived from fossil fuels is a key contributor to harmful carbon emissions which is having a detrimental impact on our climate. By reducing energy consumption schools lead by example, effectively bringing environmental issues into the curriculum and encourage students to participate in the process of energy reduction, schools will positively contribute to future change.



Chetna Patel-Liburd
Head of Service Strategy
Children's Capital
Education and Children's Services

Table of Contents

1. Useful Terminologies

1. **DYNAMATlite:** the online energy monitoring system that allows schools to view their energy consumption.

2. **Eco-Schools:** Eco-School is the largest sustainable schools programme in the world and is operated by 'Keep Britain Tidy' in England. It aims at empowering students to be the change our sustainable world needs by engaging them in fun, action-orientated learning.

   Each school follows a seven step change process and empowers their young people to lead processes and actions wherever they can. Over time and through commitment to the Eco-Schools seven step process, improvements will be seen in the learning outcomes, attitude and behavior of students, the local community and ultimately the local environment. Evidence of success in these areas will eventually lead to a school being awarded 'The Green Flag'. A project on energy is compulsory for schools aspiring to be Green Flag schools.

3. **Building Management System (BMS):** A building management system (BMS) is a control system that can be used to monitor and manage the mechanical, electrical and electromechanical services in a facility. Such services can include power, heating, ventilation, air-conditioning, and physical access control, pumping stations, elevators and lights.

4. **CHP:** Combined Heat and Power Units are a system that produces both heat and electricity. They have the ability to produce high quantities of renewable energy.

5. **Utility:** A commodity or service, in the case of energy management this will be your fuel type i.e. Gas, electricity, bio-diesel, oil or water.

6. **Utility Meter:** Meter recording consumption of the respective utility (gas, electricity, water etc.). Utility meters can be of two types:
   a. A **main meter** is the meter which your energy provider uses to calculate your bill. The majority of sites will have one main electric meter, one main gas meter and one main water meter.
   b. A **sub meter** is one that has been installed to monitor an individual part or service at your site e.g. kitchens, boilers, sports hall. The energy recorded by the submeter forms part of the energy recorded by the main meter.

7. **Virtual meter** is one which has been created online on DYNAMATlite by joining 2 other meters together. This may be due to a meter change at a certain point in time or to join a number of main meters together to give a whole site profile of a single utility. If you have a virtual meter and you are unsure why, please contact the energy management team.

8. **Heat Meter:** Heat meters are different from utility meters. They are used to measure the distribution of heat energy in heating and hot water systems. Depending on how the

meter is fitted on-site it may measure the heat in a particular heating circuit (heating or hot water), building (if there are more than one buildings on site), different heating sources (in case there is more than one heat source on site such as a set of gas boilers and district heating or bio-diesel boiler).

9. **Thermal:** The term 'thermal' meaning heat is used to describe the heat energy supplied to a building/school. This can be from a number of supply sources such as gas, biomass or oil. In DYNAMATlite there are meters measuring the gas consumption, the heat consumption and the oil consumption depending on your building systems and metering facility available on site.

10. **Cubic Meters (m^3):** The measurement unit for water. One cubic meter is equal to 1000 litres or 220 gallons.

11. **kWh:** Kilowatt hours – the measurement unit for heat, gas and electricity

12. **Baseload:** It is the constant part of the total load on a utility consumption graph. Further information can be found in Section 4: How to interpret graphs

13. **Occupancy Hours:** From the first person arriving in to the last person leaving the building, the occupancy hours refers to the period when the building is occupied. It is equal to core hours + additional school hours + community use hours.

    - **Core school hours:** School day
    - **Additional school hours:** Period of the day outside the school day when school staff are still in the building
    - **Community use hours:** Period of the day when the building is being used by the community

14. **Out of Hours:** The time period when the building is unoccupied. This is the opposite of occupancy hours. This will generally include:

    - Overnight energy consumption
    - Weekend energy consumption[1]
    - Holiday period energy consumption[1]

15. **Switch off/ Shut down procedure:** As a part of the energy management regime, a regular procedure undertaken by school premises teams that involves a step by step shutdown of non-critical mechanical, electrical and building systems and services.

16. **School walk-around:** A monitoring activity that is undertaken by school staff and/ or students to identify and where possible shut-down systems that have been unnecessarily left on overnight. Generally this would include lights, electronic equipment, ICT, any temporary heaters and fans etc.

[1] Weekend and holiday period energy consumption will be included in out of hour's consumption only if the building is unoccupied, i.e. there are no school or community activities being held in the building. If the building is occupied then this should be included in regular occupancy hour's calculation.

DYNAMATlite

2. Introduction to DYNAMATlite

DYNAMATlite is an online energy monitoring tool that helps users to visualise their energy use, identify issues and potential savings. Schools that effectively use and monitor DYNAMATlite regularly will be able to identify and eliminate energy wastage and subsequently reduce energy costs. Data and graphs generated by DYNAMATlite can be used immediately in the classroom. It allows students and staff to see the impact of behavioural change including switch off procedures almost immediately.

DYNAMATlite will also be remotely monitored by the Energy Management Team at Leicester City Council. The Energy Team use DYNAMATlite to collect information on obligatory national reporting, understanding the Local Authority's carbon footprint and supporting schools where possible by providing information on energy use, carbon emissions and potential energy savings.

How does DYNAMATlite work?

Equipment is attached to different energy meters (gas, electric, water etc.) which collects and records the energy consumption per half-hour. Once the information is recorded, they can be viewed by the user as graphs or as total consumption figures by logging on to the online platform with their unique login details (See Figure 1 below). Users can produce daily, weekly, monthly and annual graphs. They can also compare the annual consumption of the current year with that of the year before.

DYNAMATlite also has the ability to convert electricity and gas consumption to carbon emissions to help calculate the carbon footprint of the school. Additional features allow you to track energy consumption against an agreed target, download the raw data in Excel and calculate the approximate cost of your energy consumption over a given period.

These next sections will show you how to use DYNAMATlite, how to interpret your graphs and find common issues that may arise with energy consumption in your school.

3. How to use DYNAMATlite?

You can log onto DYNAMATlite by visiting https://DYNAMATlite.dynamatplus.co.uk/

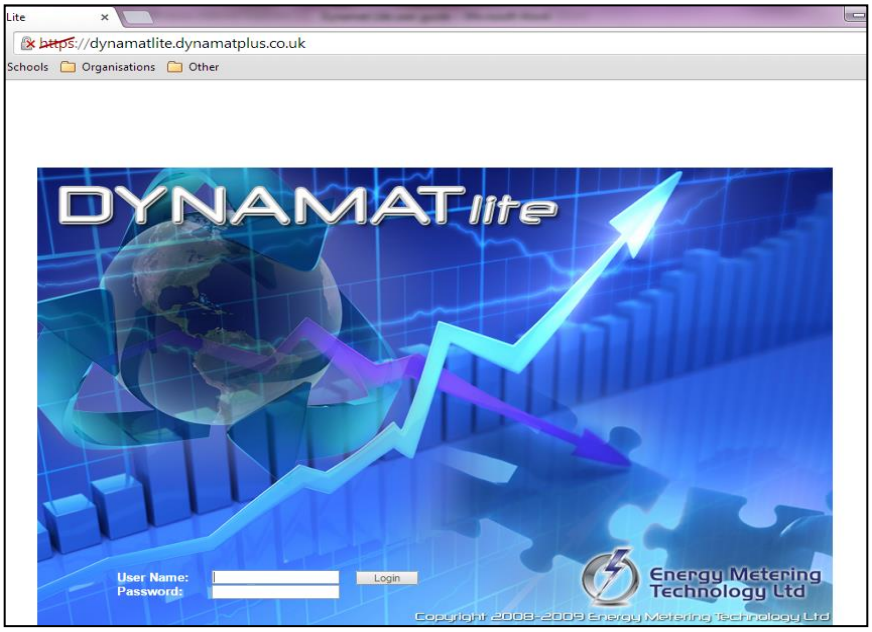


Figure 1: View of DYNAMATlite login page

Enter your school User Name and password (see page 3: School specific details) and click 'Login'. If you have forgotten your password then please contact the Leicester City Council Energy Management Team on energy.management@leicester.gov.uk

Refer to Figure 2 for a view of the DYNAMATlite homepage that you should expect to see. Click on the utility that you would like to look at (Gas, electricity, water or other).

Figure 2: View of DYNAMATlite homepage for your school

This will take you to a page (Figure 3) listing all meters for the utility selected. This only includes those meters that DYNAMATlite is monitoring for your school. If you have a corresponding utility meter that is not listed here then please contact the energy team at Leicester City Council at energy.management@leicester.gov.uk with the meter serial number.

Figure 3: View of DYNAMATlite page with hyperlinks to Utility Meters

You can identify here whether these refer to the main meters (M), a sub-meter (S) or a virtual meter (V). refer to key terminologies for details about these type of meters.

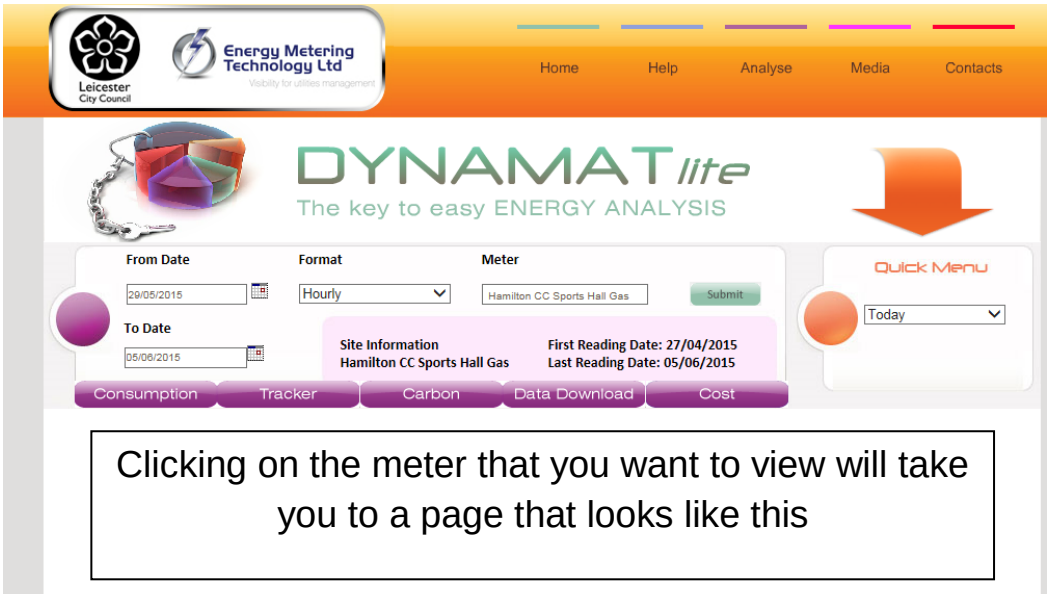


Figure 4: View of DYNAMATlite page for meters

At this point, users will need to select options for the dates (from and to) and the format that they want to view the information by. Refer to Figure 5 for further details. Continue to the next section on available formats to get a better understanding of the different formats you could use to view energy consumption data.

Options for viewing your school data

A typical DYNAMATlite output looks like this.

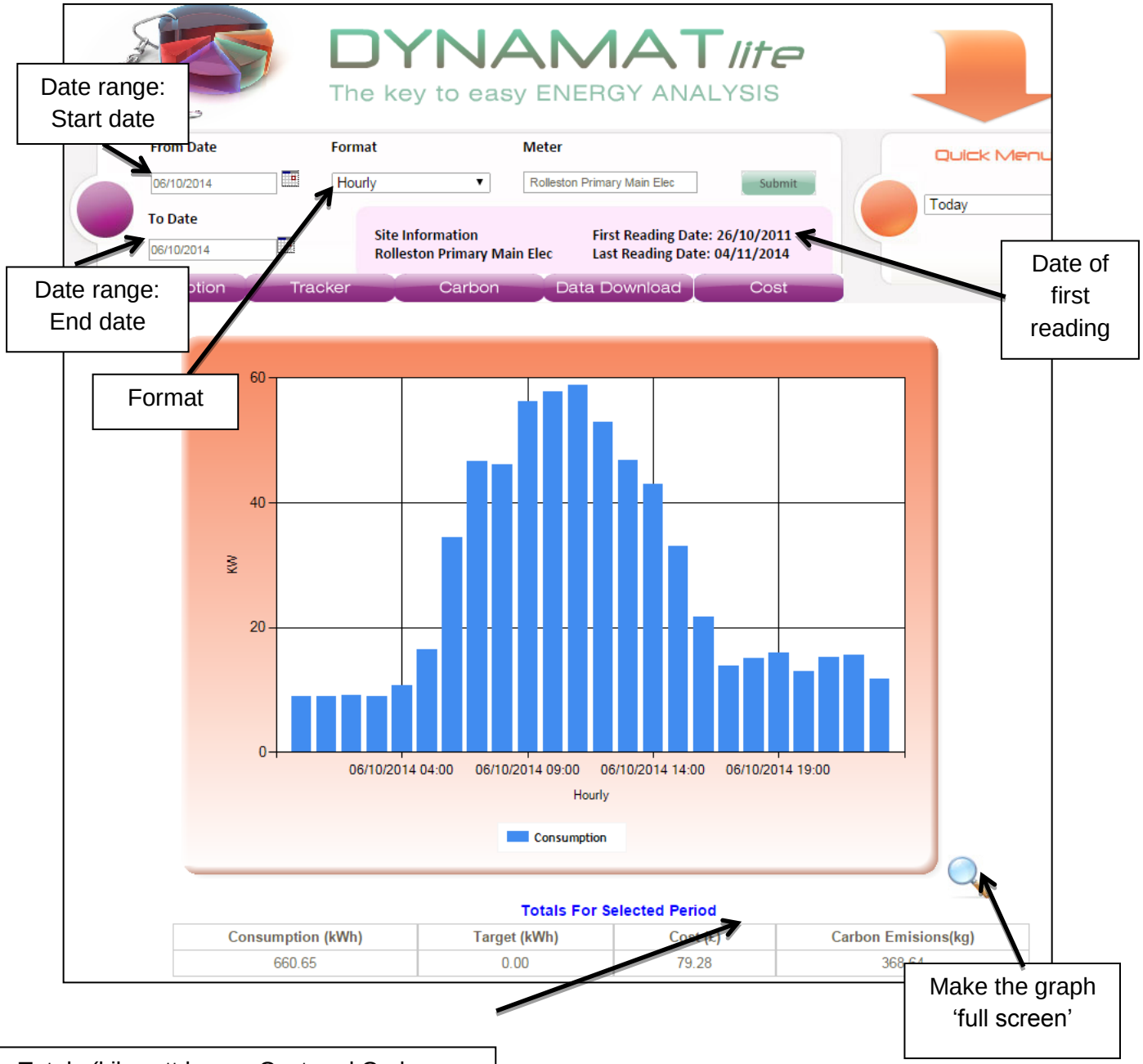


Figure 5: Directions for data input on meter page

Once you have selected the ‘From date’, ‘End date’ and ‘Format’, click ‘Submit’ to update the view. The visual bar chart is automatically updated.
You can view data hourly, daily, weekly, monthly & yearly.
Please Note: The more data you request, the longer it will take to return the results (i.e. hourly graph for a year will take longer to generate that hourly graph for a day).

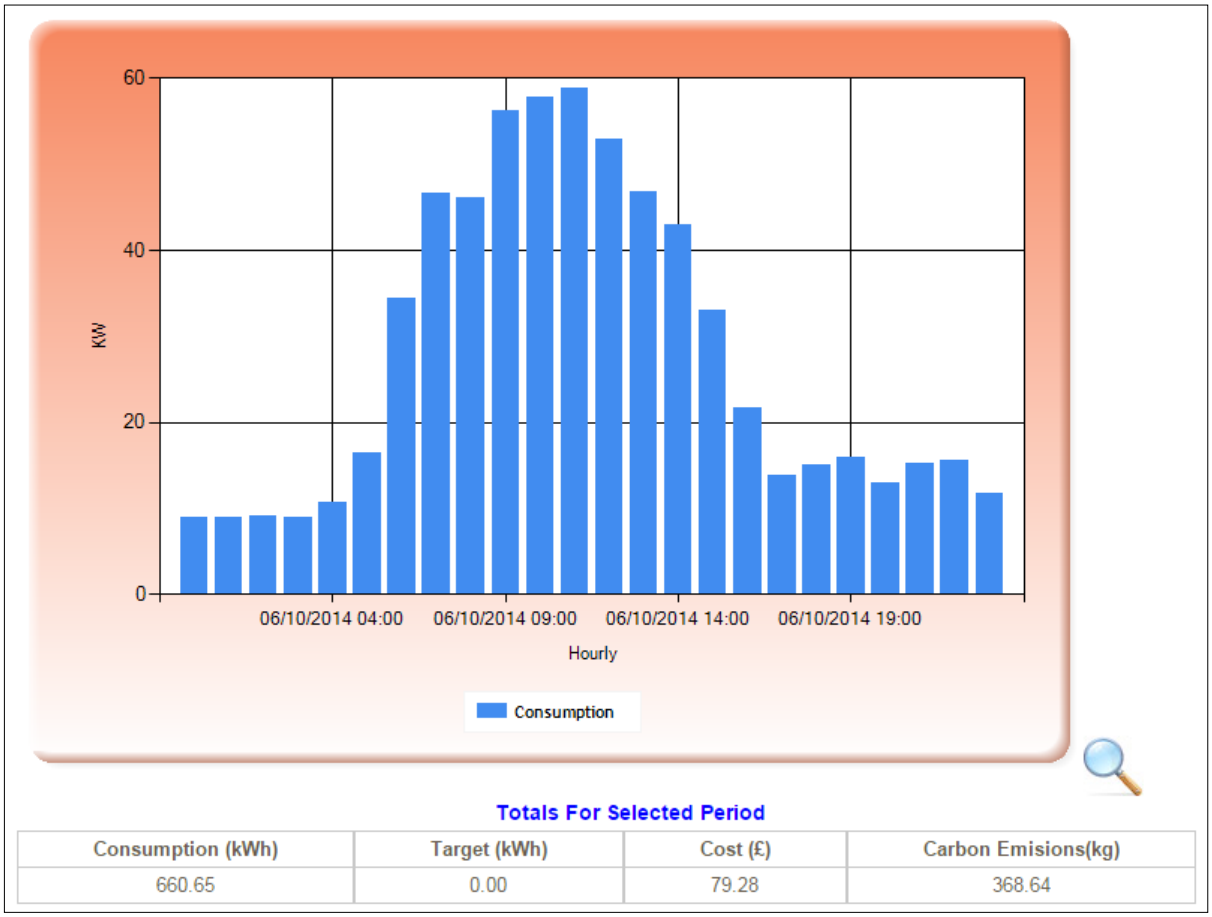
Available formats for viewing your school data:

You can view the same data in several ways:

- Consumption
- Tracker
- Carbon
- Data Download
- Cost

These are displayed below for one day to compare the presentation styles.

Consumption



Totals For Selected Period

Consumption (kWh)	Target (kWh)	Cost (£)	Carbon Emisions(kg)
660.65	0.00	79.28	368.64

Figure 6: Typical graph showing consumption over a day

Tracker

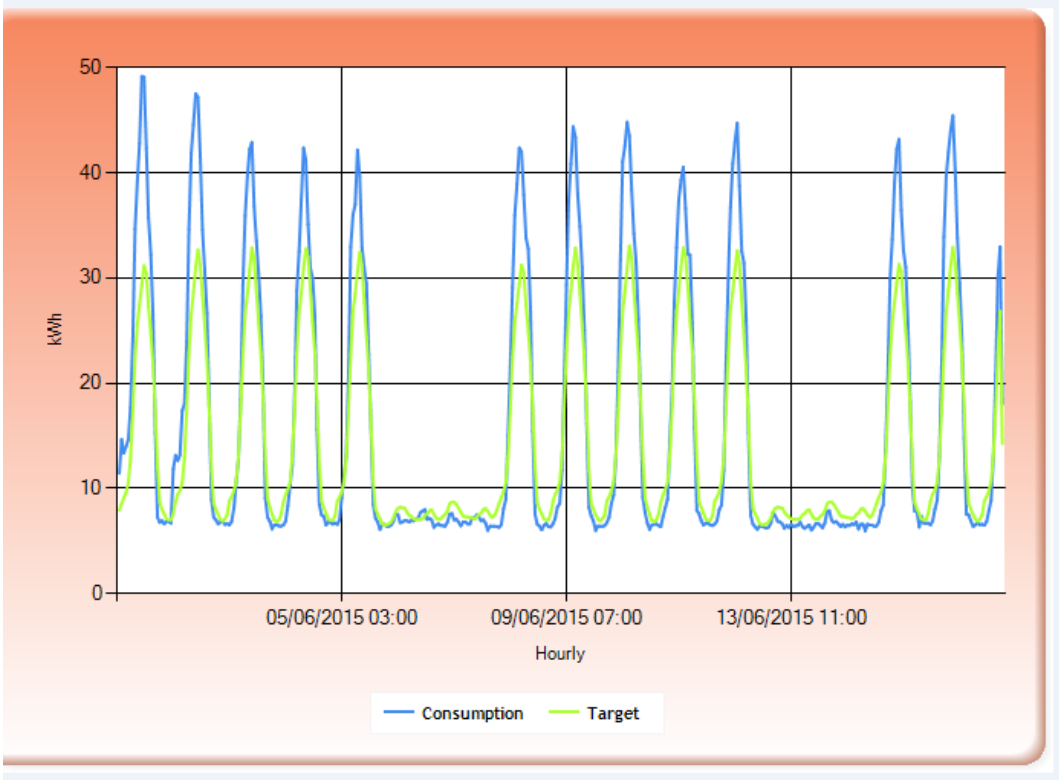


Figure 7: Typical view of page showing energy performance against set target

Carbon

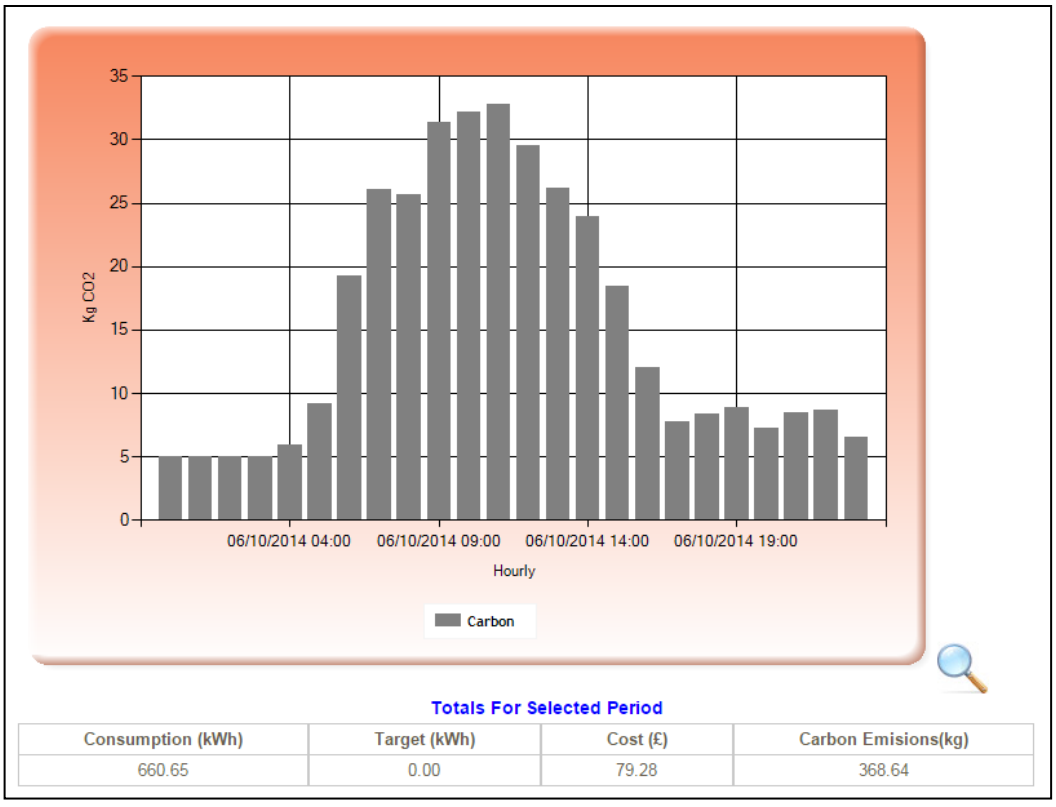
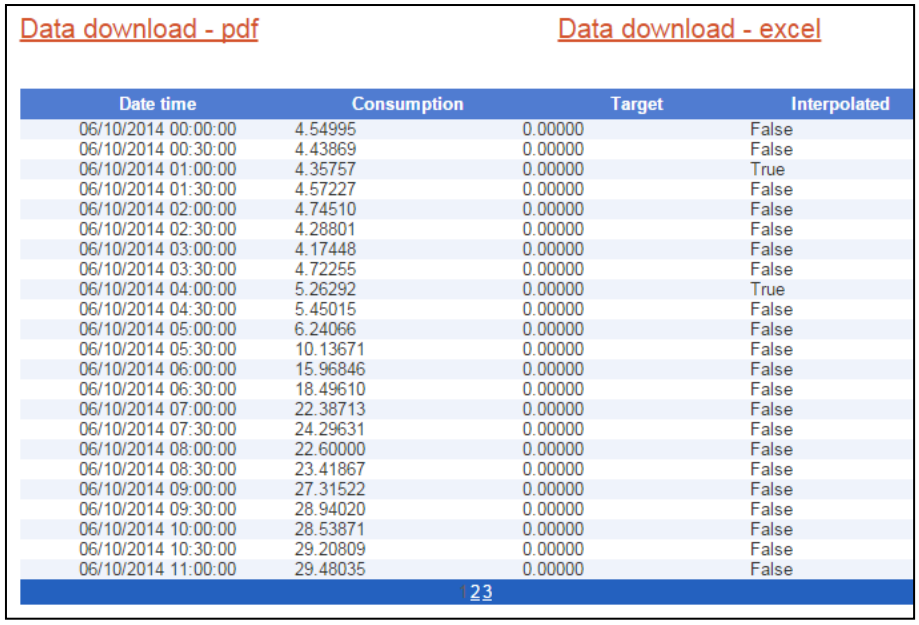


Figure 8: Typical graph showing carbon emission for the selected utility over a day

Data Download



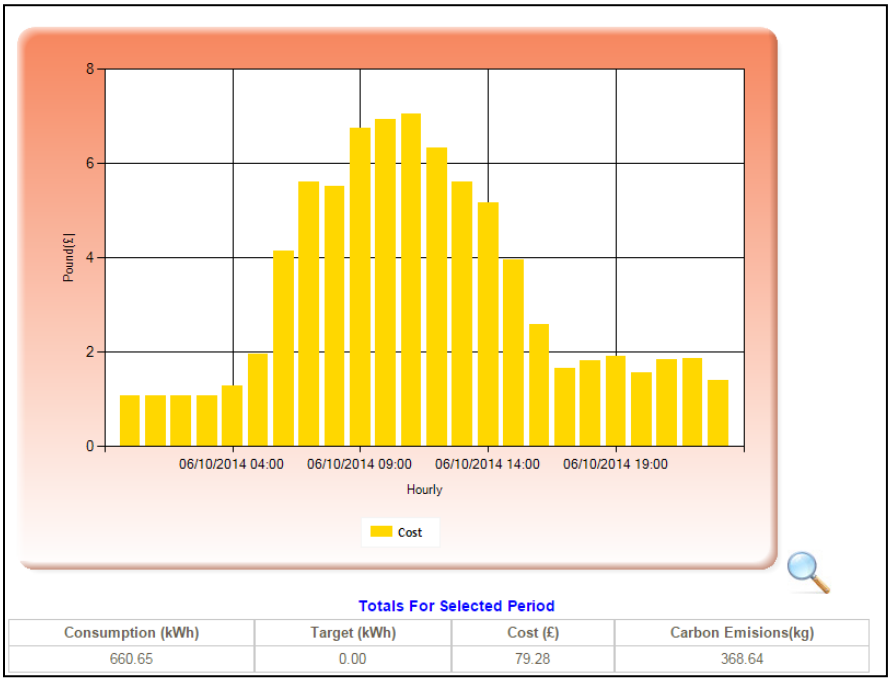
Data download - pdf Data download - excel

Date time	Consumption	Target	Interpolated
06/10/2014 00:00:00	4.54995	0.00000	False
06/10/2014 00:30:00	4.43869	0.00000	False
06/10/2014 01:00:00	4.35757	0.00000	True
06/10/2014 01:30:00	4.57227	0.00000	False
06/10/2014 02:00:00	4.74510	0.00000	False
06/10/2014 02:30:00	4.28801	0.00000	False
06/10/2014 03:00:00	4.17448	0.00000	False
06/10/2014 03:30:00	4.72255	0.00000	False
06/10/2014 04:00:00	5.26292	0.00000	True
06/10/2014 04:30:00	5.45015	0.00000	False
06/10/2014 05:00:00	6.24066	0.00000	False
06/10/2014 05:30:00	10.13671	0.00000	False
06/10/2014 06:00:00	15.96846	0.00000	False
06/10/2014 06:30:00	18.49610	0.00000	False
06/10/2014 07:00:00	22.38713	0.00000	False
06/10/2014 07:30:00	24.29631	0.00000	False
06/10/2014 08:00:00	22.60000	0.00000	False
06/10/2014 08:30:00	23.41867	0.00000	False
06/10/2014 09:00:00	27.31522	0.00000	False
06/10/2014 09:30:00	28.94020	0.00000	False
06/10/2014 10:00:00	28.53871	0.00000	False
06/10/2014 10:30:00	29.20809	0.00000	False
06/10/2014 11:00:00	29.48035	0.00000	False

1 2 3

Figure 9: Typical view of the page when trying to download consumption data

Cost



Totals For Selected Period

Consumption (kWh)	Target (kWh)	Cost (£)	Carbon Emisions(kg)
660.65	0.00	79.28	368.64

Figure 10: Typical view of page showing cost for utility per hour over a day

Exporting historical data

Data can be exported to use in excel from the ‘Data Download’ link. This can be extremely useful if you want to compare data from the same day, 2 years apart, for example:-

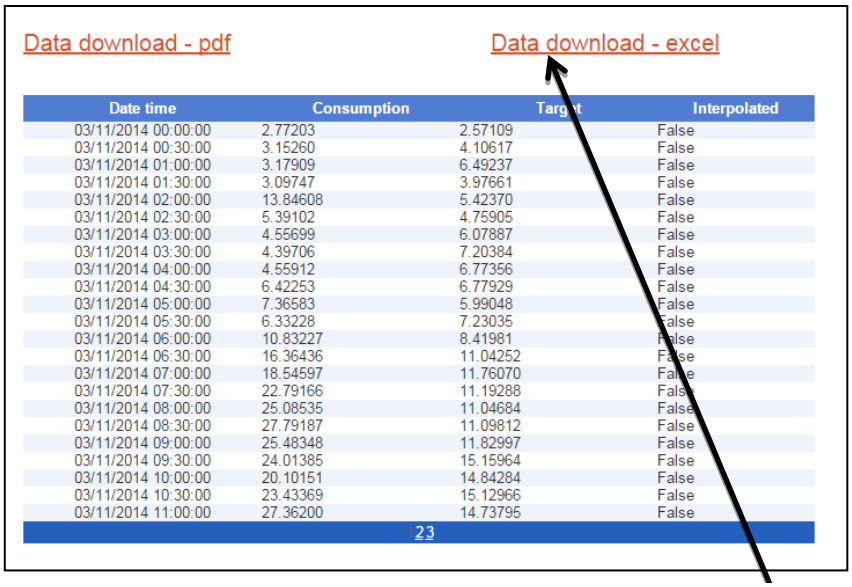


Figure 11: View of DYNAMATlite page with the "Data Download" Link

Above is a set of data for a day. Click the ‘Data download – excel’ to directly download in excel format. It can also be downloaded as pdf – however this cannot be edited or manipulated.

When Excel opens the data, it may state that the format is incorrect. Ignore this error and open the file.

Understanding Energy Graphs

4. How to Interpret Energy Graphs

This section outlines how to create, interpret and understand the graphs in DYNAMATlite. Start by looking at a typical graph showing hourly energy consumption over a week - an illustration of this is provided in Graph 1 below. This graph can be split into 2 parts:

1. **Occupancy hours consumption:**

   From the first person arriving in the morning to the last person leaving at night, this is the energy consumption of your school during the occupancy hours. For example for an electricity graph, this will include the obvious daily items such as lights, ventilation units, kitchen equipment and ICT equipment but will also include more subtle consumption such as pumps for the central heating system. In **Graph 1** below, the daily consumption is the spikes labelled **A**. In comparing two days if one day has had more daily consumption than the other then the width of this spike (W) will be more.

2. **Out of hours' consumption:**

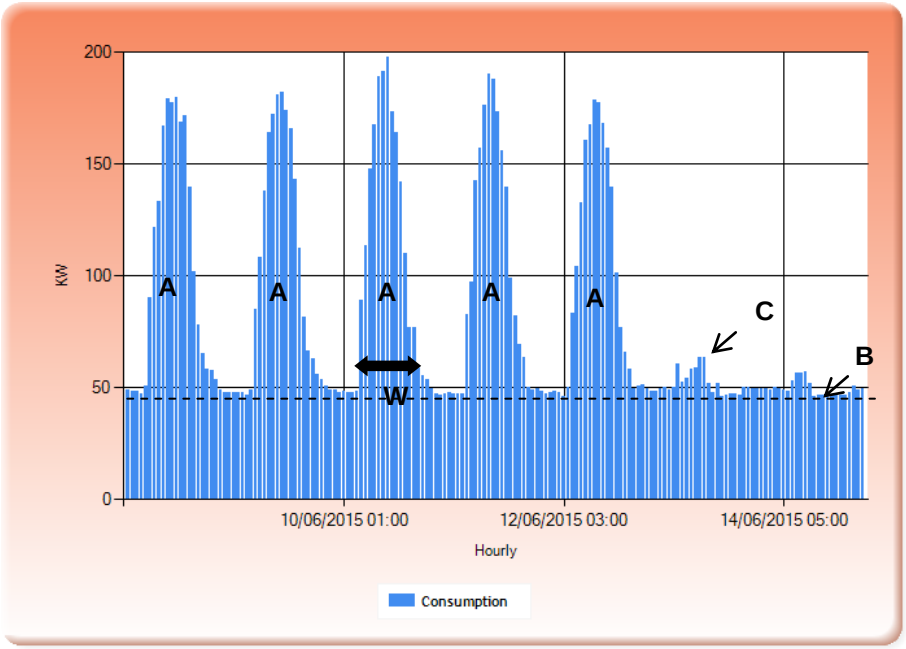
   Out of hours consumption is the energy consumed out of normal operational hours i.e. when the school is closed. The out of hours' consumption can be divided into 2 parts:

   2.1. Base load consumption (**B**):

   Base load is the minimum energy consumed regardless of whether the building is occupied or not. For example, for electricity this would include items that need to be left on 24x7 such as fridges and computer servers. In **Graph 1** below, the baseload of electricity consumption is labelled **B**. Ideally your baseload should only include those items that must be left on overnight for health and safety, security and building operational requirements.

   2.2. Increased out of hours consumption **(C)**

   These are increases in the baseload during the out of hour's period. These can be from systems timed to operate regardless of whether the building is occupied or not e.g. security lighting, frost protection systems or hygienic flushing of water systems. The out of hours increase is labelled **C** in **Graph 1** below.

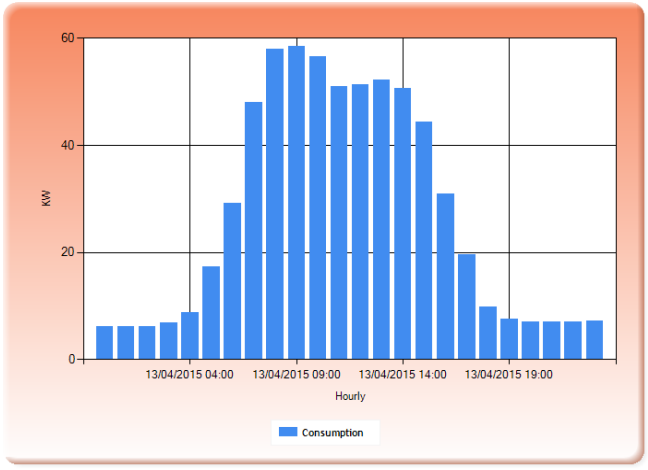


Graph 1: Typical electricity profile for 1 week

To understand your buildings try drawing the following 3 graphs:

1. One Day – input one day into the date range and keep the graph hourly

By looking at a single day you can see when the energy increases in the morning and the decreases at night take place. For electricity and water this is a good indication of when the building is occupied in the morning and vacated at night. You may also see peaks and dips in the graph through the day as demand changes e.g. electrical items are turned off at lunchtime or water consumption increases at break time.

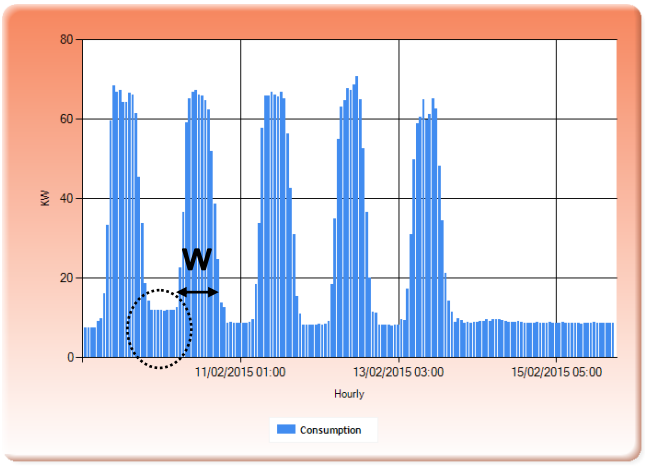


Graph 2: One Day Consumption Graph

For thermal requirements, you will often see an increase earlier than the first occupancy hour as building heating system is ensuring that the building is up to temperature in the morning. The thermal consumption will also often stop before the end of occupancy hours as the building is already up to temperature by then. This is unless your heating and hot water are combined in the same system, in which case the consumption may continue until the building is unoccupied.

2. One Week – input a Monday to Sunday into the date range and keep the graph hourly

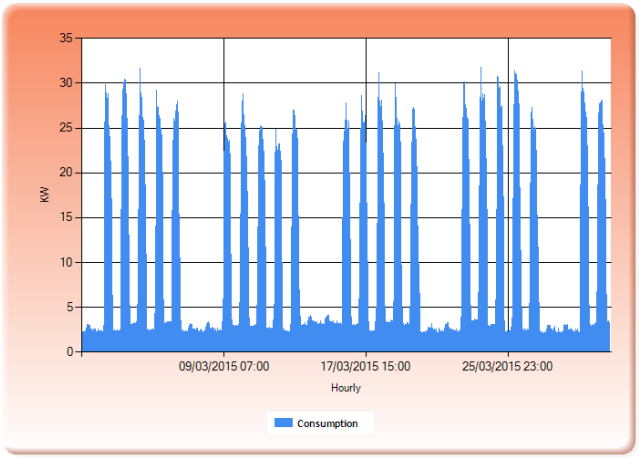
A weekly profile shows the difference between the energy used each day, at the weekend and each night. If you have had community use on a specific day, then you will notice that the stop time is different and the width (w) of your daily consumption spike is more. But this could also be due to night time consumption if items are being left on. This can be seen between Monday and Tuesday where the baseload has increased due to overnight consumption.



Graph 3: One Week Consumption of Electricity

Graph 3 shows a typical electricity graph with both occupancy and out of hour's consumption. A thermal consumption may resemble an electricity graph in the winter months. However, thermal consumption can vary due to external temperatures i.e. during the winter months or if it is colder at night or during the day, the thermal consumption will increase. Again, ideally water consumption should show no baseload.

3. One Month – input the first & last day of a month into the date range and keep the graph hourly



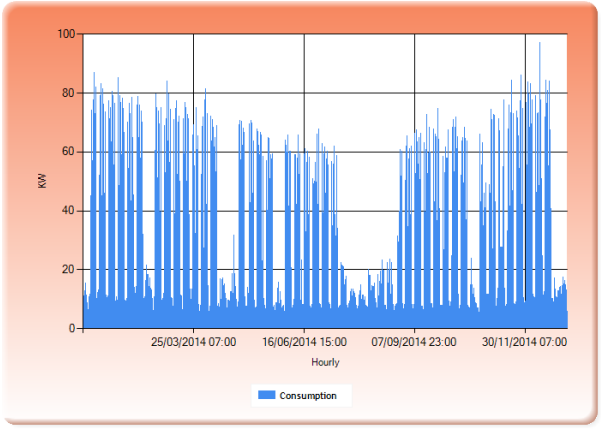
Graph 4: One Month Consumption of Electricity

A monthly profile can show how the weeks compare against each other both for daily consumption and for night time consumption.

You might see that as the days get warmer and lighter the electricity decreases and when the days get colder and darker the electricity increases (except where there is air conditioning which increases electricity consumption on warm days).

4. One Year - input the first & last day of a month into the date range and change the graph to daily

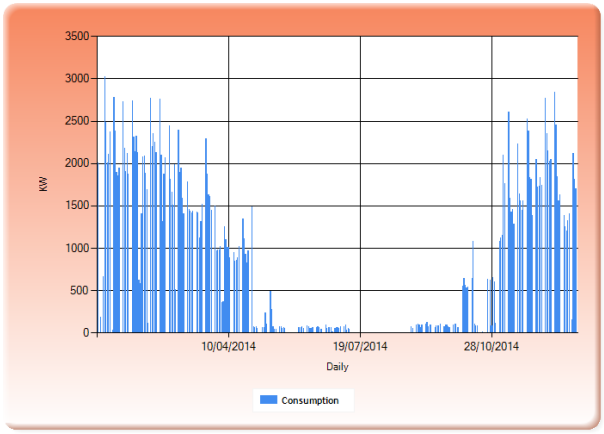
An annual graph is a good way to see how your energy consumption changes throughout the year. You will see a different profile for each of the utilities.



Graph 5: Annual electricity consumption graph

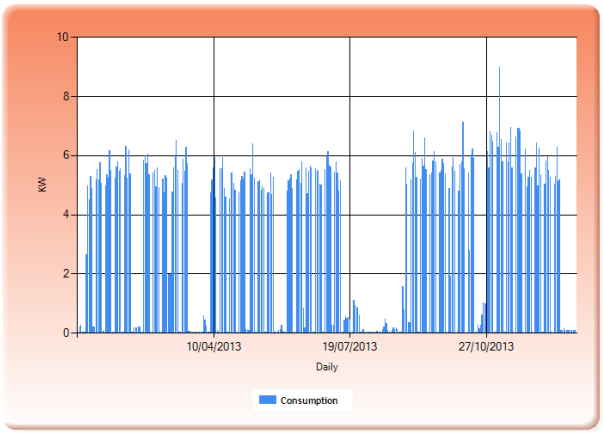
A 'best practice' annual electricity profile will show increases in consumption during the darker, colder winter months as well as gaps for the holiday periods.

Users can sometimes expect to see a baseload for electricity consumption throughout the year.



Graph 6: Annual thermal/ heat consumption graph

Ideally the thermal /heat profile should show consumption from September through to July with zero consumption over the summer holidays. However some sites may require summer hot water and will still see heat demand during this period e.g. swimming pool or community use. You may also see a small baseload during the very cold periods for frost protection purposes.



Graph 7: Annual water consumption graph

For water consumption, there should be a steady level of consumption throughout the year. There should be no baseload at all and the consumption should be zero when the building is unoccupied during the holiday periods.

Top Tips for Interpreting Graphs in DYNAMATlite:

- For daily, weekly or monthly profiles draw the graph using hourly data. For periods of 4 months and over, it is better to draw the graph using daily data. You can also draw the graph using monthly or yearly data if you wish to compare longer periods of energy consumption.

- Try creating a graph that includes a bank holiday Monday to see what electricity your building consumes on a weekday when it is closed.

- Have a look at the difference in your daily thermal consumption in summer and winter to see how your building consumes heat. During the winter you might see a baseload of heating consumption as the heating system is ensuring that the building does not drop below a set internal temperature to prevent damage from cold weather – this is known as frost protection. In the warmer months, you should see no heat baseload and a reduction in thermal loads as the weather gets warmer and the only requirement is for hot water.

- Some heating systems will be designed to consume low levels of heat out of hours. This could be the case in buildings with underfloor heating which can take longer to heat but requires a lower overall temperature. Some systems, such as combined heat and power units might perform more efficiently if run for longer.

Part 1: Electricity

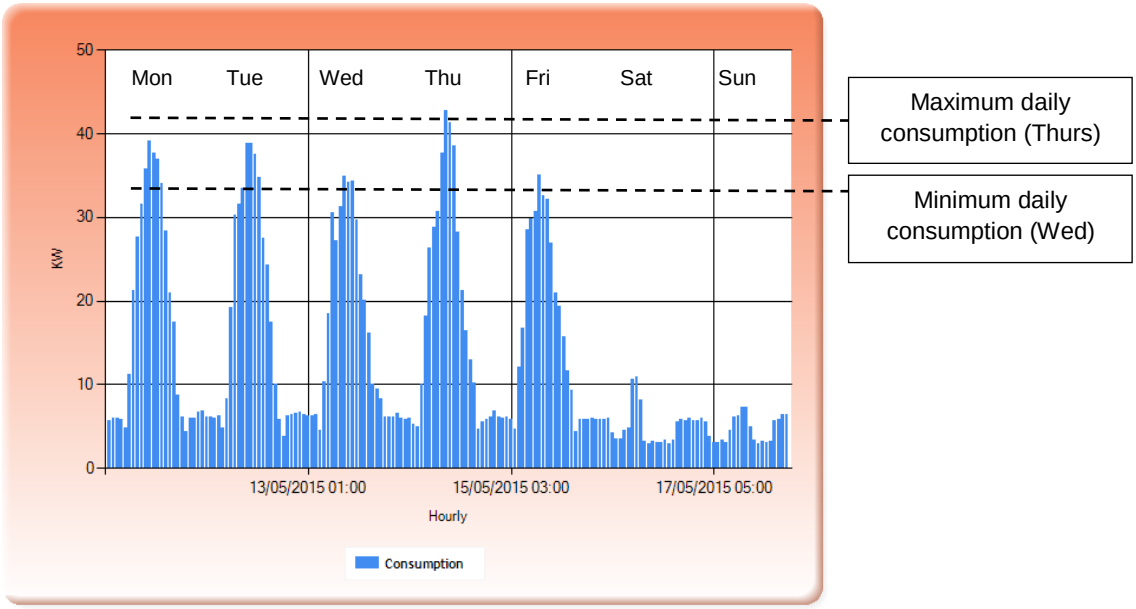
5. Part 1: Electricity

Section A: Identifying key issues with electricity consumption

There are a number of common issues that arise with electricity consumption that may lead to wastage, high consumption and increased costs. The sections below will help identify these issues and suggest solutions.

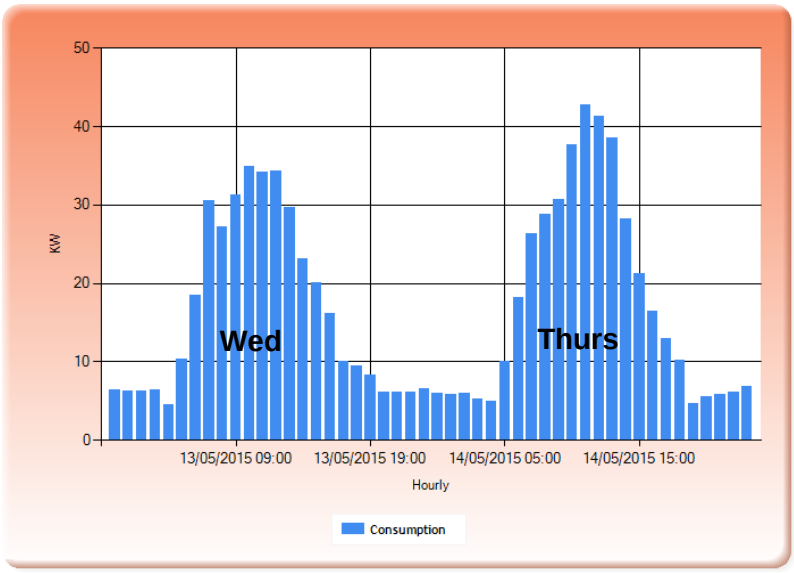
Issue 1: Fluctuating Consumption during Occupancy Hours

Often, during the occupancy hours there is higher energy consumption on some days compared to others. Sometimes the daily consumption lasts longer than other days or the energy at the beginning of the day starts earlier. In this graph, the electricity consumption levels are higher on the Monday than the rest of the week.



Graph 8: Fluctuating Daily Electricity Consumption

Looking at Wednesday and Thursday more closely there is an obvious difference between the 2 days. Although they both start at 5am and end at 6pm, the Thursday energy use is higher for every hour of the day compared to Wednesday. This type of graph is good for seeing where in the day the electricity use is highest or lowest – does it show a drop at lunchtime when classrooms are empty? Does the electricity use reduce at the end of the school day when the children leave? At what time of the day is the most electricity used and why?



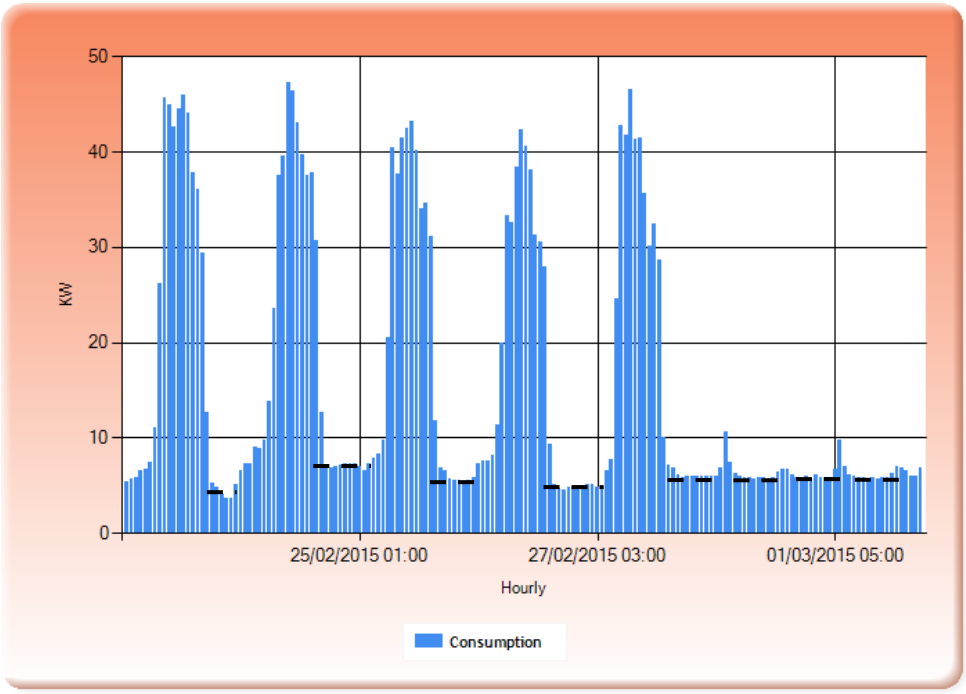
Graph 9: Two Days Electricity Consumption

Issue	Possible Cause
Higher overall consumption levels on a particular day	Some days might have higher consumption if there is higher activity onsite e.g. extra classrooms used, theatres in use, specialist equipment in use.
Consumption does not show dips at breaks, lunch or at the end of the day	There is no difference between the times when lessons are occurring and when they are not. Lights, computers, extractor fans and other electrical equipment are being left on or not switching off automatically.
Higher electricity consumption at the beginning of the day (one-off)	The schools may be opened earlier for a one-off reason e.g. contractors or cleaners on site. Timer settings for heating/lighting may have been altered.
Higher electricity consumption at the beginning of the day (regular)	If the high consumption is happening weekly it could be due to altered settings for the heating and lighting systems.
Higher electricity consumption at the end of the day (one-off)	The schools may be opened later for a one-off reason e.g. contractors or community use. Items may be left on until the premises officer closes up the building e.g. computers not shut down or failure of lighting occupancy sensors
Higher electricity consumption at the end of the day (regular)	If the high consumption is happening weekly it could be due to settings for extended school hours being left in the system or a difference in the shutdown procedures for particular days. External/security lighting systems may have been altered.
Large spike for 1 hour in the day	This could be the result of a particular intensive piece of equipment being used e.g. theatre lighting or a fault occurring causing a large number of items to be turned on unexpectedly e.g. failure of lighting daylight sensors causing all lights to be turned on.

See Part 1 Section B – Occupancy Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 2: Changing Out of Hours Baseload

The graph below shows that the baseload of electricity varies each night of the week (dashed lines). It means that items are being shut off on some nights but not others. Monday night see the lowest consumption at 4kW per hour and Tuesday night has the highest consumption at 7kW per hour. Is this is continuing throughout the year it can lead to significant electricity waste.



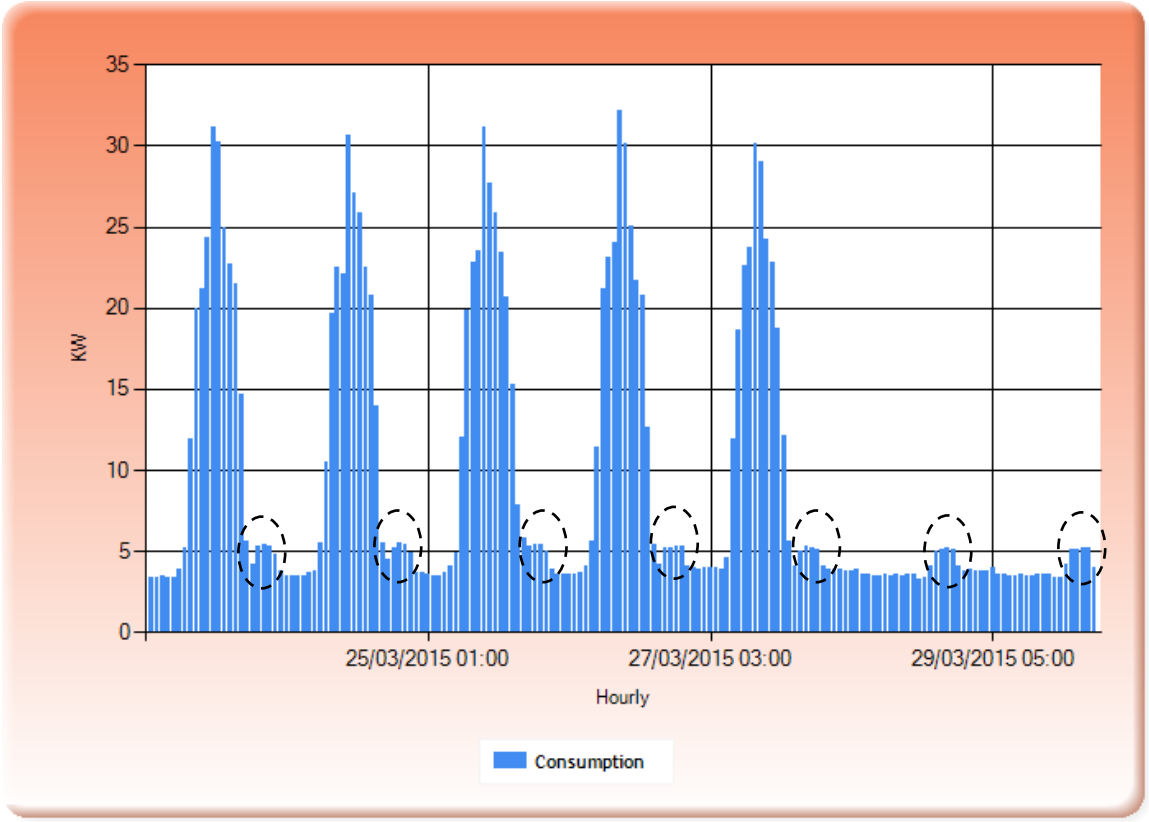
Graph 10: Fluctuating Electricity Baseload

Issue	Possible Cause
Electricity consumption higher overnight on some nights rather than others	Formal "Switch Off" procedures not in place meaning some items are left on.
	Extractors being left on in classrooms
	Classroom lights being left on due to failure of occupancy sensors.
	External and security lights being turned on some night and not others
	No formal shut down for ICT systems meaning they are turned off on some nights and not others
Electricity consumption higher on weekday nights compared to weekends	A different shut down procedure is occurring on a Friday night compared to other weeknights leading to lower energy consumption over the weekend. Investigate a formal shut down that can be replicated for every night of the week.
Baseload suddenly increases up and doesn't return to lower levels the next night	Failure of an electrical item to switch off e.g. lighting, extractor fans, emergency lighting, ICT

See Part 1 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 3: Increased Out of Hours Consumption

Out of hours consumption is where there are increases in consumption outside of the normal working hours e.g. before 7am and after 6pm. These increases may be regular (e.g. every day, once a week) or a one-off. In this graph there is a regular increase in electricity consumption in the evenings each night when the building is unoccupied (circled). This might occur for the same hours throughout the year or increase in the winter months.



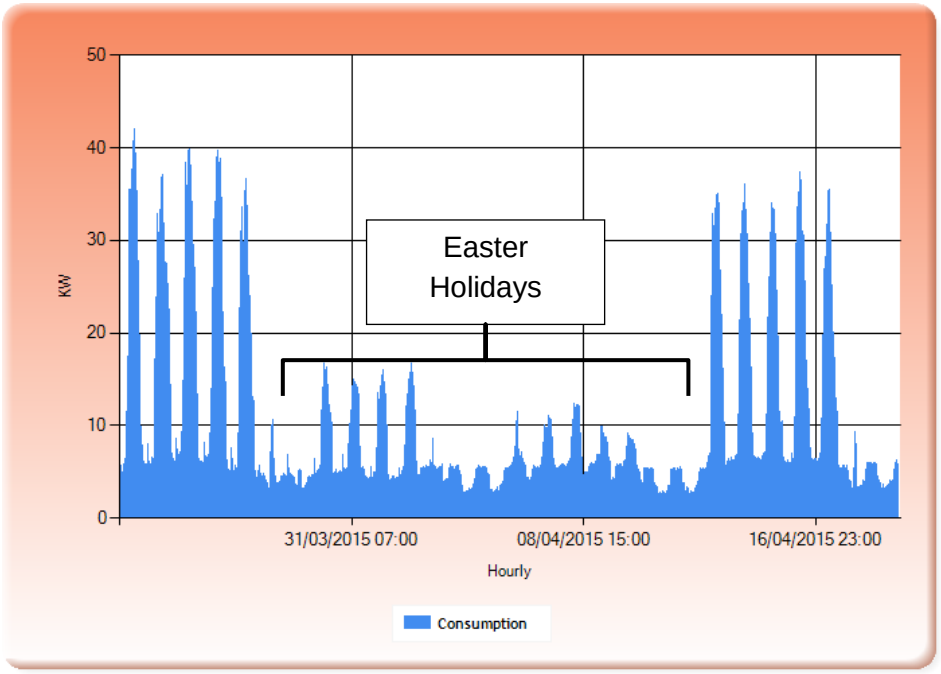
Graph 11: Out of Hours Electricity Consumption

Issue	Possible Cause
High out of hours consumption in darkness hours only	Operation of security or external lighting. If frequent occurrence, check timers to ensure that they are set correctly
High out of hours consumption in the winter months, occurring mainly in the early morning before the building opens	Operation of heating pumps under “frost protection” which ensures that the internal temperature of the building does not drop too low to damage building services. Check the frost protection settings in BMS
Out of hours consumption that reoccurs regularly	Operation under a time switch control e.g. computer updates, pool cleaning cycle
	Extended school hours or unusual building use.
Regular out of hours consumption occurring throughout the year	Operation of electrical equipment under time switch control e.g. dishwashers or lab equipment on timers to take advantage of cheaper night-rate electricity.

See Part 1 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 4: Holiday Consumption

School holidays are a good time to see how the building uses when it is unoccupied. The building management systems in schools have the ability to programme in holiday settings to achieve lower energy consumption when the building is unoccupied. The graph below shows a school shut down period during the Easter holidays where the daily energy consumption over the holidays fluctuates each day. There might be a number of reasons for this.



Graph 12: Holiday Electricity Consumption

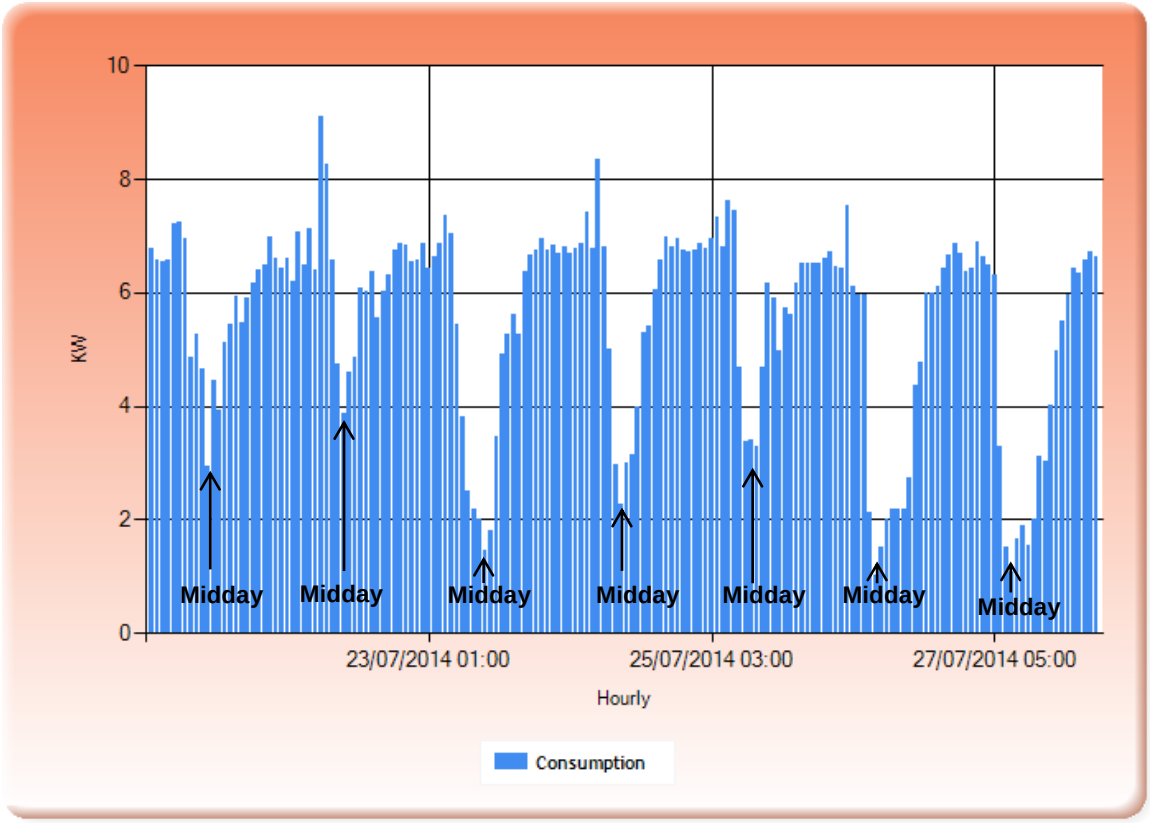
Issue	Possible Cause
Higher spikes in electricity consumption than expected during school holidays. Spikes vary each day	Building may still be occupied. Check with the premises officer to see if the building was opened for any reason e.g. contractors, staff working, community use or special events.
Higher spikes in electricity consumption than expected during school holidays. Spikes same level each day	Heating working to normal occupancy hours. Check to see if the building heating and hot water systems had been turned to holiday mode or not. If not, put procedures in place to operate holiday mode when appropriate.
	Operation of electrical equipment under time switch control. Check all items that have a time switch setting
Baseload over holidays higher than expected	Not all systems have been switched off on the last occupied day before holiday time e.g. extractor fans

See Part 1 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 5: Impact of Solar Renewable Energy

Many schools in Leicester have solar panels installed on their rooftops. These will generate electricity from the sun which is then fed into the school, with any excess usually sold back to the grid. This means that less electricity is needed to be used from the national grid, supplied through the main electricity meter.

This solar power will mean that at peak sunshine hours, the graphs on DYNAMATlite will show less consumption. This is usually hidden during term time due to the consumption by building occupants. However if you look at the summer holidays you may see that at around midday the electricity consumption dips.



Graph 13: Impact of solar power on electricity consumption

If you do not see these dips in the summer months then there might be a problem with your solar energy system. In this case we recommend taking manual readings from the solar meter (an energy meter that measures the amount of power generated from the solar panels) to see if there is any change.

Section B: Developing an Action Plan to Reduce Electricity Consumption

If you have identified electricity wastage in your school from the DYNAMATlite graphs, or if your school consumes more than 51 kwh/m^2/annum, you should use the following guidelines to develop an action plan to tackle this.

1. Occupancy Hours

Electricity management issues during occupancy hours can be further broken down into electricity consumption during core school hours, additional school periods or during community use.

1.1. During **Core School Hours** most of the electricity wastage will come from lights and equipment being left on when not in use or when occupants have left the room.

Consider **active labelling** of switches to encourage occupants to switch lights and equipment off when not in use. Refer to **Appendix D** for guidance.

Regular scheduled walk- around should be carried out to identify areas where lights and equipment's are being left on. This should specifically include the following check points:

- Early morning – to identify wastage overnight
- Lunch-time to encourage staff and students to shutdown lights and equipment in areas when not in use
- At the end of school hours

Refer to **Appendix C** for guidance on developing scheduled walk around checklist and procedure.

1.2. During **additional school periods** most of the electricity wastage will come from either one of the following:

- Lights being left on – use **active labelling** to encourage staff to switch off lights. Refer to **Appendix D**.
- ICT, electronic equipment, local electric heating or fans, room extract fans being left on when not in use - use **active labelling** to encourage staff to switch off equipment where possible. Refer to **Appendix D.** Active student campaigning and monitoring can also support with changing behaviours around use.
- BMS linked ventilation systems still running in rooms that are unoccupied. Refer to **Appendix B** for guidance

To identify if this is an issue for your school review weekly consumption graphs. Good practice is to see, a drop in energy consumption at the end of core hours. If you don't see a drop then this represents an issue with additional school period energy consumption. Conduct an after-hours walk around to develop a switch-off procedure for all equipment and lights that can be locally switched off (Refer to **Appendix C**).

1.3. Electricity wastage during **community use periods** can similarly be attributed to lights, equipment and BMS linked systems being left on and should be addressed similar to additional school periods. To identify if this is an issue for your school

review weekly consumption graphs. Good practice is to see, a drop in energy consumption at the end of additional school hours. If you don't see a drop then this represents an issue with energy consumption during community hours.

An additional issue to consider is your **community use**. It is a common mistake to have the heating, lighting and ventilation for the entire building switched on, even if only a small part of the building is being used. In schools where this is not pro-actively managed, large amount of energy and money can be wasted. To avoid this it is crucial to develop a community use energy management strategy. Some tips to develop this are:

- Cluster all areas/ rooms where community use takes place to avoid having to heat, light and ventilate large amount of access corridors.
- It is preferred if the community access is located close to your community use area to avoid having to heat, light and ventilate large amount of access corridors.
- Identify all areas/ rooms and BMS linked ventilation units that are not used during community hours. Develop a shutdown procedure for this and add it as an action point to your energy management plan.

2. Out of Hours

Electricity consumption out of hours can be attributed to energy consumption of lighting, equipment and BMS linked ventilation/cooling units being left on when the building is not occupied. This effectively contributes to increasing the baseload of electricity consumption in the building and can be one of the most significant contributors to high energy cost. To address issues of out of hour's consumption, it is recommended to break it down into four components:

2.1. **Critical systems** including lighting and equipment that must be left on for health and safety, security and facility management requirements. These might include external lighting, security lighting, certain pumps, hot water systems and other building service components. In the first instance it is important to identify these and label them to ensure that they are never switched off without prior consent of appropriate individuals. Identify this clearly in your action plan. Also ensure that the settings for critical systems such as external lighting and security lighting are always up to date.

2.2. **Weekdays out of hour's wastage:** You can identify energy wastage by comparing electricity baseload during weekdays compared to weekends. If your baseload is higher during weekdays as compared to weekends, this indicates that energy could be saved over weekdays. In your action plan consider including a weekly review of out of hours energy consumption. This should cover the following two objectives:

- Review the BMS to ensure all mechanical and electrical systems including AHU (Air Handling Units), HRU (Heat Recovery Units), Kitchen Extract Systems and all other items that can be switched off are scheduled to switch off as soon as occupants leave the building (Refer to **Appendix B** to identify more BMS related items that can be switched off)

- Conduct an out of office walk around to identify lighting and equipment that is being left on by users and develop a strategy to reduce wastage (Refer to **Appendix C**)

2.3. **Weekends out of hour's electricity wastage:** Unless your school has weekend community use, your consumption should completely drop to the minimum baseload. Even if the school has community use your consumption should be lower than weekdays, since only a part of the building should be used. If either of the following is not satisfied then a shutdown routine is necessary. Refer to **Appendix C** for guidance.

2.4. **Holiday period:** In your action plan include a formal holiday shutdown protocol. Include check points before the holidays to ensure these have been set and after the holidays to review if things shutdown as expected. This checklist should include:

- Review of your BMS settings applicable mechanical and electrical systems including AHU (Air Handling Units), HRU (Heat Recovery Units), Kitchen Extract Systems and all other items that can be switched off are scheduled to switch off. (Refer to **Appendix D** to identify more BMS related items that can be switched off)

- Conduct a school walk around to ensure lights, all additional electronic and ICT equipment have been shut down as per your shutdown protocol.

Part 2: Thermal

6. Part 2: Thermal

Part A: Identifying key Issues with Thermal Consumption

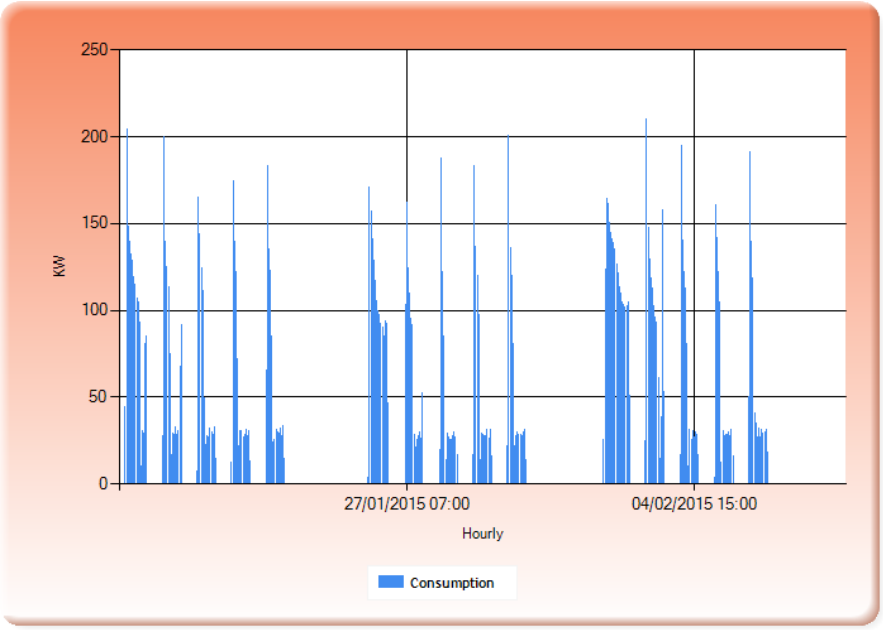
The term 'thermal' relates to the heat consumption at your site. This can be from a number of sources such as gas, biomass, bio-diesel or oil. In DYNAMATlite there are meters measuring the gas, heat and oil consumption depending on your building systems.

Bio-diesel/ Gas can be used at a school for a number of reasons – space heating, hot water demand, cooking and in science laboratories. Oil is used primarily for heating and hot water but can also be used to produce both electricity and heat through boilers or a system called combined heat and power (CHP). There are also a small number of sites which share boiler systems between 2 schools.

There are number of issues that can occur with heat, gas and oil use. These are explored below

Issue 1: Fluctuating Consumption during Occupancy Hours

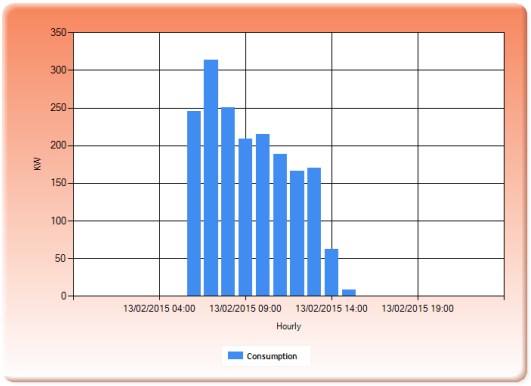
Usually, the thermal demand for a building is directly related to the outside temperature. For this reason you should see higher gas/heat/oil consumption on colder days. In the graph below it is obvious that more heat is required to heat the building on Mondays because the building is at a lower start temperature due to being unheated at the weekends. However if you see a difference in the heat required each day that is not weather related, it might mean that there is an issue with the building heating system.



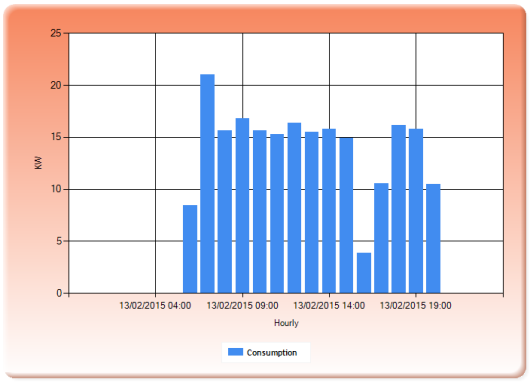
Graph 14: Higher Gas consumption on Mondays

Thermal demand during the day has a typical profile. There will be a large amount of consumption first thing in the morning, 2-3 hours before first occupancy. This shows the building getting up to temperature. The profile will then steadily decline throughout the day as less heating and/ or hot water is required. This is shown in graph **Graph 15**. **Graph 16**

shows a non-typical profile where there is a dip in heat consumption in the afternoon followed by higher consumption in the early evening. This could be typical of a building being fully open in the evening.



Graph 16: Typical day profile



Graph 15: Non-typical day profile

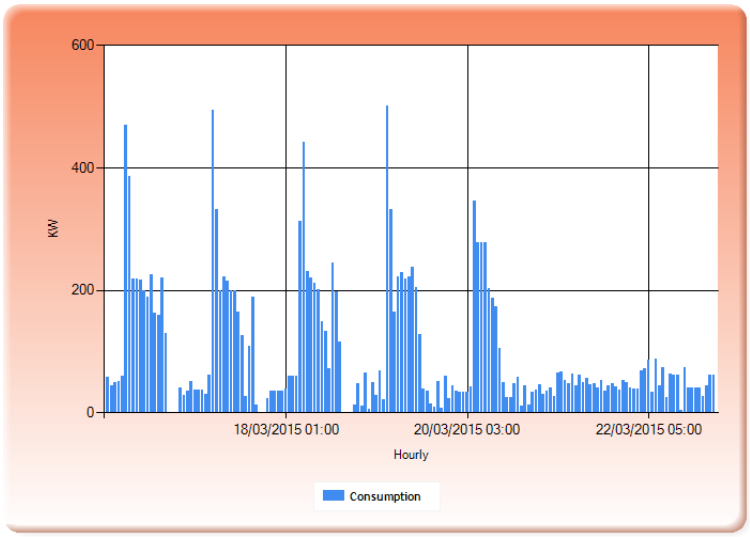
Issue	Possible Cause
Higher consumption on some days compared with others – temperature related	On exception when the weather gets cold, the BMS system is ensuring that the internal temperature maintains the required levels. As the weather warms up again if the consumption does not drop/ change, then the BMS settings may need adjusting
Higher consumption on some days compared with others – not temperature related	There may be extra heat loss from the building resulting in the heating system working harder e.g. extractor fans left running, heating is on and windows are left open overnight
Higher consumption on Mondays	This is typical of a building that is not heated at the weekends – no action required.
Consumption not matching typical day profile	Timer settings may need adjusting to reflect school occupancy hours. There may be historic settings for extended school use. If the consumption returns to the same high level in the evening, does the whole school need to be heated or can zoned use be implemented? Work with premises team and professional to develop a strategy.

See Part 2 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 2: Changing Out of Hours Baseload

Ideally there should be no requirement for heat in the evenings, weekends or during the summer months. However this is not always possible due to a number of reasons.

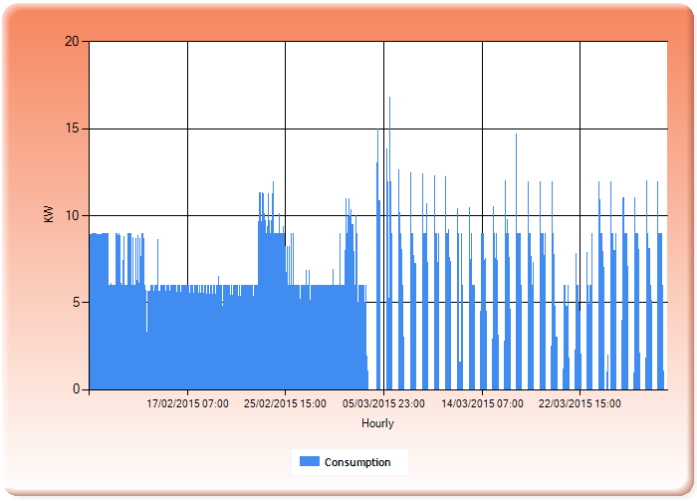
Frost protection is where the heating system will operate out of hours to protect the building suffering adverse effect of cold weather. You will usually see a constant low level of gas consumption throughout the nights and weekends when the building is unoccupied. You might find that at the beginning of the evening the gas consumption is zero but as the outside temperature drops, the gas consumption increases.



Graph 17: Typical graph during active frost protection

Frost protection will occur at the coldest times of year only, commonly over the Christmas shut down period when the building is unoccupied. There will be a frost protection setting for your heating system which determines the minimum level of internal temperature allowed before this system operates.

Most heating systems have an override function whereby the heating can be changed from timed to constantly on. This is to be used with caution as the building management system should ensure that the building is always up to the desired temperature at the right time. The difference between a constant-on setting and timed setting is shown in **Graph 18** below.



Graph 18: A typical graph when a change is made between heating being constant on to timed setting

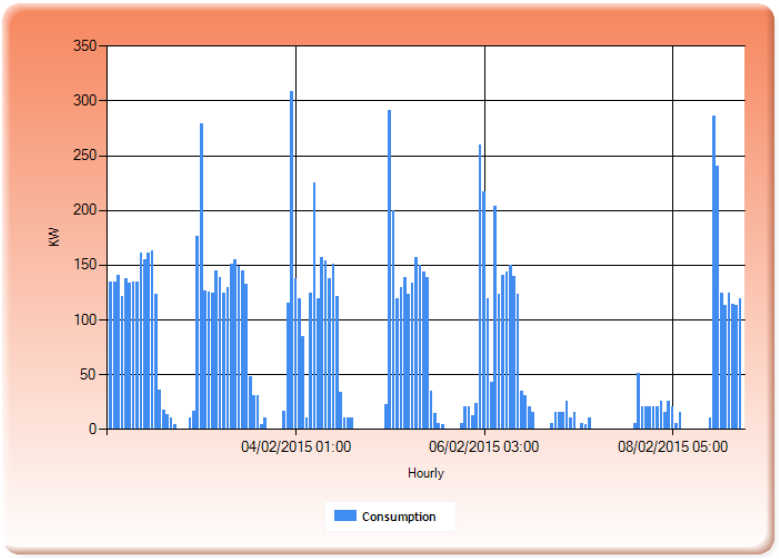
Issue	Possible Cause
Low level of thermal baseload during particularly cold periods	Likely use of Frost Protection settings. Check the frost protection levels to see what inside temperature triggers frost protection.
Baseload is 24/7 with no obvious daily spikes in heat consumption	Heating system set to override or manual setting meaning that heating is on 24/7 rather than timed. Check BMS settings

See Part 2 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 3: Unusual Out of Hours Consumption

In a normal boiler set-up, heat consumption is expected to start a few hours before the building is first occupied in the morning. This is to aim to have the building up to temperature by the time it is fully occupied.

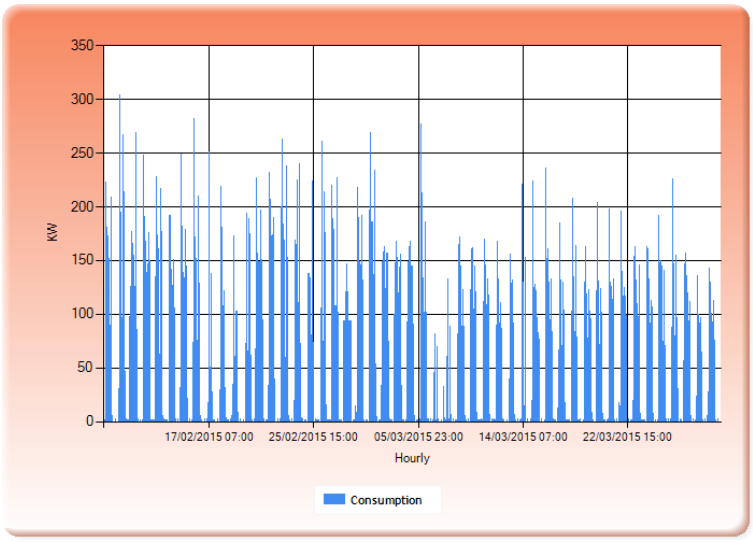
However, it is very common to see the heat consumption start early if it is very cold outside. Sometimes, as shown in the graph below, the heating may even start operating in the previous evening to ensure that the building is the correct temperature for the next day. This is unnecessary and leads to excess heat consumption.



Mon:	1600 previous day to 1200
Tues:	2300 previous day to 1200
Wed:	2300 previous day to 1200
Thurs:	0200 to 1200
Fri:	0200 to 1200

Graph 19: Typical graph showing early heating start times

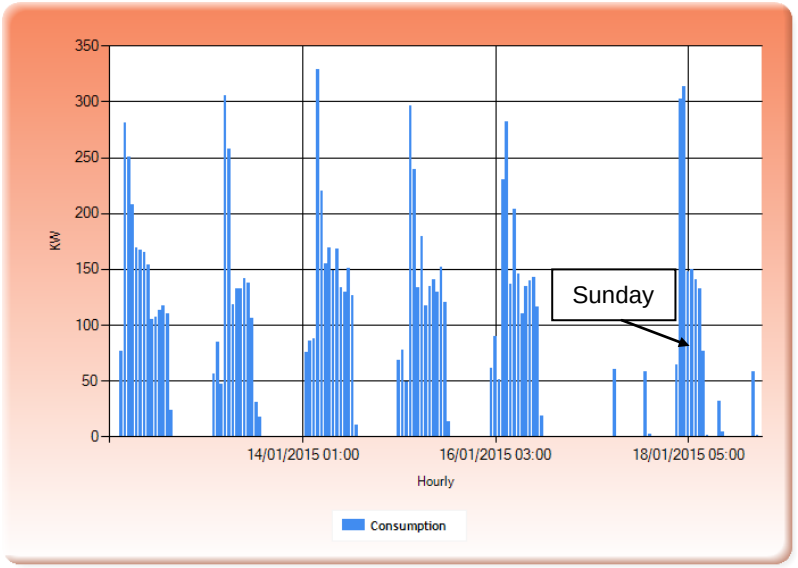
Another common out of hours issue is when the heat is being consumed 7 days a week even though the building is only occupied 5 days as shown in graph 20. This is not 'best practice'. Previously building managers have been cautious about leaving a building unheated over a weekend in the winter months due to potential damage from cold weather. However, with new building management systems this is not a problem as the internal and external temperatures are monitored and heating will automatically trigger if there is a risk of damage (**see graph 17**).



7 day consumption such as this should not be necessary unless the building is being used at the weekends.

Graph 20: 7 Day Heat Consumption

Another common issue is to see heat consumption on a Sunday when the building is unoccupied. This happens when the cold weather triggers the building heating system to operate (frost protection). This is common on Sundays as the building has been unheated since Friday afternoon and the heat loss has dropped the internal temperature to a level where frost protection will trigger and if heating systems have been left on the building will be heated like an occupied day. Graph 21 below is a good example of this, which shows the level of energy that has been wasted as a result.



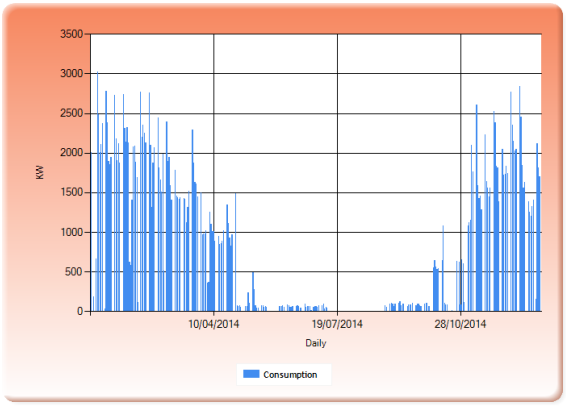
Graph 21: Sunday heat demand

Issue	Possible Cause
Heating starting significantly earlier than occupancy hours and at a higher level than frost protection	The boiler timings have been altered to come on earlier do to issues with the building heating system
	The frost protection setting is triggering the heating system to operate (see issue 2)
	Incorrect settings have been put into a BMS system with Optimised Start/ weather compensation
Evening and weekend consumption	Settings changed for extended school hours (e.g. community use) and not returned to normal.
Sunday gas consumption	The frost protection setting is triggering the heating system to operate (see issue 2)
	Community use settings to heat building outside of normal occupancy hours

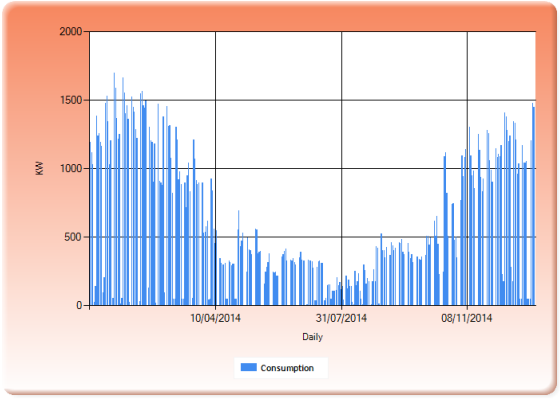
See Part 2 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 4: Holiday Consumption

A large number of sites (but not all) are able to reduce their heat consumption to zero over the summer months when the building is unoccupied. This usually applies to those with conventional gas boilers and with no specialist equipment such as swimming pools. The general rule is that if your weekend gas consumption is zero and you have no community use then the summer consumption can also be zero. However for gas consumption to be zero the 'holiday mode' setting will need to be selected in the building management system.

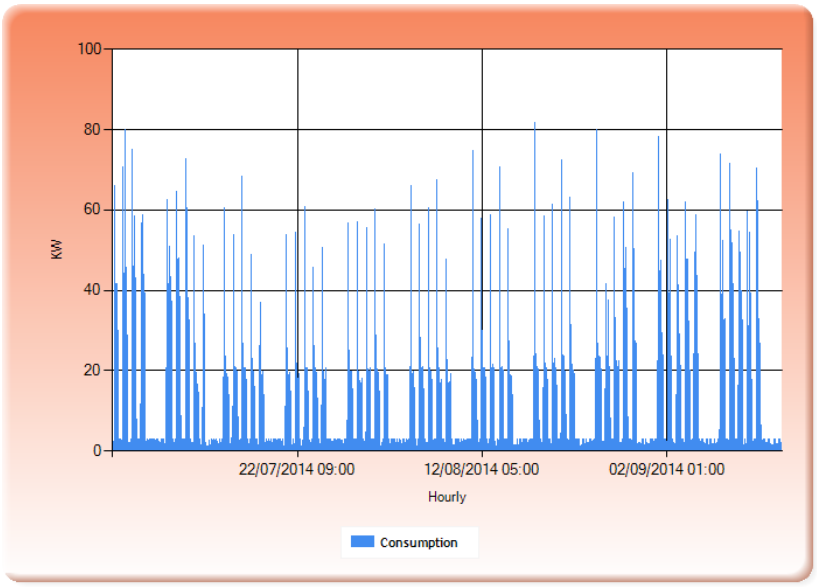


Graph 23: Zero heat consumption in the summer



Graph 22: Heat consumption over the summer months

Graph 23 shows the gas consumption for a school from beginning of July to September. It is clear that there is very little impact on the heat consumption even though the other utility profiles show that the building was unoccupied.



Graph 24: School gas consumption from July to September

Issue	Possible Cause
No change in heat consumption over the summer months even though building is unoccupied	Lack of holiday settings in the BMS system.

See Part 2 Section B – Out of Hours to see how to develop and action plan to tackle the issues highlighted in the table above.

Section B: Developing an Action Plan to Reduce Thermal Consumption

If you have identified thermal wastage in your school from the DYNAMATlite graphs, or if your school consumes more than 96kwh/m^2/annum (for schools with pool 130kWH/m^2/annum) you can use the following guidelines to develop an action plan to tackle this.

High thermal consumption in your building implies that your boilers are calling for heat either due to wastage or inefficiencies within the heating or hot-water system in your building. Inefficiencies could be due to old heating/ hot water distribution networks needing maintenance or replacement works or issues with controls, design, installation, balancing or commissioning of new systems. These are comparatively difficult to identify, however it is possible to use a systematic approach to identify most issues with heat losses by considering the following points.

1. Occupancy Hours:

Wastage or heat losses during occupancy hours are characterised by the following issues in weekly consumption graphs:

1.1 During **core school hours** most of the heat wastage will either come from incorrect settings on your boiler system causing the heating to come on too early, or heat loss from the building causing the heating system to work harder than necessary. Heat

losses could be due to behavioural issues (controls left to full heat, windows left open) or technical problems (losses from pipes, valves and junctions if not properly insulated). You will need professional assistance to identify and resolve most technical issues.

1.2 During **additional school periods** most of the heat waste will either come from incorrect settings on your boiler system causing excess heat consumption in these additional periods, or heat loss from the building causing the heating system to work harder than necessary.

1.3 During **additional school periods** most of the heat waste will come from incorrect settings on your building management system or lack of zoning controls if only part of the school is being used, or heat loss from the building causing the heating system to work harder than necessary.

There are a number of possible root causes of waste in these 3 areas. These include (but are not limited to):

- Balancing issues with heating system – consult with professionals
- Issues with heating controls – consult with professionals and review **Appendix B and C** for potential actions
- Staff opening windows to regulate heating levels rather than using thermostats or heating controls – consider actions to raise awareness amongst users and review **Appendix C** for potential actions
- Furniture in front of radiators – consider actions to raise awareness amongst users and review **Appendix C** for potential actions

2. **Out of Hours:**

Out of hour's consumption are seen as baseloads on annual energy consumption graphs.

Summer: There should be no base load in your thermal consumption charts, unless your school has a hot water system that runs 24/7 and calls for heat from the boiler. If there is a baseload in the summer, then it is strongly advised that you first ensure that the heating is off by checking the radiators/radiant panels and then if the problem persists, seek professional assistance to establish the cause of the issue.

Winter and Mid-Season Baseloads: Baseloads in winter and mid-season should be seen on cold days when the frost protection is triggered. It is normal to expect a small amount of base-load during mid-seasons (spring and autumn) and a comparatively higher and continuous baseload in the winter. To develop an action plan to reduce out of hour's wastage, it is recommended that schools break their action plan into the following steps.

a. Weekdays and weekends out of hours use: Compare your weekday thermal baseload with that of your weekend. Ensure that both are aligned, if not review and develop a switch off procedure. If not consider an out of hours switch of protocol – refer to **Appendix C.**

   Review your heating zoning strategy to see if all areas of community use fall within the same heating zone on the BMS. You will find details of heating zoning in your

heating schematics in the O&M manual. Seek help from professionals if you find it difficult to understand these.

b. Weekend and Holiday Periods: Unless there is community use over the weekend and/ or holiday period, your total consumption should not be more than the minimum necessary baseload. If not consider an out of hours switch of protocol – refer to **Appendix C**

In old buildings, users sometimes would set heating to come on earlier than occupancy hours to provide an element of pre-heat to get the building up to temperature. But in most new buildings, there is weather compensation for heating systems. As a result depending upon how cold it is outside, the start time of the heating will vary in the morning. This is also why it is not necessary for users to set the heating to start earlier than occupancy hours because the heating system automatically calculates and accounts for this based on external temperatures and internal heating set points.

Part 3: Water

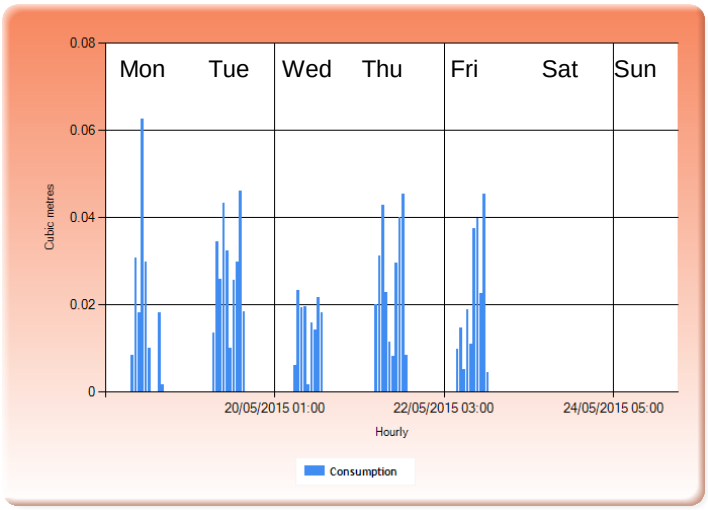
7. Part 3: Water

Part A: Understanding Your Water Consumption

There are number of issues that can occur with water consumption. These are explored below

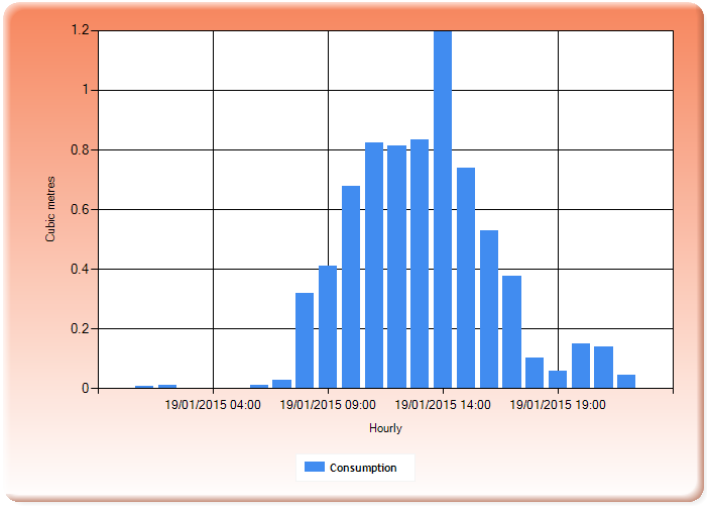
Issue 1: Fluctuating Consumption during Occupancy Hours

As water consumption is highly dependent on user activities onsite, you may see a wide variation in the consumption from one day to the next. In **Graph 25** below, there is a difference between water consumption on each day with some days using high amounts in a short space of time (e.g. the spike on Monday) and others using lower levels for longer periods of the day (e.g. the consumption on Wednesday).



Graph 25: Water Consumption Varying Over the Week

If you look at a 1-day profile for water you should see the consumption matching the occupancy pattern. **Graph 26** below shows a school with evening community use. The consumption is highest around 2pm and gradually reduces as the school day comes to an end. However it does not return to zero until 10pm after the school has closed after community use.



Graph 26: Daily profile of water consumption showing community use

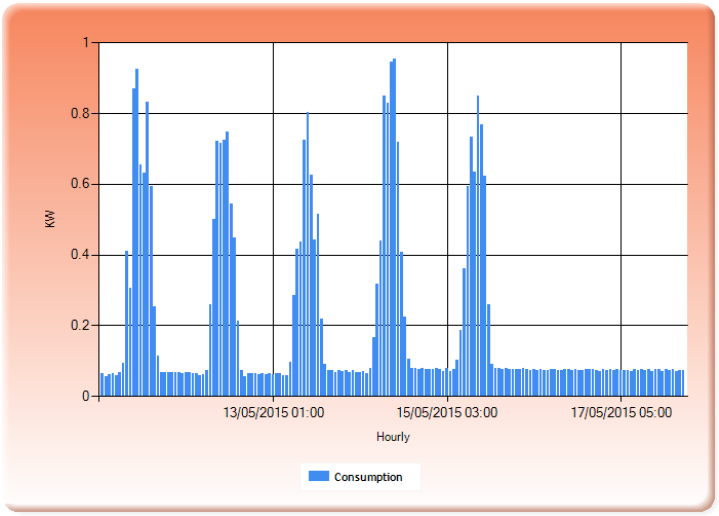
Whilst changing daily consumption is not a specific issue, it is important to understand where the water is being consumed in your building and why there might be higher consumption on some days compared to others.

Issue	Possible Cause
High consumption on some days compared to others	May be due to higher demand or could be a sign of taps left running during school hours.
Water consumption continues after school hours finish	Check whether the school was being used by the community. If not, may be an indication of taps left running until premises officer does final checks of the building.

See Part 3 Section B to see how to develop and action plan to tackle the issues highlighted in the table above.

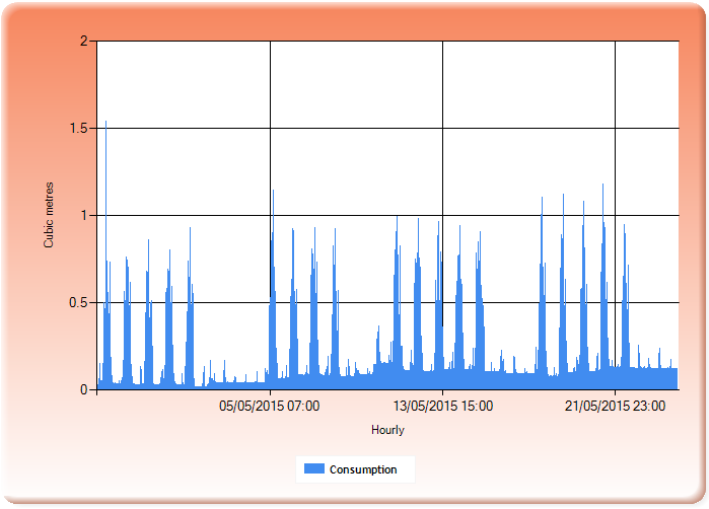
Issue 2: Changing Baseload Out of Hours

A good water profile should show no baseload as there should be no consumption when the building is unoccupied. However, dripping taps, faulty urinal controls and leaks often mean that water is being used 24/7. The water profile below shows a steady water baseload of 0.05 cubic meters (11 gallons) an hour. The fact that the water consumption is steady, not increasing or decreasing on different nights indicated that it is most likely a leak. This level of leak is likely to waste over 96,000 gallons of water a year costing over £1000.



Graph 27: Water baseload

The profile in **graph 28** shows a water baseload that is gradually increasing over time. This indicates an issue that is gradually getting worse such as a pipe leak, a faulty ball valve or a urinal control that is failing. If left unchecked this leak could continue to worsen.



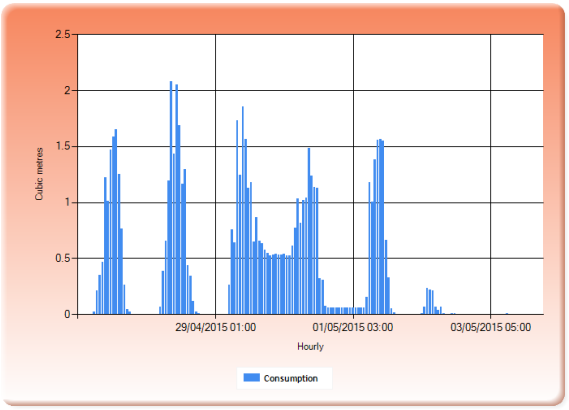
Graph 28: Increasing water baseload

Issue	Possible Cause
Continuous steady baseload of water	Ongoing leak in the building
Increasing baseload of water	Building leak getting worse or numerous leaks in building

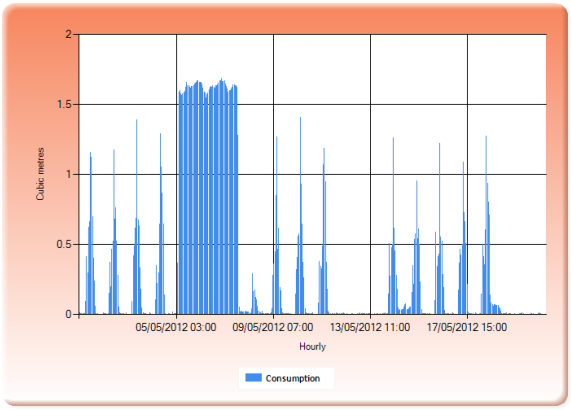
See Part 3 Section B to see how to develop and action plan to tackle the issues highlighted in the table above.

Issue 3: Increased Out of Hours Consumption

Sometimes you might see an overnight baseload appear suddenly and disappear again as shown in **graphs 29 and 30** below. Most commonly this is where a tap has been left running and then turned off the next day. However it could also be a leak occurring and being fixed very quickly. If you see a number of these occurrences of out of hour's consumption over a month with no obvious reason then it is probably an indication that taps are regularly being left running.



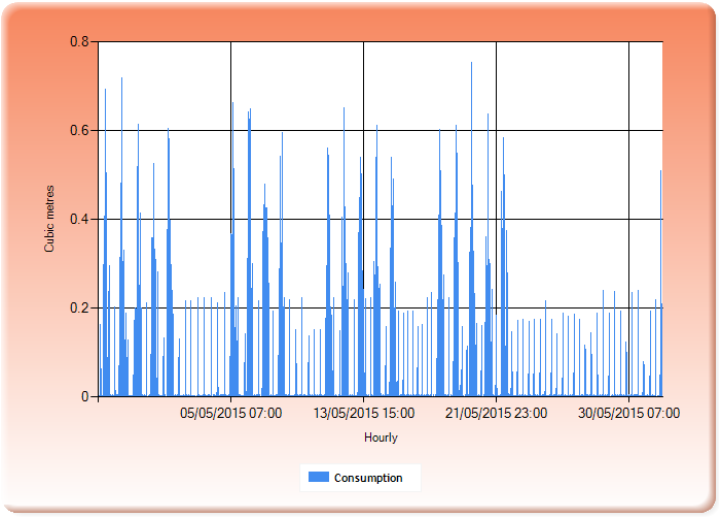
Graph 30: Overnight Out of Hours Use



Graph 29: Weekend Out of Hours Use

Another common out of hours consumption is to see very regular spikes in water use throughout the night and weekend with each one reaching the same level and being a couple of hours apart. This is typical of hygienic flushing of a urinal control. These

usually have timer controls on them to ensure that they only operate during school hours but if the battery unit fails they will flush throughout the day and night, giving the profile like **graph 31** below.



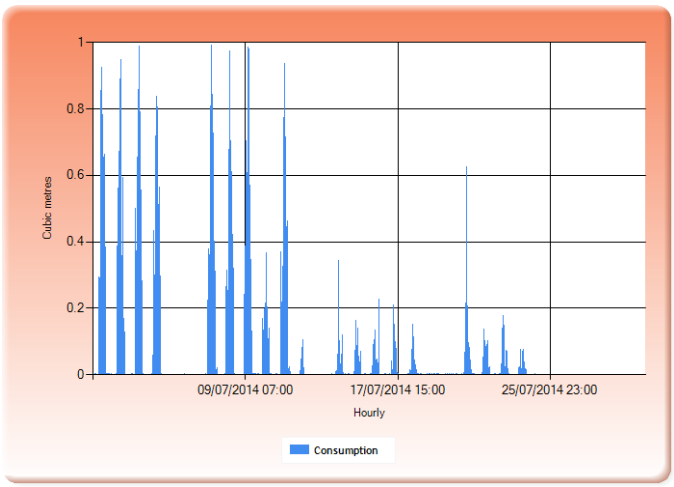
Graph 31: Faulty Urinal Control

Issue	Possible Cause
Overnight or over weekend water consumption	Either a tap left running or a leak that has been quickly repaired
Regular spikes in water consumption happening every night	Faulty urinal control leading to constant hygienic flushes, after hours grounds maintenance, cleaning

See Part 3 Section B to see how to develop and action plan to tackle the issues highlighted in the table above.

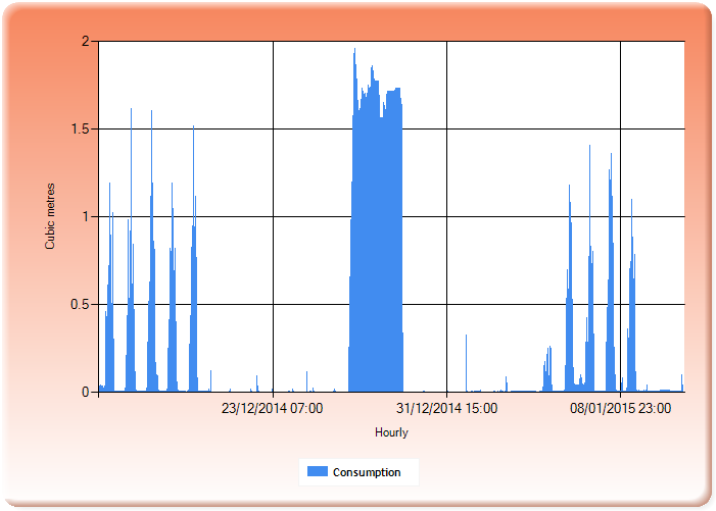
Issue 4: Holiday Consumption

If the building is unoccupied then the ideal water consumption is zero. There is no need to set any holiday settings as if there is no-one on site then there should be no consumption. The **graph 32** below shows the water consumption at the end of term before the summer holidays. There is 2 weeks of high consumption as the school is still operating as normal followed by 2 weeks of low consumption as there is occupancy after the term has officially ended. After this, the consumption is zero.



Graph 32: Declining water consumption for holiday period

Graph 33 below shows the shutdown period of a school over the Christmas holidays. Whilst the building was unoccupied there was a major leak of over 1.6 cubic meters (350 gallons) an hour. Luckily this was caught after a couple of days and fixed before the term restarted.



Graph 33: Water Leak over Christmas Period

Issue	Possible Cause
Water consumption during holiday period	Check that the building was definitely unoccupied. If not, this could be a leak or faulty piece of equipment.

See Part 3 Section B to see how to develop and action plan to tackle the issues highlighted in the table above.

Water 2015-16

Water Usage/Hour			Water Usage/Day			Water Usage/Year		
Cubic Meters	Gallons	Cost	Cubic Meters	Gallons	Cost	Cubic Meters	Gallons	Cost
0.01	2.2	£ 0.02	0.24	52.8	£ 0.57	87.60	19,272	£ 206.72
0.02	4.4	£ 0.05	0.48	105.6	£ 1.13	175.20	38,544	£ 413.44
0.03	6.6	£ 0.07	0.72	158.4	£ 1.70	262.80	57,816	£ 620.16
0.04	8.8	£ 0.09	0.96	211.2	£ 2.27	350.40	77,088	£ 826.87
0.05	11.0	£ 0.12	1.20	264.0	£ 2.83	438.00	96,360	£ 1,033.59
0.06	13.2	£ 0.14	1.44	316.8	£ 3.40	525.60	115,632	£ 1,240.31
0.07	15.4	£ 0.17	1.68	369.6	£ 3.96	613.20	134,904	£ 1,447.03
0.08	17.6	£ 0.19	1.92	422.4	£ 4.53	700.80	154,176	£ 1,653.75
0.09	19.8	£ 0.21	2.16	475.2	£ 5.10	788.40	173,448	£ 1,860.47
0.10	22.0	£ 0.24	2.40	528.0	£ 5.66	876.00	192,720	£ 2,067.18
0.11	24.2	£ 0.26	2.64	580.8	£ 6.23	963.60	211,992	£ 2,273.90
0.12	26.4	£ 0.28	2.88	633.6	£ 6.80	1051.20	231,264	£ 2,480.62
0.13	28.6	£ 0.31	3.12	686.4	£ 7.36	1138.80	250,536	£ 2,687.34
0.14	30.8	£ 0.33	3.36	739.2	£ 7.93	1226.40	269,808	£ 2,894.06
0.15	33.0	£ 0.35	3.60	792.0	£ 8.50	1314.00	289,080	£ 3,100.78
0.16	35.2	£ 0.38	3.84	844.8	£ 9.06	1401.60	308,352	£ 3,307.50
0.17	37.4	£ 0.40	4.08	897.6	£ 9.63	1489.20	327,624	£ 3,514.21
0.18	39.6	£ 0.42	4.32	950.4	£ 10.19	1576.80	346,896	£ 3,720.93
0.19	41.8	£ 0.45	4.56	1003.2	£ 10.76	1664.40	366,168	£ 3,927.65
0.20	44.0	£ 0.47	4.80	1056.0	£ 11.33	1752.00	385,440	£ 4,134.37
0.21	46.2	£ 0.50	5.04	1108.8	£ 11.89	1839.60	404,712	£ 4,341.09
0.22	48.4	£ 0.52	5.28	1161.6	£ 12.46	1927.20	423,984	£ 4,547.81
0.23	50.6	£ 0.54	5.52	1214.4	£ 13.03	2014.80	443,256	£ 4,754.53
0.24	52.8	£ 0.57	5.76	1267.2	£ 13.59	2102.40	462,528	£ 4,961.24
0.25	55.0	£ 0.59	6.00	1320.0	£ 14.16	2190.00	481,800	£ 5,167.96
0.26	57.2	£ 0.61	6.24	1372.8	£ 14.73	2277.60	501,072	£ 5,374.68
0.27	59.4	£ 0.64	6.48	1425.6	£ 15.29	2365.20	520,344	£ 5,581.40
0.28	61.6	£ 0.66	6.72	1478.4	£ 15.86	2452.80	539,616	£ 5,788.12
0.29	63.8	£ 0.68	6.96	1531.2	£ 16.42	2540.40	558,888	£ 5,994.84
0.30	66.0	£ 0.71	7.20	1584.0	£ 16.99	2628.00	578,160	£ 6,201.55
0.31	68.2	£ 0.73	7.44	1636.8	£ 17.56	2715.60	597,432	£ 6,408.27
0.32	70.4	£ 0.76	7.68	1689.6	£ 18.12	2803.20	616,704	£ 6,614.99
0.33	72.6	£ 0.78	7.92	1742.4	£ 18.69	2890.80	635,976	£ 6,821.71
0.34	74.8	£ 0.80	8.16	1795.2	£ 19.26	2978.40	655,248	£ 7,028.43
0.35	77.0	£ 0.83	8.40	1848.0	£ 19.82	3066.00	674,520	£ 7,235.15
0.36	79.2	£ 0.85	8.64	1900.8	£ 20.39	3153.60	693,792	£ 7,441.87
0.37	81.4	£ 0.87	8.88	1953.6	£ 20.96	3241.20	713,064	£ 7,648.58
0.38	83.6	£ 0.90	9.12	2006.4	£ 21.52	3328.80	732,336	£ 7,855.30
0.39	85.8	£ 0.92	9.36	2059.2	£ 22.09	3416.40	751,608	£ 8,062.02
0.40	88.0	£ 0.94	9.60	2112.0	£ 22.65	3504.00	770,880	£ 8,268.74
0.41	90.2	£ 0.97	9.84	2164.8	£ 23.22	3591.60	790,152	£ 8,475.46
0.42	92.4	£ 0.99	10.08	2217.6	£ 23.79	3679.20	809,424	£ 8,682.18
0.43	94.6	£ 1.01	10.32	2270.4	£ 24.35	3766.80	828,696	£ 8,888.89
0.44	96.8	£ 1.04	10.56	2323.2	£ 24.92	3854.40	847,968	£ 9,095.61
0.45	99.0	£ 1.06	10.80	2376.0	£ 25.49	3942.00	867,240	£ 9,302.33
0.46	101.2	£ 1.09	11.04	2428.8	£ 26.05	4029.60	886,512	£ 9,509.05
0.47	103.4	£ 1.11	11.28	2481.6	£ 26.62	4117.20	905,784	£ 9,715.77
0.48	105.6	£ 1.13	11.52	2534.4	£ 27.18	4204.80	925,056	£ 9,922.49
0.49	107.8	£ 1.16	11.76	2587.2	£ 27.75	4292.40	944,328	£ 10,129.21
0.50	110.0	£ 1.18	12.00	2640.0	£ 28.32	4380.00	963,600	£ 10,335.92

Water Usage/Hour			Water Usage/Day			Water Usage/Year		
Cubic Meters	Gallons	Cost	Cubic Meters	Gallons	Cost	Cubic Meters	Gallons	Cost
0.51	112.2	£ 1.20	12.24	2692.8	£ 28.88	4467.60	982,872	£ 10,542.64
0.52	114.4	£ 1.23	12.48	2745.6	£ 29.45	4555.20	1,002,144	£ 10,749.36
0.53	116.6	£ 1.25	12.72	2798.4	£ 30.02	4642.80	1,021,416	£ 10,956.08
0.54	118.8	£ 1.27	12.96	2851.2	£ 30.58	4730.40	1,040,688	£ 11,162.80
0.55	121.0	£ 1.30	13.20	2904.0	£ 31.15	4818.00	1,059,960	£ 11,369.52
0.56	123.2	£ 1.32	13.44	2956.8	£ 31.72	4905.60	1,079,232	£ 11,576.23
0.57	125.4	£ 1.35	13.68	3009.6	£ 32.28	4993.20	1,098,504	£ 11,782.95
0.58	127.6	£ 1.37	13.92	3062.4	£ 32.85	5080.80	1,117,776	£ 11,989.67
0.59	129.8	£ 1.39	14.16	3115.2	£ 33.41	5168.40	1,137,048	£ 12,196.39
0.60	132.0	£ 1.42	14.40	3168.0	£ 33.98	5256.00	1,156,320	£ 12,403.11
0.61	134.2	£ 1.44	14.64	3220.8	£ 34.55	5343.60	1,175,592	£ 12,609.83
0.62	136.4	£ 1.46	14.88	3273.6	£ 35.11	5431.20	1,194,864	£ 12,816.55
0.63	138.6	£ 1.49	15.12	3326.4	£ 35.68	5518.80	1,214,136	£ 13,023.26
0.64	140.8	£ 1.51	15.36	3379.2	£ 36.25	5606.40	1,233,408	£ 13,229.98
0.65	143.0	£ 1.53	15.60	3432.0	£ 36.81	5694.00	1,252,680	£ 13,436.70
0.66	145.2	£ 1.56	15.84	3484.8	£ 37.38	5781.60	1,271,952	£ 13,643.42
0.67	147.4	£ 1.58	16.08	3537.6	£ 37.95	5869.20	1,291,224	£ 13,850.14
0.68	149.6	£ 1.60	16.32	3590.4	£ 38.51	5956.80	1,310,496	£ 14,056.86
0.69	151.8	£ 1.63	16.56	3643.2	£ 39.08	6044.40	1,329,768	£ 14,263.58
0.70	154.0	£ 1.65	16.80	3696.0	£ 39.64	6132.00	1,349,040	£ 14,470.29
0.71	156.2	£ 1.68	17.04	3748.8	£ 40.21	6219.60	1,368,312	£ 14,677.01
0.72	158.4	£ 1.70	17.28	3801.6	£ 40.78	6307.20	1,387,584	£ 14,883.73
0.73	160.6	£ 1.72	17.52	3854.4	£ 41.34	6394.80	1,406,856	£ 15,090.45
0.74	162.8	£ 1.75	17.76	3907.2	£ 41.91	6482.40	1,426,128	£ 15,297.17
0.75	165.0	£ 1.77	18.00	3960.0	£ 42.48	6570.00	1,445,400	£ 15,503.89
0.76	167.2	£ 1.79	18.24	4012.8	£ 43.04	6657.60	1,464,672	£ 15,710.60
0.77	169.4	£ 1.82	18.48	4065.6	£ 43.61	6745.20	1,483,944	£ 15,917.32
0.78	171.6	£ 1.84	18.72	4118.4	£ 44.18	6832.80	1,503,216	£ 16,124.04
0.79	173.8	£ 1.86	18.96	4171.2	£ 44.74	6920.40	1,522,488	£ 16,330.76
0.80	176.0	£ 1.89	19.20	4224.0	£ 45.31	7008.00	1,541,760	£ 16,537.48
0.81	178.2	£ 1.91	19.44	4276.8	£ 45.87	7095.60	1,561,032	£ 16,744.20
0.82	180.4	£ 1.94	19.68	4329.6	£ 46.44	7183.20	1,580,304	£ 16,950.92
0.83	182.6	£ 1.96	19.92	4382.4	£ 47.01	7270.80	1,599,576	£ 17,157.63
0.84	184.8	£ 1.98	20.16	4435.2	£ 47.57	7358.40	1,618,848	£ 17,364.35
0.85	187.0	£ 2.01	20.40	4488.0	£ 48.14	7446.00	1,638,120	£ 17,571.07
0.86	189.2	£ 2.03	20.64	4540.8	£ 48.71	7533.60	1,657,392	£ 17,777.79
0.87	191.4	£ 2.05	20.88	4593.6	£ 49.27	7621.20	1,676,664	£ 17,984.51
0.88	193.6	£ 2.08	21.12	4646.4	£ 49.84	7708.80	1,695,936	£ 18,191.23
0.89	195.8	£ 2.10	21.36	4699.2	£ 50.41	7796.40	1,715,208	£ 18,397.94
0.90	198.0	£ 2.12	21.60	4752.0	£ 50.97	7884.00	1,734,480	£ 18,604.66
0.91	200.2	£ 2.15	21.84	4804.8	£ 51.54	7971.60	1,753,752	£ 18,811.38
0.92	202.4	£ 2.17	22.08	4857.6	£ 52.10	8059.20	1,773,024	£ 19,018.10
0.93	204.6	£ 2.19	22.32	4910.4	£ 52.67	8146.80	1,792,296	£ 19,224.82
0.94	206.8	£ 2.22	22.56	4963.2	£ 53.24	8234.40	1,811,568	£ 19,431.54
0.95	209.0	£ 2.24	22.80	5016.0	£ 53.80	8322.00	1,830,840	£ 19,638.26
0.96	211.2	£ 2.27	23.04	5068.8	£ 54.37	8409.60	1,850,112	£ 19,844.97
0.97	213.4	£ 2.29	23.28	5121.6	£ 54.94	8497.20	1,869,384	£ 20,051.69
0.98	215.6	£ 2.31	23.52	5174.4	£ 55.50	8584.80	1,888,656	£ 20,258.41
0.99	217.8	£ 2.34	23.76	5227.2	£ 56.07	8672.40	1,907,928	£ 20,465.13
1.00	220.0	£ 2.36	24.00	5280.0	£ 56.64	8760.00	1,927,200	£ 20,671.85

Section B: Developing an Action Plan to Reduce Water Consumption

Issues with high water wastage are most often to do with either with burst pipes, leaks or taps being left open. These are easy to identify if water consumption is reviewed regularly. Here are some pointers to help you develop an action plan to reduce water consumption.

- If your water consumption varies on a daily basis without any clear explanation then this would represent varying behaviour around use. Consider developing a strategy around awareness raising and posters and labels to constantly encourage users to use water wisely.

- If you find unusual spikes in water consumption overnight or after school hours when there was no community use, then this might represent a leak, tap being left on or any other similar issue. Consider investigating the issue with your premises team to rectify the problem.

- Ideally there should not be a continuous baseload in water consumption. If you find a continuous baseload then this might represent wastage or a leakage. You can use the decision map shown in **Appendix F** to identify the issue, but please do note there could be other technical problems that might not be listed on this diagram. In that case it is recommended to bring in a specialist to investigate.

- Review your water consumption over weekends and holiday periods, if the building is out of use and has not community use then the consumption should be zero. If you find unusual consumption then consider an out of hour's shutdown protocol. Refer to **Appendix C** for pointers.

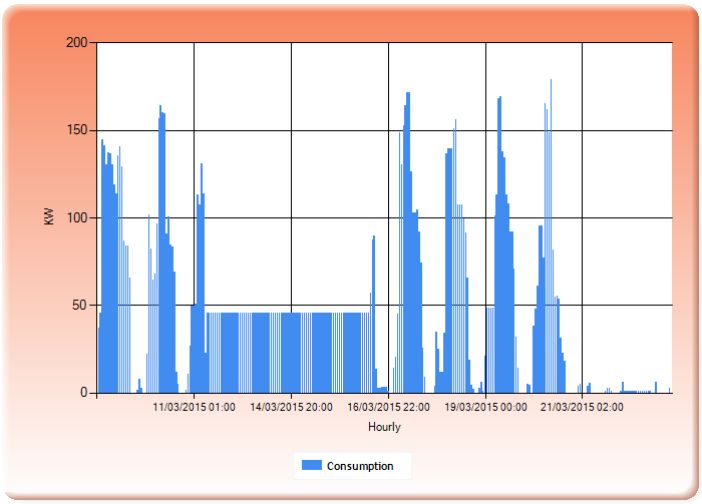
Troubleshooting

8. Troubleshooting

The information below outlines some of the issues that can occur with DYNAMATlite. If you are having trouble using this system or find a fault that you cannot fix, please contact the Leicester City Council's Energy Management Team on energy.management@leicester.gov.uk

1. **Interpolated data**

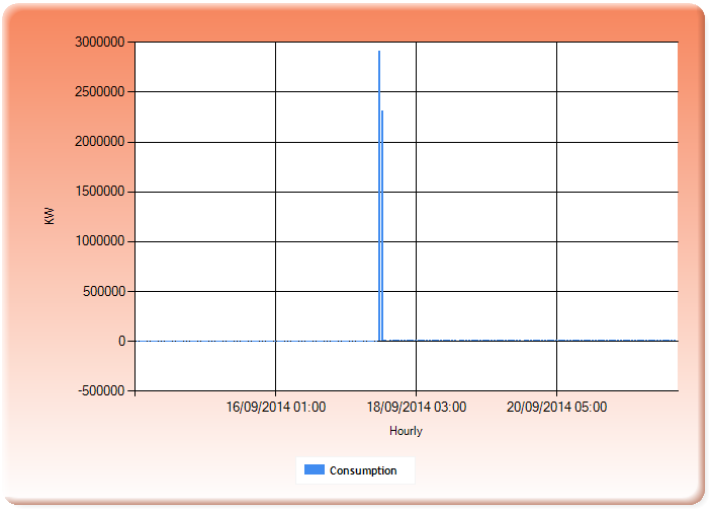
Interpolated data is where there is a loss of detail in the data due to a communication issue with the monitoring equipment. This means that instead of receiving the data in half-hour blocks, it is received as one large chuck of data which can last up to a few days. This results in a large block appearing on the graph similar to the one below.



This should correct itself in time. However, if it does not correct itself or it keeps on happening then please contact the energy management team.

2. **Spikes in data**

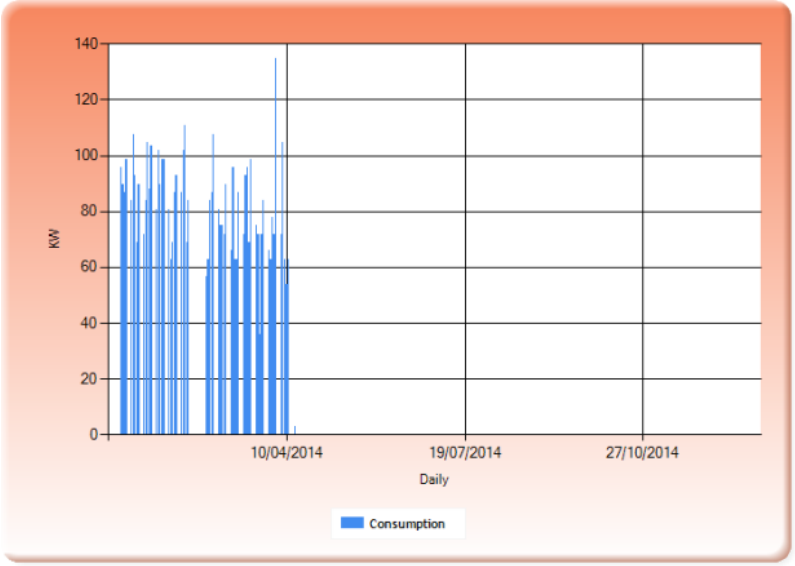
A spike occurs when interference causes the equipment to register a very large number instead of actual consumption as illustrated in the graph below. As part of the system relies on radio transmission, the signal can often be affecting by outside influences such as temporary traffic lights or other systems using radio waves.



Again, this should correct itself as the interference disappears. The Energy Management team can delete the spikes in data from the Dynamat system if required.

3. **Loss of data**

   Unfortunately, sometimes the Dynamat system may stop working due to a number of reasons. This can result in the system receiving zero consumption levels as illustrated in the graph below. If this occurs please check that your meter is still operating before contacting the energy management team.



4. **Data doesn't update**

   If you log onto the system and find that there is no current data then there is likely to be a transmission issue with the Dynamat system. Please contact the Energy Management team to inform them of this issue

5. **Times don't match**

   You may find that the times on the DYNAMATlite system are incorrect by an hour. This is because the meters are not updated for daylight savings/British summer time. This is not something that can be altered.

6. **Consumption doesn't match**

   If you are seeing unusual consumption which you do not believe is a true representation of your energy consumption onsite please let the Energy Management team know and we will investigate.

Appendices

Appendix A: Sample Energy Action Plan

This section provides a sample action plan that you could use to develop the Energy Action Plan for your school:

Sample School Policy Statement

All of us at _____ School understand that there is a need to improve the way we consume energy and water, to become more energy efficient, decrease our CO_2 emissions and save money towards energy costs. We are committed to reducing the environmental impact of our activities and to ensure that we are using energy and water wisely.

Our objective is to reduce our energy consumption by _____% using the consumption from _____ year which is a total of _____kWh as the baseline.

Our initial target will be to reduce our energy and water consumption by _____% in the first year with a further _____% saving over the following ____ years. In order to achieve this we will:

Management:

- Establish and follow an Energy Reduction Action Plan
- Identify and implement all cost-effective energy efficiency measures
- Provide regular management reports on our energy and water consumption and its associated cost to governors and senior management
- Report energy and carbon savings to Leicester City Council Energy Management team and revise targets on a regular basis
- Ensure competency in the energy efficient management (including BMS) of the school and its equipment
- Ensure advice is sought from Leicester City Council Energy Management team on improvements in energy efficiency and that the installation of new technologies are considered for capital investment
- Encourage continued professional development for technical issues related to energy
- Incorporate carbon saving and sustainability into the school curriculum wherever possible

All staff and students:

- Identify and report our actual energy performance to the school and wider community
- Identify targets for future energy performance and report on progress
- Train a number of staff and students to become energy champions for the school
- Encourage energy saving suggestions from all staff and students
- Take day to day responsibility for ensuring minimal energy and water waste and encourage all school users to do the same
- We will share this policy with all who use our school and make it available if requested.

Signed on behalf of _____ School by:

Head Teacher: Date:

Governor Representative: Date:

Site Representative: Date:

Student Representatives: Date:

Next Date of Review:

Example Checklist for Energy Reduction Team

Essential actions for School Energy Reduction Action Plan								
Who can do what?	**Head/ Deputy**	**Teacher**	**Governor**	**Student**	**LA Adviser**	**Bursar**	**Caretaker**	**Energy Champion**
a. Set up an Energy Team								
b. Identify responsibilities								
c. Establish key priority areas								
d. Organise and manage **school shutdown/ switch off procedure**								
e. Develop an ICT shutdown plan								
f. Organise and manage **school walk around**								
g. Identify quick wins and no cost measures and ensure active participation								
h. Raise awareness of staff and students								
i. Active labelling procedure								
j. Read meter regularly								
k. Record/analyse/monitor energy bills and consumption								
l. Review progress towards targets								
m. Present initiatives and findings back to whole school								
n. Identify curriculum opportunities								
o. Plan for long-term measures								
p. Ensure staff training								

Guidance on all Essential Actions

a. Set up an Energy Team
This would ideally be led by a member of staff or Governors and could include: • Member of Senior Leaders Team • Member of Governing Body • Pupil representatives • Staff representatives (teachers/ TAs/ office staff / kitchen staff) • Site manager • Parents (parents undertaking very pro-active energy saving activities at home might like to be involved – communicate plan with them) The leader of this group should ensure all measures are being undertaken for this action plan to work. They should ensure that: • There is clarity around the importance of energy, carbon and cost reduction for their school. • Develop targets and performance measures that could be used to monitor progress and success • Develop a communication plan to cover staff, students, governors and parents • Ensure energy is on the staff/ governor meeting agenda • Appoint energy monitors/ green champions and ensure they are actively undertaking measures and driving change • Develop a continuous campaigning and change management plan • Promote students to design and develop campaigning material through their understanding and learning
b. Identify responsibilities
There will be roles that suit particular groups or individuals but it will depend on capacity and availability: • Attribute roles to individuals and make it public • Approach parents to take on roles • Attribute targets or KPIs for roles to inspire them to develop their own management plan
c. Establish key priority areas
Establish the key priority areas first, use DYNAMATlite to identify the key areas of concern with respect electricity, thermal and water. This could also extend beyond energy management issues.
d. Develop shut-down procedures
Work with your Premises Team to develop a shutdown procedure for your buildings. For guidance on planning refer to **Appendix B.** Shut down procedures should include procedures for

- BMS linked mechanical and electrical services
- Non-BMS mechanical and electrical services controlled through independent control panels
- Locally controlled mechanical and electrical services

e. Develop an ICT Shut Down Plan

ICT in modern schools if not managed will be one of the key energy cost issues. Work with your ICT curriculum lead and premises team to develop an ICT switch off policy. Appendix C contains guidance around developing an ICT shut down plan.

f. Organise and manage school walk around procedures

A walk around the school is needed to establish where energy is being wasted. It should take place at different times of day:

- During lessons
- Break time
- After school
- Weekends where possible

See Appendix C for sample checklist for walk around activity

g. Identify quick wins and no cost measures and ensure active participation

Establish the quick win measures, which can be achieved at no additional cost. Use school walk around to identify these if necessary

- What can be done immediately
- What does the school need pupils and staff to do in class
  How does the school embed behaviour change

h. Raise awareness of staff and pupils

- Present policy and plan – use assemblies/notice boards/ energy bulletins
- Launch a campaign - hold termly events to raise awareness and encourage continued engagement/ design a mascot/ display 'Switch-off' stickers and posters around the site
- Write a newsletter – to distribute internally and externally
- Set up an Eco-Schools Council – meet regularly to discuss campaign/ monitoring/ targets/ presentations
- Present updates at assembly – Schools Energy Council could drive this
- Present target progress - School Energy Council
- Hold competitions – contact companies that produce energy saving equipment for prizes/ visits
- Embed a behaviour change – explain that the school is striving for a different attitude to how electricity is used and wasted and why!

i. Identify quick wins and no cost measures and ensure active participation

Active labelling is a good tool to communicate needs around behaviour change with respect to energy use. Appendix D provides guidance around this.

j. Read meter regularly

This will probably be undertaken by caretaker/site manager :

- Manual meter readings also need to be taken on a monthly basis (Good Practice) to resolve billing issues
- Provide Supplier with manual meter reading to ensure accurate billing

k. Record/ analyse/ monitor energy and water consumption

As part of Action Plan a system must be in place whereby Energy & Water Profiles are monitored / reviewed regularly using DYNAMATlite:

- Start by reviewing daily consumption and analyse when energy is being used and were could be reduced.
- Set regular review dates and review progress toward target
- Compare with baseline data
- Establish obvious wastage

l. Review progress towards targets

Keep an eye on reaching targets that have been set:

- Inform Energy Team of progress
- Establish if targets are going to be met or not!
- Think ahead and put plans in place to reach future targets (long term measures)

m. Present initiatives and findings back to whole school

Presenting initiatives and findings back to the school keeps the momentum going. Schools could use forums such as governors and staff meeting as well as assemblies to provide feedback

n. Identify curriculum opportunities

Think how the energy saving campaign can be used to aid learning:

- Maths - Using Automatic Meter Reading (AMRs) data analysis and interpretation
- Science - climate change/ energy production and consumption/ carbon emissions
- Business Studies/ Economic – energy reduction saves money, carbon tax
- Art/Design – design campaign material
- Media – plan and implement the campaign
- English - hold debates around the energy campaign

o. Ensure staff training

Ensure that all new staff are being trained on basic energy management requirements and are following the energy policy of your school.

For new members of staff joining the premises team ensure that they undertake training on energy management. Identify at least two champions within the premises team who can train new staff on energy management, DYNAMATlite and special management regimes for your school.

APPENDIX B: Guidance on "Shutdown/Switch-off procedure"

Shutdown or switch-off procedures involve the systematic shut down of non-critical mechanical, electrical and building systems and services to limit energy wastage.

While this section provides guidelines on issues to consider while developing a shutdown procedure for schools, it is important noting that every school is different and thus schools must tailor the procedures to suit the design and operation of their own building.

*The **first step** in any shutdown procedure is to identify the critical services that need to be left on/untouched for security, health & safety and/or facility management reasons. These could include servers, fire alarms, security, emergency lighting, certain hot water systems, pumps, isolation or master shutdown switches etc.*

Seeking the help of a professional and/or using your operation and maintenance manuals, identify and mark these as not to be touched.

1. Winter and during cold spells:

1.1. Heating:

1.1.1. New buildings are well insulated and airtight and should be able to retain the heat in most rooms for long periods, unless windows and doors are left open and let heat out. For heating that is controlled through the BMS, ensure that the heating is set to come on only during necessary periods within occupancy hours.

1.1.2. Check the time-setting for the heating on your BMS for each of the heating zone to ensure that the heating is not on beyond occupancy hours. Where sections of the building are not used for community use or during additional school periods, ensure that the heating for these areas are switching off immediately after core hours.

1.1.3. Check the time setting on the BMS to ensure that the heating is switched off during the weekend and holidays, unless it is used for community use. Time-table checkpoints for these.

1.1.4. Ensure all windows are closed and local extractor fans in classrooms and any other relevant areas are switched off. The switches for the extractor fans in the new buildings are mostly located near the Interactive White Boards.

1.1.5. Advise staff to use thermostat to control heating and avoid opening too many windows that may let the heat out - regularly monitor this

1.1.6. Advise staff to not block radiators with furniture – regularly monitor this

1.2. Ventilation:

1.2.1. Most Air Handling Units (AHU) and Heat Recovery Units (HRU) for your new building will be on a time setting controlled through the BMS. Ensure these are switching off at the end of core/ additional hours/ community use based on how the area of the building is used.

1.2.2. If AHU and HRU are not linked to the BMS then they will have a control panel either located in the plant room or locally. Ensure they either are set to switch of automatically after occupancy hours or if necessary switch them off manually.

1.2.3. Ensure all windows are closed and local extractor fans in classrooms and any other relevant areas are switched off. The switches for the extractor fans in the new buildings are mostly located near the Interactive White Boards.

1.3. Lighting:

1.3.1. Switch off all non-critical lighting.

1.3.2. If certain lights are controlled through sensors then ensure that the sensors are working by observing if and when these light switch off. In the event that the lights are not switching off automatically, immediately seek professional help to look into the sensors

1.3.3. Take additional measures to ensure that lights are being switched off after community hours if the premises team are not the last people to leave the building

1.4. Other Equipment:

If you do not have a staff and students team working alongside you then the premises team will have to additionally take on the responsibility of ensuring all locally controlled equipment including ICT, local heaters, wall electric heaters, electronic equipment etc. are switched off. Premises teams can choose to undertake active labelling themselves in the absence of involvement from the student's council. *See further guidance for ICT shutdown procedure below.*

2. Summer and during heat waves

2.1. Heating

2.1.1. Ensure heating is switched off at the BMS

2.1.2. Additionally ensure every thermostat in the building is turned to zero**.** This is especially critical for schools with ceiling radiant panels.

2.2. Cooling

2.2.1. Check BMS time setting to ensure systems are shutting down as per their relevant occupancy hours

2.2.2. For cooling units that do not need to be used during community or additional school hours ensure they are shutting down after core hours

2.2.3. Certain specialist areas like changing rooms with HRU (heating, cooling and ventilation) may have local controls. It is advised to switch these on only when

the rooms are in use rather than all through the day. Don't forget to check they are switched off.

2.3. Ventilation

Follow the guidance for winter

2.4. Lighting

Follow the guidance for winter

2.5. Other equipment

Follow the guidance for winter

Developing your ICT shutdown procedure

Schools rely on ICT equipment, with staff and students routinely making use of technology for teaching and learning. Electricity consumption from ICT equipment will account for a significant portion of overall school energy use, so it is important to take steps to manage ICT and reduce unnecessary use.

Schools are encouraged to actively develop, monitor and manage an ICT energy use plan. Your plan should clearly identify the following:

- Who is responsible for leading on developing and managing the schools ICT energy use plan?
- Who is responsible for ensuring that the plan is monitored and implemented? This may be an additional role to the lead. It could be an individual, or a group which includes teaching staff, premises staff, and students.
- Develop a checklist of daily tasks – when do these tasks need to take place? Who is responsible for them?
- Consider how you could use active labelling to support ICT energy use management.

Some basic guidelines around ICT energy use management are provided below. However, it is important to note that schools should develop procedures based on their ICT specifications and curriculum requirements:

1. Most computers have standby features. Make sure power-down features have been set up and activated – we suggest 15 minutes for your monitor and 30 minutes for your computer.

2. Shutting down laptops and desktops saves more energy than leaving them overnight on standby. All equipment that can be turned off at the end of the day should be.

3. Don't use screen savers – they may consume more energy than not using one and may disable power-down features.

4. You can save even more energy by manually turning off your monitor when not in use. Turn off your monitor if you aren't going to use your computer for more than 20 minutes.
5. Turn off both your computer and monitor if you aren't going to use your PC for more than 1 hour.
6. Always turn off projectors and classroom display audio when not in use

7. Use any energy saving function printers have. Switch off local printers when they are not in use. Find out if networked printers can be switched off, and if so, switch them off at the end of the day.

8. Consider using a mains timer switch to control laptop trolley charging times, and use any energy saving features the trolleys may have. Leaving laptop trollies on continually will decrease battery life. Switch trollies off when they are not in use.
9. Shredders, laminators, photocopiers, desk fans and non-networked items should be turned off at the end of the day or when not in use.
10. Personal chargers - unplug from PC/ turn off at wall

11. If monitors, printers, and other accessories are on a power strip/surge protector, they can be switched off via the power strip to prevent them from drawing power. If you don't use a power strip, unplug extra equipment when it's not in use.

Appendixes C – Example of School walk around checklist

The purpose of this checklist is to help Energy Reps as they walk round their buildings. The questions are designed to stimulate discussion about energy/water consumption.

In relation to lighting it is important to ensure that health and safety is not compromised by switching off lights (e.g. in stairwells). Similarly in relation to saving water it is important to ensure that hygiene standards are not compromised.

Walkround Details

Date of Walkround	
Time of Walkaroud	
Area of Walkround	
Normal Hours of Occupancy	

Observation	Areas/Comments/Actions
Lighting	
Has lighting been left on in unoccupied areas?	
Is there lighting switched on when daylight is sufficient?	
Are the light switches clearly labelled to identify what needs to be turned off and what should be left on?	
Is there external/security lighting on during daylight hours?	
Is there anything blocking natural daylight into the room? Could this be removed?	
Do the windows, skylights, luminaires, sensors or light diffusers need cleaning?	

Observation	Areas/Comments/Actions
Electrical Equipment	
Is any electrical equipment running unnecessarily? E.g. photocopiers, projectors, visualizers, fans, whiteboards, printers, chargers, laptops	
Any chargers left plugged in and switched on even if they are not charging anything?	
Can screens and other equipment be switched off during the day (e.g. during lunch)?	
Have unoccupied PC's/screens been left running?	
Heating	
What is the room temperature? Is this suitable?	
Does the room have a thermostat? Is it set correctly?	
Is any portable electric heating running? Could it be switched off?	
Is the main heating system running during out of hour's period?	
Are any air ducts, heaters and radiators are obstructed?	
Have doors/windows/other areas been left open?	
Have extractor fans been left running?	
Water Consumption	
Are there any dripping taps?	
Is there any evidence of water leaks? (e.g. wet pathways on a dry day)	
Are urinal controls in use in men's toilets and operating properly?	
Is water escaping from overflows either inside or outside buildings?	
Other Considerations	
Are any window panes cracked or broken?	
Is there evidence of problems with double glazing? (e.g. moisture between panes)	
Is there adequate draught proofing on windows and external doors?	
Are fridge doors kept closed? Do seals need replacing?	
Are posters and stickers displayed in appropriate areas to encourage end users to be more efficient?	
Are there any other problems?	

Example Record of Targets (template)

Baseline Data: March_____ to February _____				
Utility	**kWh (Litres)**	**kWh/m² (Litres/student)**	**Kg CO_2**	**Cost (£)**
Gas				
Bio Diesel Heat				
Electricity				
Water				
Current Performance - Year 1 March_____ to February _____				
Utility	**kWh (Litres)**	**kWh/m² (Litres/student)**	**Kg CO_2**	**Cost (£)**
Gas				
Bio Diesel Heat				
Electricity				
Water				
Targets				
Target Aims		**Target Reached**		
Gas		**Gas**		
Electricity		**Electricity**		
Water		**Water**		
Savings achieved				
Gas / Bio Diesel Heat	**Year 1**	**Year 2**	**Year 3**	
kWh				
CO_2				
£				
Electricity	**Year 1**	**Year 2**	**Year 3**	
kWh				
CO_2				
£				
Water	**Year 1**	**Year 2**	**Year 3**	
Litres				
£				

APPENDIX D: Guidance on “Active labelling of switches”

This approach has been proved to be successful in many schools where users are either not confident or forget to switch off. If you are an Eco-school then consult with your Eco-School coordinator to develop the “Active Labelling” strategy for your school. This is a task that can also involve students.

For schools that have not registered as Eco-Schools please follow the following guidelines to develop a basic “Active Switching Plan”.

This approach to energy management requires labelling your switches with coloured stickers. For example:

- **Red dot Stickers:** Do not touch
- **Green dot stickers:** Switch off when not in use or before leaving the room
- **Blue dot stickers:** To be used by staff as per operational guidance policy

Some schools have used different shapes with the colours to assist those that may be colour blind. Schools should ideally develop a labelling system that best meets the needs of its staff and students.

New Buildings

1. **Lighting:** Most schools have a combination of automatic and manually operated lighting. To reduce energy consumption label all manually operated switch with a **green dot sticker** to encourage users to switch lights off under the following conditions:

    - When not in use for more than 10 minutes
    - When daylight levels are bright enough
    - Before leaving for the day

    If automatic lights have a manual override switch then the above protocol should be followed for these as well. This is because the automatic setting is a back-up safeguarding measure in case occupants forget to switch off lights and should not be the primary mode of operation. It is healthy behaviour for occupants to switch lights off wherever possible.

2. **Ventilation Systems:** New buildings under Leicester BSF (Phase 3-6) have locally controlled extract fans in most classrooms and staff areas. In schools where extract fans have inbuilt automatic shutdown function (refer to figure below) these will have lights with ¼, ½, 1 and 2 indicating when the extract system is due to shut down.

   For schools where extract fans do not have automatic switch off functions, the switch is labelled with the word "**FAN"** as shown in figure below. Label all these fans with **green dot stickers** to encourage staff to switch it off when the room is not in use.

Figure 12: Extract fan switch with inbuilt automatic switch off function

Figure 13: Extract fan switch without inbuilt automatic switch off function

"Special considerations should be taken in the winter with extract fans. If extract fans are left on overnight then they will remove all the heat from the room and dump it outside. This will either result in the room being cold in the morning or energy wastage in heating the room back up to temprature.

In the winter, it is also important to be careful not to have the windows open and the extractor on as far as possible. However, it is understood that occupants might need to do this in the event the room gets too stuffy. In case of stuffiness please remember to first try turning down the thermostat before opening the windows. Don't forget to close the windows before you leave the building"

3. **Electronic Equipment:**
   Work with your ICT team to develop an active ICT shut down procedure. Use **red, green and blue** dot stickers to guide users in understanding switch off procedures. Where switches are out of sight consider additional labels to remind users to switch equipment off. Further guidance on ICT shutdown is provided in **Appendix B**

Retained Estate
Follow similar recommendations as those provided for new build areas.

Additional notes for Lighting
All schools have different lighting layouts in their classroom; as a result it is difficult to outline a generic switch of plan. Some schools might have lighting arranged as individual rows which can be switched off independently others might have every alternate light linked together. Follow the following steps to identify those rows of light that could be switched off

under good daylight levels to save energy and implement a programme to ensure they remain switched off.

1. With your Action Team, identify which rooms in the school have multiple light switches which allow rows or banks of fittings to be controlled independently.

2. Choose a day with average levels of daylight (i.e. overcast day/not too sunny) and carry out the following procedures in each room.

    a. Switch off all the lights and then, starting furthest from the window, switch each row back on one at a time. Each time consider whether there is an adequate amount of light to work effectively at desk level. (Note: in some classrooms, it is lighting installed close and adjacent to an internal wall that is best left off).

    b. When you feel there is an acceptable amount of light in the room, stop switching.

    c. In consultation with the class teachers in these rooms, discuss your findings and get their agreement as to which rows of lights could normally be left switched off. If teachers are uncertain about progressing this, try switching off one set of lights nearer the window and see if the students notice in the next class.

3. Once identified, mark up the respective switches with red stickers in order to indicate to the staff and students that these marked switches are not to be used unless necessary (i.e. at night, on a very overcast day, or if a student needs more lights on).

4. You could also use green stickers for lights/switches that should be used as needed. In this case the labelling system would be:
   Red Dots – Do not touch and do not use (override this as necessary at teachers' discretion)
   Green Dots – Switch and use lights as required

APPENDIX E: Activities to engage students and staff – lead by curriculum lead

Below is a table of possible activities that students and staff can engage, in led by their curriculum lead. Below this you will find a description of each activity.

	Occupancy Hours			Out of Hours		
	Core school hours	Additional school hours	Community use hours	Overnight	Weekend	Holiday
1. Bespoke materials	✓	✓	✓	✓	✓	✓
2. Corporate posters	✓	✓	✓	✓	✓	✓
3. Switch off stickers				✓	✓	✓
4. Active switch labelling	✓	✓	✓			
5. Whole school policy and shutdown procedure		✓	✓	✓	✓	✓
6. Energy monitors – students	✓	✓		✓		
7. Curriculum area leads - staff	✓	✓	✓	✓	✓	✓
8. Assembly	✓	✓	✓	✓	✓	✓
9. Curriculum areas – tutor time	✓	✓	✓	✓	✓	✓
10. Switch off hour	✓					
11. Switch off day	✓	✓				
12. DYNAMATlite	✓	✓	✓	✓	✓	✓
13. National awareness days	✓	✓	✓	✓	✓	✓
14. Campaigns	✓	✓		✓	✓	✓
15. Audits	✓	✓	✓	✓	✓	✓
16. Timers/sensors a. Automatic—timers b. Manual switch off				 ✓ ✓	 ✓ ✓	 ✓ ✓
17. Staff training and taking control of their own classrooms	✓	✓		✓	✓	✓
18. Mechanism for reporting problems	✓	✓	✓	✓	✓	✓

19. ICT Shutdown systems			✓	✓	✓	✓

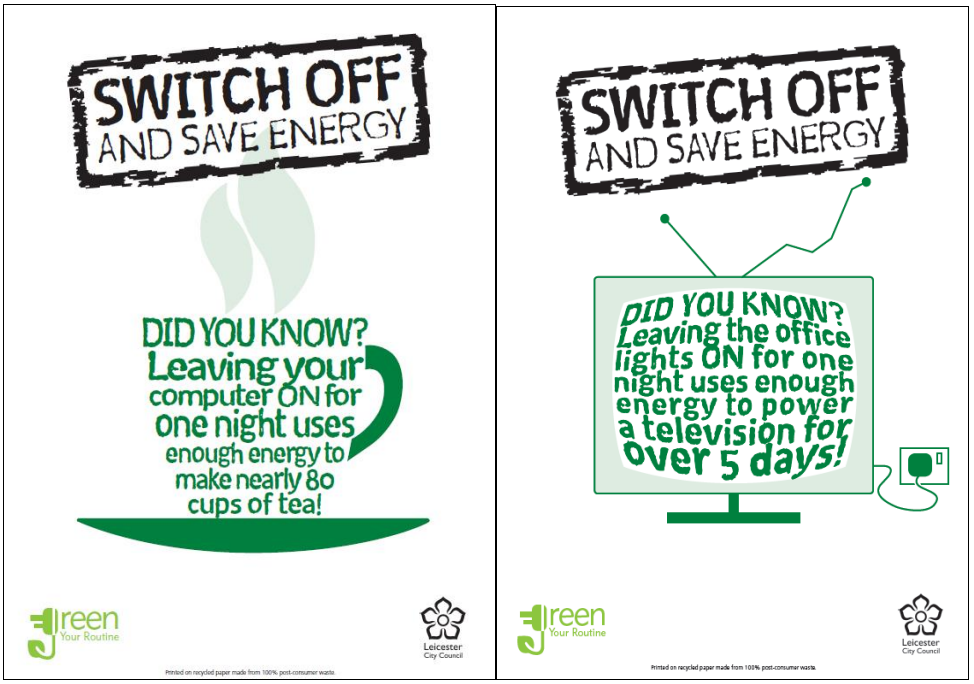
There are a number of case studies on the Eco-Schools website at www.eco-schools.org.uk/gettingstarted/casestudies?category=Energy which are students and staff carrying out energy reduction in their schools!

1. Bespoke materials

Engage the whole school or a specific year group through a poster competition which can be printed and published online. Don't forget badges, mugs and T shirts! Believe it or not these are really good ways to engage.

2. 'Corporate' posters

Many companies such as The Carbon Trust, EDFs 'the pod', British Gas and Scottish Power provide free posters (mainly through downloads) which can be printed in school or displayed on screens and ICT desktops. We also have a number of council posters which can be printed.



www.carbontrust.com/resources/faqs/technology-and-energy-saving/posters-and-stickers
http://jointhepod.org/resources/0/0/0/72/0/0/0/1 (direct link to energy resources including posters)
www.britishgas.co.uk/business/smarter-working/energy-made-simple/saving-energy/posters
www.scottishpower.co.uk/your-business/small-business/saving-energy/tips

3. Switch off stickers – labelling to switch off at the wall

Labelling of plugs, switches and lights give all students and staff the opportunity to switch off at the wall any equipment when not in use. Green switch off stickers are used for equipment and switches can be turned off at the end of the day. Red stickers are for pieces of equipment which need to be left on overnight e.g. fridges, boilers. Good habits will be created as everyone knows exactly what should be switched off or left on. Clearly there will be some places where switches are inaccessible and therefore cannot be managed.

4. Active switch labelling – switch off those you don't use

Do you have classrooms or corridors in school where all the lights are switched on but not needed, especially in retained estate and older buildings? Labelling switches involves colour coding light switches - green stickered switches which should be switched on all the time during occupancy and red stickered switches which could be left off all the time.

5. Whole school policy and shutdown procedure

A whole school policy and shutdown procedure which all staff sign up to is a great way to ensure that once all the hard work has been done, good habits continue. Review annually and ensure all staff are given a copy during induction. Typical shutdown procedures include shutting down PCs, switching off at the wall where possible and lights in shared working areas.

6. Energy monitors – students

By establishing a group of students who are keen, they can help reduce the workload associated with monitoring. Students can have dedicated areas of the school to check or have dedicated times of the week. Eco-Schools award helps to establish to structures that may be needed to establish and run these activities.

The Environmental Education Co-ordinator is also able to lead this activity at school.

7. Curriculum area leads - staff

In order for each area of the school to achieve the lowest energy and water consumption, champions can be created in each curriculum area. This way the workload is more evenly spread and initiatives are more likely to be adopted. It could simply be a way of an email, a smaller number of people check lists or ways of feedback any problems. There is also likely to be more ownership if more staff is involved.

8. Assembly

A quick way to raise the profile of reducing consumption is through assemblies. They can be linked to national or international days or just something within the school. See number 13 for dates of national events.

9. Curriculum activities – tutor time

Quizzes, competitions, video clips and other activities can be produced and shared with form/class tutors in school as part of the morning/afternoon routine. Many are produced nationally for various events. Don't forget things such as BBC iPlayer, BBC Newsround and similar sites which can be used to highlight global events. Education Scotland produces a large collection of videos suitable for classroom use at
http://www.educationscotland.gov.uk/weatherandclimatechange/resourcebank/videos/

10. Switch off hour

Using DYNAMATlite it is possible to monitor energy use half hourly. If you school sets a switch off hour it will not only raise awareness, you will also be able to see the impact this has on energy consumption and ultimately bills! Staff and students are encouraged in advance to switch off all electrical equipment including lighting where possible. These events work best in the spring/summer when days are lighter. There may need to be some

compromising with some subject areas, particularly ICT/computing – however it means staff can be creative with their teaching – perhaps even having all having outdoor lessons.

11. Switch off day

As switch off hour – but school wide for the whole day

12. DYNAMATlite

DYNAMATlite is the main web-based tool for analysing energy and water use in your school. Remember the username and password is unique to your school and cannot be changed – therefore can be given to your students to use both in school and at home. Many of the activities described in this section will use DYNAMATlite as a tool to monitor the impact.

13. National Awareness Days

International days and national weeks are a good way to have a focus on specific behaviours and embed them with staff and students. Students are more likely to carry out tasks of they can make direct links locally and globally with their actions. Below are a few examples which schools can engage in during term time. Please note the dates occasionally change each year so check before hand

a. World Polar Bear Day – 27th February http://www.polarbearsinternational.org/our-work/international-polar-bear-day
b. Climate Change Week usually 2-8th March, due in Autumn 2015 www.climateweek.com
c. World Environment Day - 5th June www.unep.org/wed
d. Energy Saving Week – now included in switch off fortnight
e. Switch off Fortnight – 18th November – 1st December
f. World Water Day www.unwater.org/worldwaterday
g. World Toilet day www.wateraid.org/uk/get-involved/campaigns

14. Campaigns

a. Goodbye standby http://jointhepod.org/campaigns
b. Switch on to switch off http://jointhepod.org/campaigns/switch-off-fortnight-info

15. Audits

Various audits can be carried out by students, taking the burden away from premises and teaching staff. They can be broadly put into 2 categories:

a. Out of hours (i.e. after the end of school day)
b. During school hours (i.e. breaks, lunches)

16. Timers/sensors – purchasing

There are two types of household timers which are available that can be used on PCs and laptops. Below are a couple of examples. They are intended to be used as security timers in houses as well as specifically removing the standby mode in PC screens.

a. Automatic-timers – set up to automatically turn on before school starts and switch off after the end of school day. The PC do however needs to be shutdown (either manually or via an automated shutdown procedure which can be centrally carried out). The purpose of this is to stop power being used overnight in 'standby' and sleep mode of PCs. The 7-day timers can also be set up to remain off during the weekend. Typically this can save £6 per year, meaning pay-back on the kit is less than a year. The user does not need to do anything on a

daily basis. There may need to be annual checks to ensure the digital timer's time remains correct and the times have not been altered. 'Electronic digital timers' are available from various places.

b. Manual switch off (remote controls) – there may be plug sockets which aren't easily accessible or multiple plugs. There are a number of products which can be put between the socket and plug which function with a remote control – manually turning the power on and off. The user needs to manually remember to switch on and off the equipment each day. 'Remote control sockets' are available from various places.

c. Semi-automatic – there are a number of products which can switch off power to peripheral pieces of equipment once the main PC is turned off. When the PC base is powered back up, the other pieces of equipment will automatically be given power. This system automatically cuts off standby without the user being aware or having to intervene.

17. Staff training and taking control of teaching staff's own classroom

In many schools, particularly new buildings there are an expectation that everything is automated and there is nothing that individuals can do. However this is generally not the case. A simple training programme for all staff can be delivered in face to face meetings as well as visually through user guides which can be displayed on the wall. These should cover:

- Use of blinds
- Use of lighting
- Radiator and radiant heat panel controls
- Extraction (and heating) air system control and managing open windows
- Air conditioning units (centrally or locally managed)
- Basic BMS training

18. Mechanism for reporting problems with classrooms

Do staff members in your school know how to report heating and/or cooling problems? If not, this needs to be made clear and a system to ensure that staff feels like their concerns are addressed. This way problem of overheating and/or cooling can be reduced and the knock on effect is energy can be reduced. Otherwise staff will 'take it into their own hands' and actually use more energy by opening windows or overworking systems.

19. ICT shutdown systems

A whole school policy of shutting PCs down at the end of the school day can save literally thousands of pounds a year. PC shutdown is a last resort if staff and students forget to shut PCs down at the end of the day. There are a number of commercial pieces of software available to shutdown PCs at the end of school day; however they all use the built-in Windows shutdown protocol. This can be set up to automatically shut all PCs down at a set time. It can also include a countdown time for any staff still working. This can take some time to plan and may involve doing a whole school audit to exclude certain PCs e.g. main hall used for school productions or ICT used by the community after hours. For further information on case studies see. This can be done by the ICT technicians centrally and rolled out across the network.

Information about the Green Button Campaign Software
www.lssit.ie/energywatch/Schools_Green_Button_Campaign.pdf

APPENDIX F: Flowchart to identify issues with water management