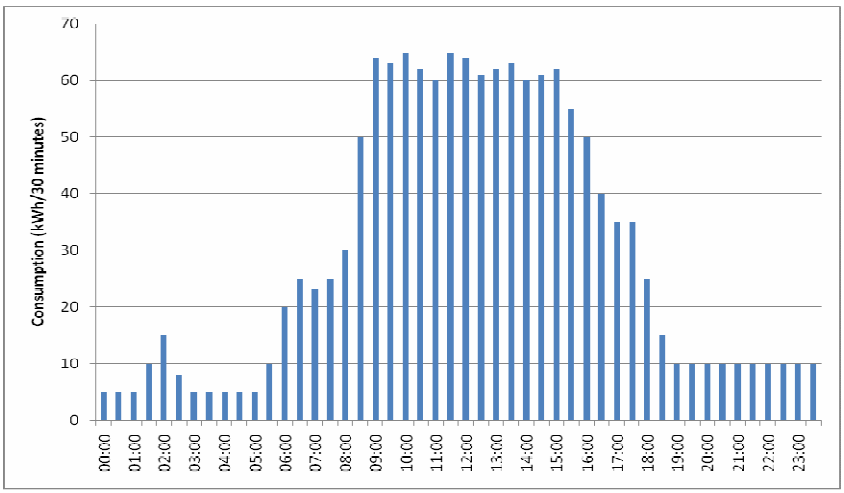
SCoRE

Getting the Benefit from AMR



September 2011

Getting the Benefit from AMR

Introduction

Automatic Metering Reading (AMR) facilities (sometimes called 'smart' meters) fitted to your electricity, gas or water supplies, can provide you with an invaluable insight into how and when your school is consuming energy.

The AMR meters record your consumption in half-hourly chunks and this information is then retrieved electronically by your utility supplier. This 'half hourly data' can be presented in graphical format and this can immediately reveal periods of unexpected energy use, particularly overnight and at the weekend.

These guidance notes use typical consumption profiles to illustrate the features that may indicate energy or water waste at your school (and hence savings opportunities). The guidance also lists some possible causes and suggests actions you can take to deliver savings.

- Common issues with electricity consumption are considered on pages 4 to 11.
- Common gas consumption issues are considered on pages 12 to 15.
- Common water consumption issues are considered on page 16.

Pages 17 onwards provide guidance on how to use your profiles to estimate the savings achieved as the result of implementing energy or water saving initiatives.

Accessing your profile graphs

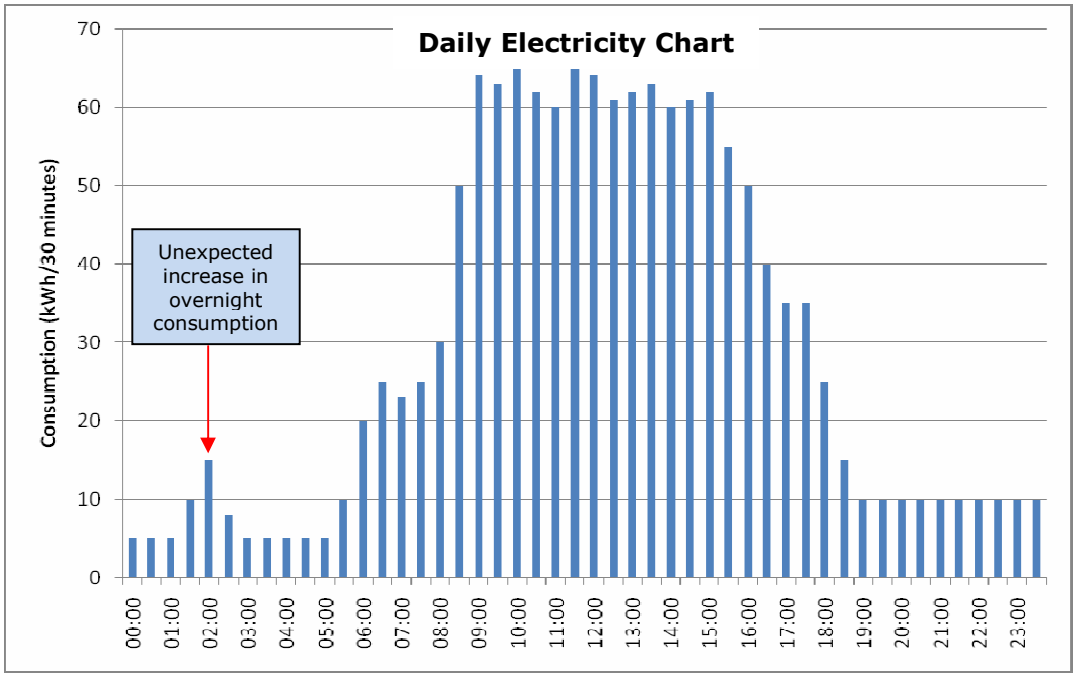
To receive your half hourly profiles for electricity or gas please contact the Energy Management Section at Trent Bridge House either Phil Berrill on 01159 77641 e-mail phil.berrill@nottscc.gov.uk or Tom McHale on 01159 774891 e-mail thomas.mchale@nottscc.gov.uk or Luke Jackson on 01159 774851 e-mail luke.jackson@nottscc.gov.uk. We can either provide you with your profiles directly or arrange log in details for you to access the data directly from the supplier using the internet.

Common terms:

Kilowatt (kW) – a kilowatt is a unit of energy, equal to 1,000 Watts.

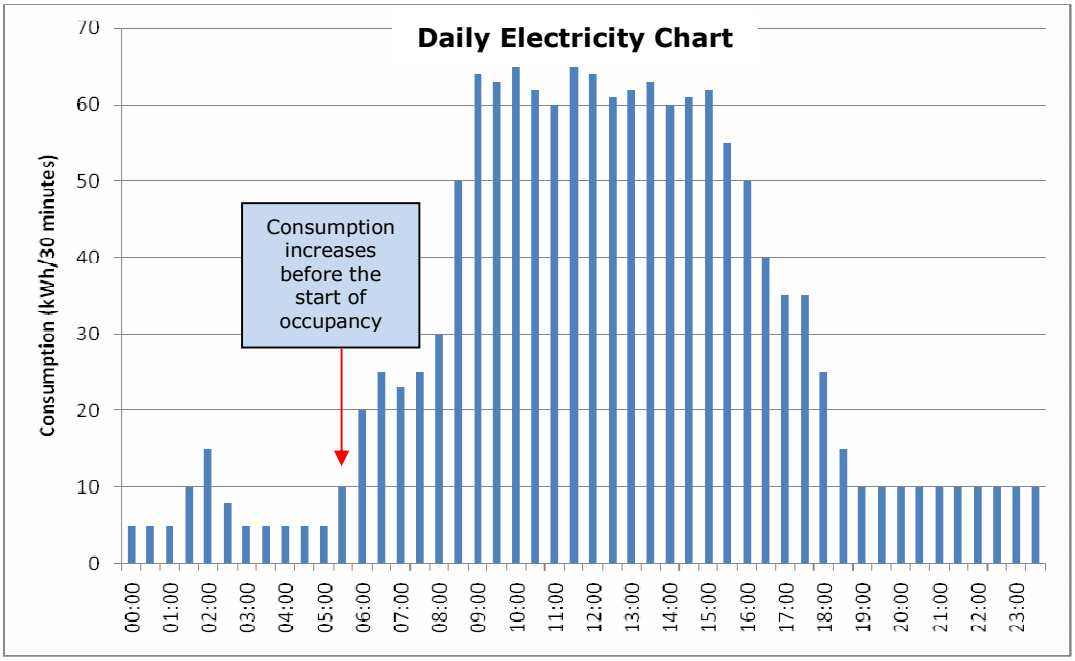
Kilowatt hour (kWh) – a kilowatt hour is a unit of energy equivalent to 1,000 Watt hours. It is calculated by multiplying power (in Watts or kilowatts) by time. It is the unit usually used by energy suppliers on their bills.

Electricity Issue 1: Unexpected increase in overnight consumption



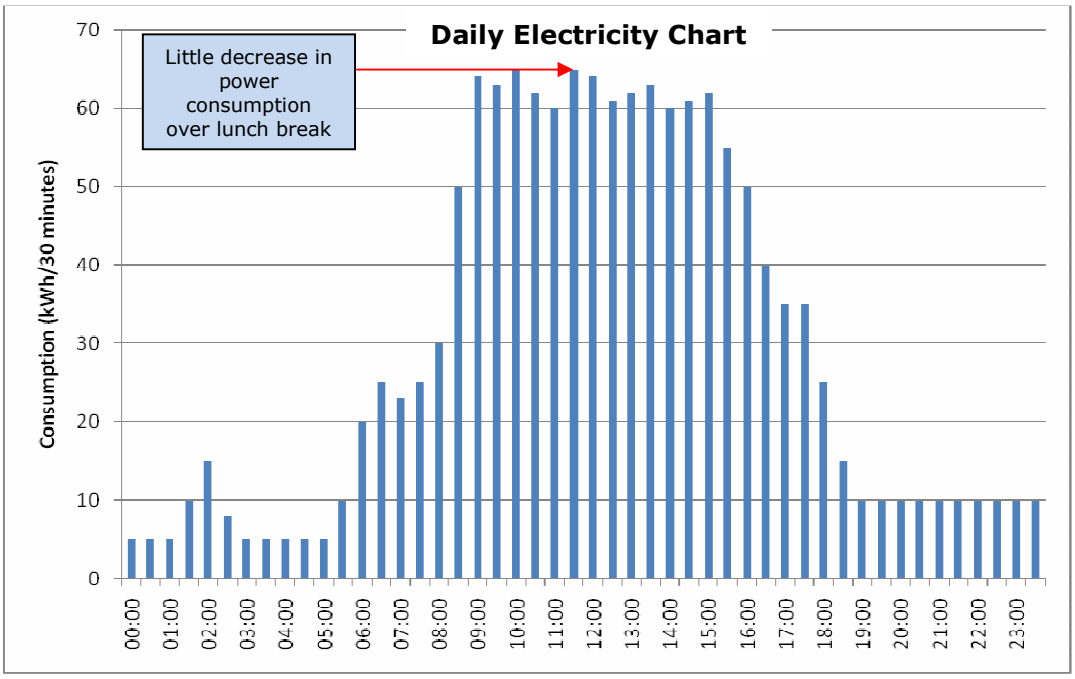
Possible Cause	Remedial Action
1. Operation of security lighting (on presence detector).	If frequent occurrence, check sensitivity of presence detector.
2. Operation of heating under "frost protection".	If frequent occurrence, or if temperatures have not dropped below freezing, get the operation of the frost protection controls checked.
3. Operation of craft or lab equipment under timeswitch control.	Check validity of use.
4. Night storage electrical heating.	Confirm time settings and omit operation on Friday and Saturday nights if appropriate.

Electricity Issue 2: Consumption increases several hours before the start of occupancy



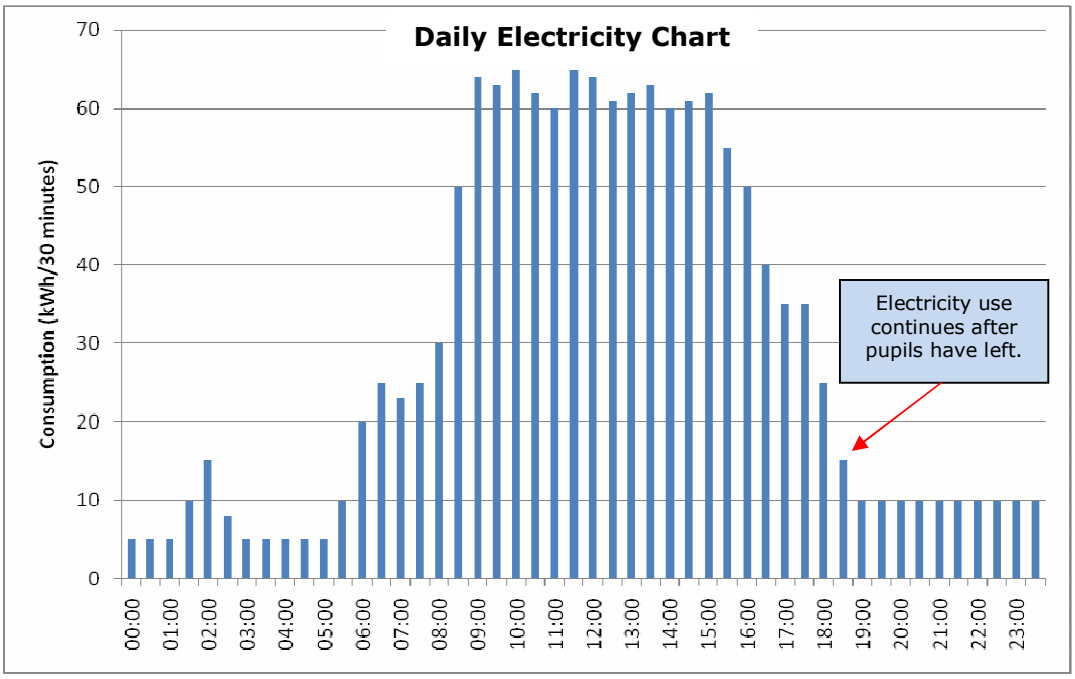
Possible Cause	Remedial Action
1. Heating system start-up.	Most heating systems should not need to start up more than 2 hours before the start of occupancy (or less in mild weather). Get heating controls checked if warm-up period appears too long.
2. External lighting (under timeswitch or photocell control).	Check when external lights actually need to be on and adjust time controls accordingly. Consider installing an additional timeswitch if a photocell is keeping your external lighting on throughout the night (without good reason).

Electricity Issue 3: Little decrease in power consumption over lunch break



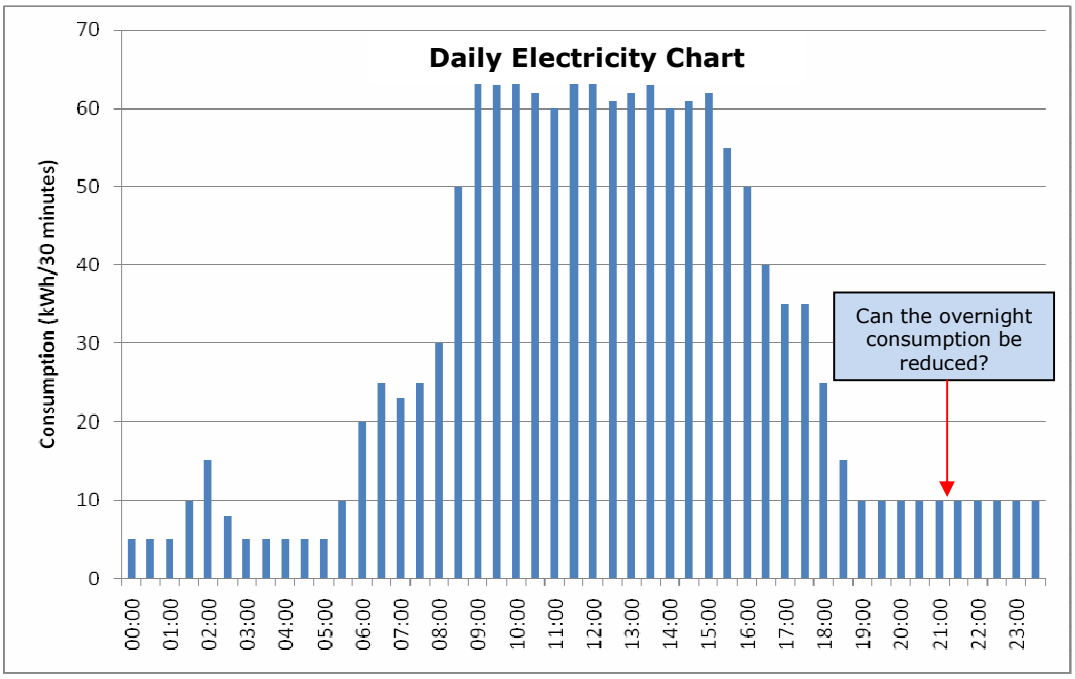
Possible Cause	Remedial Action
1. Lighting and ICT equipment left on in classrooms over lunch.	Pursue more rigorous switch-off procedures.

Electricity Issue 4: Electricity use continues after pupils have left



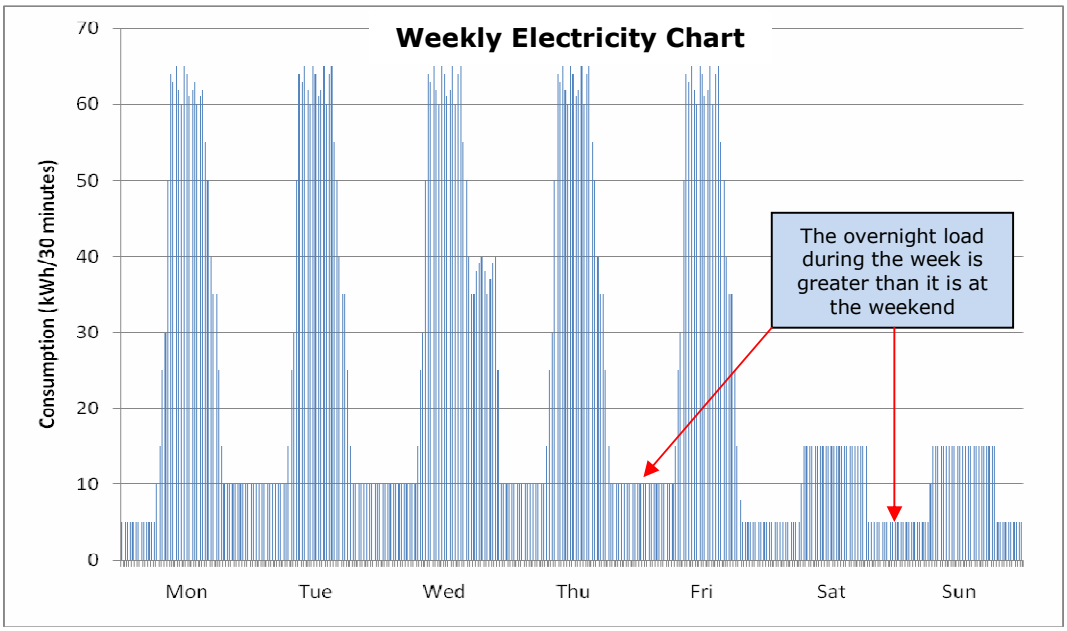
Possible Cause	Remedial Action
1. Lighting and ICT equipment left on in classrooms.	Pursue more rigorous switch-off procedures.
2. Extended working hours, meetings or the cleaners are working.	Check working procedures to ensure that lights etc. are switched off except when a room is actually being cleaned.
3. Heating system operating after hours.	Check heating control settings.
4. External lighting (under timeswitch or photocell control).	Check when external lights actually need to be on and adjust time controls accordingly. Consider installing an additional timeswitch if a photocell is keeping your external lighting on throughout the night (without good reason).
5. Evening school activity.	Check the extended hours match expectations. Do large areas of the school have to be lit, just to support one or two classrooms that have out of hours activity?

Electricity Issue 5: Can overnight consumption be reduced?



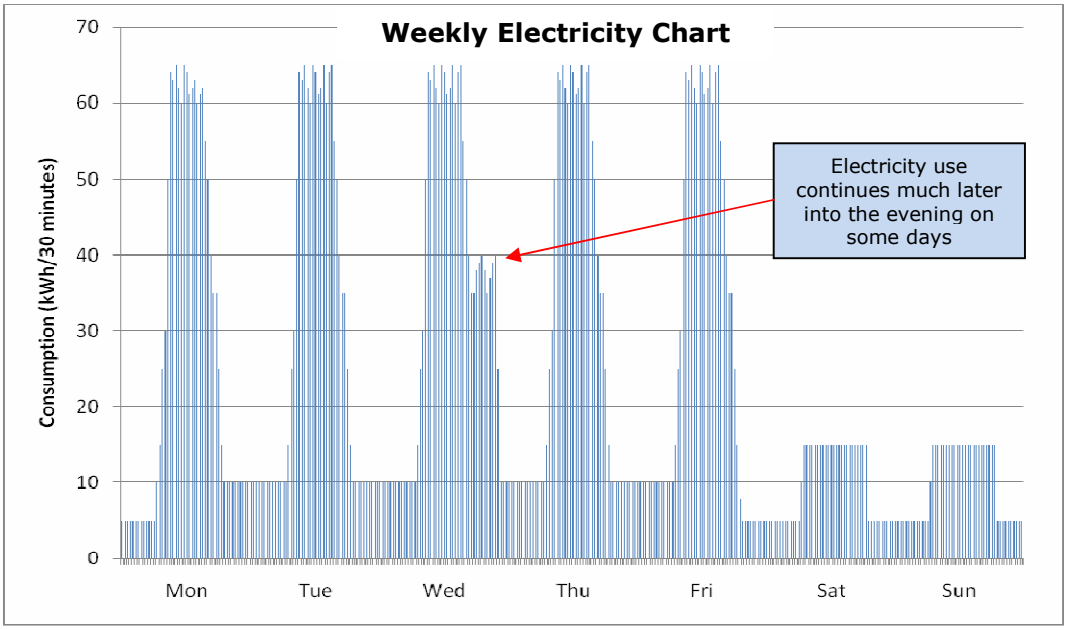
Possible Cause	Remedial Action
1. Non-essential electrical equipment being left on overnight.	Perform out of hours survey to identify and tackle offending equipment
2. External lighting (under timeswitch or photocell control).	Check when external lights actually need to be on and adjust time controls accordingly. Consider installing an additional timeswitch if a photocell is keeping your external lighting on throughout the night (without good reason).
3. Heating pumps or ventilation fans running overnight	Check heating controls.
4. Night storage electrical heating	Confirm time settings and omit operation on Friday and Saturday nights if appropriate.

Electricity Issue 6: The overnight load during the week is greater than it is at the weekend



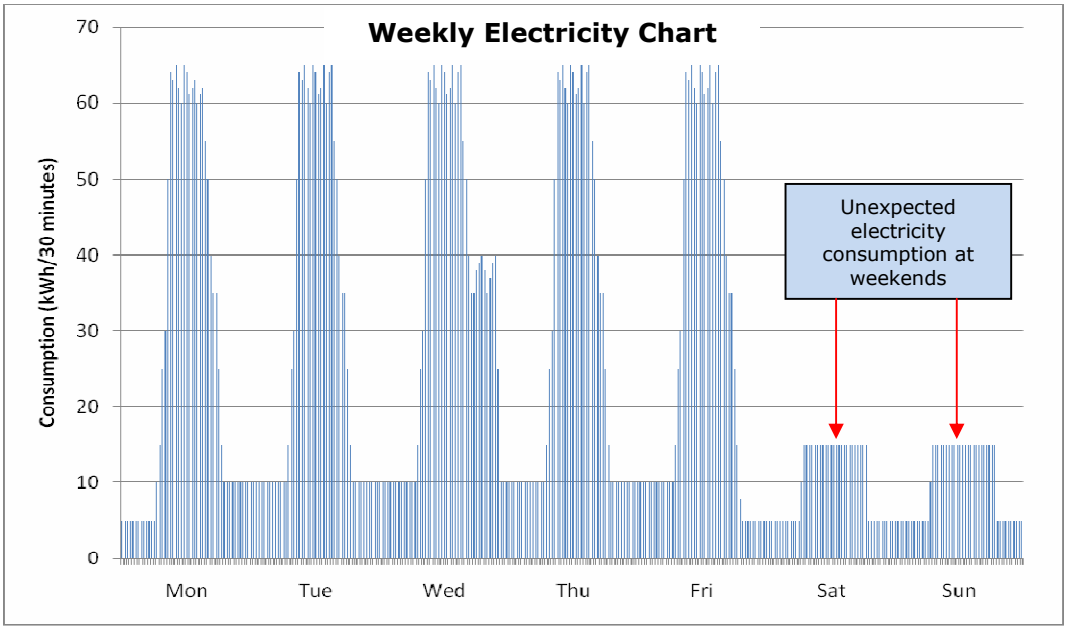
Possible Cause	Remedial Action
1. "Switch off" procedures are less rigorous during the week.	Perform out of hours survey to identify and tackle offending equipment.
2. Heating pumps or ventilation fans running at different settings during the week	Check heating controls.
3. Night storage electrical heating running at different settings during the week	Confirm time settings are appropriate

Electricity Issue 7: Electricity use continues much later into the evening on some days



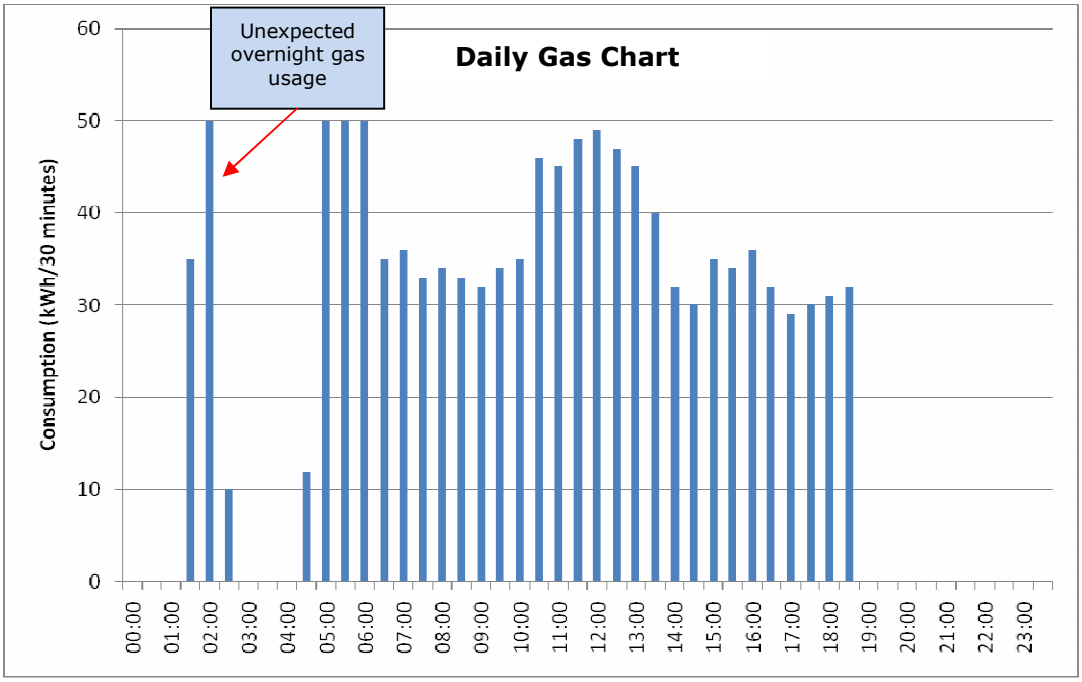
Possible Cause	Remedial Action
1. Evening school activity.	Check that the extended hours match expectations. Do large areas of the school have to be lit, just to support one or two classrooms that have out of hours activity?
2. Operation of heating system.	Check heating controls
3. Operation of external lighting.	Check lighting controls

Electricity Issue 8: Unexpected electricity consumption at weekends



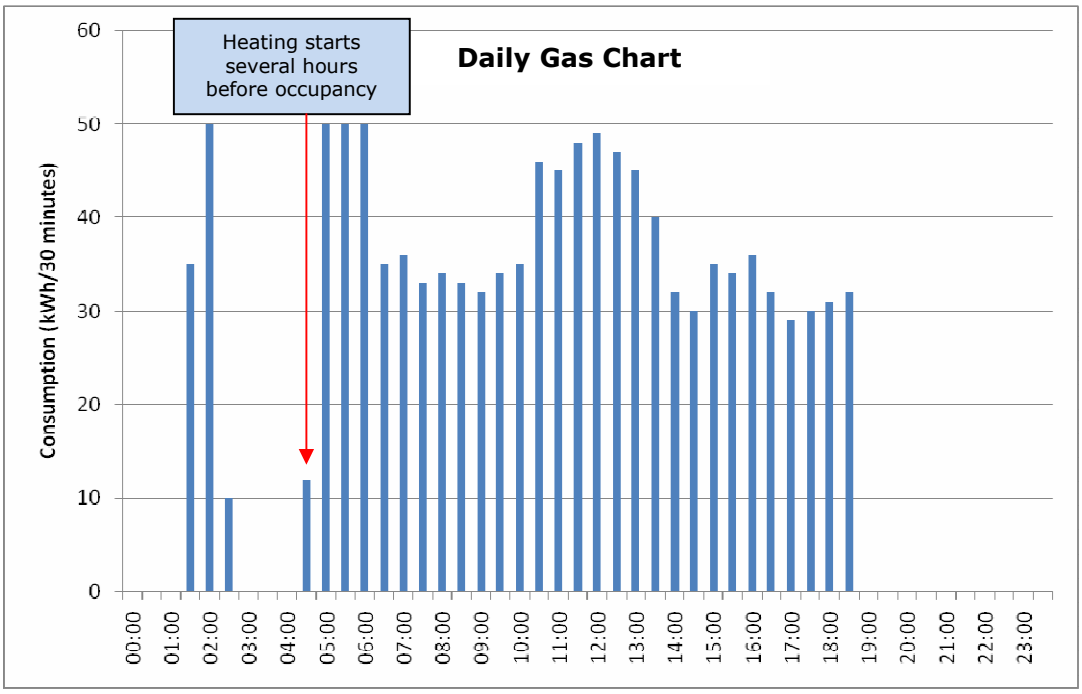
Possible Cause	Remedial Action
1. Operation of craft or lab equipment under time switch control.	Check validity of use.
2. Operation of heating or hot water systems.	Check heating controls.

Gas Issue 1: Unexpected overnight gas usage.



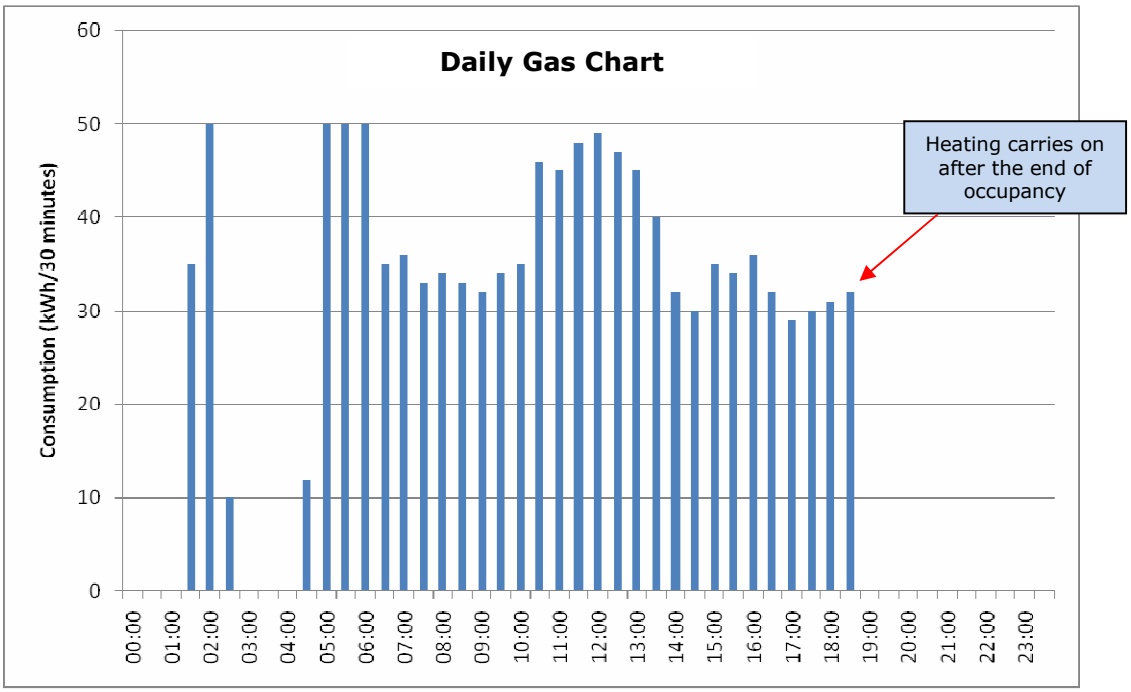
Possible Cause	Remedial Action
1. Operation of heating system.	Check heating controls
2. Operation of heating under "frost protection".	If frequent occurrence, or if temperatures have not dropped below freezing, get the operation of the frost protection controls checked.

Gas Issue 2: Heating starts several hours before occupancy



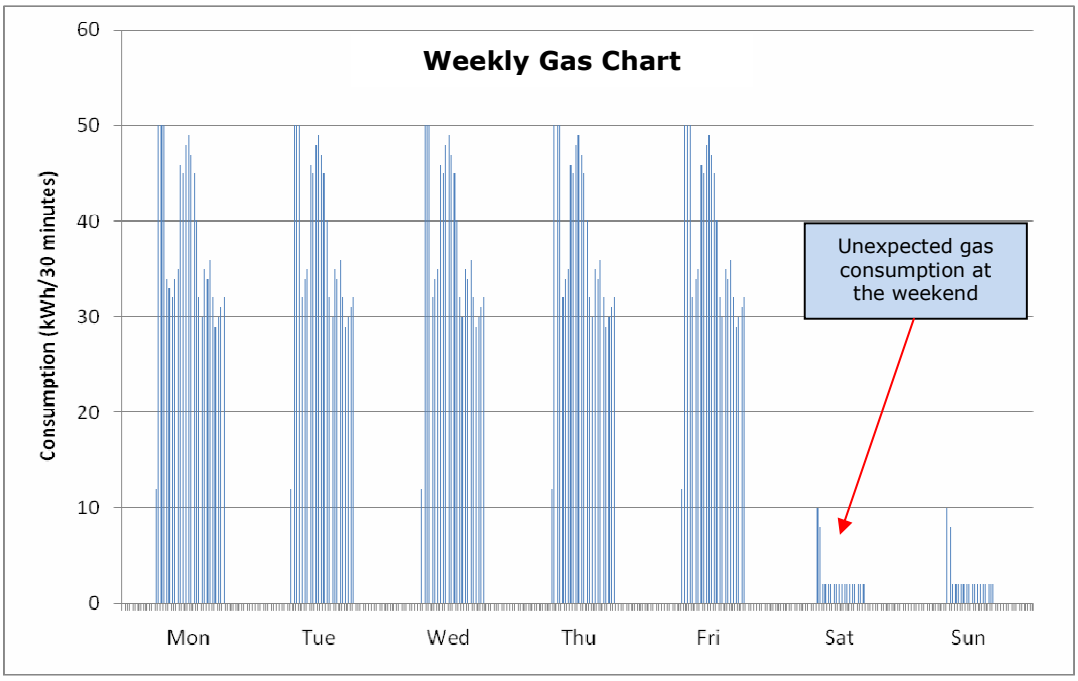
Possible Cause	Remedial Action
1. Heating system start-up.	Most heating systems should not need to start up more than 2 hours before the start of occupancy (or much less in mild weather). Get heating controls checked if warm-up period appears too long.

Gas Issue 3: Heating carries on after the end of occupancy.



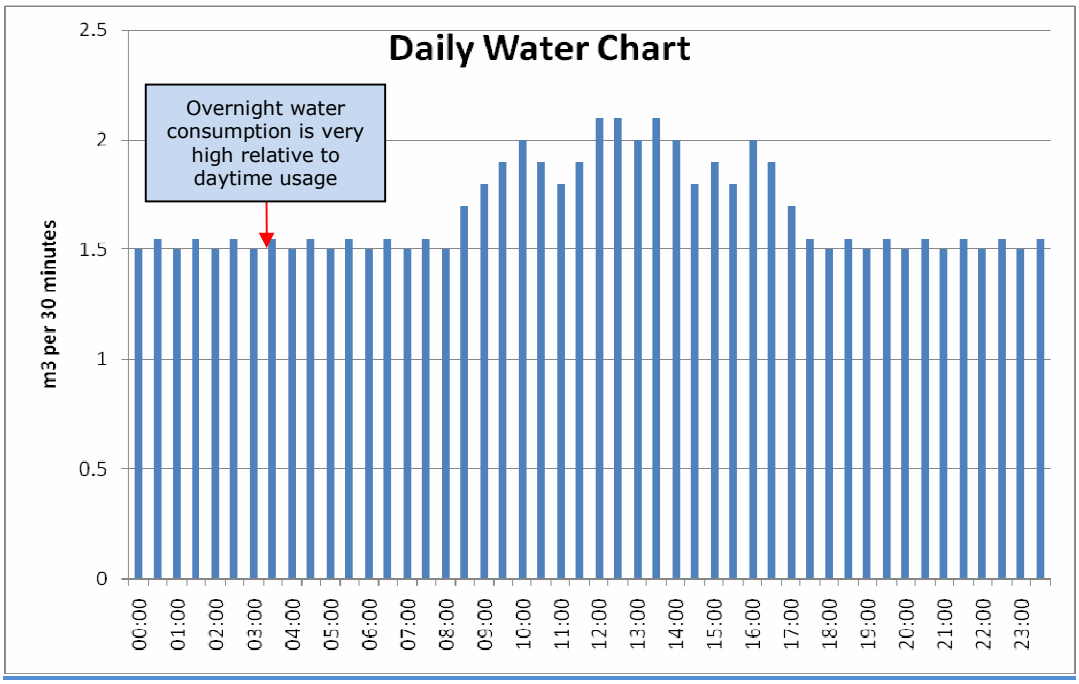
Possible Cause	Remedial Action
1. Heating system operating after hours.	Check heating control settings. Heating should be switched off 30 minutes before the school closes.
2. Evening school activity.	Check that the extended hours match expectations. Do large areas of the school need to be heated, just to support one or two classrooms that have out of hours activity?

Gas Issue 4: Unexpected gas consumption at the weekend.



Possible Cause	Remedial Action
1. Operation of heating or hot water systems.	Check heating controls.

Water Issue 1: High overnight consumption



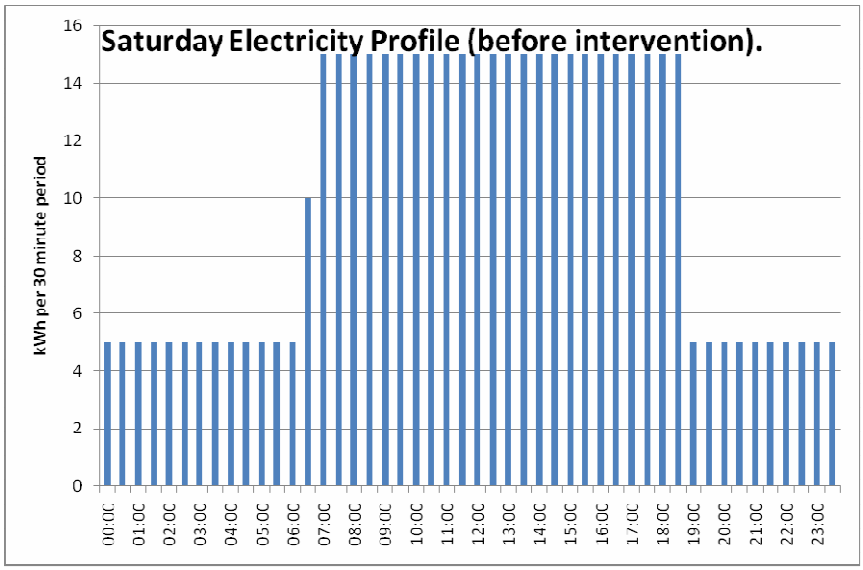
Possible Cause	Remedial Action
1. Uncontrolled flushing of urinals.	Check operation of urinal flush controls.
2. Overflows from WC cisterns or water storage tanks.	Check for overflows and rectify as necessary.
3. Underground leak.	Isolate at incoming valve to building or isolate all building water users and check whether water is still being used. If so, commission leak detection and repair.
4. Grounds maintenance.	Ensure that all hoses and sprinklers etc are being fully turned off.
5. Swimming pool make-up.	If you have a swimming pool, make sure that excessive make-up is not occurring (leading to overflow). Reduce the need for make-up by using a pool cover.

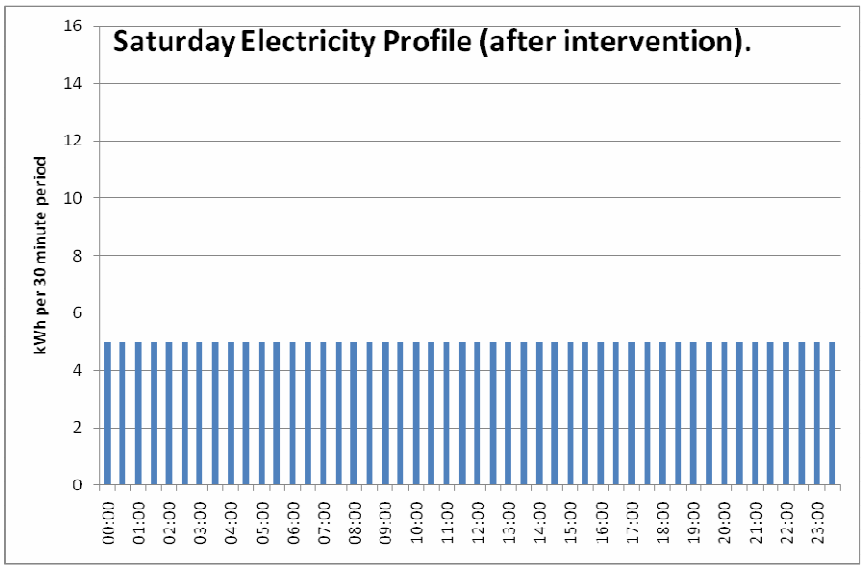
Using AMR profiles to estimate savings achieved

Your AMR profiles can be invaluable as a means of identifying when energy or water waste is occurring.

They can also be used to calculate the value of savings achieved as a result of implementing efficiency measures.

The following two graphs are an example – the first profile shows unexpected electricity consumption on a Saturday, while the second one shows the profile once the heating controls had been re-set to prevent unwanted Saturday operation of the heating pumps and fans.





To estimate the savings achieved use the following process:

Step 1: Calculate the daily reduction in consumption by adding up the reductions achieved in each half-hourly period.

Daily consumption saving = [ ] units (A)

In the example, the savings add up as follows:

Period	***Savings***	***Comments***
06.30	*5*	*Reducing from 10 kWh to 5 kWh*
07.00	*10*	*Reducing from 15 kWh to 5 kWh*
07.30	*10*	*"*
08.00	*10*	*"*
08.30	*10*	*"*
09.00	*10*	*"*
09.30	*10*	*"*
10.00	*10*	*"*
10.30	*10*	*"*
11.00	*10*	*"*
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15.30	*10*	*"*
16.00	*10*	*"*
16.30	*10*	*"*
17.00	*10*	*"*
17.30	*10*	*"*
18.00	*10*	*"*
18.30	*10*	*"*
Total	*245*	*units /day*

Step 2: Select the appropriate "kWh conversion factor" from the table below.

kWh conversion factor= [ ] (B)

The required "kWh conversion factor" will vary depending upon the units in which the original consumption data is presented.

Table of kWh conversion factors

Original data units	kWh Conversion factor
kWh	x1.0
kW	x0.5

Step 3: Multiply the daily saving figure by the "kWh conversion factor" to convert the savings to kWh per day

AxB = [ ] kWh (C)

In the example, the daily saving is 245, the factor is 1.0 and therefore the daily kWh saving is 245 kWh.

Step 4: Calculate how many days per year that the daily saving will be achieved

Number of days = [ ] days (D)

In the example, the savings will be achieved on one day per week x 52 weeks per year = 52 days per year.

Step 5: Calculate the annual kWh saving, by multiplying the daily kWh saving by the number of days each year that the saving will be achieved

CxD = [ ] kWh/yr (E)

In the example, the annual kWh saving = 245 x 52 = 12,740 kWh/yr

Step 6: Identify the price in pence per kilowatt hour that you currently pay for electricity or gas (as appropriate). Alternatively, as a rough guide, assume 9p/kWh for electricity or 3p/kWh for gas

Fuel price = [ ] p/kWh (F)

Step 7: Multiply the annual kWh saving by the p/kWh fuel price to get an indication of the annual cost saving

ExF = [ ] £/yr (G)

In the example the annual cost saving would be 12,740kWh/yr x 9p/100 = £1,147/yr.

Step 8: Annual CO_2 savings will be approximately 1 tonne CO_2 per £165 saved

G/165 = [ ] tCO2/yr (H)

In the example, the annual CO_2 savings will be £1,147/165 = 6.9 tonnes CO_2/year.