Transition Bath

- Local voluntary charity interested in Sustainability:

  www.transitionbath.org

  http://transitionbath.org/newsletter-signup/

- Three main groups
  - Energy
  - Food
  - Transport

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Transition Bath Energy Group

- Schools Energy
- Thermal Imaging
- LED Lighting (library based ‘try-before-you-buy kit)
- Planning and consultations
- Bath Green Homes
- Blower door
- Bath & West Community Energy (6.5MW solar PV)

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Schools Energy

- Project started in 2011 to help schools save energy
- Early on we noticed there was a wide disparity on energy use per floor area (m^2) – up to a factor of 6 – but not related to the age of the building – used this to target schools using DEC data
- Smart Meter (AMR) data became available – ½ hourly meter readings could be used to understand how well a schools was using energy

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Schools Energy

- 2012 started analysing schools AMR data using spreadsheets
- 2013 – we were involved in paid energy survey of 75 B&NES schools and 200+ electricity and gas meters

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Process

½ hourly gas readings

½ hourly temperatures
Floor areas, pupil numbers
Degree days

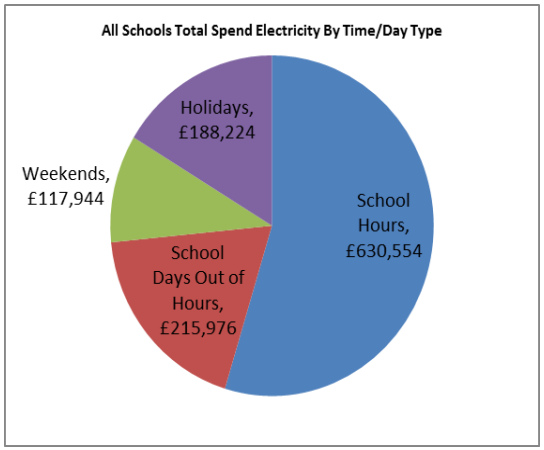
½ hourly electricity readings

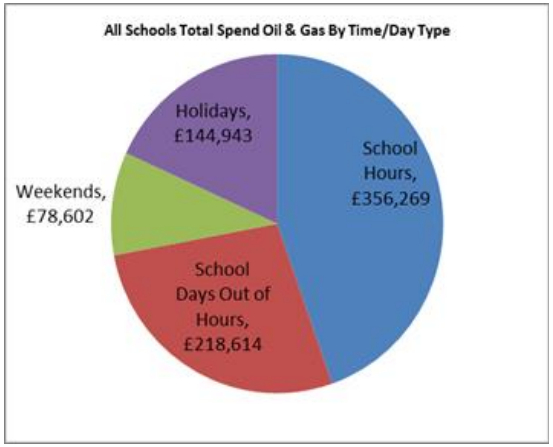
100ft³ or 1 m² unit conversion

Electricity Analysis Spreadsheet

Common Data Spreadsheet

Gas Analysis Spreadsheet





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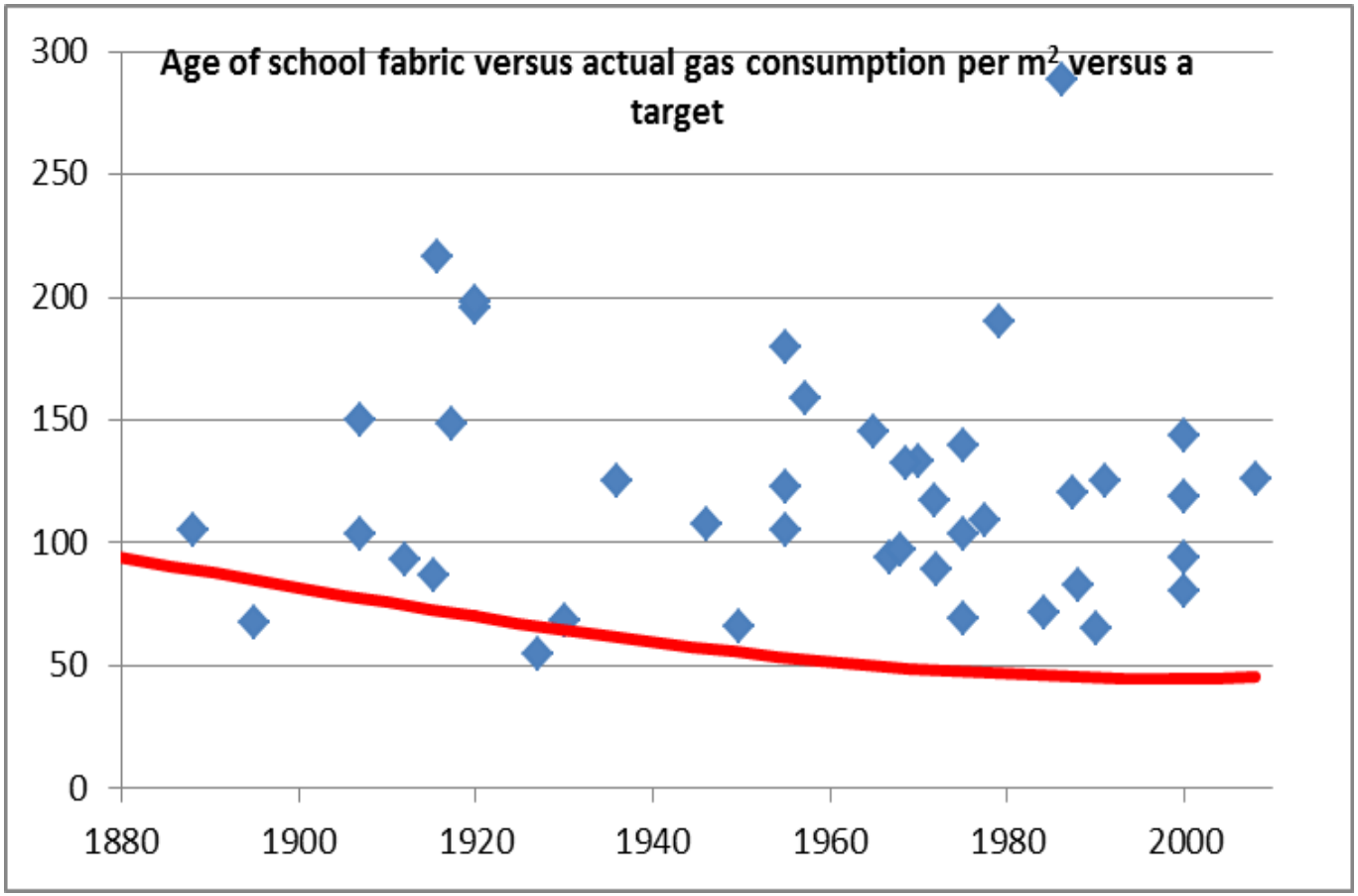
Gas Analysis



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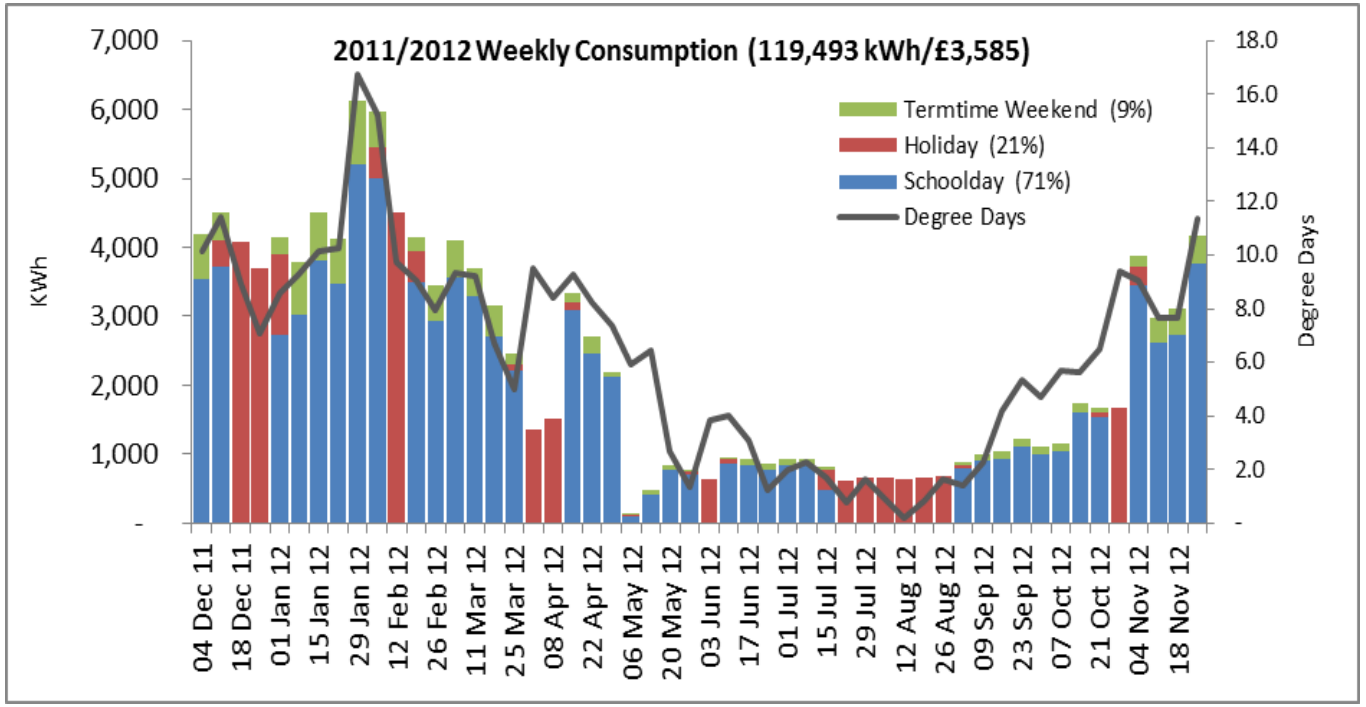
Gas Analysis

By week of year: look for correlation with ‘Degree Days’, usage in holidays



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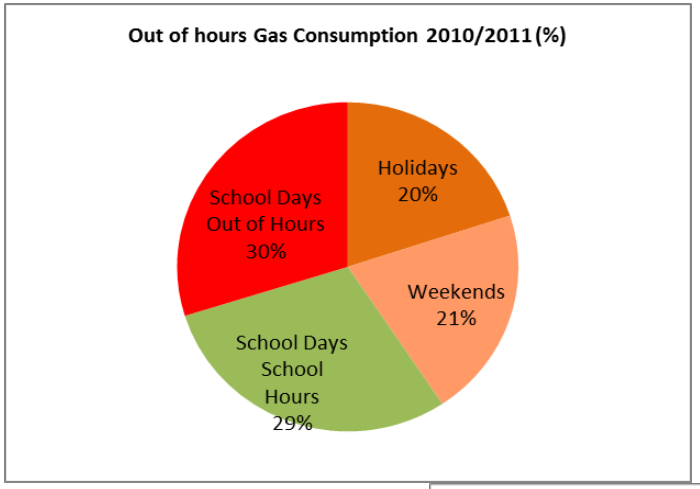
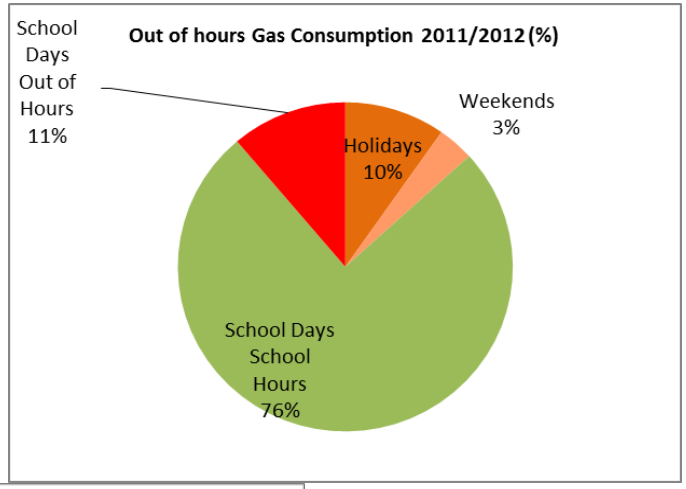
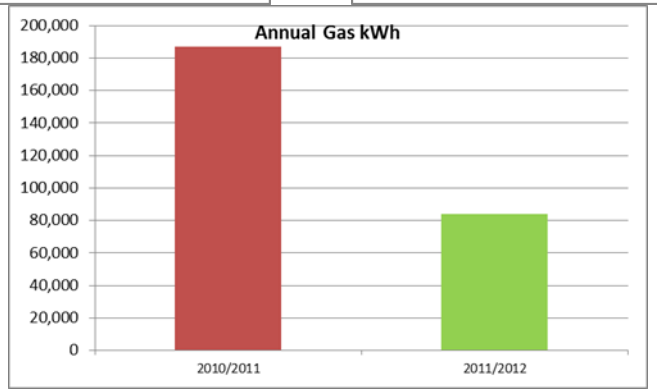
Gas Analysis

By time/day: look for usage outside opening hours (15% of year)







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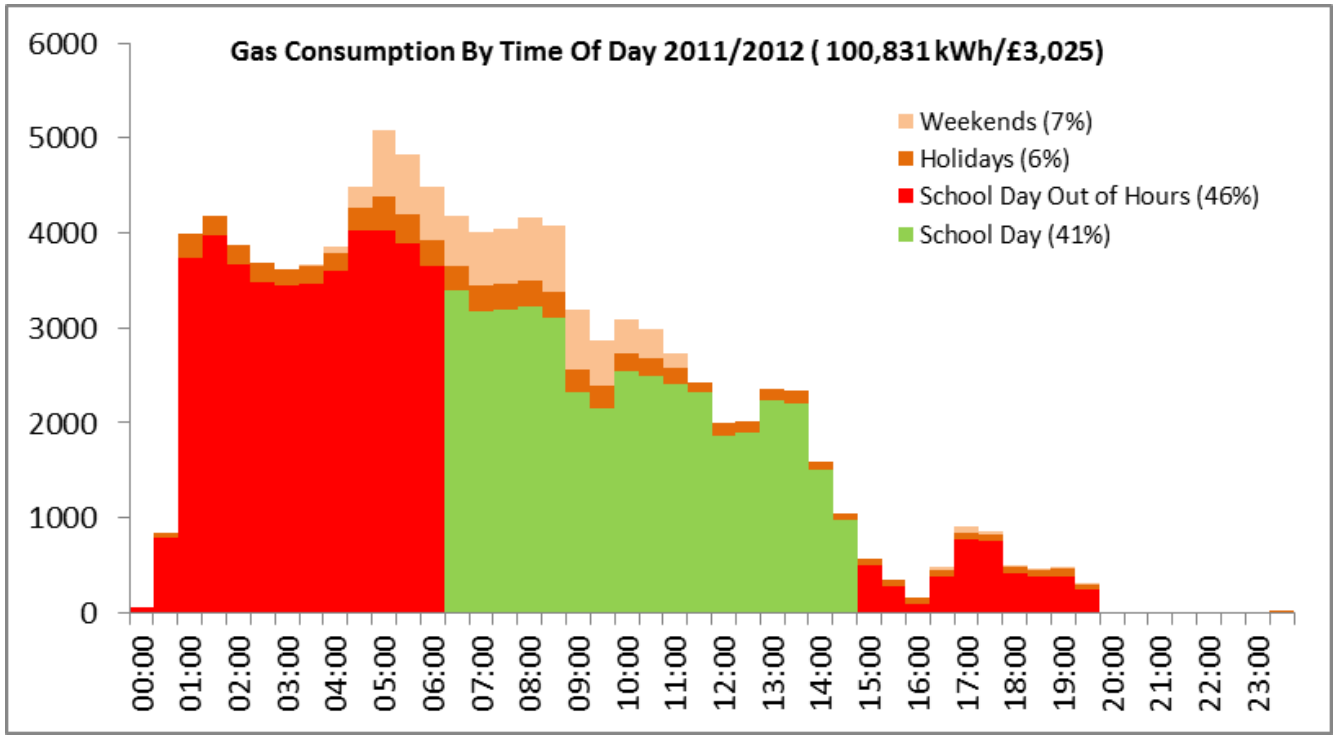
Gas Analysis

By time of day: starts too early – optimum start, radiator type and thermostat location issue



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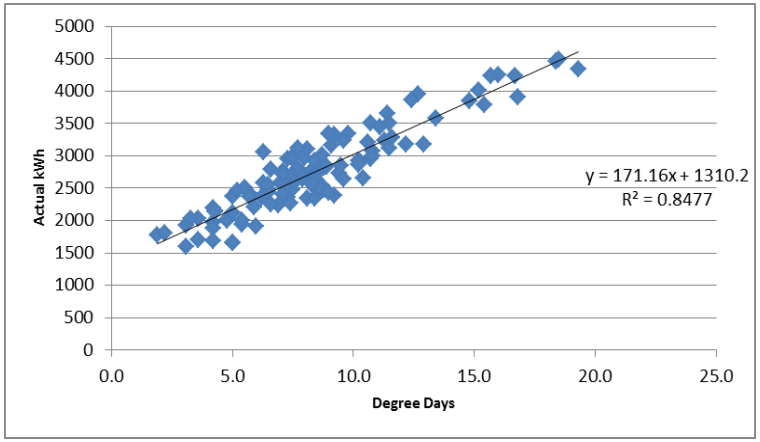
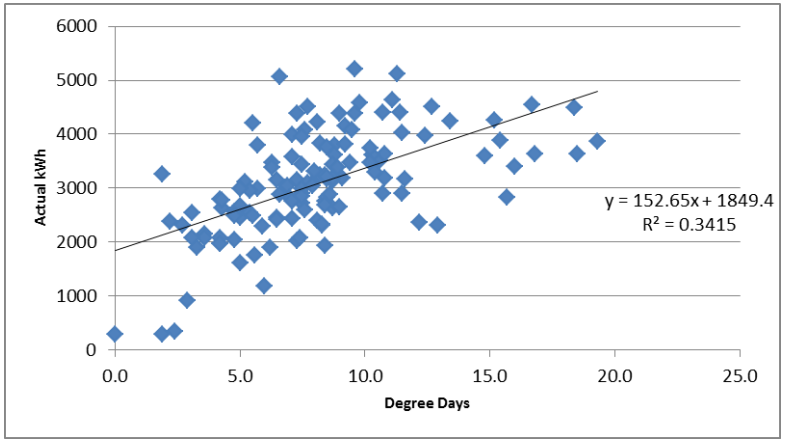
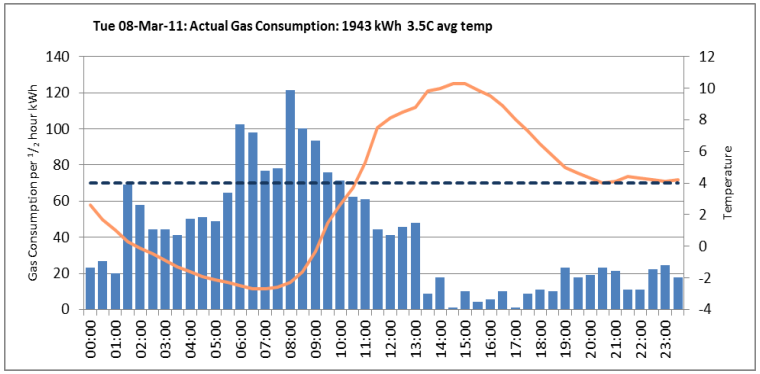
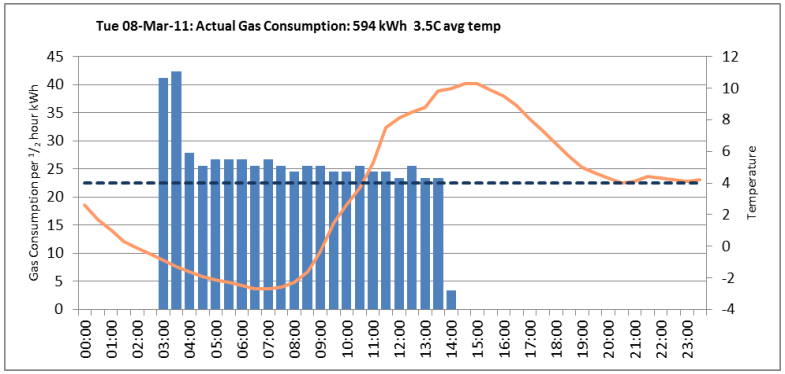
Gas Analysis

Thermostatic Analysis: degree days versus daily consumption









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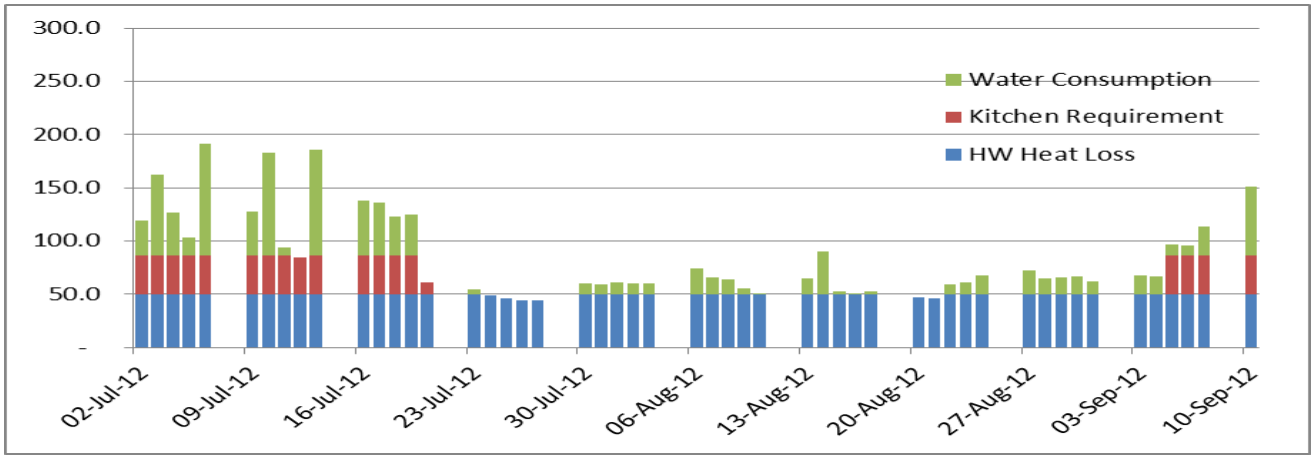
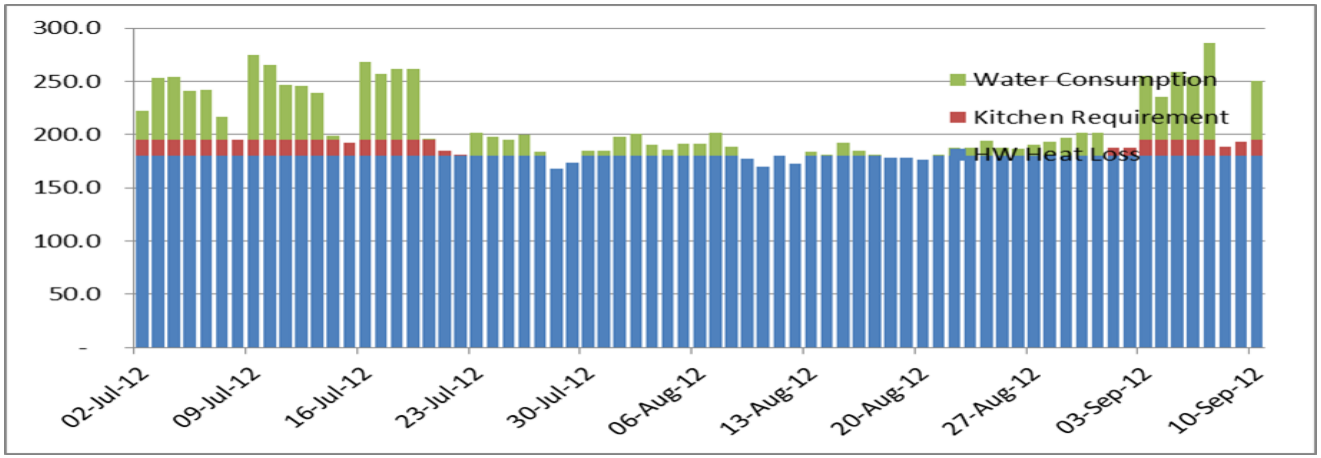
Gas Analysis

Hot Water: try to infer efficiency by analysing summer use, particularly if hot water is accidently left on over holidays (e.g. May Day) often less than 20% efficient – should be 90%!





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Electricity Analysis

Comparative Benchmark: typically per pupil or per m^2

Rank	School	kWh/pupil
1	[redacted] Primary School [redacted]	137.8
2	[redacted] Primary School	174.8
3	[redacted] C of E Infant School (VC)	175.2
4	[redacted] Infant School	192.8
	……	
28	[redacted] C of E Junior School (VC)	440.2
29	[redacted] Primary School	545.5
30	[redacted] Junior School	699.7
31	[redacted] Primary	1006.0

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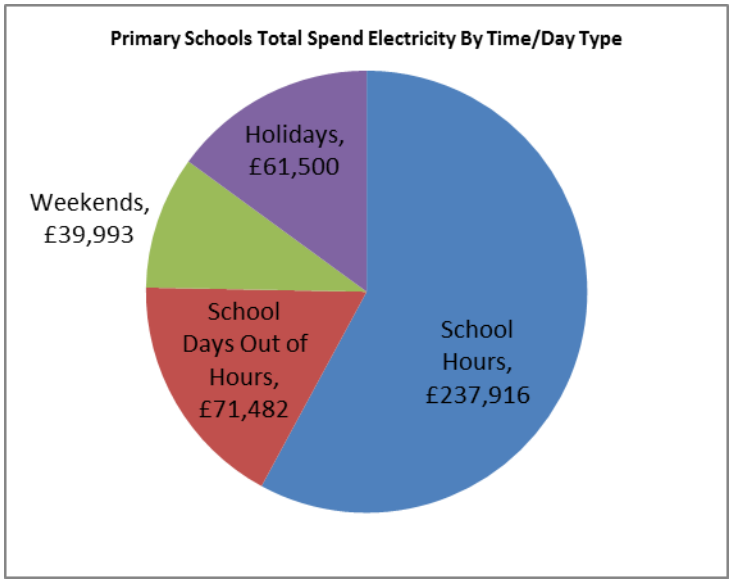
Electricity Analysis

By time/hour of day



Rank	School	Type	School Hours	School Days Out of Hours	Weekends	Holidays
1	[redacted]Primary School	Primary	70%	12%	8%	10%
2	[redacted]C of E Primary	Primary	69%	14%	6%	11%
3	[redacted] School	Primary	67%	13%	8%	13%
4	[redacted] Primary School	Primary	67%	12%	6%	15%
	……					
42	[redacted] Primary School	[redacted]	47%	23%	12%	19%
43	[redacted] School		45%	20%	13%	21%
44	[redacted]		45%	21%	13%	21%
45	[redacted] School		44%	20%	14%	22%

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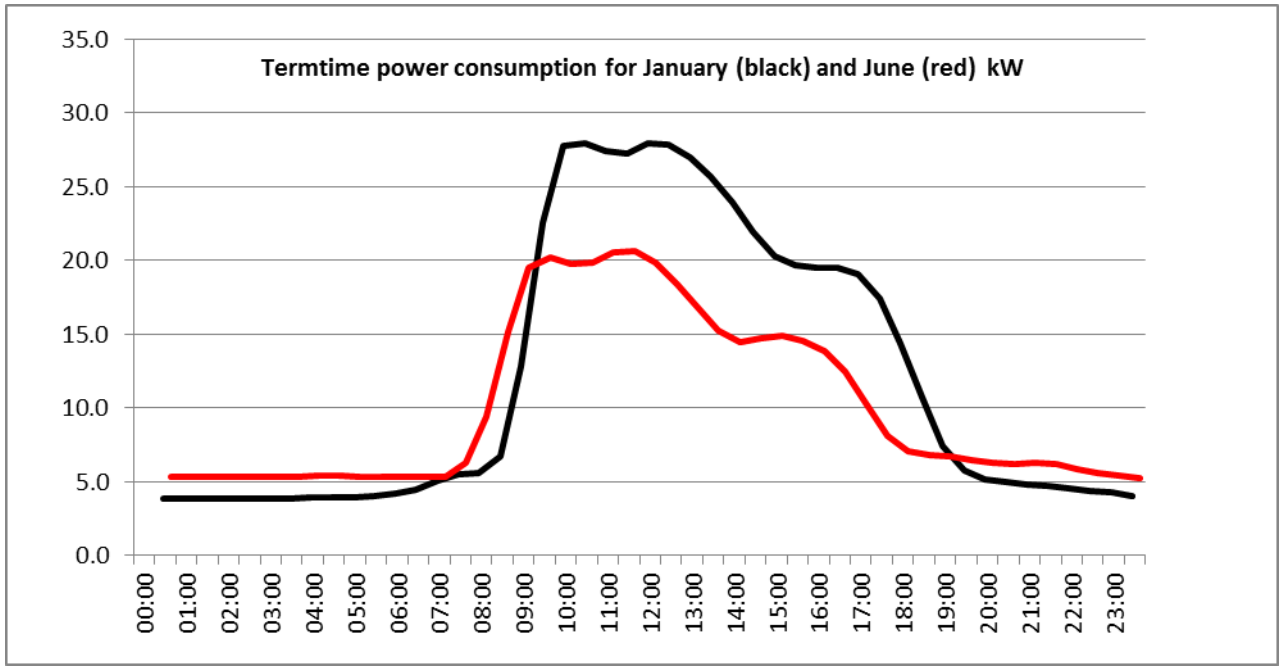
Electricity Analysis

Intraday: more lighting, boiler pumps, heating in winter



Note: high base load – 5 kW when school empty

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Electricity Analysis

Baseload: needs fixing at many schools, could lead to big as schools unoccupied for 85% of year

Rank	School (consumption normalised to 200 pupils)	Average Baseload kW
1	[redacted]rimary School – [redacted]	1.45
2	[redacted] Primary School	1.73
3	[redacted] Infant School	1.74
4	[redacted] Primary School (VA)	1.81
5	[redacted] School (VC)	1.82
6	[redacted] Infant School (VC)	1.91
7	[redacted] Junior School (VA)	1.92
	.....	
24	[redacted] Primary School (VC)	4.70
25	[redacted] Primary School	4.80
26	[redacted] Primary School	5.64
27	[redacted]rimary School (VC)	6.21
28	[redacted] Junior School (VC)	7.02
29	[redacted] School	7.21
30	[redacted] School	11.49
31	[redacted] Primary School	19.12

Sometimes caused by swimming pools

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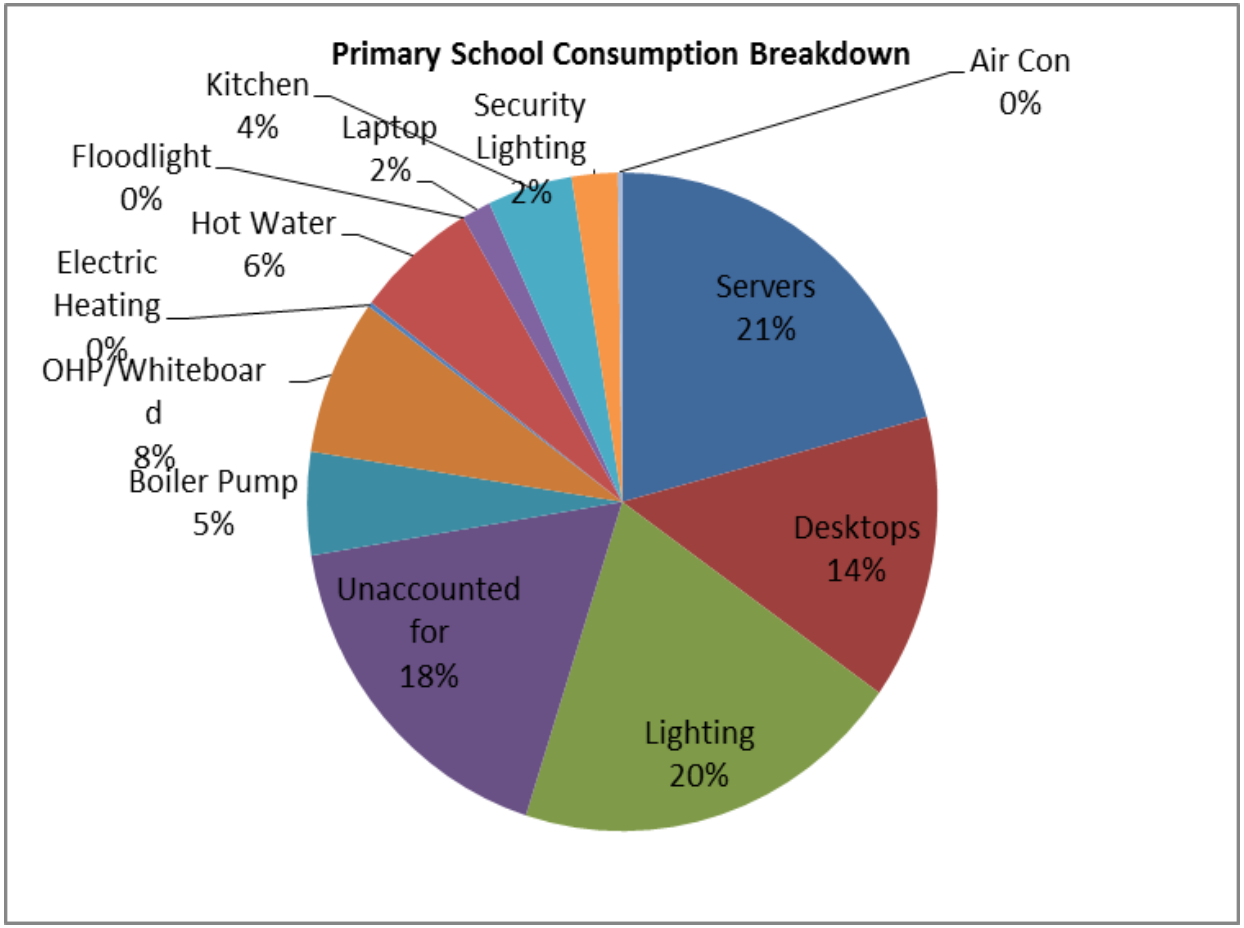
Electricity Analysis

Modelling: try to automatically fit model of school consumption to provide breakdown for targeting



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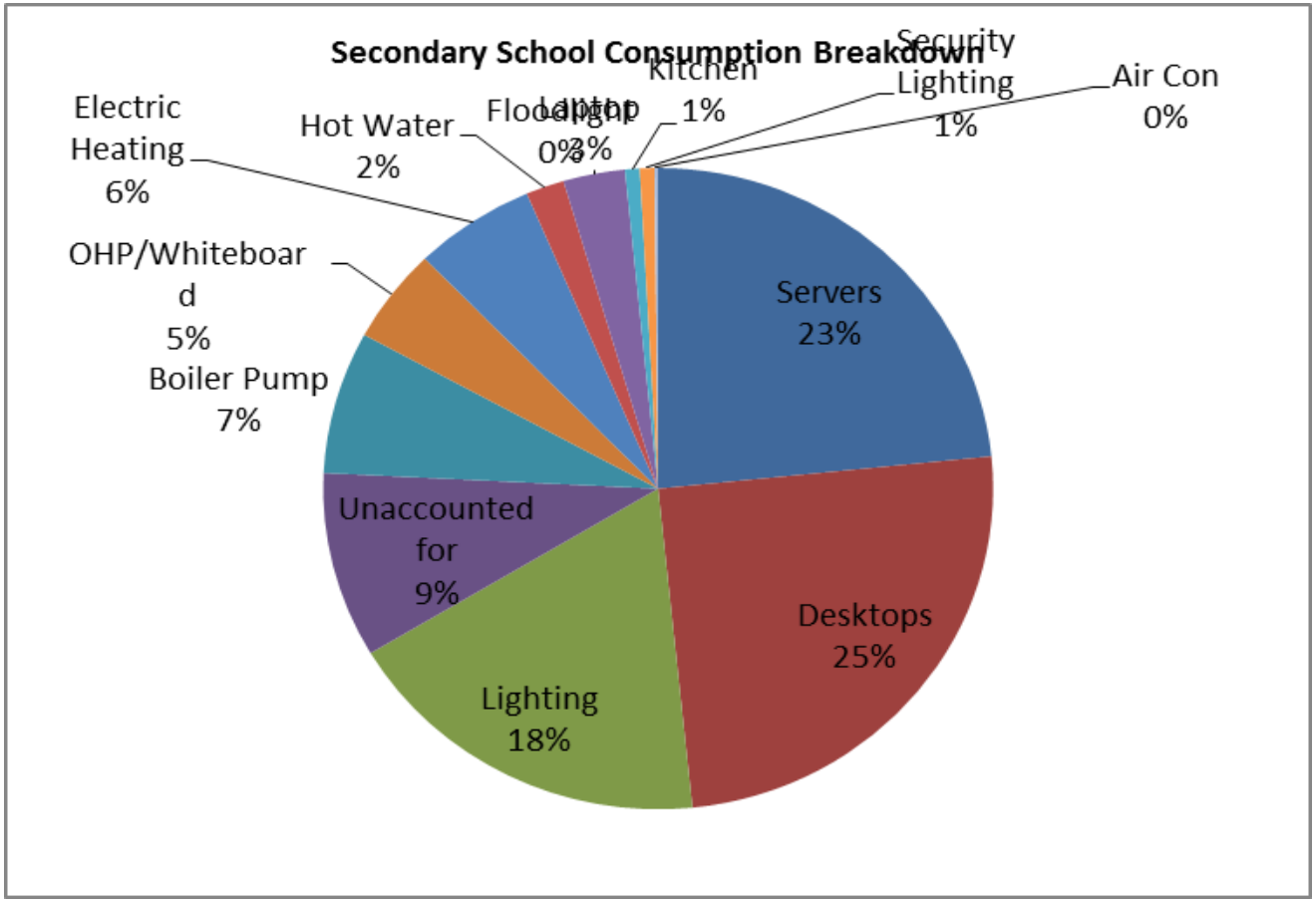
Electricity Analysis

Modelling: Secondary schools have different profile – more IT



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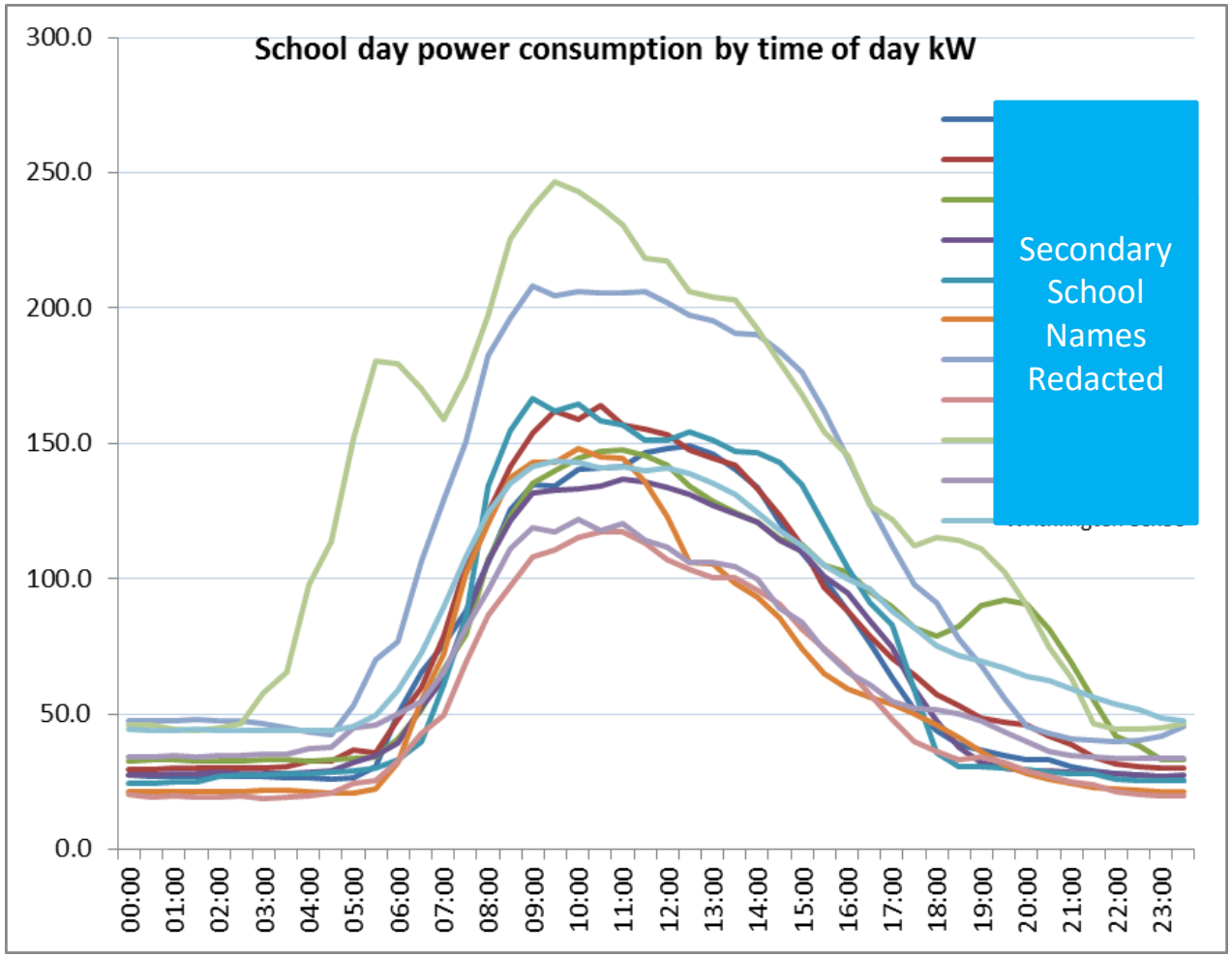
Electricity Analysis

School Comparison (normalised to 1,000 pupils)



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Shortcomings of Excel based analysis

- Can only analyse one school at a time
- Multi-year analysis more difficult
- Time-consuming:
  - 20 minutes per meter to setup
  - 1 to 3 hours to generate a report
- But:
  - Good for cleaning bad data
  - Eyeballing and drilling down into specific issues

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What can Bath Hacked Do?

- Provide high level comparisons between schools – competition?
- Provide multi-year comparison – but sometimes need to adjust heating for temperature

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- Schools Energy project not active
  - Partly because getting access to data difficult
  - Energy costs sometimes not a priority at a school – Ofsted rules!
  - Low energy costs make it challenging
  - But, pupil involvement leads to good life skills – energy is invisible, climate change and saving the planet more of a concern for youngsters