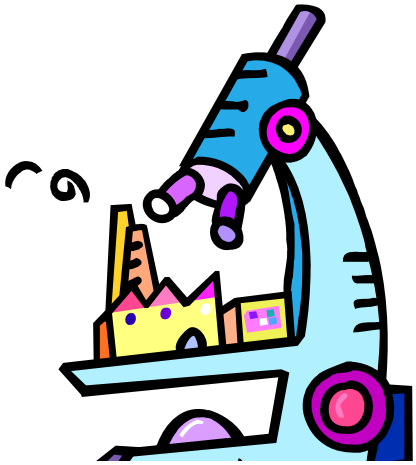
Colorado Springs Utilities
It's how we're all connected

White Paper #1

April 28, 2009

Energy Management: Where to Start?

Tracking Use? Benchmark? Audit?

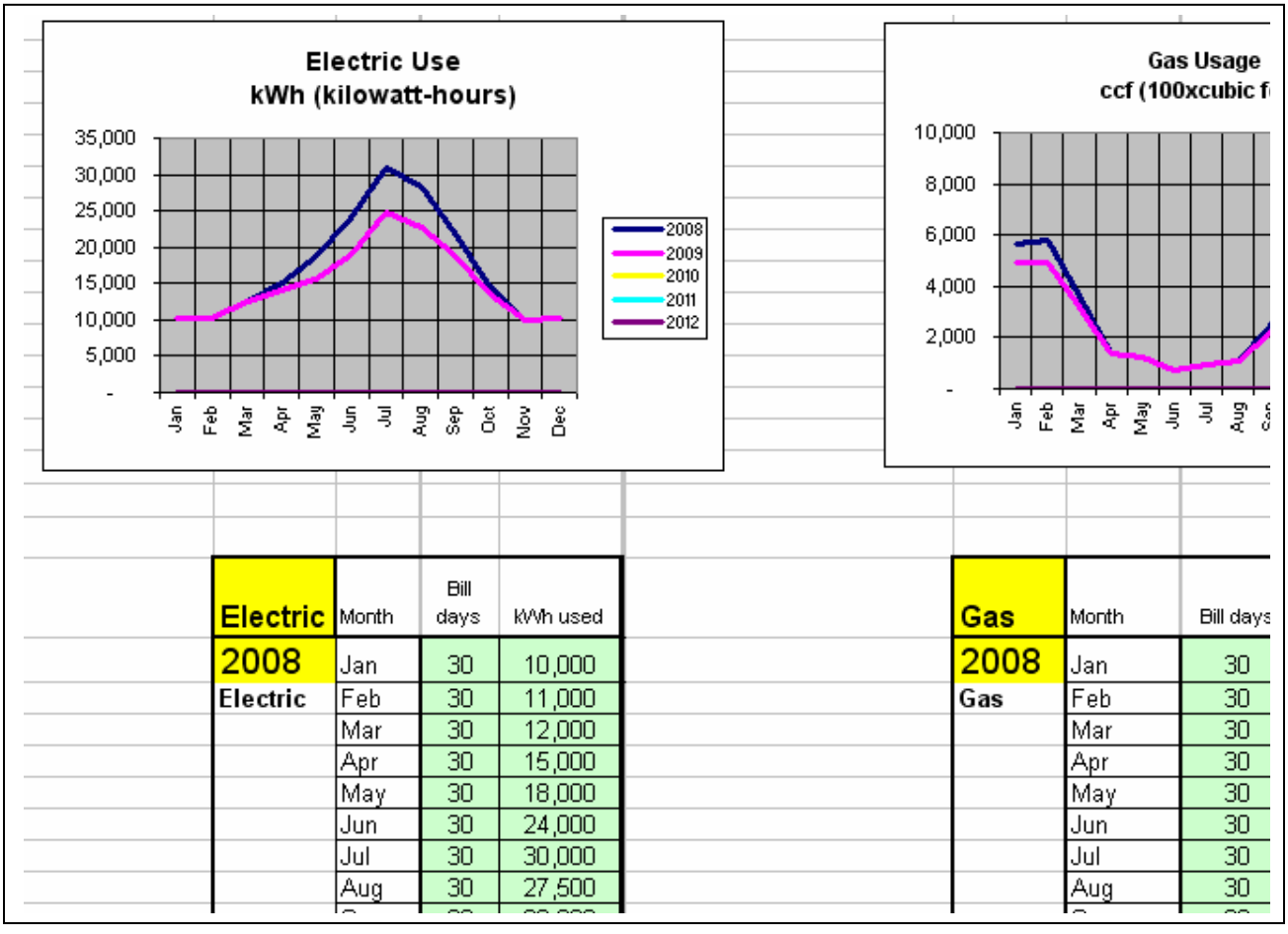


Tracking Your Usage

You can't manage what you don't measure. Is your usage the same as this month last year? Did the lighting replacement project really produce the expected savings? With just a little effort, this can easily be tracked. Keeping records of energy use is a necessary tool for all energy management activities.

It can be as simple as a spreadsheet of usage by month or as complicated as you need for specific purposes. Graphing is especially useful for 'at a glance' information and for reports. One approach is usage by month, with successive years overlaid.

Here is a sample spreadsheet for basic energy tracking. The same approach works for electric, gas, and water. Note how easy it is to compare "this month last year".



Electric	Month	Bill days	kWh used
2008	Jan	30	10,000
Electric	Feb	30	11,000
	Mar	30	12,000
	Apr	30	15,000
	May	30	18,000
	Jun	30	24,000
	Jul	30	30,000
	Aug	30	27,500

Gas	Month	Bill days
2008	Jan	30
Gas	Feb	30
	Mar	30
	Apr	30
	May	30
	Jun	30
	Jul	30
	Aug	30

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Benchmark Energy Use Index values (EUI)
You can review your own energy bills and see how you compare to similar facilities. The customary units for comparison are Btu/SF-yr.

This can be easily calculated, if you have 12 month total electric (kWh) and gas (ccf) usage data.

Begin with the total yearly amounts

Step 1: Total kWh * 3.413
Step 2: Total ccf * 80.2
Step 3: Add the results of Step 1 and Step 2, for total "kBtu per year"
Step 4. Divide the result of Step 3 by the facility size in square feet.

Compare your results with the Typical Benchmark Values shown below:

Category	Function Rev 2, 06-07-07	kBtu/SF-yr Note 1
Assembly	Entertainment/culture, recreation, social/meeting, library, other public assembly	**94**
	Library	**138**
Computer Data Center	All energy use within the data center	**1170**
	Computers and cooling units only	**865**
Education	College/university buildings	**155**
	K-12 school	**72**
Food Sales	Grocery store/food market	**214**
Food Service	Fast food	**451**
	Full service restaurant/cafeteria	**231**
	Catering, bars, donut/bagel shops, coffee shops, ice cream shops	**193**
Healthcare	Hospital	**249**
	Outpatient	**95**
	Assisted living / nursing home	**125**
Lodging	0 - 50,000 SF	**83**
	> 50,000 SF	**100**
Office	0 - 50,000 SF	**82**
	> 50,000 SF	**102**
Residential	With air conditioning	**69**
	Without air conditioning	**64**
Warehouse	Distribution/shipping center, non-refrigerated warehouse, self-storage	**45**
	Refrigerated storage	**98**
Worship	Church	**44**

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What's an energy audit?

- A facility overview from an energy perspective
- The goal is to reduce facility operating cost
- An evaluation of utility rates and facility energy costs
- Compares your usage to available benchmarks to see if it's above or below average
- Provide ECMs (energy conservation measures) for you to consider
- ECMs are prioritized by cost/benefit ratio – so you know paybacks and which ones to do first.
- ECMs should be grouped by
    - **Strategic** (smart choices for future projects)
    - **Low-Cost** (simple things), and
    - **Capital** (investment + savings = payback)

When do I need one?

- Prior to major renovation. Tt may reveal opportunities to include in project scope
- Whenever energy use is higher than it should be
- If you want to make energy improvements

What should it cost?

- Cost varies by size. For large facilities over 200,000 square feet (SF), should cost around 10-15 cents per SF. Ask questions if the audit price seems too low – remember "Free advice is often worth just what you paid for it."
- For smaller facilities, there may be a minimum charge.

Some things to look for in an energy audit team:

- Qualified and specialized in the field of energy
- Professional engineer (PE), usually mechanical
- Certified energy manager (CEM)
- Energy issues are often embedded in design construction issues, so a provider experienced in design as well as energy will often bring more insightful and effective solutions
- Five to ten years experience. A novice armed with a checklist is not a good recipe. Pick a consultant who has been doing this for awhile
- Skill at quantifying savings
- Follow-up service to track / graph results

What part does the owner play?

- A Big One!
- The more you participate, the better the outcome
- Ask for a preliminary list of questions from the audit team and fill it out
- Spend all the time you can with the audit team
- Ask questions
- It is excellent training and raises awareness of energy issues
- Often the owner can lead the auditors to important areas
- Explain operational methods
- Review the control parameters and strategies being used
- Explain any system problems
- Avoid spending money to get a more efficient problem

Energy audit red flags:

- Savings look too good to be true
- Recommendations that don't fall into the primary use categories (sanity check)
- Self-serving solutions (recommending something they sell)
- One approach is to subtract 30 percent from the savings to be sure
- Savings don't consider demand charges
- Demand charge benefits claimed for non-peak times
- System life should be well within the system life. If it pays for itself right about the time it is worn out, what have you accomplished?
- Exotic – complicated systems – may actually work, but needs to be compatible with facilities operators. Be sure the idea can be understood and sustained
- Anything that compromises comfort
- Anything that compromises ventilation
- Anything that increases maintenance cost
- Lighting savings calculations that take credit for cooling benefit, except in areas where there is practically no heat used
- 8760 hours of use – usually not true
- Continuous 100 percent equipment loading – usually not true
- HVAC efficiency estimates based solely on summer design conditions
- Cost estimates that do not include design fees, project management fees, escalation, or contingency allowance
- Renovation costs are always higher than new construction
- Contractors as engineers, or the reverse. These are different tasks

(Energy Auditing is discussed in further detail in White Paper #2)