



Smart Management for
Small Water Systems

Understanding Your Electric Bill + Establishing a Baseline

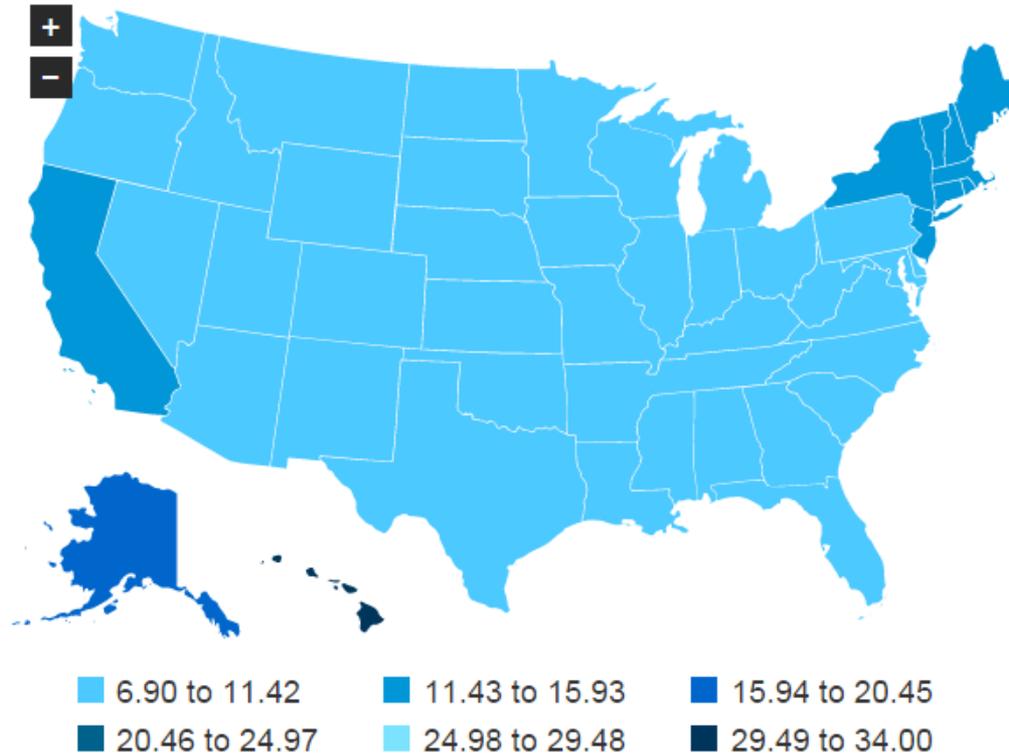


UNC
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This program is made possible under a
cooperative agreement with EPA.



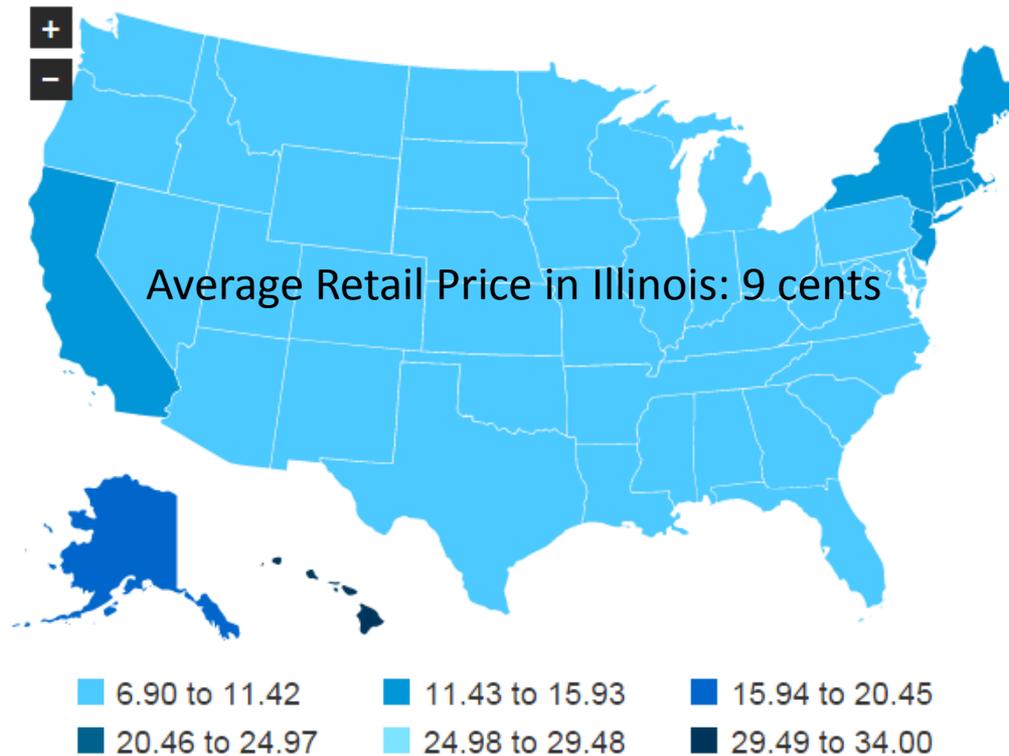
U.S. average retail price per kilowatthour is 10 cents



Source: U.S. Energy Information Association as of Feb. 2016



U.S. average retail price per kilowatthour is 10 cents



Source: U.S. Energy Information Association as of Feb. 2016



Base charges / Customer charges / Service availability

- Typically charged on a per meter basis regardless of consumption
- Typically covers administrative costs of providing service to the customer / access to the grid



Consumption Charges (by kWh)

- Charged on monthly, per kWh basis
- Typically covers the cost of fuel
- Can vary based on season
- Can vary based on time of day



kWh – like odometer

kW – like speedometer





Demand Charges

- Charged on a kW basis (or kVa)
 - Real power versus apparent power
- May be charged against the customer's peak demand or the utility's peak demand (coincident peak)
- Typically covers capital costs, particularly for peaking capacity
- Does it carry over? (Ratchet Charge)



Rate options that can reduce your energy bills

- Time-of-use rates
- Interruptible rates
- Net metering
- On-bill financing

Will likely require operational changes to take full-advantage of rate



NYSERDA Step 2 - Developing a Baseline of Energy Use



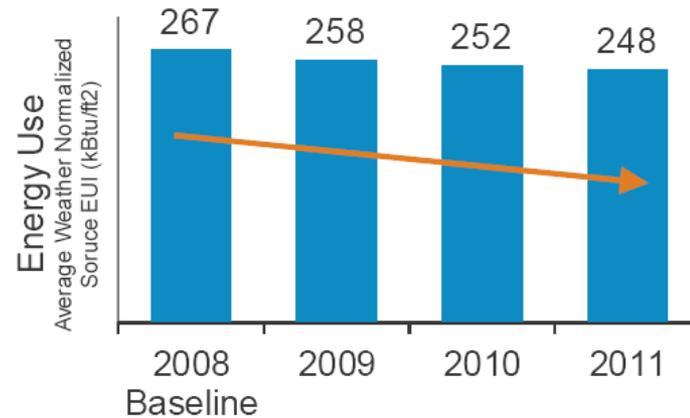
The Value of Benchmarking

Consistent benchmarking in buildings results in energy savings and improved performance.

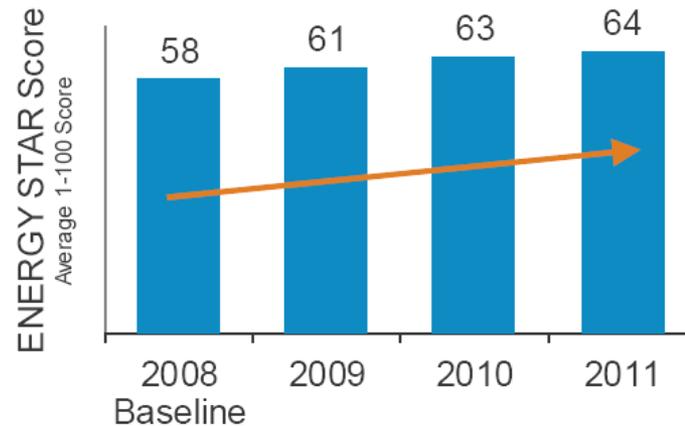
Source:

http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends_Savings_20121002.pdf?8d81-8322

Energy Savings in Portfolio Manager



7% Savings



6 point increase

Building a Basic Energy Usage Baseline

Better Baseline Exercise_Example - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Building a Simple Baseline														
2															
3	Facility:	Tutu Park Mall													
4	Meter #:	68980288													
5															
6	Bill Date (Month/Year)	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	
7	Customer Charge	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	\$48.67	
8	Total Monthly Electrical Use (kWh)	21,600	19,680	25,440	15,600	18,960	26,640	19,680	22,800	19,440	26,160	22,560	19,440	26,880	
9	Total Monthly Cost of Electric Use	\$11,757.83	\$10,711.02	\$14,759.89	\$9,435.27	\$10,115.05	\$14,235.93	\$10,496.80	\$12,120.80	\$10,343.68	\$13,897.93	\$11,478.42	\$9,899.52	\$13,587.63	
10	Total Monthly Demand (kW)	2.6	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	
11	Total Monthly Demand Costs	\$1,177.80	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	\$883.35	
12	Number of Days in Billing Cycle	34	30	33	29	29	33	29	28	30	32	29	30	33	
13	Average kWh Cost	\$0.54	\$0.54	\$0.58	\$0.60	\$0.53	\$0.53	\$0.53	\$0.53	\$0.53	\$0.53	\$0.51	\$0.51	\$0.51	
14	Average Cost Per Day	\$381.89	\$388.10	\$475.51	\$357.49	\$380.93	\$459.63	\$394.10	\$466.17	\$375.86	\$463.44	\$427.95	\$361.05	\$439.99 #DIV	
15	Average Use Per Day (kWh)	635	656	771	538	654	807	679	814	648	818	778	648	815 #DIV	
16	Demand Charge as Percent of Total Bill	9.07%	7.59%	5.63%	8.52%	8.00%	5.82%	7.73%	6.77%	7.83%	5.96%	7.12%	8.16%	6.08% #DIV	
17	Meter Usage Metric (Described)	Sales													
18	Meter Usage Metric (Measurement)	6,000,000	7,500,000	7,200,000	5,600,000	5,000,000	4,900,000	4,500,000	3,900,000	3,200,000	5,200,000	6,000,000	6,200,000	8,000,000	
19	Energy Use Intensity	0.0036	0.002624	0.003533333	0.002785714	0.003792	0.0054367	0.0043733	0.0058462	0.006075	0.0050308	0.00376	0.0031355	0.00336 #DIV	
20															
21															
22	Dashboard														
23															
24		Monthly Electric Use							Electric Demand						



Data Needs

Inputs

- Bill Date
- Customer Charge
- Electric Use
- Electric Charge
- Demand
- Demand Charge
- Meter Usage Metric and Measurement

Calculations

- Average cost per kWh
- Average cost per day
- Average use per day
- Demand charges as a percent of total bill
- Energy use intensity



ENERGY STAR Commercial Buildings Program

- Offers a strategic approach to energy management
- Enables building owners, managers, and tenants to save money & protect the environment
- Provides organizations with measurable information on energy savings and greenhouse gas emissions reductions from commercial buildings
- Builds on strong ENERGY STAR brand recognition
- ENERGY STAR on a building = Superior Energy Performance
- Benchmarking is the first step



ENERGY STAR® PortfolioManager®

- ENERGY STAR Portfolio Manager is an effective **management tool** – it helps business and organizations by offering a platform to:
 - Assess whole property energy and water consumption
 - Track changes in energy, water, greenhouse gas emissions, and cost over time
 - Track green power purchase
 - Share/report data with others
 - Create custom reports

www.energystar.gov/benchmark



ENERGY STAR® PortfolioManager®

- Portfolio Manager is also a **metrics calculator** – it provides key performance metrics to integrate into a strategic management plan.
 - Energy consumption (source, site, weather normalized)
 - Water consumption (indoor, outdoor)
 - Greenhouse gas emissions (indirect, direct, total, avoided)
 - ENERGY STAR 1-to-100 score (available for many building types and wastewater treatment plants)
 - Compare to national median energy use intensity (site, source)
 - Compare baseline year vs. current year (energy, water, ghg)



Energy Assessments

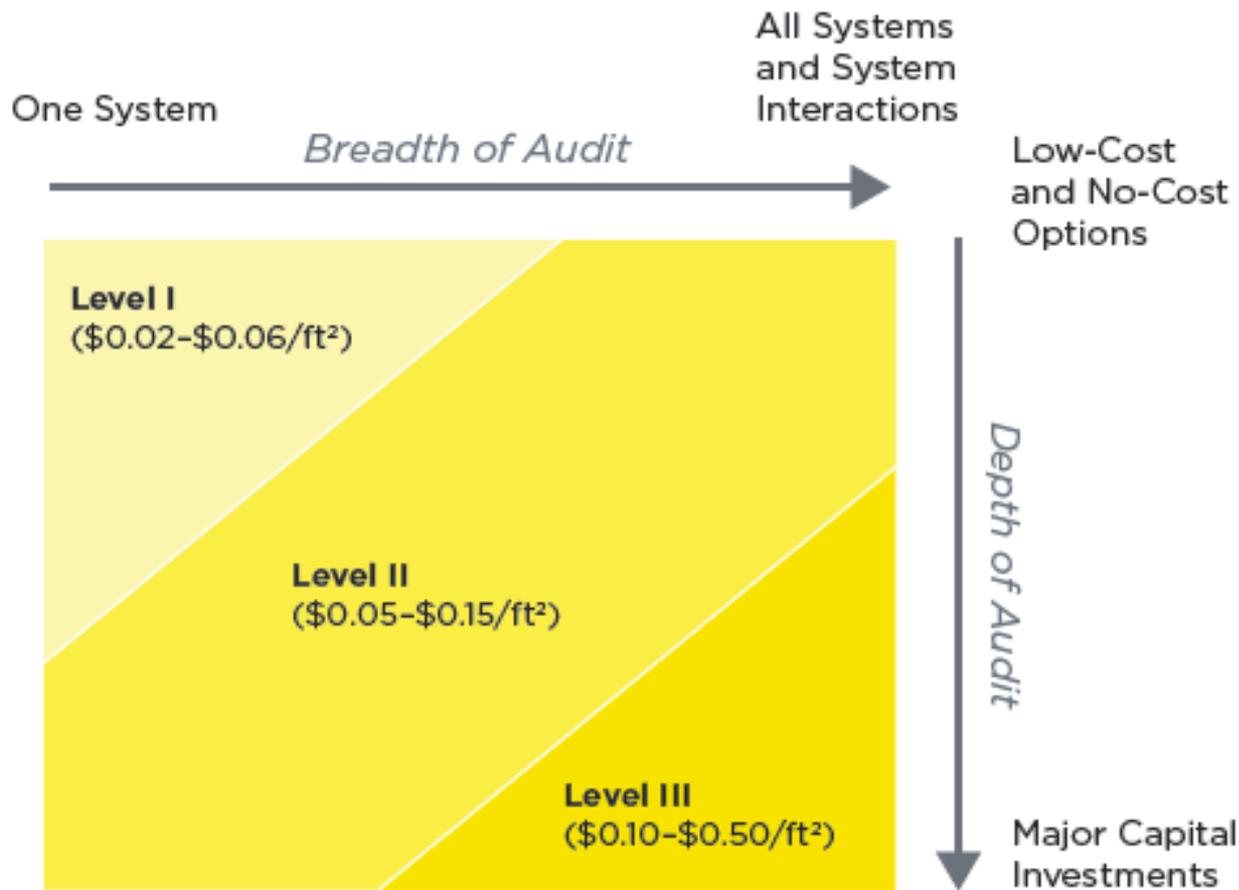


Figure 2-3 Cost and quality of the three levels of energy audits beyond preliminary analysis

Source: NRAL Advanced Energy Retrofit Guide – K-12 Schools



Level 1 Energy Audit

1. Visit each water system to complete a “walk through” inventory of facilities.
2. Interview personnel to understand how each facility is used.
3. Gather data on energy use, facility capacity, and energy cost.
4. Prepare energy use inventory report to serve as documentation of baseline energy use of facilities and to identify potential opportunities to reduce energy use.



Reviewing Your Energy Assessments

- Assets – Primarily associated with drinking water system
- Nameplate Horsepower (HP)
- Variable Speed – for motors
- Calculated Power Consumption = Horsepower x 0.746 (conversion factor)



Reviewing Your Energy Assessments

- Hours of Operation per Year – Either based on observation or staff report
- Total kWh per Year – Calculated power consumption x Hours of operation per year
- Average Run Time - Either based on observation or staff report
- Design Specs – Based on observation (HP and head) or staff report



Reviewing Your Energy Assessments

- Operating Status – Based on observation or staff report
- Average Cost – Based on current electric rates
- Total Cost = Total kWh per year x Average cost
- Cost per MG = Total cost/Total flow (Total flow based on estimates)



Strategy: Use Lowest Cost Water First

- Determine the total unit cost of using each source
- Know the limitations of each source (water rights, capacity, water quality)
- Understand the additional cost of using more than one source or pump station at once
- Have prioritized source operation plans that maximize the use of lower cost water.

Source: Steve Jones/Hasen, Allen, and Luce



Strategy: Use Lowest Cost Water First

- Automate the prioritized operation plan as much as possible.
- Use proper PRV settings and controls settings that don't allow high cost water to be used over low cost water.
- Keep higher cost water where it is needed
- Maximize the use of lower cost water in the areas of the system where it can be used

Source: Steve Jones/Hasen, Allen, and Luce

Tool Demo: The Electricity Usage Baseline Builder for Water Systems

4-Electricity Usage Baseline Builder.xlsx - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Developer

Clipboard Font Alignment Number Styles Cells Editing

Electricity Baseline Building for Water Utilities

Water System Name
Town of Anywhere

Facility Name
Groundwater Well #1

Electric Meter Number
654321

Rate Structure
Increasing Block

Go to Dashboard

View an Example Bill

Tips
Enter your data in the green cells.
Not sure what these columns mean? Click on the header to learn more!
Seeing red? Make sure you have entered in all the necessary information!

Meter Usage Metric
Have something else you want to compare to electricity usage? Use this column!
This could be gallons per month, residents, square feet, or any measure against which you want to measure energy efficiency.

Bill Date (Month/Year)	Fixed Costs		Variable Costs					Total Electricity Bill	Average kWh Cost (\$)	Average Cost Per Day (\$)	Average Electricity Use Per Day (kWh)	Demand Charge as Percent of Total Bill	Meter Usage Metric	Electricity Intensity
	Customer Charge (\$)	Other Fixed Costs (\$)	Days in the Billing Cycle	Total Electricity Use (kWh)	Total Cost of Electricity (\$)	Peak Monthly Demand (kW)	Peak Monthly Demand Charge (\$)						Units (gallons, residents, etc)	
Jan-14	\$28.00	\$0.00	34	1,250	\$73.13	59.45	\$406.00	\$507.13	\$0.0585	\$14.92	37	80.06%	23270	0.0537
Feb-14	\$28.00	\$0.00	30	950	\$58.40	55.58	\$398.87	\$485.27	\$0.0615	\$16.18	32	82.20%	28980	0.0328
Mar-14	\$28.00	\$0.00	28	800	\$56.95	46.8	\$388.97	\$473.92	\$0.0712	\$16.93	29	82.08%	26290	0.0304
Apr-14	\$28.00	\$0.00	30	750	\$43.88	58.8	\$401.60	\$473.48	\$0.0585	\$15.78	25	84.82%	285650	0.0026
May-14	\$28.00	\$0.00	32	1,250	\$73.13	59.2	\$404.34	\$505.47	\$0.0585	\$15.80	39	79.99%	1924000	0.0006
Jun-14	\$28.00	\$0.00	27	1,900	\$111.15	58.65	\$400.59	\$539.74	\$0.0585	\$19.99	70	74.22%	6406090	0.0003
Jul-14	\$28.00	\$0.00	32	10,950	\$640.58	58.9	\$402.29	\$1,070.87	\$0.0585	\$33.46	342	37.57%	5881590	0.0019

Instructions Electricity Use Graphs Sample blank worksheet

Exercise: Putting Your Electricity Bill into the Electricity Baseline Tool

Electricity Baseline Building for Water Utilities

Want to know where to find the information you need? Check out this sample electricity bill!

Days in Billing Cycle

← Back to Your Electricity Bill Data

Cycle					Service From	To	Days	Rate / Reference / Bill Type
2					11/01/2014	12/01/2014	30	45 / MUNICIPAL WAT / REGULAR

Meter Nbr	Pres Rdg	Prev Rdg	Mult	kWh Used
50078	4867	4742	200.0000	25000

Total Electricity Use

Peak Monthly Demand

Total Cost of Electricity Use

Peak Monthly Demand Charge

Customer Charge(s)

Your bill may (will) look completely different! That's OK, this is here just to give you an idea of what you are looking for. You may not have demand charges, or customer charges, or may have something that is not shown here. Every utility has different ways of charging for electricity.

ACTIVITY PRIOR TO BILLING	
PREVIOUS BALANCE	4790.71
PAYMENTS	-4790.71
BALANCE FORWARD	0.00
CURRENT BILL INFORMATION	
ENERGY	1997.75
DEMAND CHARGE 260.00 KVA	871.00
GRID ACCESS	58.95
FRANCHISE FEE	87.83
Current Charges Due By 12/29/2014	3015.53
Previous Balance Was Due 12/01/2014	0.00
Total Amount Due	3015.53

Date: 12/11/14
 Acct: _____
 Authorized By: _____

Retain this copy for your records.



Questions?