



Smart Management for
Small Water Systems

Managing Energy at Your Small Drinking Water System – A Workshop Series for New Hampshire Utilities

Workshop 1 – 07/19/16
Ashland Fire Station, Ashland, NH

Facilitator – Stacey Isaac Berahzer

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



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Developing and Comparing Your Baseline

*“What doesn’t get measured doesn’t
get managed.”*

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						



Why should we benchmark?

- To know where you're starting from with your water system's electricity usage
- To be able to find usage variations across time and understand them
- To track effectiveness of energy management projects implemented
- To support stakeholder communication



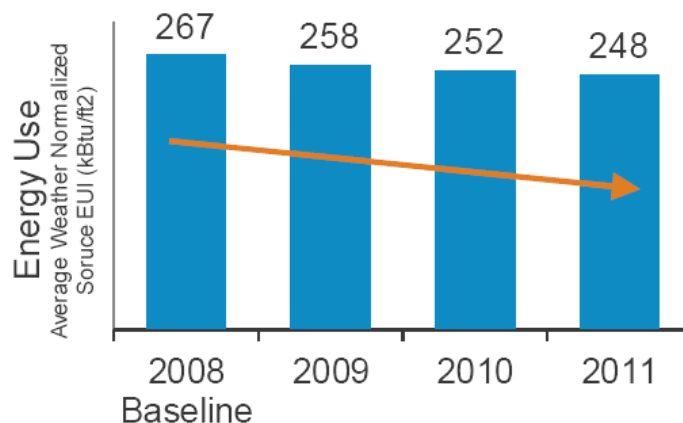
The Value of Benchmarking

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

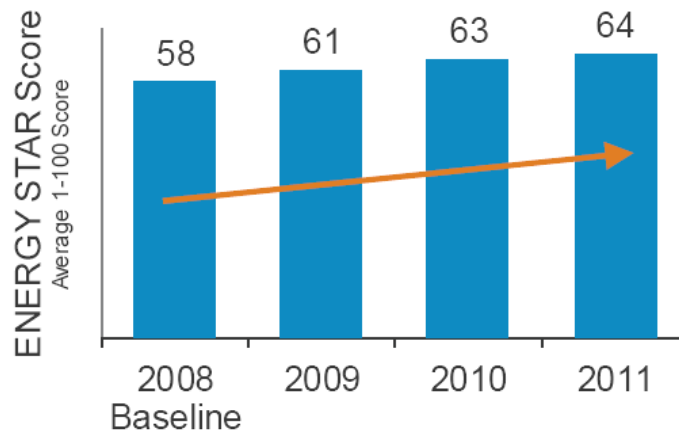
Source:

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

Energy Savings in Portfolio Manager



7% Savings



6 point increase



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



Portfolio Manager

- One example of benchmarking energy use
- Developed by ENERGY STAR program
- Maintained by US EPA and partners
- Not optimal for most small water systems
- More useful for larger water systems and/or wastewater systems



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



Benefits of Benchmarking: Examples

After getting an energy assessment by a competent auditor, and using an electricity usage benchmarking tool, you may be able to identify and use your lowest cost water first.



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



Common Energy Use Intensity (EUI) Metrics

Metric	Application
Btu/ft ²	Any building
Btu/employee	Office building
Btu/unit of product	Assembly plant
Btu/lb of product	Manufacturer
Btu/number of beds occupied	Hotel or hospital
kWh/ft ²	Lighting
kWh/ton	Chilled water efficiency
W/ft ² airflow/min	HVAC systems

Tool Demo: The Electricity Usage Baseline Builder for Water Systems

4-Electricity Usage Baseline Builder.xlsx - Microsoft Excel

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		Days in the Billing Cycle	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 (\$)		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

Tool Demo: 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					
					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				
					<p style="text-align: center;">Date: <u>12/11/14</u></p> <p style="text-align: center;">Acct: _____</p> <p style="text-align: center;">Authorized By: _____</p>				
					Current Charges Due By 12/29/2014 3015.53				
					Previous Balance Was Due 12/01/2014 0.00				
					Total Amount Due 3015.53				

Total Cost of Electricity Use

Peak Monthly Demand Charge

Peak Monthly Demand

Customer Charge(s)

Total Electricity Use

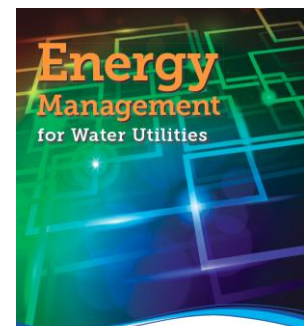
Your bill may (will) look completely different! That's OK, this is here just to give you an idea of what you are looking for. You may not have demand charges, or customer charges, or may have something that is not shown here. Every utility has different ways of charging for electricity.

Retain this copy for your records.



Other Resources

- U.S. EPA Portfolio Manager
- AWWA “Energy Management for Water Utilities” 2016
- WEF Energy Roadmap (2013)
- WEF MOP 32 (2009)
- U.S. EPA - Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities (2008)
- Tools & Guidance for Water Industry Professionals -
- http://water.epa.gov/infrastructure/sustain/energy_use.cfm
- Energy Management for Water Utilities, AWWA





Regnier & Winters: Things to Look for in Your Audit / System

Reviewing typical savings situations.

1. Evaluating pumping efficiency
2. Understanding demand control
3. Managing kilowatt-hour use



JOHN E. REGNIER AND RICHARD WINTERS

Reducing electric power costs in small water systems

Operation of water and wastewater systems is a power-intensive process, frequently requiring large electric motors for pumping, mixing, and other elements of the treatment and distribution functions. In this era of rapidly increasing energy costs and especially with the Obama Administration's avowed intention to emphasize climate control and the likely resulting increase in power costs, minimizing power consumption assumes significant importance both in terms of energy conservation and monetary savings. This article describes the typical rate structures used by US electric utilities

OPPORTUNITIES EXIST FOR SMALL WATER SYSTEMS TO REDUCE ELECTRIC POWER

Source: Regnier and Winters, "Reducing electric power costs in small water systems," Journal AWWA, April 2013, 67-72.



Upcoming - Benchmarking Water/Wastewater Treatment Facilities in Portfolio Manager

Thursday, July 28, 2016 1:00 pm

Duration: 1 hour

Description:

Learn how to track the progress of energy efficiency efforts and compare the energy use of wastewater treatment plants to other peer facilities across the country. Attendees will learn how to measure and track energy use and carbon dioxide emission reductions in water and wastewater treatment plants to establish baseline energy use, prioritize investments, set goals, and track improvements over time.

<https://esbuildings.webex.com/mw3100/mywebex/default.do?siteurl=esbuildings>