



Smart Management for
Small Water Systems

Managing Energy at Your Small Drinking Water System – A Workshop Series for North Carolina Utilities

Workshop 1 – Tuesday, 11/29/16

Land-of-Sky Regional Council,
Asheville, NC

Facilitators – Dawn Nall (SW EFC)
and Carol Rosenfeld (UNC EFC)

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



American Water Works
Association



UNC
ENVIRONMENTAL
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Developing and Comparing Your Baseline

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

(paraphrasing William Thomson, Lord Kelvin)

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
15	Average Use Per Day (kWh)	635	656	771	538	654	807	679	814	648	818	778	648	815
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%
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
20														
21														
22	Dashboard													
23														
24		Monthly Electric Use							Electric Demand					

Meter 1 | Meter 2 | Meter 3



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.
- To be a “detective” and look for ideas or problems!



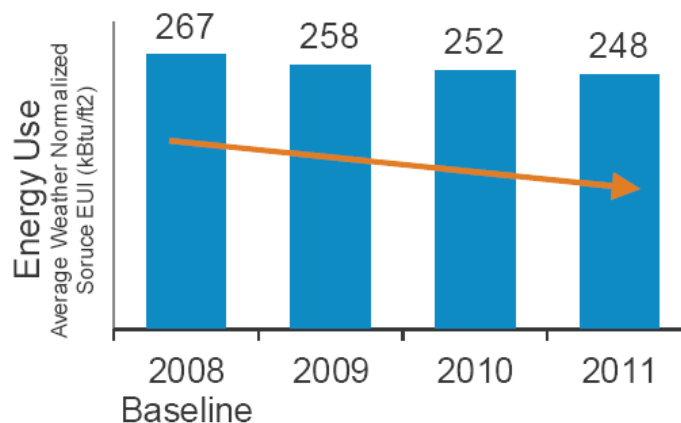
The Value of Benchmarking

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

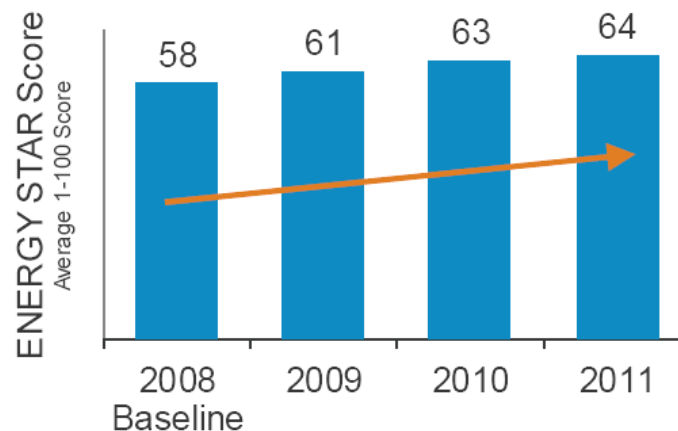
Source:

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 - Examples

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



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)



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.
- We'll do an exercise shortly with the UNC EFC's Excel-based energy baseline tool!



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
kWh/gallon of water produced	Drinking water system
Btu/ft ²	Any building
Btu/employee	Office building
Btu/unit of product	Assembly plant
Btu/lb of product	Manufacturer
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

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

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

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.

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


Date: 12/1/14	
Acct: _	
Authorized By: _____	

Current Charges Due By 12/29/2014	3015.53
Previous Balance Was Due 12/01/2014	0.00
Total Amount Due	3015.53

Retain this copy for your records.



Webinar: Where am I Starting From? Understanding Your Water System's Electric Bill + The Energy Usage Baseline Tool



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Where Am I Starting From? Understanding Your Water System's Electric Bill + the New Electricity Baseline Builder for Water Utilities Tool

Event(s): Webinar: Where Am I Starting From? Understanding Your Water System's Electric Bill + the new Energy Usage Baseline Tool

Subject:

Author(s): David Tucker

Program: [Drinking Water and Wastewater](#)

Presentation type: [Powerpoint](#)

Date: 06/08/2016

Host Organization(s): [Environmental Finance Center Network](#)

File: [Where Am I Starting From - Understanding Your Electric Bill + the new Energy Usage Baseline Tool 2016-06-08 FINAL.pdf](#) ()

Project page: [Smart Management for Small Water Systems](#)

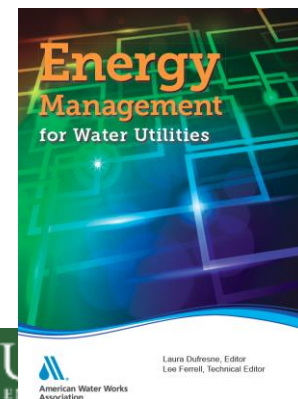
Environmental Finance Center
Knapp-Sanders Building
Campus Box 3330
UNC-Chapel Hill, Chapel Hill, NC 27599-3330
T: 919.843.3528 | F: 919.843.2528

<http://www.efc.sog.unc.edu/event/webinar-where-am-i-starting-understanding-your-water-system%E2%80%99s-electric-bill-new-energy-usage>



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

OPPORTUNITIES EXIST FOR
SMALL WATER SYSTEMS TO
REDUCE ELECTRIC POWER

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

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



Questions?