Smart Management for
Small Water Systems

Energy Management and Cost Reduction for Small Water Systems

Thursday, October 26, 2017 | Asheville, NC

www.efcnetwork.org

EFCN
environmental finance center network

UNC
ENVIRONMENTAL
FINANCE CENTER

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

The Small Systems Program Team

- Environmental Finance Center at The University of North Carolina at Chapel Hill
- Environmental Finance Center at Wichita State University
- EFC West
- New England Environmental Finance Center at the University of Southern Maine
- Southwest Environmental Finance Center at the University of New Mexico
- Syracuse University Environmental Finance Center
- Environmental Finance Center at the University of Maryland
- American Water Works Association (AWWA)

About the Environmental Finance Center Network (EFCN)

The Environmental Finance Center Network (EFCN) is a university-based organization creating innovative solutions to the difficult how-to-pay issues of environmental protection and improvement. The EFCN works with the public and private sectors to promote sustainable environmental solutions while bolstering efforts to manage costs.

The Smart Management for Small Water Systems Program

This program is offered free of charge to all who are interested. The Program Team will conduct activities in every state, territory, and the Navajo Nation. All small drinking water systems are eligible to receive free training and technical assistance.

What We Offer

Individualized technical assistance, workshops, small group support, webinars, eLearning, online tools & resources, blogs

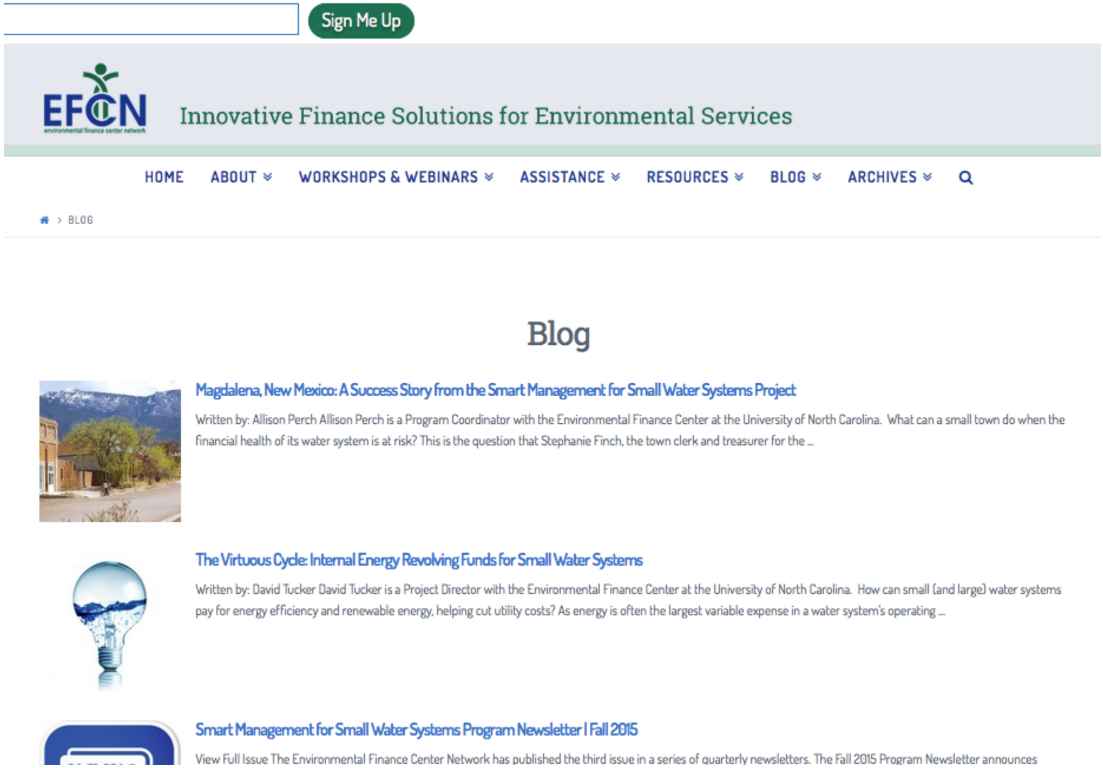
Areas of Expertise

- Asset Management
- Rate Setting and Fiscal Planning
- Leadership Through Decision-making and Communication
- Water Loss Reduction
- Energy Management Planning
- Accessing Infrastructure Financing Programs
- Workforce Development
- Water Conservation Finance and Management
- Collaborating with Other Water Systems
- Resiliency Planning
- Managing Drought

Small Systems Blog

Learn more about water finance and management through our Small Systems Blog! Blog posts feature lessons learned from our training and technical assistance, descriptions of available tools, and small systems “success stories.”

efcnetwork.org/small_systems_blog/



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Blog

Magdalena, New Mexico: A Success Story from the Smart Management for Small Water Systems Project

Written by: Allison Perch Allison Perch is a Program Coordinator with the Environmental Finance Center at the University of North Carolina. What can a small town do when the financial health of its water system is at risk? This is the question that Stephanie Finch, the town clerk and treasurer for the …

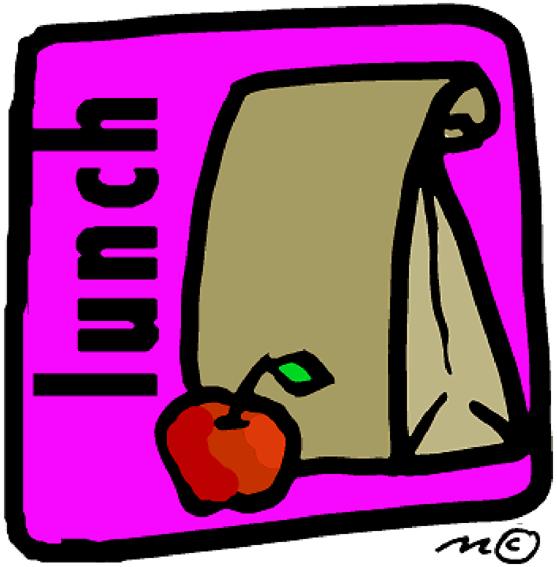
The Virtuous Cycle: Internal Energy Revolving Funds for Small Water Systems

Written by: David Tucker David Tucker is a Project Director with the Environmental Finance Center at the University of North Carolina. How can small (and large) water systems pay for energy efficiency and renewable energy, helping cut utility costs? As energy is often the largest variable expense in a water system's operating …

Smart Management for Small Water Systems Program Newsletter | Fall 2015

View Full Issue The Environmental Finance Center Network has published the third issue in a series of quarterly newsletters. The Fall 2015 Program Newsletter announces

Safety Message and Housekeeping Items



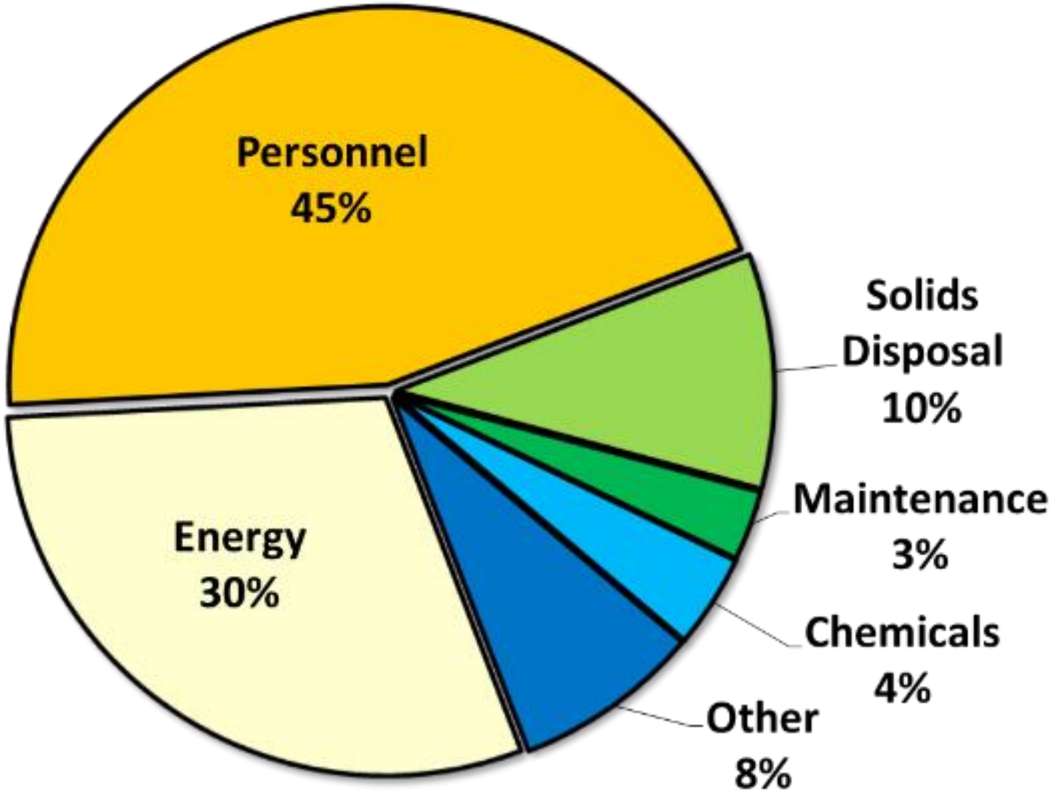
Workshop Goals

Learn to:

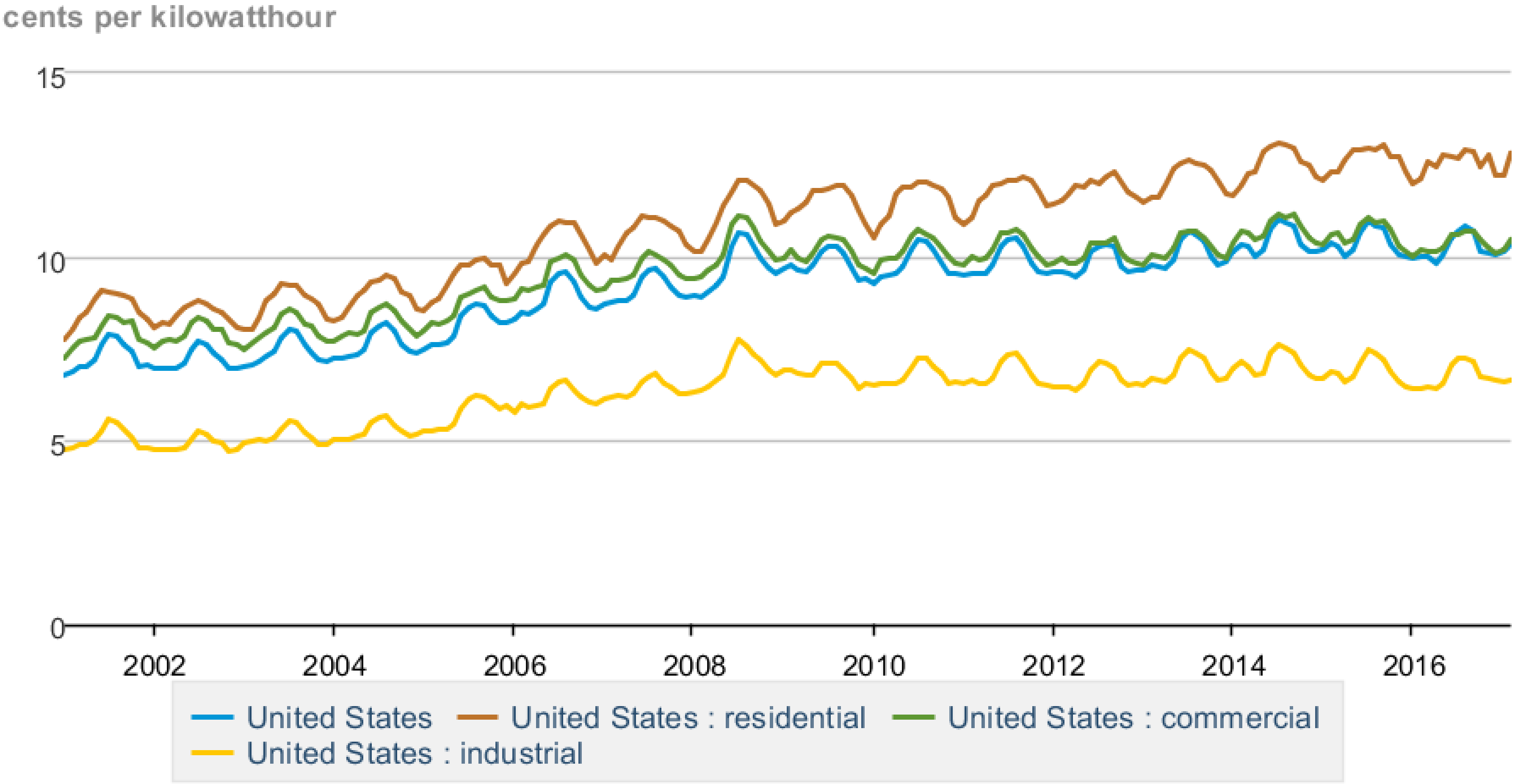
- Understand your energy usage and bills
- Develop a baseline of energy use
- Evaluate your system for energy efficiency and water loss reduction opportunities
- Prioritize and implement projects
- Identify ways to finance energy projects

And, have a forum for sharing energy management perspectives, ideas, and experiences.

Why are we here today?

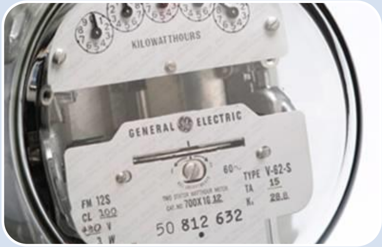


Average retail price of electricity, monthly



Source: U.S. Energy Information Administration

Why should a small water utility care about energy?



2 trillion gallons of H_2O: estimated amount pumped each year by small systems.

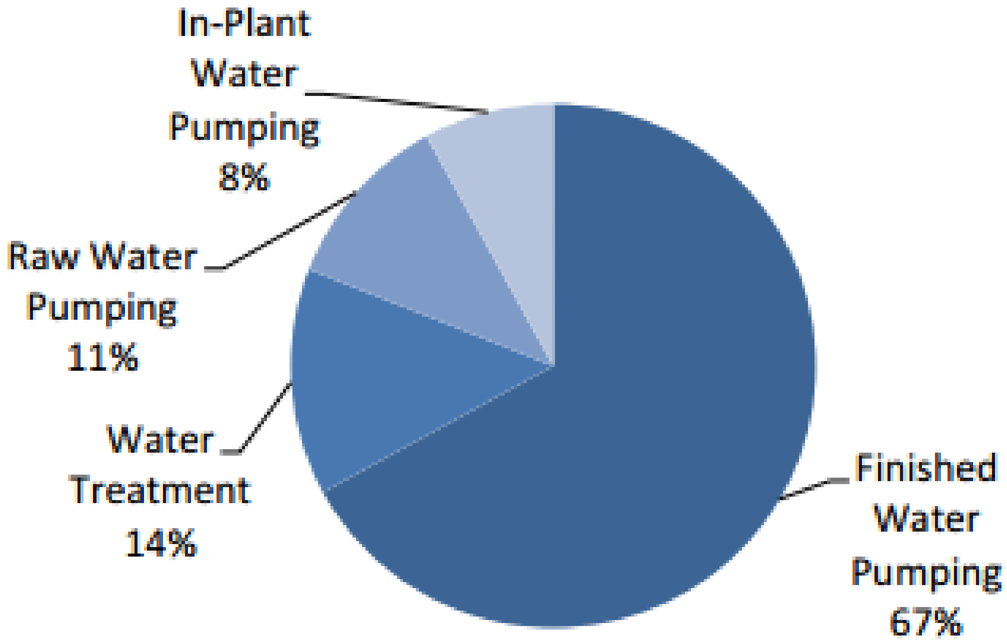
$1 billion: estimated electric power costs per year for these small systems.

$10 million: annual electric bill savings from a 1% reduction in electric costs.

$100 million: annual electric bill savings from a 10% reduction in electric costs.

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

Typical Energy End-Uses in Public Surface Water Systems



Source: Keith Carns, EPRI Solutions, “Bringing Energy Efficiency to the Water & Wastewater Industry: How Do We Get There?,” presented at *WEFTEC 2005*, Washington DC, November 2, 2005.

Letting a faucet run for

five minutes

uses as much energy as

leaving a

60-watt light bulb

on for

22 HOURS

EPA

epa.gov/watersense

Energy Management Post-Workshop Opportunities

- Contact the EFC Network (http://efcnetwork.org) to request free technical assistance under the Small Systems grant in developing your utility's new energy management plan.
- Attend our energy management webinars.
- Read our very active blog.
- Get an energy audit.

Introductions

- Your Name
- Organization and role at organization
- Water system size (# of people served)
- Who provides your water utility’s power

Who I am and how to contact me

- Carol Rosenfeld
- Senior Project Director
- Environmental Finance Center at UNC’s School of Government
- crosenfeld@sog.unc.edu
- (919) 843-5240
- www.efc.sog.unc.edu

Let’s take a look at the agenda…

Safety Message

Energy Management Goals

- Improve energy efficiency and manage total energy consumption
- Control peak demand for energy
- Manage energy cost volatility
- Improve energy reliability

These goals often overlap with other management practices (i.e. preventive maintenance program improves motor efficiency and improves reliability)

Energy Management Program Basic Steps

Step 1. Establish Organizational Commitment

Step 2. Develop a Baseline of Energy Use

Step 3. Evaluate the System and Collect Data

Step 4. Identify Energy Efficiency Opportunities

Step 5. Prioritize Opportunities for Implementation

Step 6. Develop an Implementation Plan

Step 7. Provide for Progress Tracking and Reporting

Source: NYSERDA

http://efcnetwork.org/publication/nyserda-water-wastewater-energy-management-practices-handbook/

Step 1: Establish Organizational Commitment

Energy Management for Small Water Systems

Step 1 – Establish Organizational Commitment

- Team responsibilities include:
  - develop the plan
  - establish goals
  - define the resources needed
  - provide information to others (i.e. CIP team)

Is your team defined?

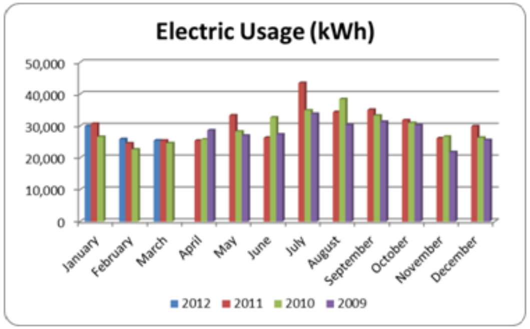
Is your team diverse?

Does it represent various interests and responsibilities within the utility?

Who would you include on your energy team?

Step 2: Develop a Baseline of Energy Use

Energy Management for Small Water Systems


Electric Usage (kWh)

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!

Developing an Energy Baseline – What to Do?

Gather basic information

Review hydraulic data

Evaluate energy bills

Understand energy rate structure

Build a basic model

How are you charged for energy use?

Energy Terminology

Kilowatt-hours (kWh)
Electricity measurement
1,000 watts used for 1 hour

Consumption Charge
$/kWh

Demand or Power Charge
$/KW

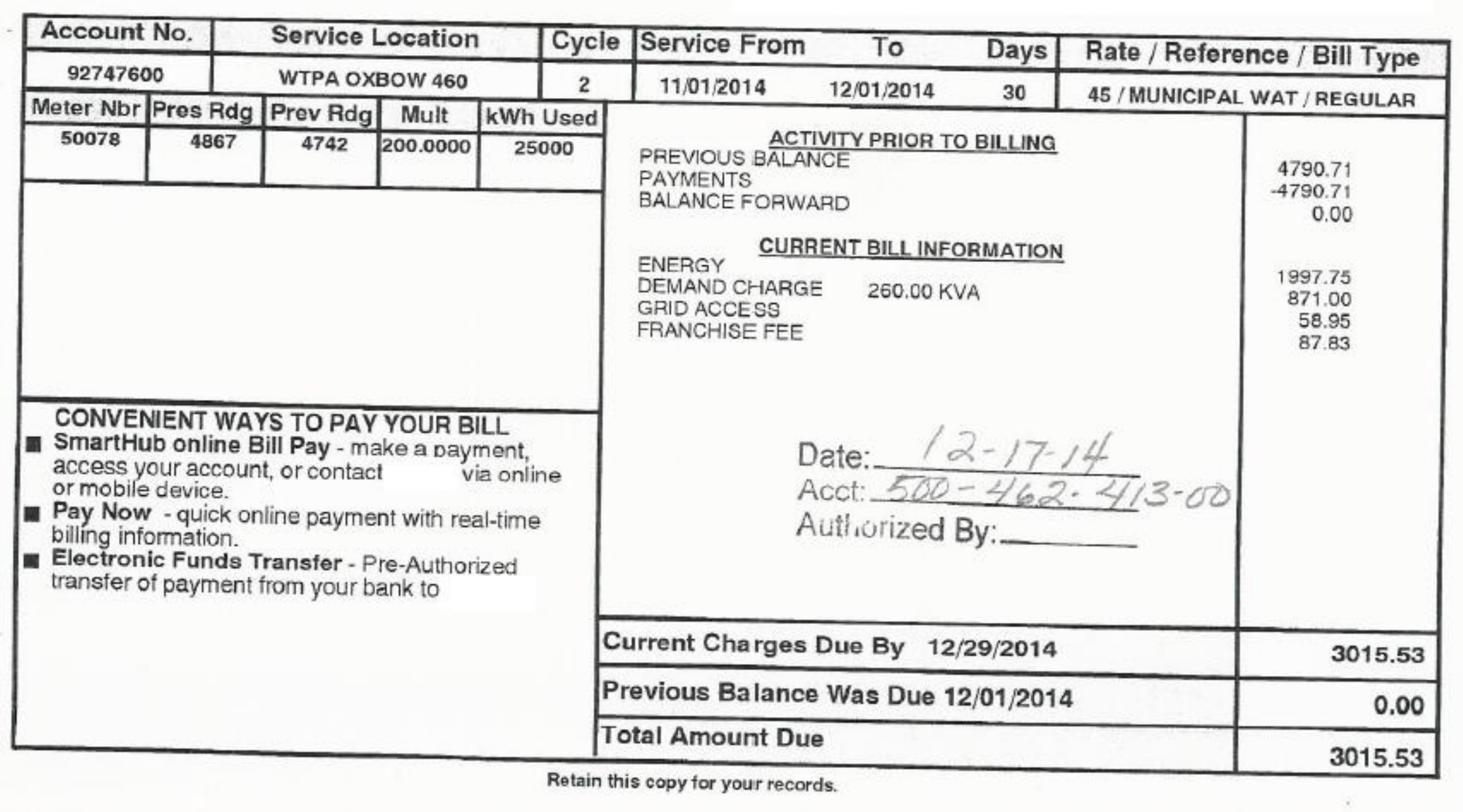
5 kW motor x 10 hours use = 50 kWh

50 kW motor x 2 hours use = 100 kWh

300 kW x 8 hours = 2,400 kWh

100 kW x 24 hours = 2,400 kWh

Sample Electricity Bill for a Small Water System



Account No.	Service Location	Cycle	Service From	To	Days	Rate / Reference / Bill Type
92747600	WTPA OXBOW 460	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: 12-17-14
Acct: 500-462-413-00
Authorized By:

CONVENIENT WAYS TO PAY YOUR BILL

- **SmartHub online Bill Pay** - make a payment, access your account, or contact via online or mobile device.
- **Pay Now** - quick online payment with real-time billing information.
- **Electronic Funds Transfer** - Pre-Authorized transfer of payment from your bank to

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.

Typical Electric Bill Components

- Customer / base / service availability charge
- Consumption charge (kWh)
- Demand charge (kW or kVa)
  - May not apply in some rate structures, e.g. residential electric rate structures
- Other charges
- You may be able to switch rate structures

Types of Electric Rate Structures

- Your electric rate structure may go by any of many different names
- A s … all
  Ge … e
  ele

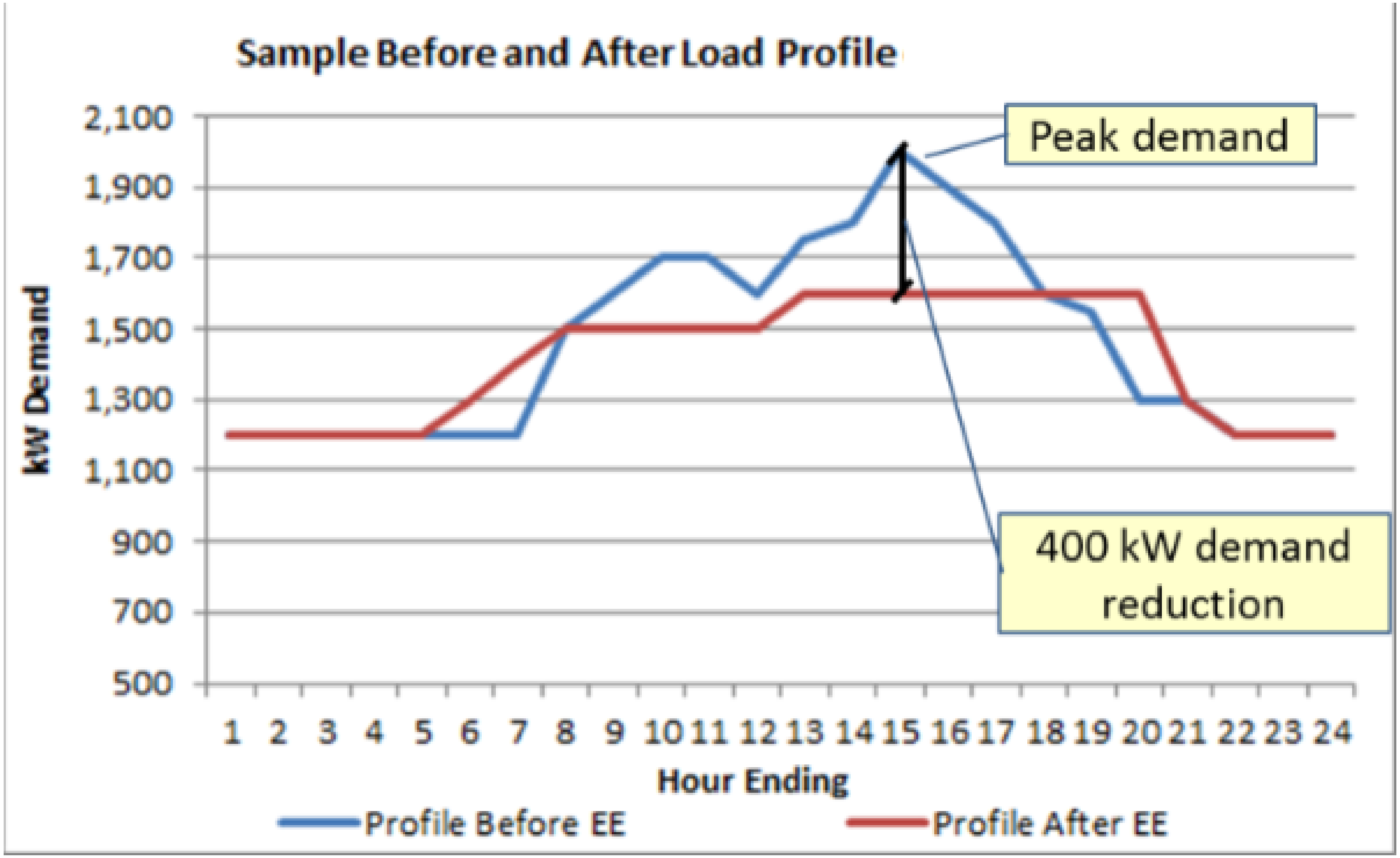
Does the application match the rate structure?

- Consumption charge (per kWh) portion:
  - Uniform rate
  - Increasing / inclining block rate
  - Decreasing / declining block rate

Demand Charges

- Charged on a per 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)
  - E.g. the top one hour per month, or top 15 min., etc.
- Typically covers capital costs, particularly for peaking capacity
- Does it carry over? (ratchet charge)

Control Peak Demand



kWh – like **odometer** (a measure of total energy you use over a specific period of time, NOT at a given moment)

kW – like **speedometer** (a measure of energy use at a given moment, NOT over time)

Other Charges

- Fuel surcharges
- Line loss charges
- Maintenance charges
- Renewable energy and energy efficiency portfolio standard cost compliance charges
- Taxes

What elements do your water system's electric bills include?

Benchmarking Tools

- EFCN’s Electricity Baseline Builder for Water Utilities
  - http://efcnetwork.org/tool/electricity-baseline-builder-water-utilities/
- Energy Star’s Portfolio Manager
  - https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager
- State Energy Office Tools
- AWWA “Energy Management for Water Utilities” 2016
- WEF Energy Roadmap (2013)

Data Needs - Examples

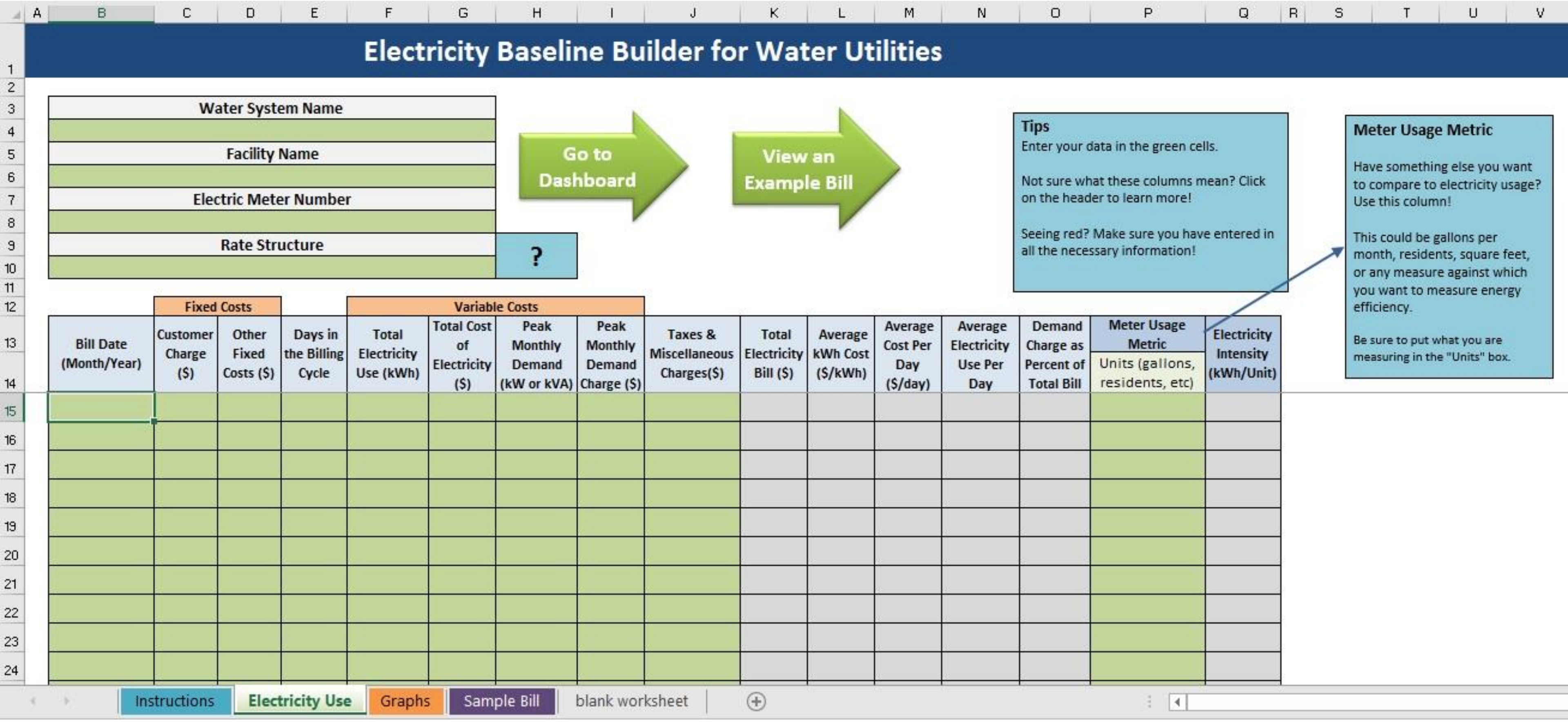
Inputs

- 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

EFCN’s Electricity Baseline Builder for Water Utilities



Electricity Baseline Builder for Water Utilities

Water System Name

Facility Name

Electric Meter Number

Rate Structure ?

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

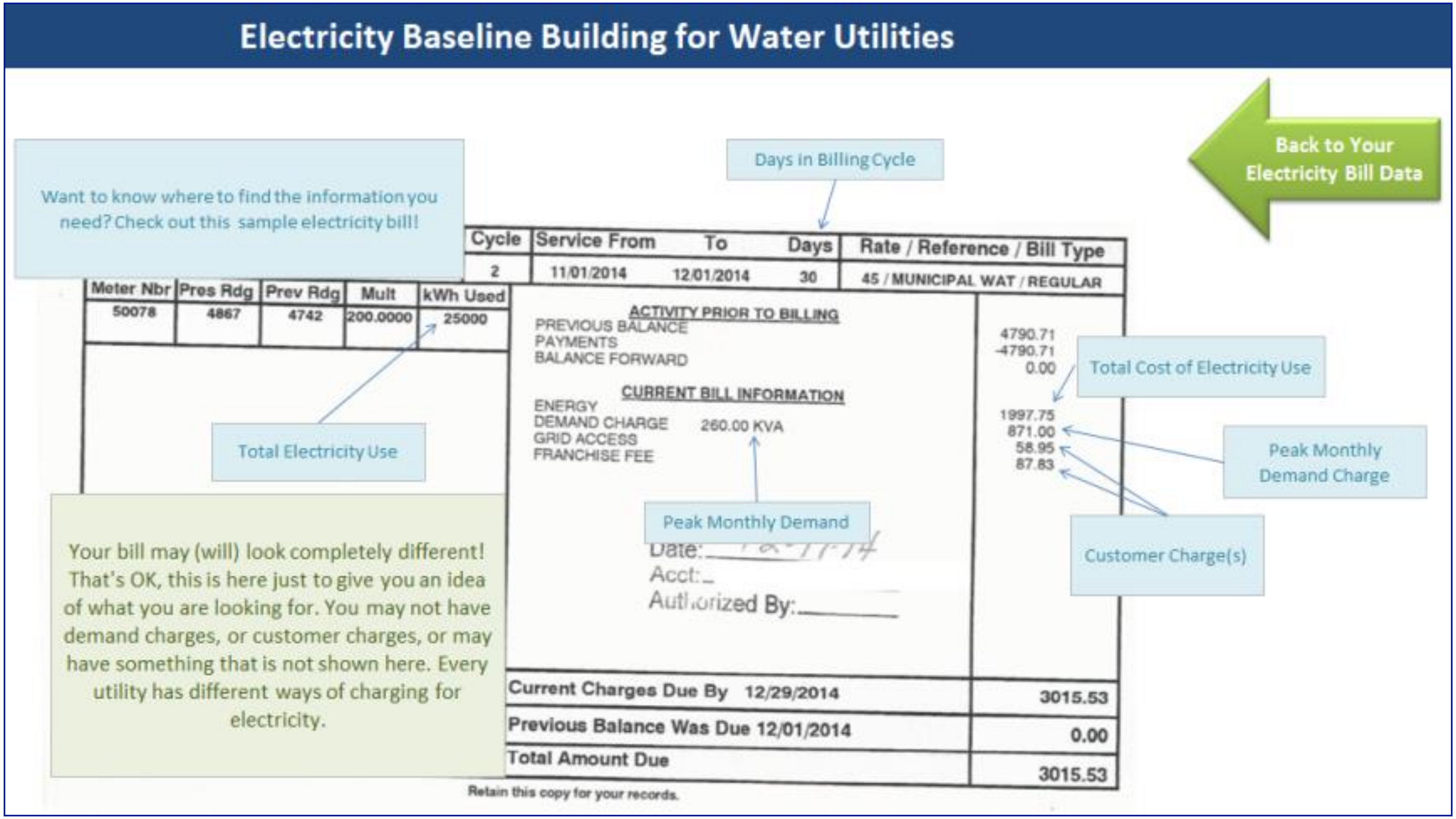
Have something else you want to compare to electricity usage? Use this column!

This could be gallons per month, residents, square feet, or any measure against which you want to measure energy efficiency.

Be sure to put what you are measuring in the "Units" box.

	Fixed Costs			Variable Costs											
Bill Date (Month/Year)	Customer Charge ($)	Other Fixed Costs ($)	Days in the Billing Cycle	Total Electricity Use (kWh)	Total Cost of Electricity ($)	Peak Monthly Demand (kW or kVA)	Peak Monthly Demand Charge ($)	Taxes & Miscellaneous Charges($)	Total Electricity Bill ($)	Average kWh Cost ($/kWh)	Average Cost Per Day ($/day)	Average Electricity Use Per Day	Demand Charge as Percent of Total Bill	Meter Usage Metric	Electricity Intensity (kWh/Unit)
														Units (gallons, residents, etc)	

Tool Demo: Putting Your Electricity Bill into the Electricity Baseline Tool



Electricity Baseline Building for Water Utilities

Back to Your Electricity Bill Data

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

Days in Billing Cycle

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

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

Total Cost of Electricity Use

Peak Monthly Demand Charge

Peak Monthly Demand

Customer Charge(s)

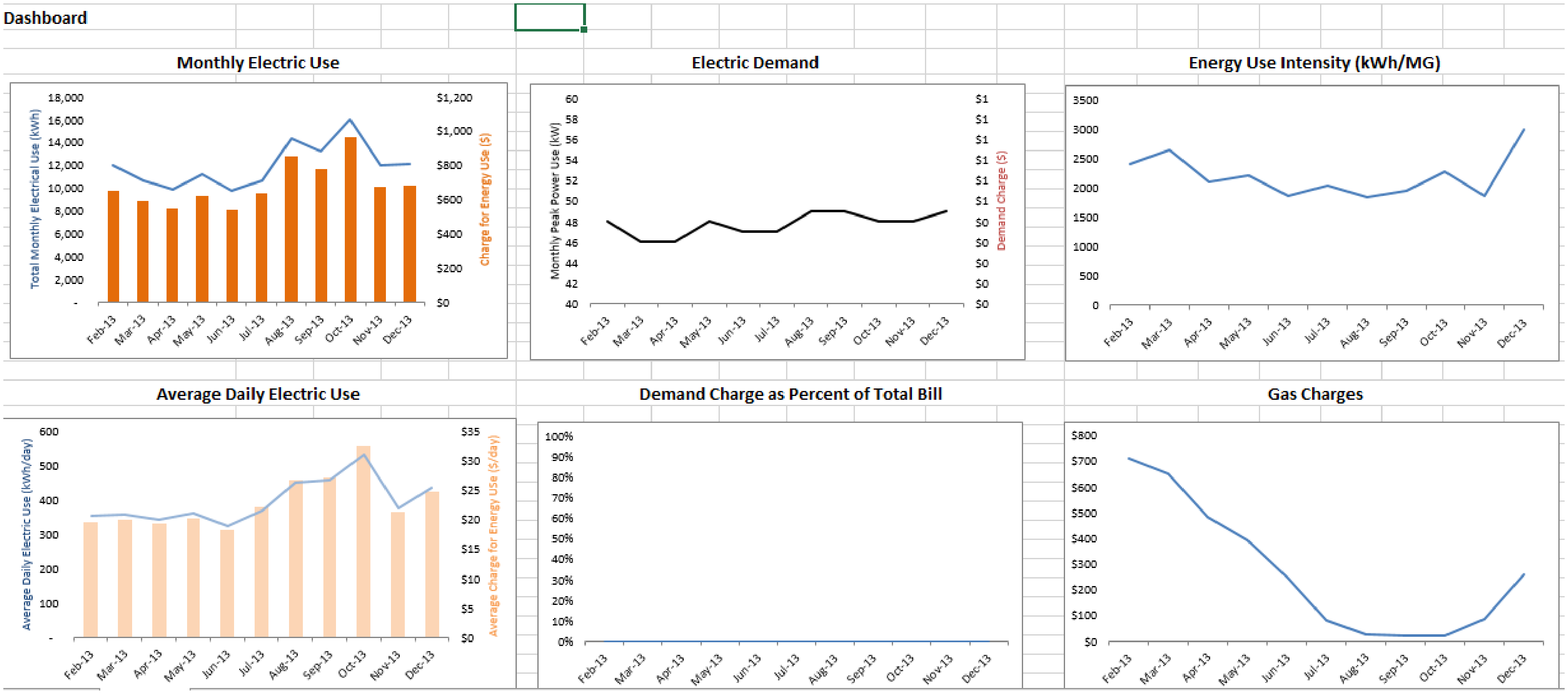
Date: 12-17-14
Acct: _
Authorized By: ________

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

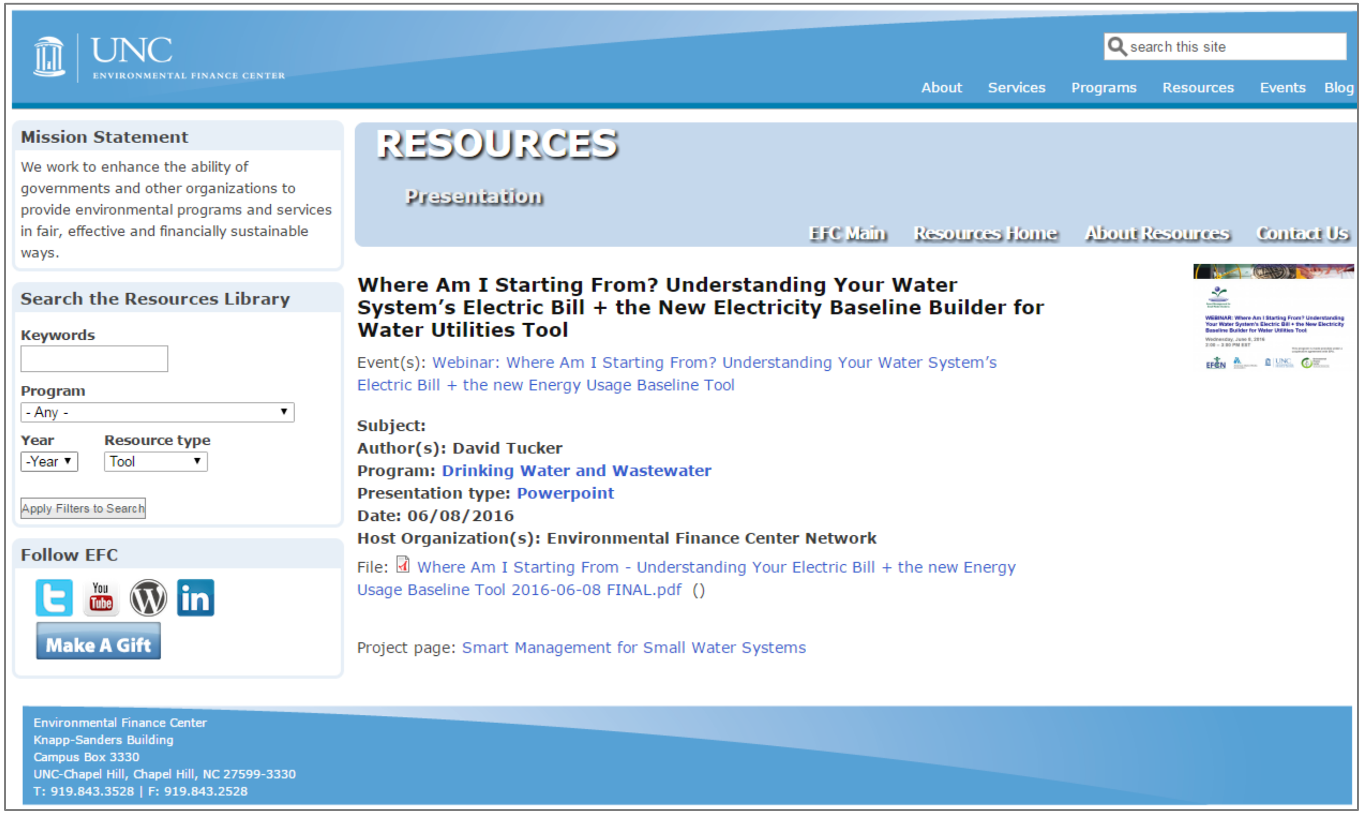
Retain this copy for your records.

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.

EFCN's Electricity Baseline Builder for Water Utilities



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



Mission Statement

We work to enhance the ability of governments and other organizations to provide environmental programs and services in fair, effective and financially sustainable ways.

Search the Resources Library

Follow EFC

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

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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

Asset management is tied to energy management

Asset Management: Identifying how existing assets will be managed, maintained, repaired, and replaced. Inventorying assets is a key first step.

All water and wastewater facilities are made up of many, many individual assets

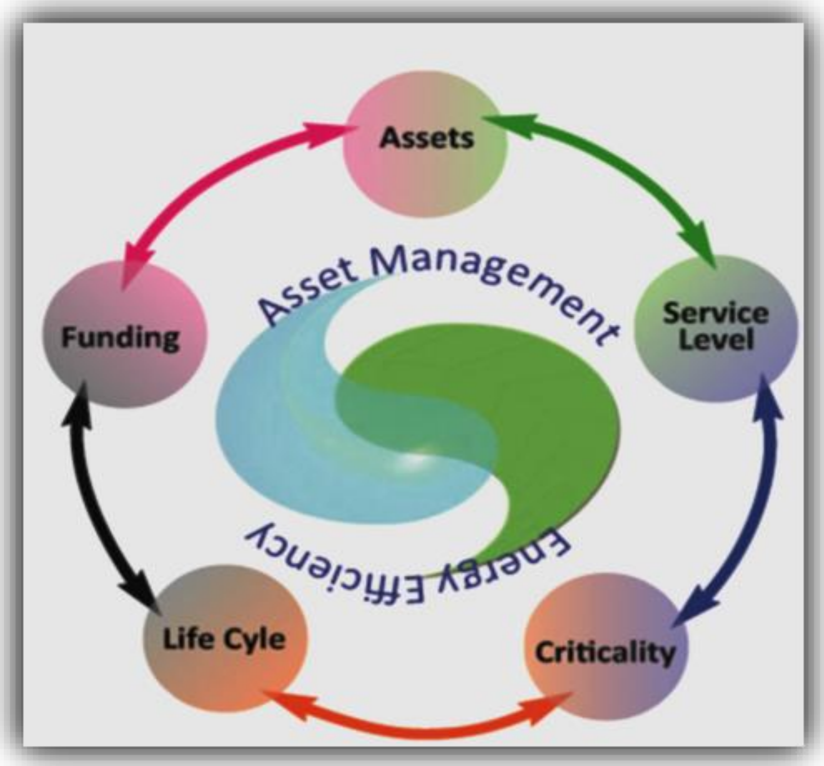
It costs money to construct, operate, maintain, repair, rehabilitate and replace the assets

You most likely don't have all the money you need to do everything that needs to be done within the facility……

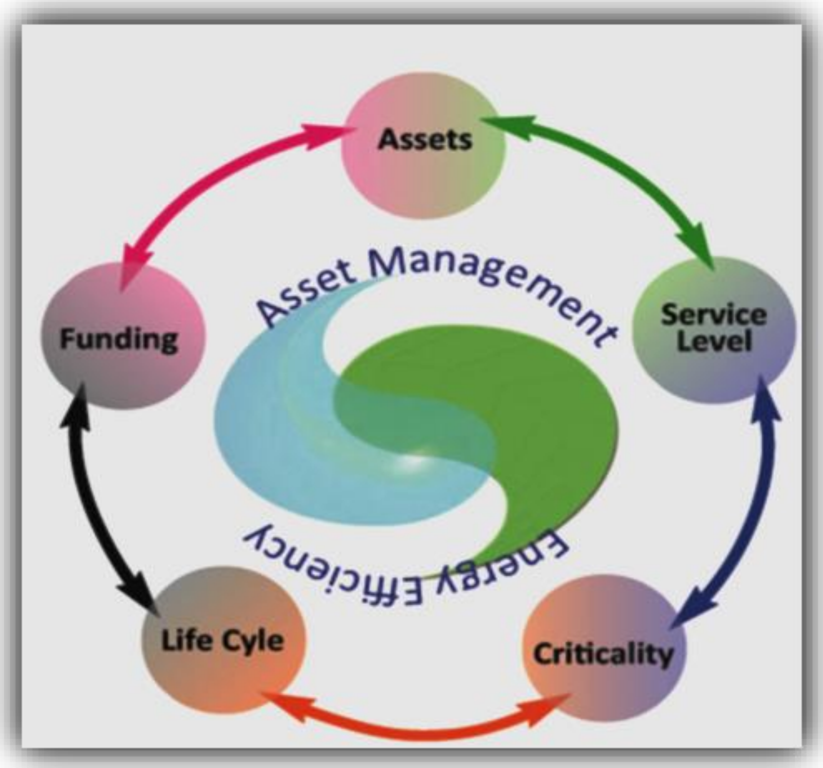
Therefore, you have to make choices about where to spend the money

VS

Asset management helps you determine how, where, and when to spend your money

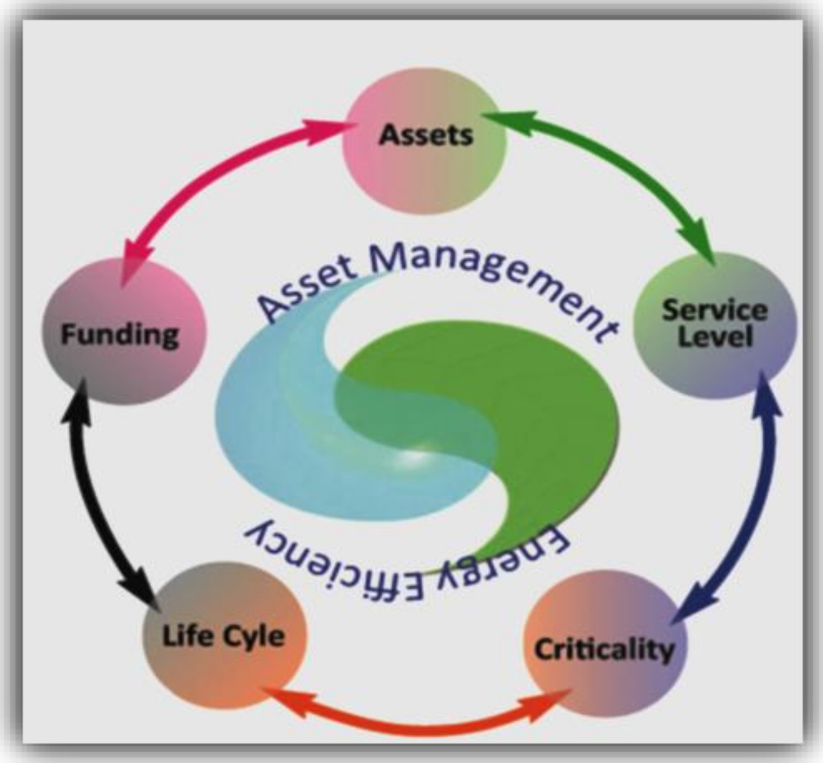


AM thought process - Five core components



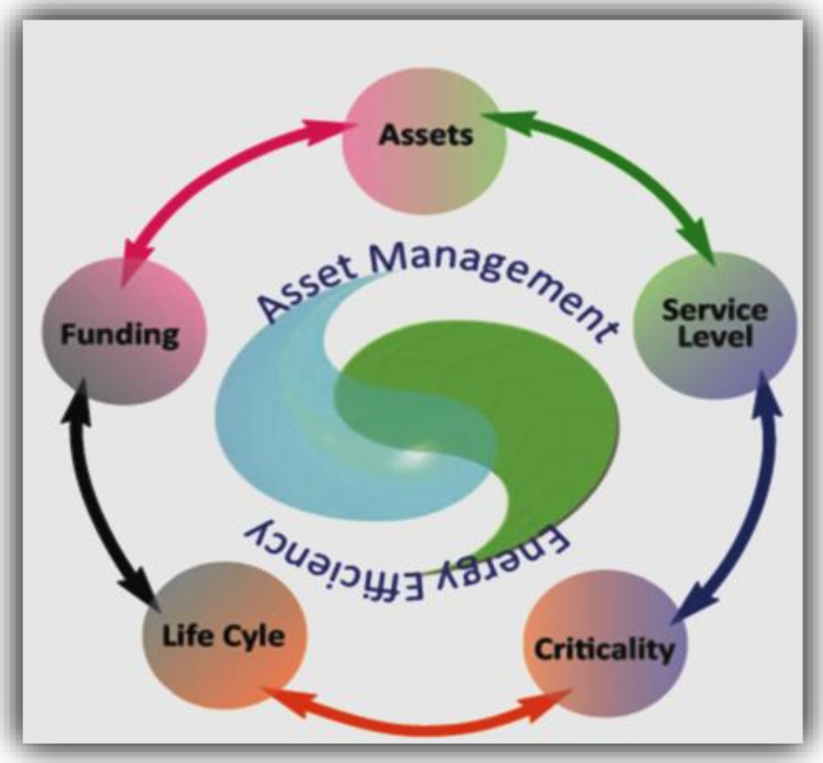
CURRENT STATE OF THE ASSETS

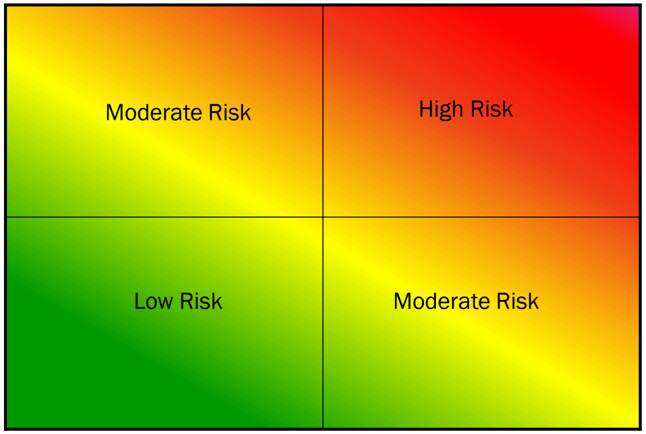
AM thought process - Five core components



LEVEL OF SERVICE

AM thought process - Five core components

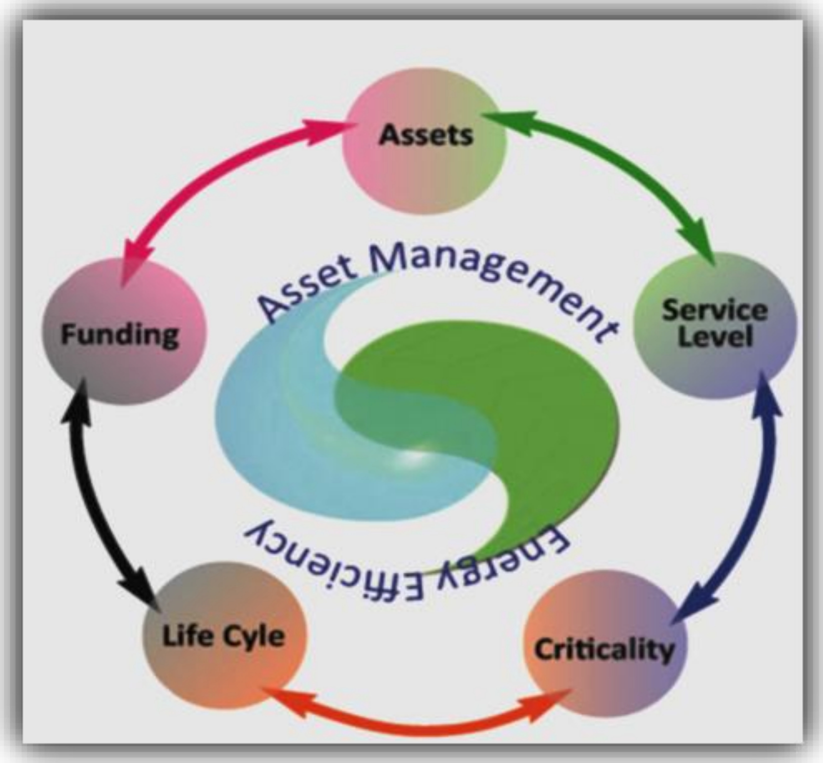




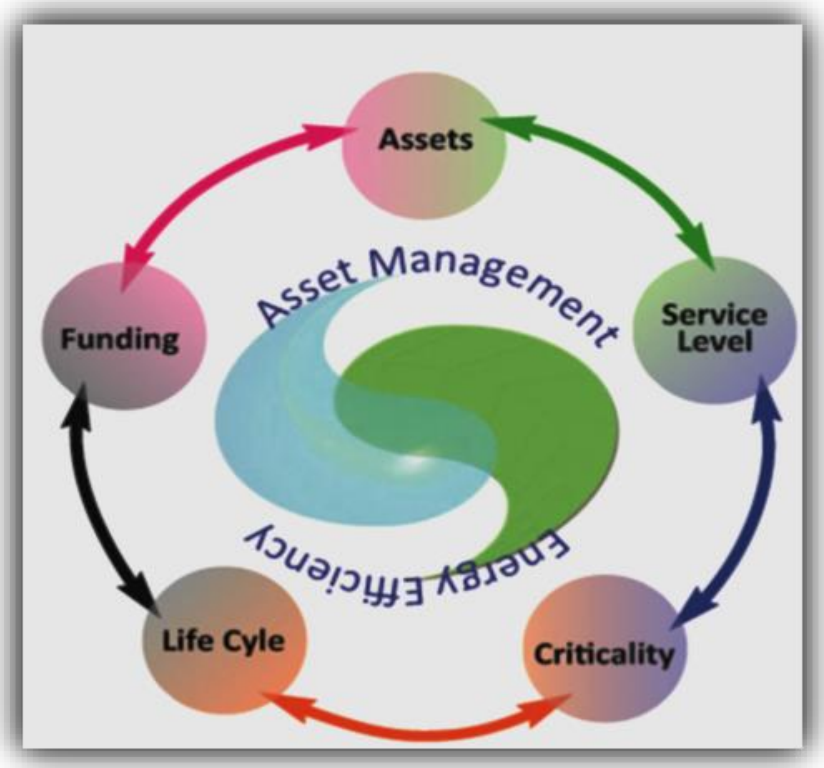
Moderate Risk	High Risk
Low Risk	Moderate Risk

CRITICALITY

AM thought process - Five core components

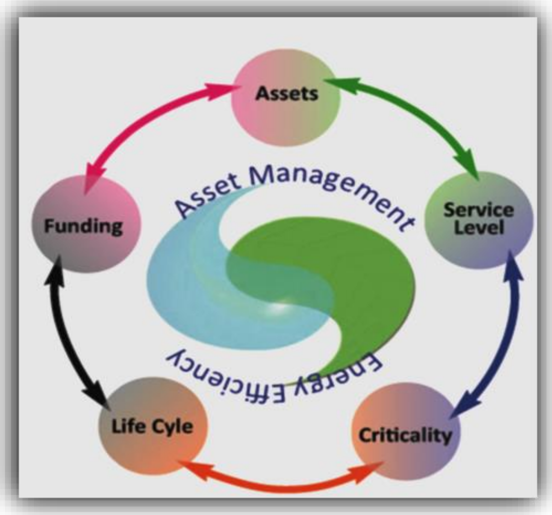


AM thought process - Five core components



FUNDING

The benefits of using asset management



✓ Better operational decisions

✓ Improved emergency response

✓ Greater ability to plan and pay for future repairs and replacements

✓ Increased knowledge of asset location and condition

✓ Increased understanding of which assets are critical to the utility

✓ More efficient operation

✓ Improved customer communication & service

✓ Easier rate-setting

✓ Rates based on sound information

✓ Increased acceptance of rates

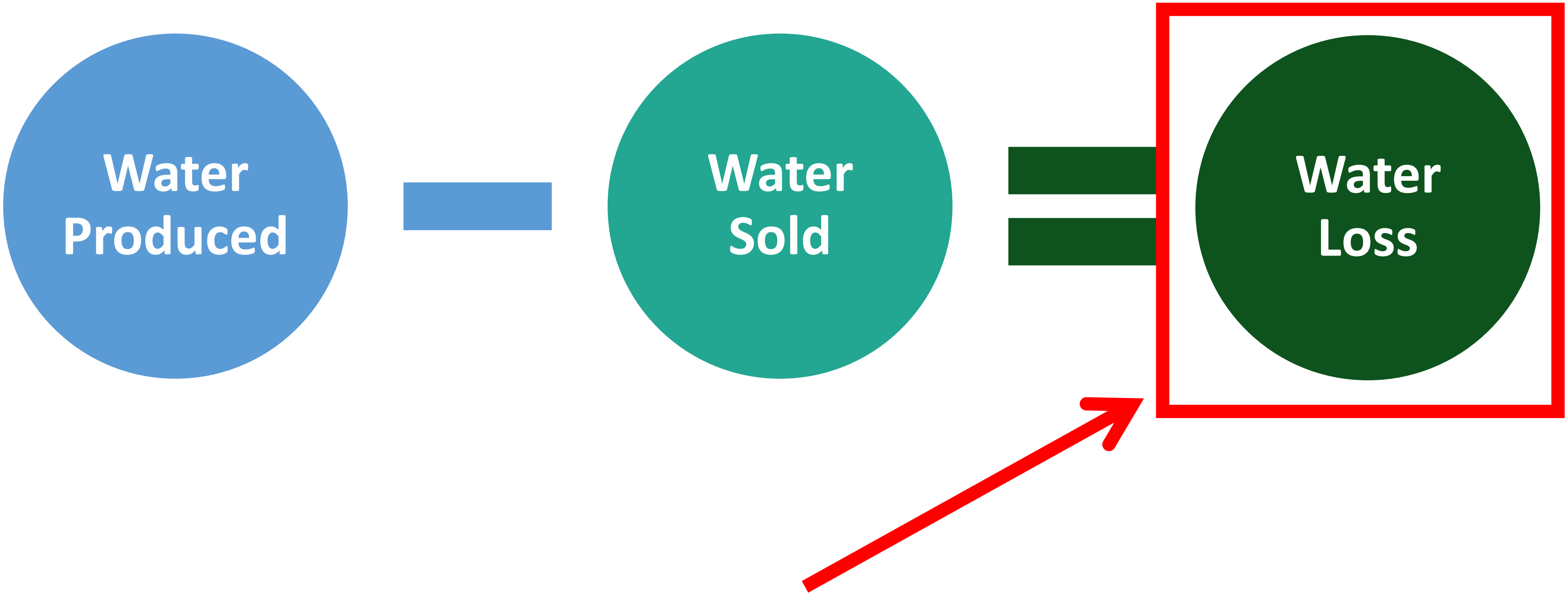
✓ Better prioritization of capital improvement projects

Water Loss tied to Energy Management

- Case Study – Wisconsin
  - 1997-2000: Average use was 1.6 kWh per 1,000 gallons of water produced = $0.086 per 1,000 gallons of water produced
  - 23.5 billion gallons lost per year

  - 23,500,000 x $0.086 = ~ $2 million on 38 million kWh to produce lost water

Does this look familiar?



Water Produced − Water Sold = Water Loss

This value is not water loss

Water Produced − Water Sold = NON-REVENUE WATER (NRW)

NON-REVENUE WATER:

Water Use for City, Town, Muni Purposes

Illegal Water Use

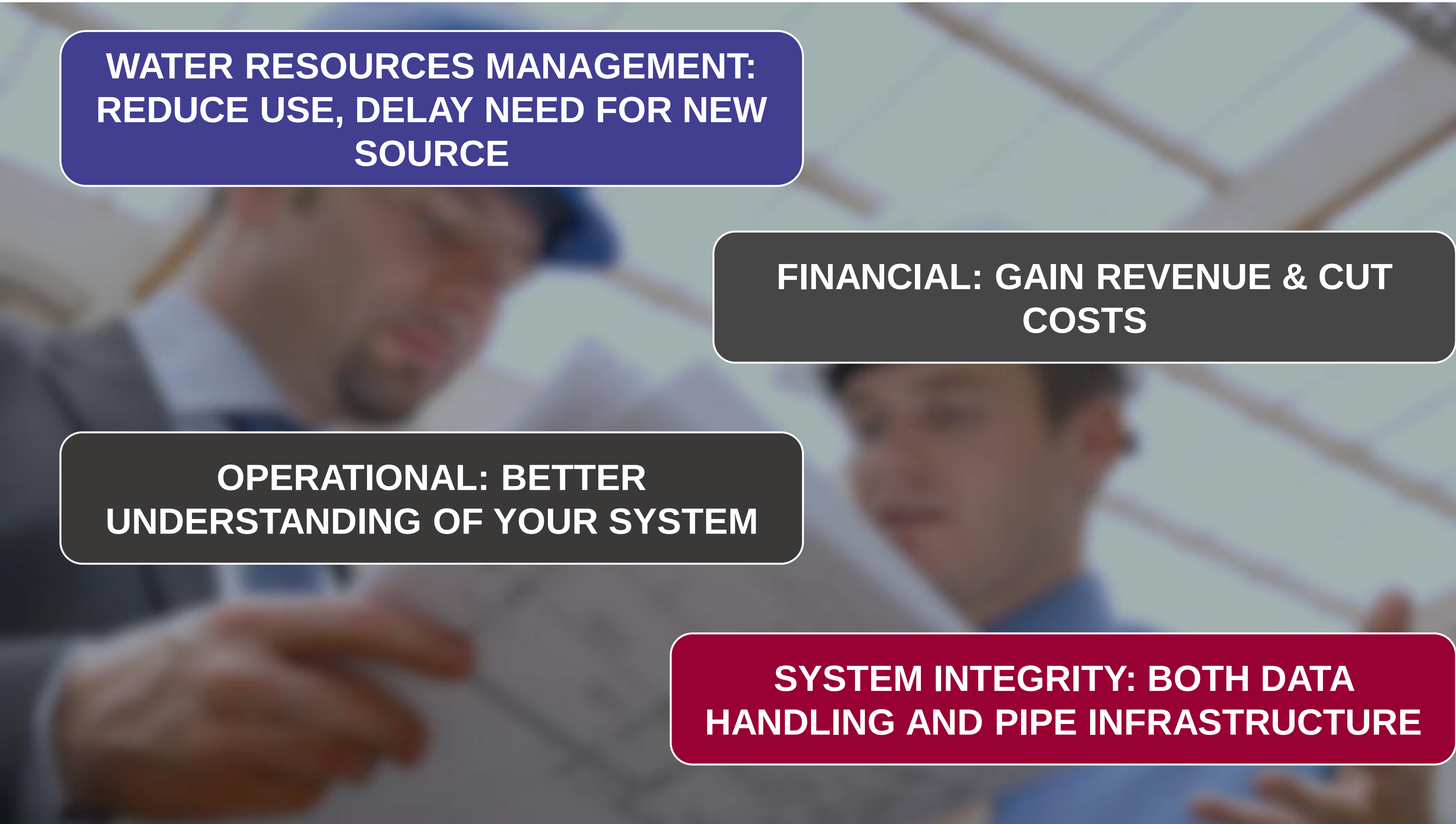
Water Use by Water Utility for flushing or other purposes

Lost Water

Inaccurate Meters

Poor Data Handling

WHY CARE ABOUT NRW?



WATER RESOURCES MANAGEMENT: REDUCE USE, DELAY NEED FOR NEW SOURCE

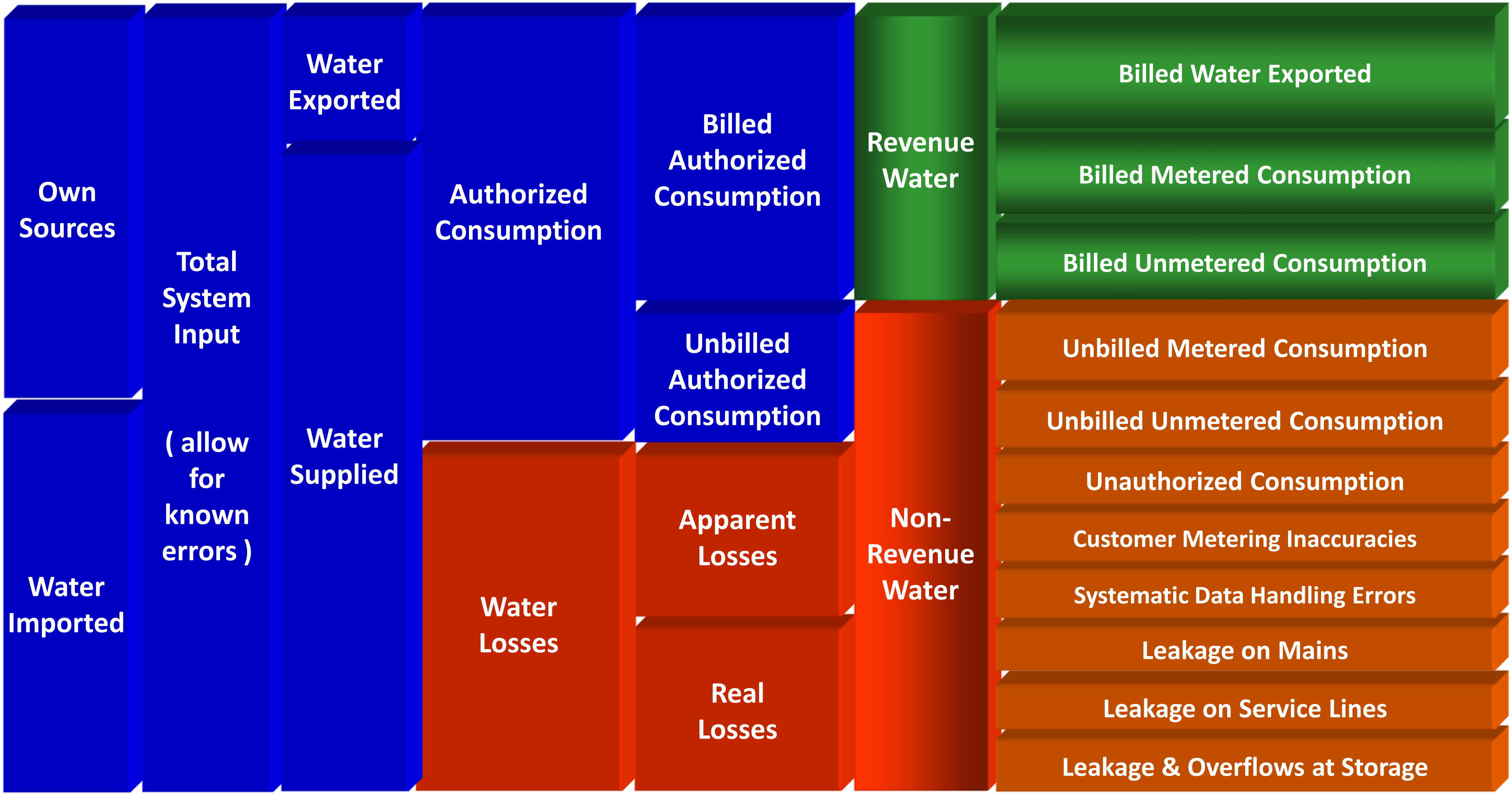
FINANCIAL: GAIN REVENUE & CUT COSTS

OPERATIONAL: BETTER UNDERSTANDING OF YOUR SYSTEM

SYSTEM INTEGRITY: BOTH DATA HANDLING AND PIPE INFRASTRUCTURE

If we don’t understand the nature of the problem, we may apply the wrong solution.

IWA/AWWA Standard Water Balance

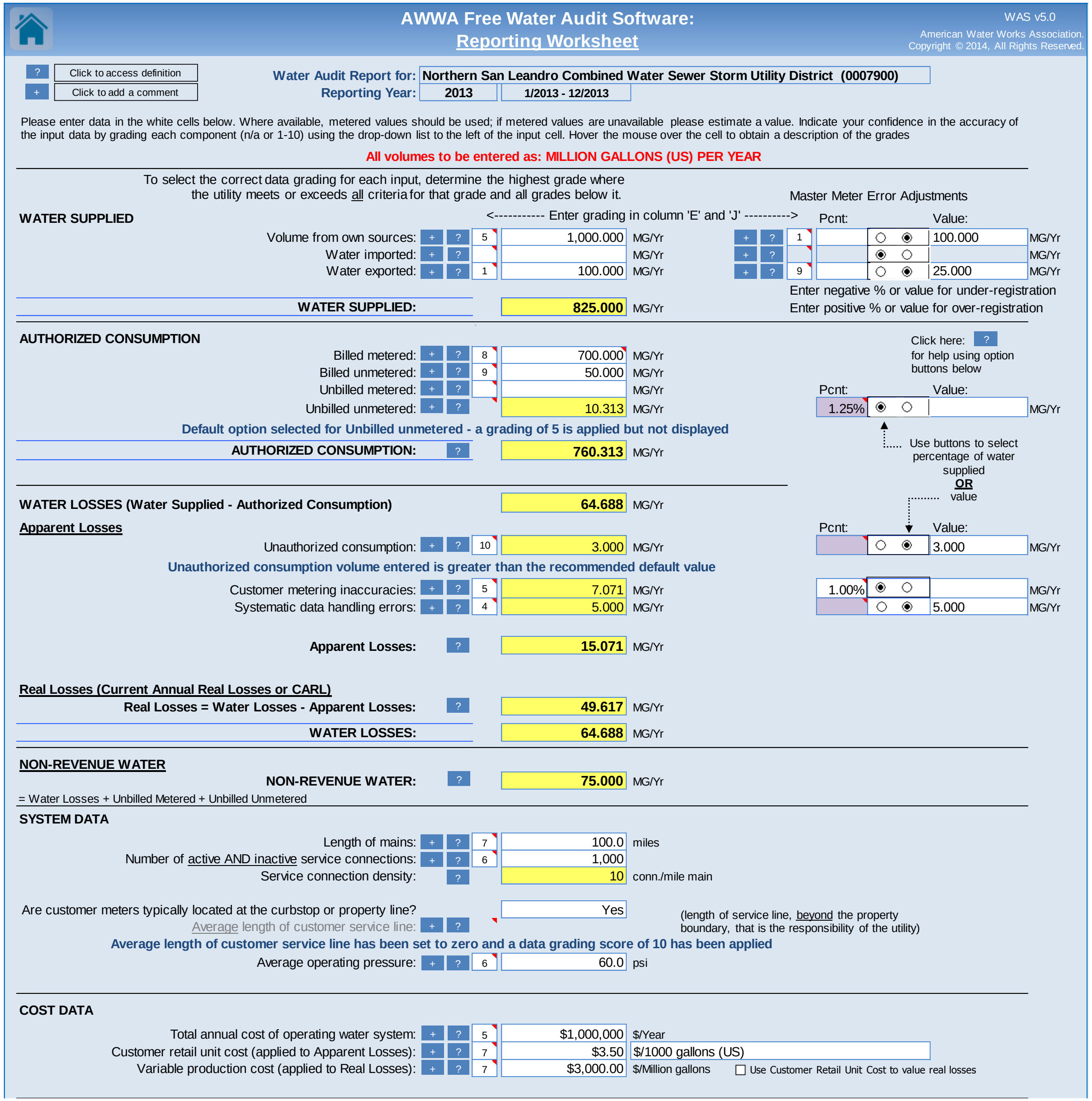


Own Sources	Total System Input (allow for known errors)	Water Exported	Authorized Consumption	Billed Authorized Consumption	Revenue Water	Billed Water Exported
		Water Supplied				Billed Metered Consumption
						Billed Unmetered Consumption
				Unbilled Authorized Consumption	Non-Revenue Water	Unbilled Metered Consumption
Water Imported						Unbilled Unmetered Consumption
			Water Losses	Apparent Losses		Unauthorized Consumption
						Customer Metering Inaccuracies
						Systematic Data Handling Errors
				Real Losses		Leakage on Mains
						Leakage on Service Lines
						Leakage & Overflows at Storage

Goal: No "Unaccounted for" water

All Water placed in it's applicable category

AWWA Free Water Audit Software



AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.
Copyright © 2014, All Rights Reserved.

Water Audit Report for: Northern San Leandro Combined Water Sewer Storm Utility District (0007900)
Reporting Year: 2013 | 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter Error Adjustments

WATER SUPPLIED

	Grade	Value	Unit	Grade	Pcnt:		Value:	Unit
Volume from own sources:	5	1,000.000	MG/Yr	1		○ ●	100.000	MG/Yr
Water imported:			MG/Yr			● ○		MG/Yr
Water exported:	1	100.000	MG/Yr	9		○ ●	25.000	MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED:		825.000	MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grade	Value	Unit	Pcnt:		Value:	Unit
Billed metered:	8	700.000	MG/Yr				
Billed unmetered:	9	50.000	MG/Yr				
Unbilled metered:			MG/Yr				
Unbilled unmetered:		10.313	MG/Yr	1.25%	● ○		MG/Yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

AUTHORIZED CONSUMPTION:		760.313	MG/Yr

Use buttons to select percentage of water supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption)		64.688	MG/Yr

Apparent Losses

	Grade	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption:	10	3.000	MG/Yr		○ ●	3.000	MG/Yr

Unauthorized consumption volume entered is greater than the recommended default value

	Grade	Value	Unit	Pcnt:		Value:	Unit
Customer metering inaccuracies:	5	7.071	MG/Yr	1.00%	● ○		MG/Yr
Systematic data handling errors:	4	5.000	MG/Yr		○ ●	5.000	MG/Yr
Apparent Losses:		15.071	MG/Yr				

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:		49.617	MG/Yr
WATER LOSSES:		64.688	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER:		75.000	MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Value	Unit
Length of mains:	7	100.0	miles
Number of active AND inactive service connections:	6	1,000	
Service connection density:		10	conn./mile main
Are customer meters typically located at the curbstop or property line?		Yes	
Average length of customer service line:			(length of service line, beyond the property boundary, that is the responsibility of the utility)

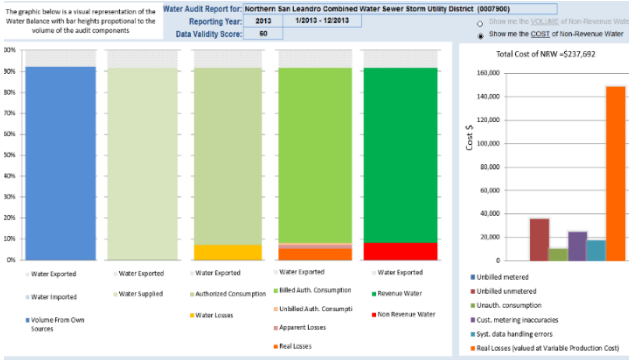
Average length of customer service line has been set to zero and a data grading score of 10 has been applied

	Grade	Value	Unit
Average operating pressure:	6	60.0	psi

COST DATA

	Grade	Value	Unit
Total annual cost of operating water system:	5	$1,000,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	7	$3.50	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	7	$3,000.00	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses



The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

Water Audit Report for: Northern San Leandro Combined Water Sewer Storm Utility District (0007900)
Reporting Year: 2013 | 1/2013 - 12/2013
Data Validity Score: 60

○ Show me the VOLUME of Non-Revenue Water
● Show me the COST of Non-Revenue Water

Industry Standard (M36)

Free

Defaults provided

~10 Volume Inputs
~7 System Data Inputs

awwa.org/waterlosscontrol

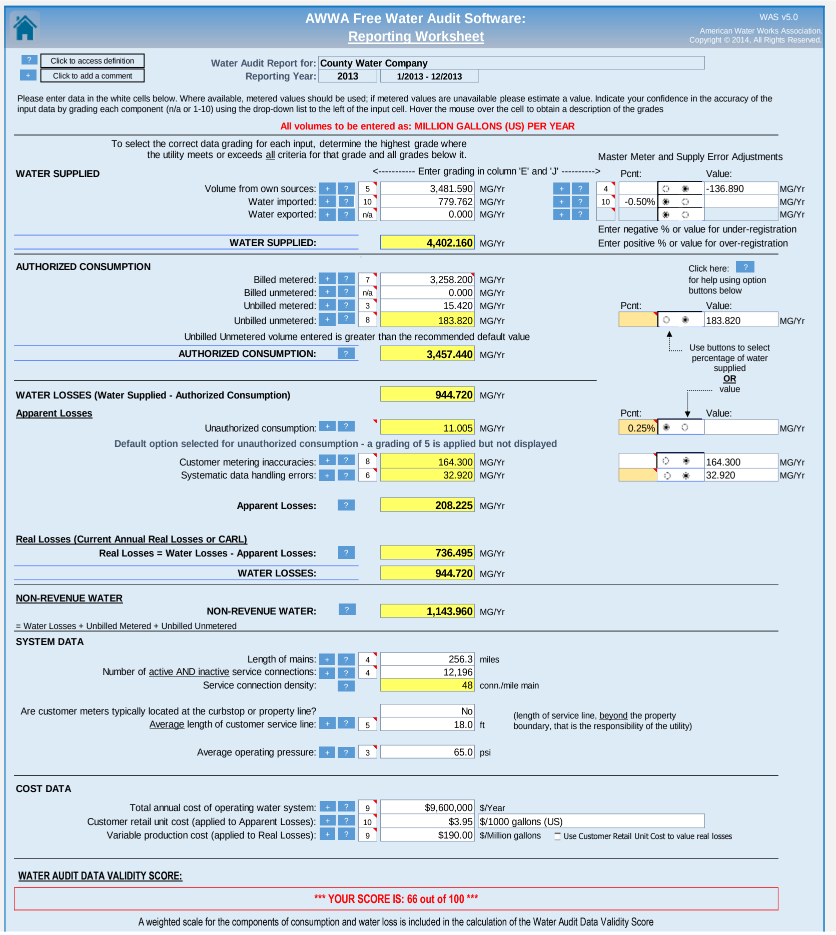
IT’S NOT AS BAD AS IT LOOKS

Inputs

- 13 Volume inputs
- 5 System attribute inputs
- 3 Cost inputs
- 21 total

After defaults & n/a’s:

- only about 10-15 inputs to deal with



AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.
Copyright © 2014, All Rights Reserved.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: County Water Company
Reporting Year: 2013 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

	Grade			Grade	Pcnt:		Value:
Volume from own sources:	5	3,481.590	MG/Yr	4		○ ●	-136.890 MG/Yr
Water imported:	10	779.762	MG/Yr	10	-0.50%	● ○	MG/Yr
Water exported:	n/a	0.000	MG/Yr			● ○	MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 4,402.160 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Billed metered:	7	3,258.200	MG/Yr			
Billed unmetered:	n/a	0.000	MG/Yr			
Unbilled metered:	3	15.420	MG/Yr	Pcnt:		Value:
Unbilled unmetered:	8	183.820	MG/Yr		○ ●	183.820 MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied
OR
value

AUTHORIZED CONSUMPTION: 3,457.440 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 944.720 MG/Yr

Apparent Losses

				Pcnt:		Value:
Unauthorized consumption:		11.005	MG/Yr	0.25%	● ○	MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	8	164.300	MG/Yr		○ ●	164.300 MG/Yr
Systematic data handling errors:	6	32.920	MG/Yr		○ ●	32.920 MG/Yr

Apparent Losses: 208.225 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 736.495 MG/Yr

WATER LOSSES: 944.720 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 1,143.960 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	4	256.3	miles
Number of active AND inactive service connections:	4	12,196	
Service connection density:		48	conn./mile main
Are customer meters typically located at the curbstop or property line?		No	
Average length of customer service line:	5	18.0	ft
Average operating pressure:	3	65.0	psi

(length of service line, beyond the property boundary, that is the responsibility of the utility)

COST DATA

Total annual cost of operating water system:	9	$9,600,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	10	$3.95	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	9	$190.00	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 66 out of 100 ***

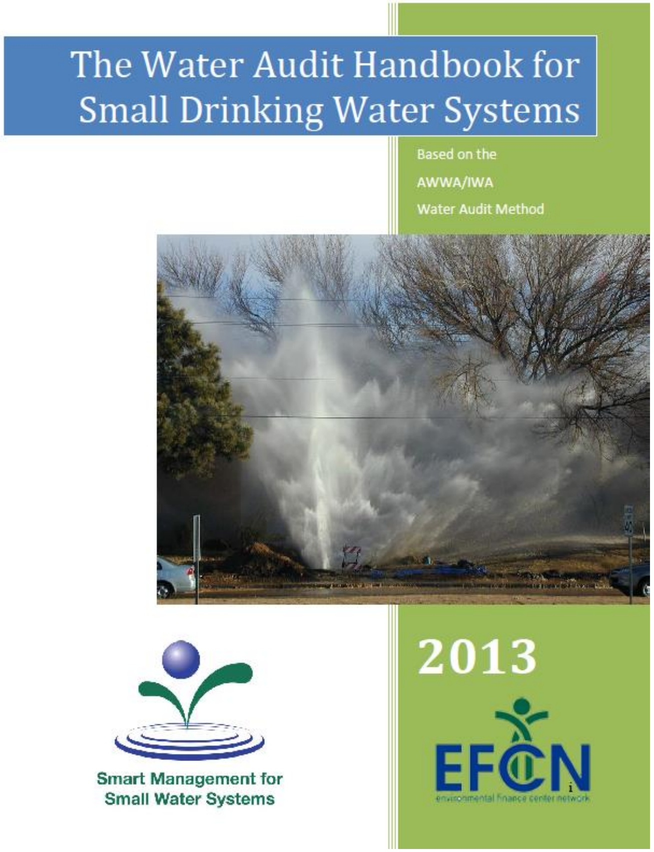
A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

Resource: AWWA Water Audit Software© (version 5.0)

- Free Excel Workbook at http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx
- Must log in or register to access the tool – the tool is free

Resource: EFCN's "The Water Audit Handbook for Small Drinking Water Systems"

- http://efcnetwork.org/documents/2014/01/water-audit-handbook.pdf



The Water Audit Handbook for Small Drinking Water Systems

Based on the
AWWA/IWA
Water Audit Method

2013

Smart Management for Small Water Systems

EFCN
environmental finance center network

Water loss reduction case study: Asheville

Brandon Buckner, Meter Services Division Manager, Asheville Water Resources

Energy Management Program Basic Steps

Step 1. Establish Organizational Commitment

Step 2. Develop a Baseline of Energy Use

Step 3. Evaluate the System and Collect Data

Step 4. Identify Energy Efficiency Opportunities

Step 5. Prioritize Opportunities for Implementation

Step 6. Develop an Implementation Plan

Step 7. Provide for Progress Tracking and Reporting

Source: NYSERDA

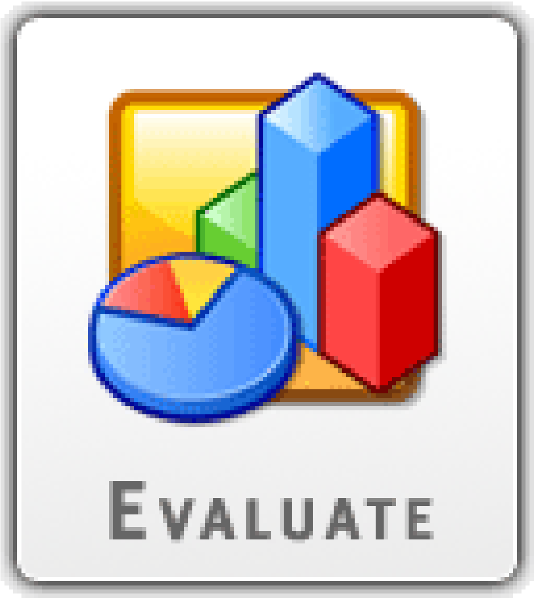
http://efcnetwork.org/publication/nyserda-water-wastewater-energy-management-practices-handbook/

Step 3: Evaluate the System and Collect Data

Energy Management for Small Water Systems

EVALUATE

Beyond Baseline Development



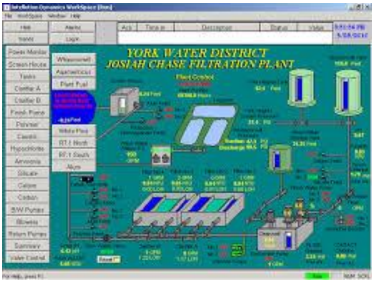
- System walk-through
- Staff interviews
- Gather energy performance data
- Update energy use model

Have you ever had an energy audit or assessment completed at your utility?

- Yes
- No
- Not a Water Utility

Possible Areas of Evaluation

- Raw and Finished Water Pumping
- Chemical Mixing
- Backwashing
- Well Systems
- Ozonation



- Load Shifting
- Distribution
- Supervisory Control and Data Acquisition (SCADA)
- Energy Efficient Motors

And… System Water Loss

Who can help?

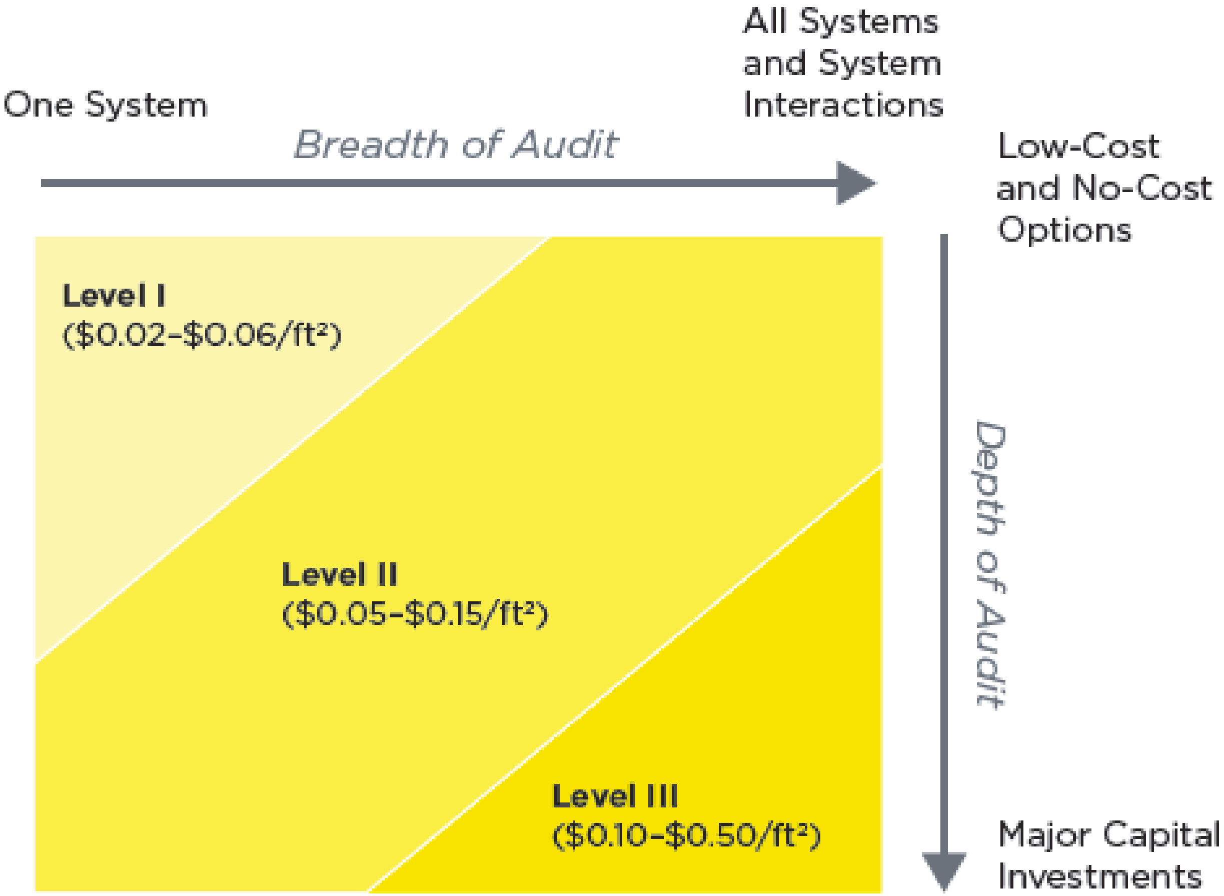
Power companies

State energy or environmental agencies

Engineering firms

Energy Service Companies-ESCOs

EFCN



One System

Breadth of Audit

All Systems and System Interactions

Low-Cost and No-Cost Options

Level I ($0.02–$0.06/ft²)

Level II ($0.05–$0.15/ft²)

Level III ($0.10–$0.50/ft²)

Depth of Audit

Major Capital Investments

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

Energy Assessment

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.

Walk Through Process Assessment

Before the Walk Through

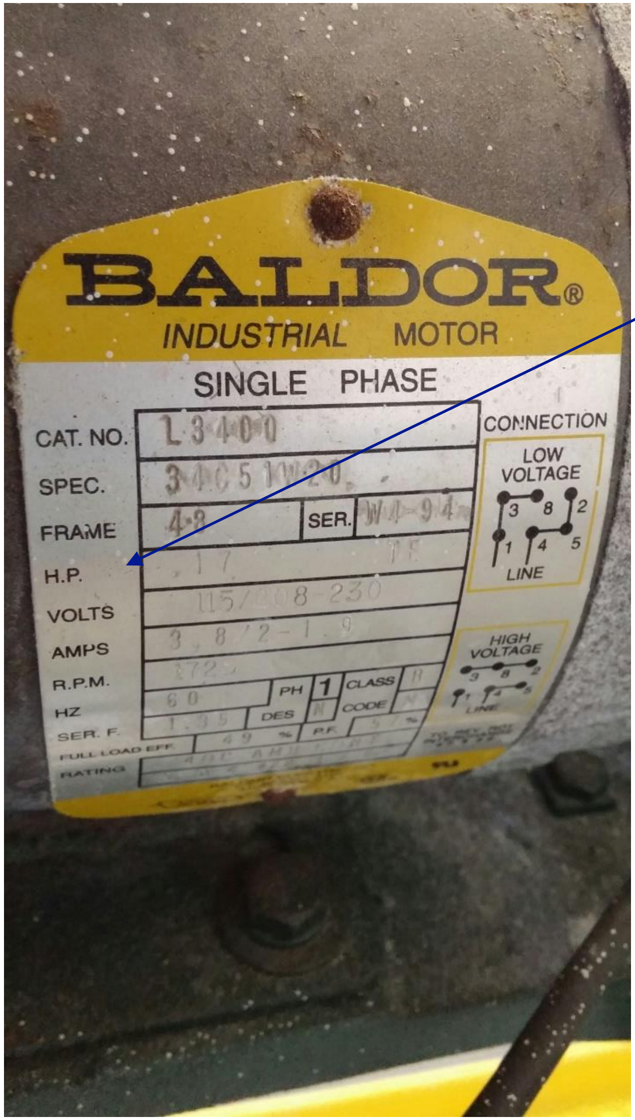
- Define the energy team
- Discuss goals and deliverables
  - reduce energy use/costs
  - reduce demand during peak hours
  - minimize disruption of service
- Develop a schedule
- Gather available data / plant information (baseline)
- Identify rate schedules
- Other preparations
  - Energy using equipment accessibility – ladder, broom
  - Flashlight
  - Camera

The Process Walk Through

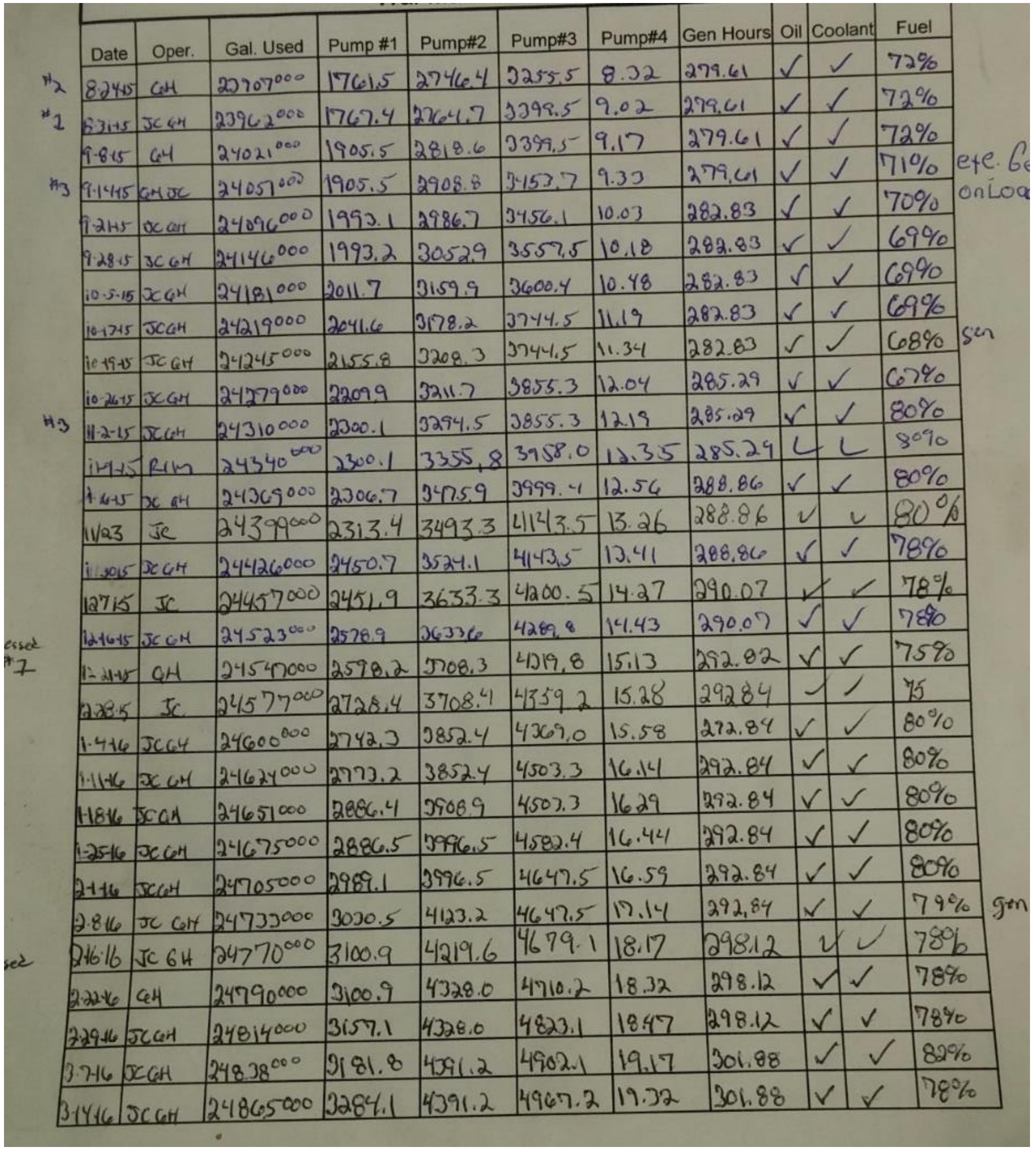
- Gather Important Field Data
  - Nameplate Horsepower
    - Take a picture of the equipment and then zoom in on the nameplate
  - Operational Information
    - Seasonal
    - Variable Speed
    - Pumping against throttled valve
  - Runtime Information
    - Hours per day, month or year

Note this pump has a VFD

Find the Nameplate



Find the HP rating



	Date	Oper.	Gal. Used	Pump #1	Pump#2	Pump#3	Pump#4	Gen Hours	Oil	Coolant	Fuel	
#2	8-24-15	GH	22707000	1761.5	2746.4	3255.5	8.32	279.61	✓	✓	72%	
#1	8-31-15	JC GH	23962000	1767.4	2764.7	3399.5	9.02	279.61	✓	✓	72%	
	9-8-15	GH	24021000	1905.5	2818.6	3399.5	9.17	279.61	✓	✓	72%	
#3	9-14-15	GH JC	24057000	1905.5	2908.8	3453.7	9.33	279.61	✓	✓	71%	ete. Ge
	9-21-15	JC GH	24096000	1993.1	2986.7	3456.1	10.03	282.83	✓	✓	70%	onLoa
	9-28-15	JC GH	24146000	1993.2	3052.9	3557.5	10.18	282.83	✓	✓	69%	
	10-5-15	JC GH	24181000	2011.7	3159.9	3600.4	10.48	282.83	✓	✓	69%	
	10-12-15	JCGH	24219000	2041.6	3178.2	3744.5	11.19	282.83	✓	✓	69%	
	10-19-15	JC GH	24245000	2155.8	3208.3	3744.5	11.34	282.83	✓	✓	68%	sen
	10-26-15	JC GH	24279000	2209.9	3211.7	3855.3	12.04	285.29	✓	✓	67%	
#3	11-2-15	JC GH	24310000	2300.1	3294.5	3855.3	12.19	285.29	✓	✓	80%	
	11-9-15	RLM	24340000	2300.1	3355.8	3958.0	12.35	285.29	L	L	80%	
	11-16-15	JC GH	24369000	2306.7	3475.9	3999.4	12.56	288.86	✓	✓	80%	
	11/23	JC	24399000	2313.4	3493.3	4143.5	13.26	288.86	✓	✓	80%	
	11-30-15	JC GH	24426000	2450.7	3524.1	4143.5	13.41	288.86	✓	✓	78%	
	12-7-15	JC	24457000	2451.9	3633.3	4200.5	14.27	290.07	✓	✓	78%	
essed	12-14-15	JC GH	24523000	2578.9	3633.6	4289.8	14.43	290.07	✓	✓	78%	
#7	12-21-15	GH	24547000	2578.2	3708.3	4319.8	15.13	292.82	✓	✓	75%	
	12-28-15	JC	24577000	2728.4	3708.4	4359.2	15.28	29284	✓	✓	75	
	1-4-16	JC GH	24600000	2742.3	3852.4	4369.0	15.58	292.84	✓	✓	80%	
	1-11-16	JC GH	24624000	2773.2	3852.4	4503.3	16.14	292.84	✓	✓	80%	
	1-18-16	JC GH	24651000	2886.4	3908.9	4507.3	16.29	292.84	✓	✓	80%	
	1-25-16	JC GH	24675000	2886.5	3996.5	4582.4	16.44	292.84	✓	✓	80%	
	2-1-16	JC GH	24705000	2989.1	3996.5	4647.5	16.59	292.84	✓	✓	80%	
	2-8-16	JC GH	24733000	3030.5	4123.2	4647.5	17.14	292.84	✓	✓	79%	gen
sed	2-16-16	JC GH	24770000	3100.9	4219.6	4679.1	18.17	298.12	✓	✓	78%	
	2-22-16	GH	24790000	3100.9	4328.0	4710.2	18.32	298.12	✓	✓	78%	
	2-29-16	JC GH	24814000	3157.1	4328.0	4823.1	18.47	298.12	✓	✓	78%	
	3-7-16	JC GH	24838000	3181.8	4391.2	4902.1	19.17	301.88	✓	✓	82%	
	3-14-16	JC GH	24865000	3284.1	4391.2	4967.2	19.32	301.88	✓	✓	78%	

Copy or Photograph Operational Information found in the field

After the Assessment

Interpreting the data – going from HP to $

What to do with your data?

- Collect it in one place – at least one year’s worth
  - Handwritten
  - Electronic
    - Table
    - Spreadsheet
- The benefit of a spreadsheet – it helps you do the math

Calculations

- Calculated Power Consumption (kW) = Horsepower x 0.746 (conversion factor)
- Hours of Operation per Year –calculated from the avg. run time (convert hrs/day to hrs/year, etc.)
- Total kWh per Year – Calculated power consumption (kW) x Hours of operation per year

Calculations

- Average Energy Costs (cents/kWh) – Based on energy bills, energy rate schedule
- Total Cost = Total kWh per year x Average Energy Cost
- Cost per MG = Total cost/Total flow – this is often the only way to compare “apples to apples”

Water System - Energy Use Assessment

City of Wellman, IA - 05/13/2015

Asset Name	Type of Energy Used	Nameplate HP	Variable Speed Y/N	Calculated Power Consumption (kW)	Hours of Operation per Year	Total kWh per Year	Average Run Time	Design Specs	Operating Status	Avg. Cost cents/kWh	Total Cost	Cost per MG
Well 2	Electric	40	Y	29.84	3,889	116,054	324			$ 0.09	$10,495	$ 186.65
Well 3	Electric	20	Y	14.92	2,383	35,557	199	235gpm		$ 0.12	$4,313	$ 116.20
Aerator	Electric			0		0				$ 0.09	$0	
High Service Pump 1	Electric	30	Y	22.38	2,740	61,324	228		alternate	$ 0.09	$5,546	$ 124.94
High Service Pump 2	Electric	30	Y	22.38	2,702	60,465	225			$ 0.09	$5,468	
CIP Pumps 1 and 2	Electric	10	N	7.46	192	1,432			based on pressure drop	$ 0.09	$130	
CIP Heaters 1 and 2	Electric			24	80	1,920				$ 0.09	$174	
RO Booster 1	Electric	20	Y	14.92	2,740	40,883		33 gpm		$ 0.09	$3,697	$ 89.44
RO Booster 2	Electric	20	Y	14.92	2,702	40,310		33 gpm		$ 0.09	$3,645	
Finish Water Booster 1	Electric	10	Y	7.46	2,740	20,441				$ 0.09	$1,849	$ 54.07
Finish Water Booster 2	Electric	10	Y	7.46	2702	20,155				$ 0.09	$1,823	
TOTAL ENERGY COST PER YEAR											$ 37,138	77%

Step 4: Identify Energy Efficiency Opportunities

Work with the energy management team to identify a broad array of energy efficiency opportunities

Using the Data to Make Decisions about Energy Use and Operations

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

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

One example

The cost savings could prove to be higher since we are only looking at the average energy costs for the entire plant. Why? Demand charges may decrease with using the lower HP pump.

	Well 1	Well 2
HP	30	15
kW	22.38	11.19
gpm	445	230
Tank Setpoints	well on: 23' well off: 30'	well on: 23' well off: 30'
Tank diameter (ft)	30	30
Fill volume (cubic ft.)	4,948	4,948
Fill volume (gallons)	37,014	37,014
Pump Run Time (min)	83.18	160.93
Pump Run Time (hrs)	1.39	2.68
kWh	31.02	30.01
Avg. Energy Costs ($/kWh)	0.13	0.13
Cost to fill tank	$ 4.03	$ 3.90
Tank fills per year	400	400
Cost per year	$ 1,613.30	$ 1,560.69
		$ 52.61

Categories for Energy Efficiency Opportunities

- Capital program or equipment replacement
- Process change
- Operational change
- Automation or controls
- Maintenance improvements
- Business measures

High Impact Projects

Potential High Impact Projects

- Water system optimization
- Pumping system efficiencies
- Motor management
- Promote customer water efficiency / conservation (through rates or non-rate measures)
- Utility conservation – reduce water loss
- Reduce heating and cooling load for buildings and well-houses
- Efficient lighting
- Use of renewable energy

NYSERDA's Best Practices

Facility Energy Assessment*

Real Time Energy Monitoring*

Energy Education for Facility Personnel*

Comprehensive Planning Before Design*

Design Flexibility for Today and Tomorrow*

Electric Peak Reduction*

Manage Electric Rate Structure*

Idle or Turn off Equipment*

Electric Motors: Install High Efficiency Motors*

Electric Motors: Automate to Monitor and Control*

Supervisory Control and Data Acquisition (SCADA)

Electric Motors: Variable Frequency Drives Applications*

Electric Motors: Correctly Size Motors

Electric Motors: Properly Maintain Motors

Electric Motors: Improve Power Factor

Pumps: Optimize Pump System Efficiency*
Pumps: Reduce Pumping Flow

Pumps: Reduce Pumping Head

Pumps: Avoid Pump Discharge Throttling*

Filtration: Sequence Backwash Cycles

Ultraviolet (UV) Disinfection Options*

Renewable Energy Options*

Integrate System Demand and Power Demand*

Computer-Assisted Design and Operation*

System Leak Detection and Repair*

Manage Well Production and Draw-down*

Sequence Well Operation*

Optimize Storage Capacity

Promote Water Conservation*

Sprinkling Reduction Program*

Manage High Volume Users*

Utah’s Savings Handbook

- Water Conservation
- Water Accountability
- System Inefficiencies
  - Looping
  - Leaping
  - Losing Head
  - Loading

- Supply Side
- Demand Side
- Pumping
- Storage
- Distribution
- Plant
- Technology
- Operational
- Behavioral
- Energy Supplier

EFC's Project List

- Raw and Finished Water Pumping
- Valve Throttling
- Rapid Mixing of Coagulant Chemicals
- Backwashing
- Load Shifting
- Wells
- Distribution Systems
- Other Considerations

Tools and Resources

- NYSERDA’s Water and Wastewater Energy Management Best Practices Handbook
- Utah’s Drinking Water Energy (Cost) Savings Handbook
- EFC’s Energy Efficiency Opportunities List
- Case Studies and Checklists

A few words about…

- Soft Starts
- Variable Frequency Drives
- Pump Replacement

When, where, and why to use a soft start

- Likely won’t see much energy savings directly, but indirectly is possible (demand charges)
- Excellent in some applications to protect equipment and prevent spills & clogs
- Cheaper than Variable Frequency Drives, but less flexibility

When, where, and why to use VFDs

- VFDs can save a lot of energy in the right application
- VFDs are sometimes utilized as a band-aid
  - Ensure equipment is right before VFD install
- VFDs have been heavily marketed, but big savings only exist in specific applications
  - Use a soft start where appropriate
- Utilizing VFDs in water pumping by replacing a throttling valve is almost always cost effective

When, where, and why to replace a pump

- If your pump is not sized for the flow it pumps most often, you are most likely wasting energy
- If your pump is several years old there is likely a more energy efficient version available today
- Know how to read a pump curve – see handout
- If you pump against a throttled valve, make sure you understand why and what you can do about it
- Optimize storage fill and drain times to run pumps as efficiently as possible

Identifying energy efficiency opportunities

Lonnie Russell, Certified Energy Manager,
South Carolina Rural Water Association

Energy Management Program Basic Steps

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Step 6. Develop an Implementation Plan

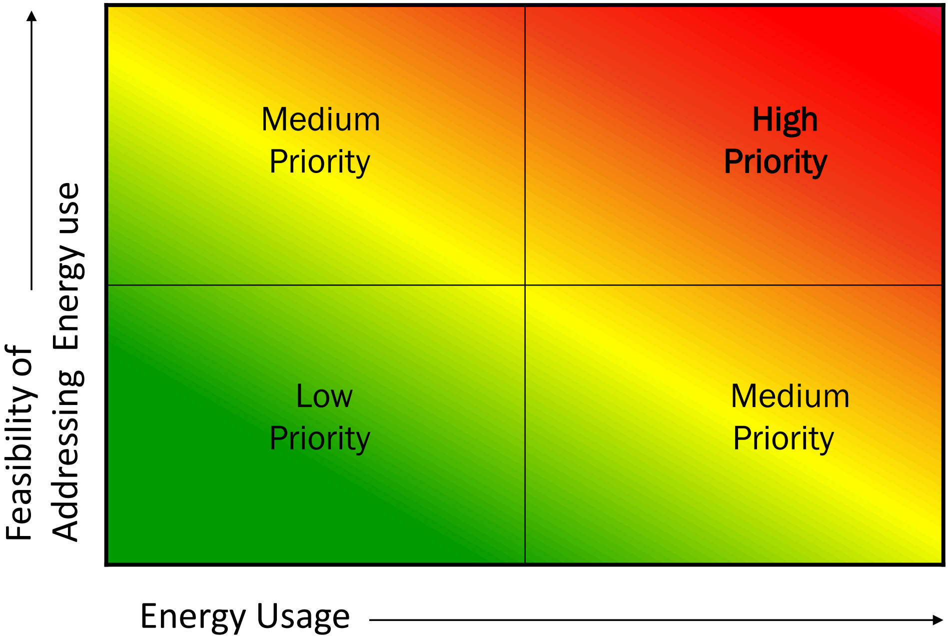
Step 7. Provide for Progress Tracking and Reporting

Source: NYSERDA

http://efcnetwork.org/publication/nyserda-water-wastewater-energy-management-practices-handbook/

Step 5: Prioritize Opportunities for Implementation

Prioritization of Energy Use



Medium Priority

High Priority

Low Priority

Medium Priority

Feasibility of Addressing Energy use

Energy Usage

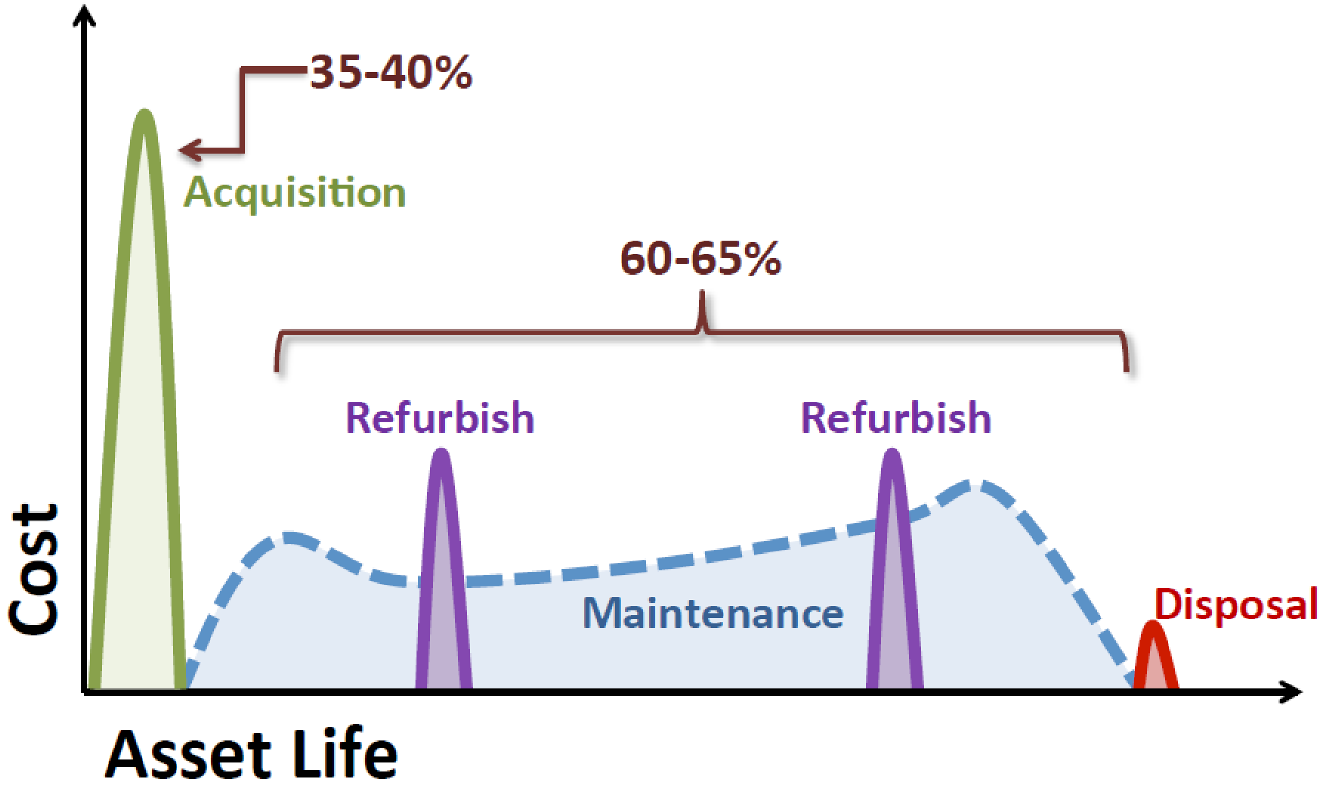
Which category of assets will be the most important for energy efficiency?

Least important?

How do you rank EE opportunities?

- Compare costs and benefits
- Benefits can include non-monetary benefits (operability, risk factors)
  - Define evaluation criteria for non-monetary benefits – may be a simple 1-5 scoring system
- Evaluate monetary costs / benefits
- Rank the opportunities against one another

Evaluating monetary costs / benefits – Capital investment is just the beginning



Simple Payback Period: Definition

$$\text{Simple payback (years)} = \frac{\text{Total cost of project (\$)}}{\text{Annual savings (\$/year)}}$$

Simple Payback Period: Example

- Project A: Replace inefficient pump motors
- Cost: $200,000
- Savings: $100,000 per year in energy costs
- Life span: 5 years
- What is the simple payback?

$$\text{Simple payback (years)} = \frac{\text{Total cost of project (\$)}}{\text{Annual savings (\$/year)}} = 2 \text{ years}$$

Source: NYSERDA, “Water & Wastewater Energy Management: Best Practices Handbook,” 2010.

Life-Cycle Cost Analysis: Definition

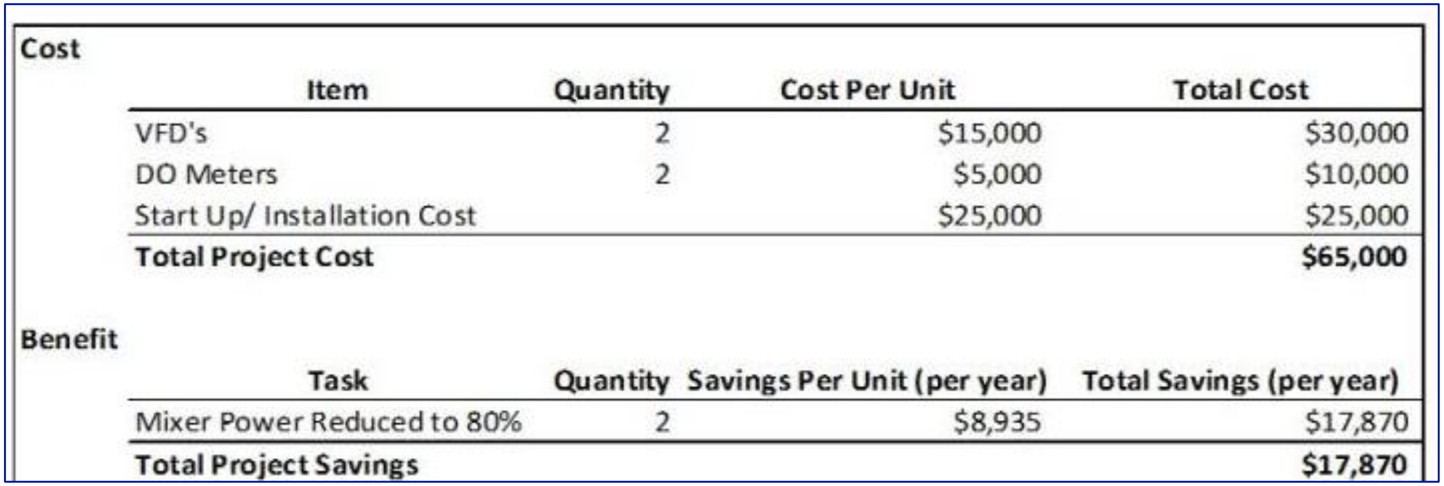
A type of cost benefit analysis

LCC ($) = Initial cost of project
+ Cost to operate
+ Cost to maintain
– Savings over the life of the project

Source: NYSERDA, “Water & Wastewater Energy Management: Best Practices Handbook,” 2010.

Life-Cycle Cost Analysis: Example

- Assume 15 year lifespan of VFDs and DO meters



Cost

Item	Quantity	Cost Per Unit	Total Cost
VFD's	2	$15,000	$30,000
DO Meters	2	$5,000	$10,000
Start Up/ Installation Cost		$25,000	$25,000
Total Project Cost			**$65,000**

Benefit

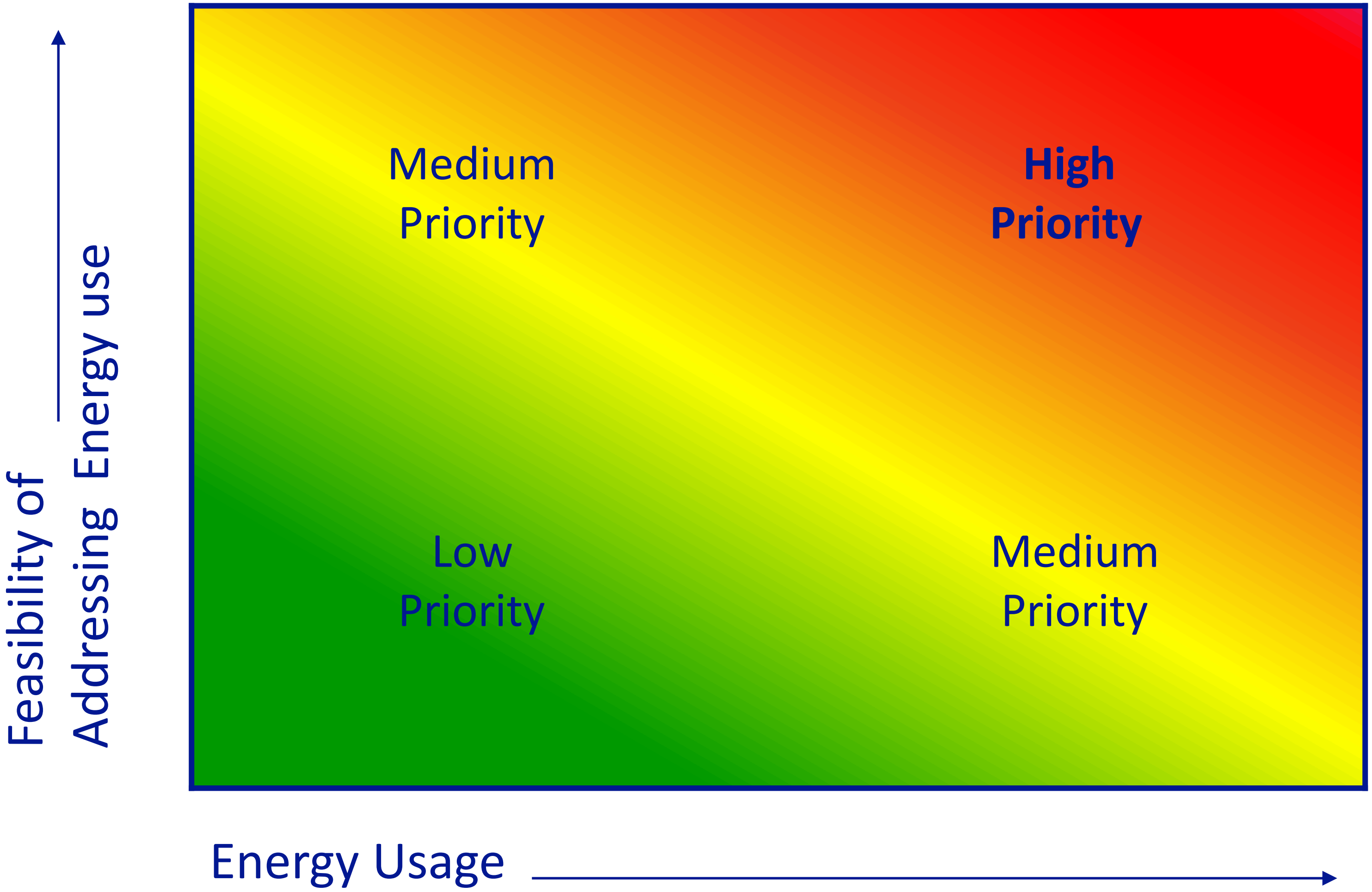
Task	Quantity	Savings Per Unit (per year)	Total Savings (per year)
Mixer Power Reduced to 80%	2	$8,935	$17,870
Total Project Savings			**$17,870**

LCC ($) = Cost of project = -$203,050

– Savings over life of project

Source: “The Quest for Energy Savings! City of Derby, KS. By Eddie Sheppard, Assistant Director of Public Works, Dec. 2012.

Prioritization tools



Medium Priority

High Priority

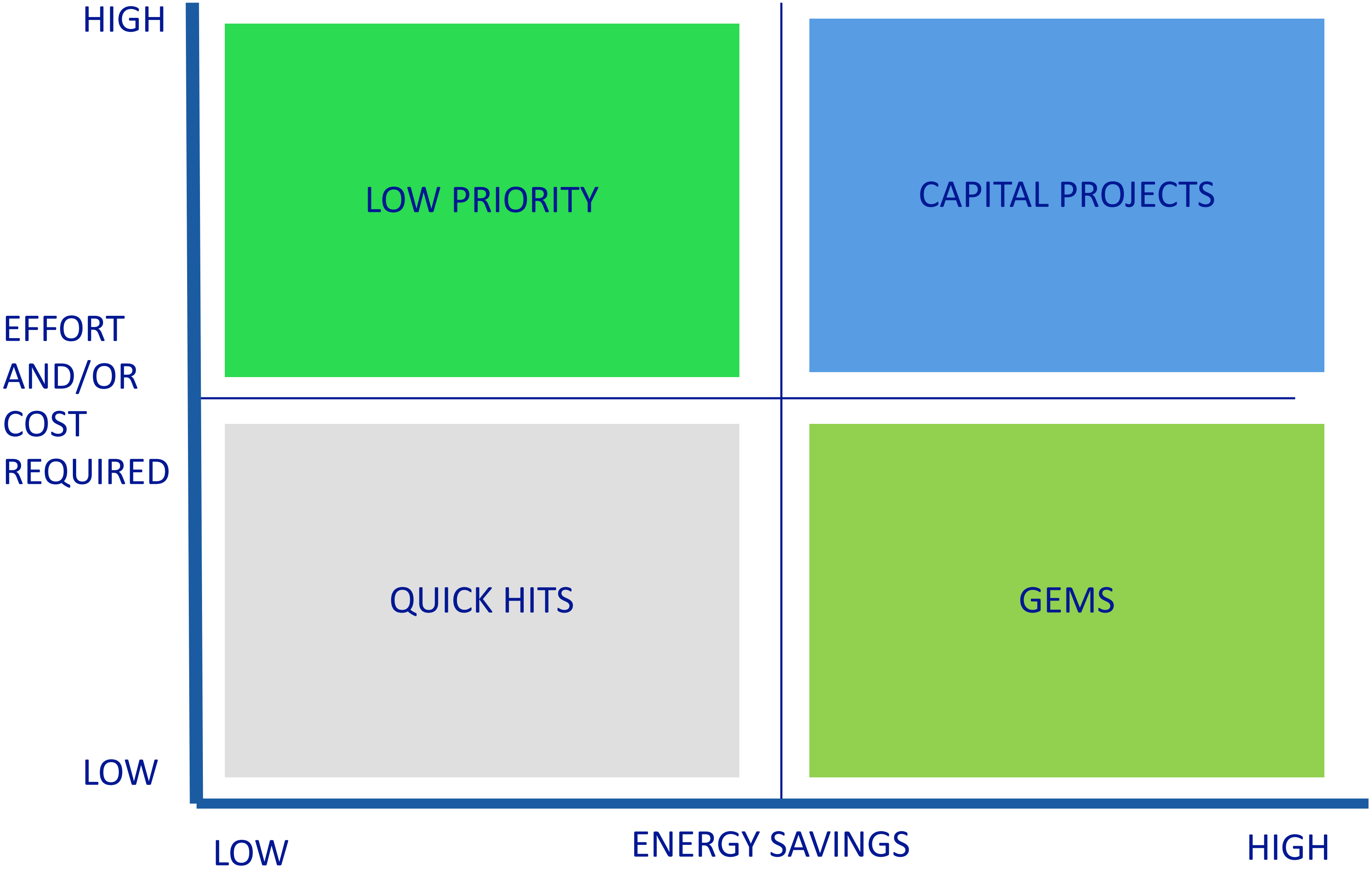
Low Priority

Medium Priority

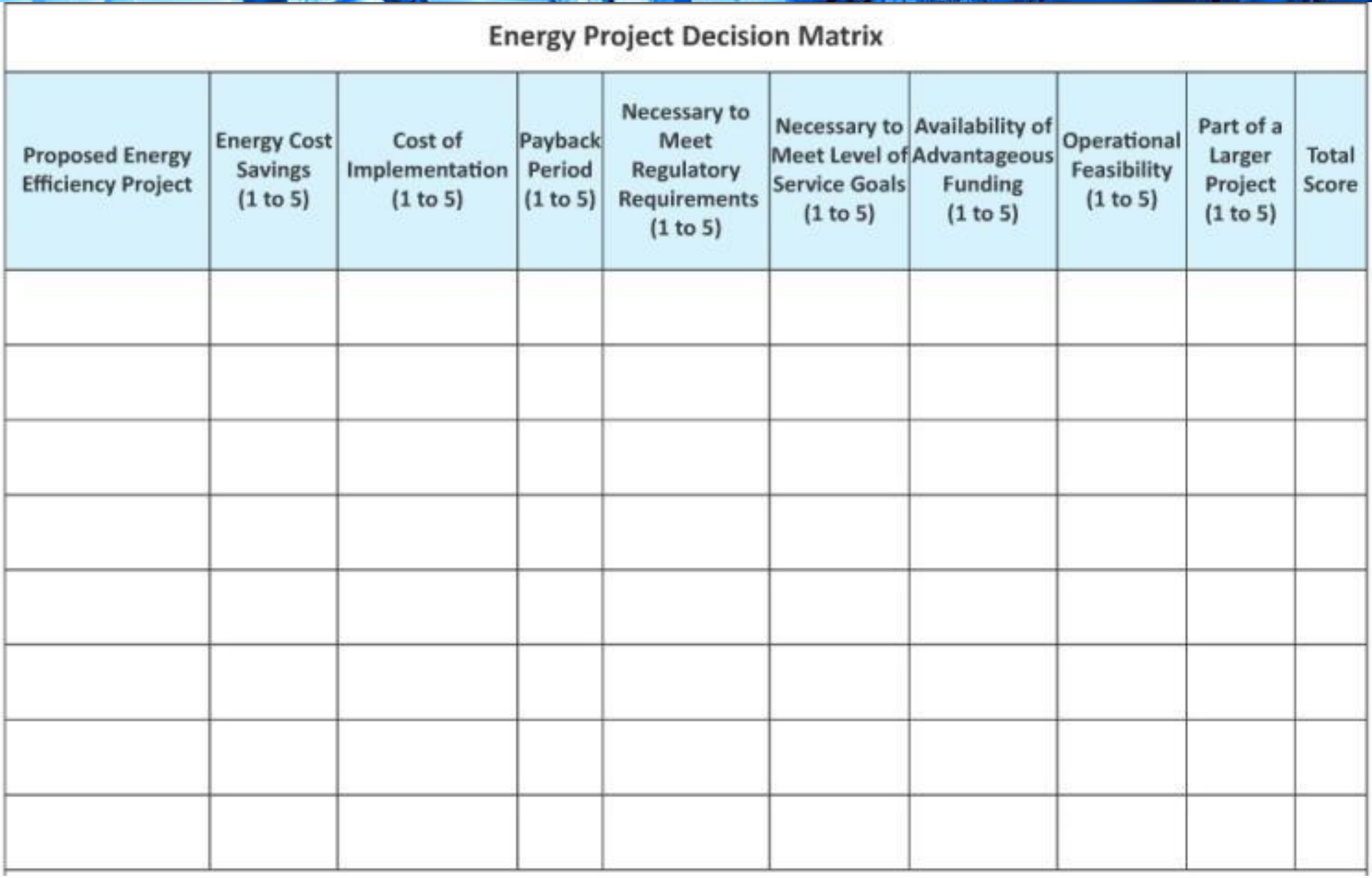
Feasibility of Addressing Energy use

Energy Usage

Source: SW EFC’s AM KAN Work!



Source: Doug Evans, Mountain Regional Water District, Park City, UT



Energy Project Decision Matrix

Proposed Energy Efficiency Project	Energy Cost Savings (1 to 5)	Cost of Implementation (1 to 5)	Payback Period (1 to 5)	Necessary to Meet Regulatory Requirements (1 to 5)	Necessary to Meet Level of Service Goals (1 to 5)	Availability of Advantageous Funding (1 to 5)	Operational Feasibility (1 to 5)	Part of a Larger Project (1 to 5)	Total Score

Source: EPA's Energy Management Guidebook for Wastewater and Water Utilities

Scoring in the Decision Matrix

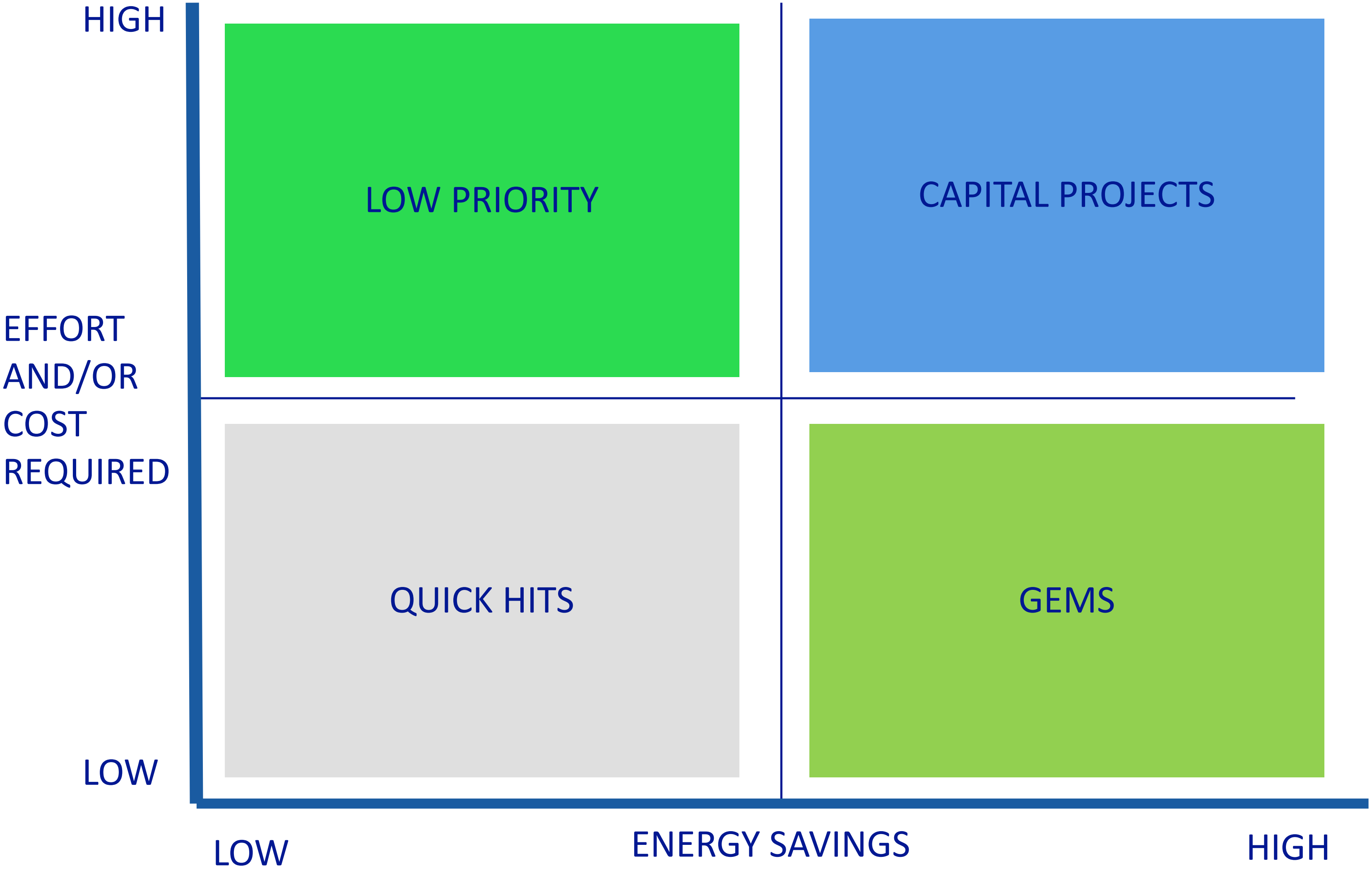
- Score each category from 1 to 5. Bigger numbers are better! ☺
- In other words, higher scores are more attractive projects for energy savings, ease of implementation, and so on.

Keep your goals in mind

- Energy cost savings
- Cost of implementation
- Simple payback period
- Regulatory compliance or service level goals
- Advantageous funding availability
- Operational feasibility
- Other

Now it’s your turn

Project Prioritization Exercise



HIGH

EFFORT AND/OR COST REQUIRED

LOW

LOW PRIORITY

CAPITAL PROJECTS

QUICK HITS

GEMS

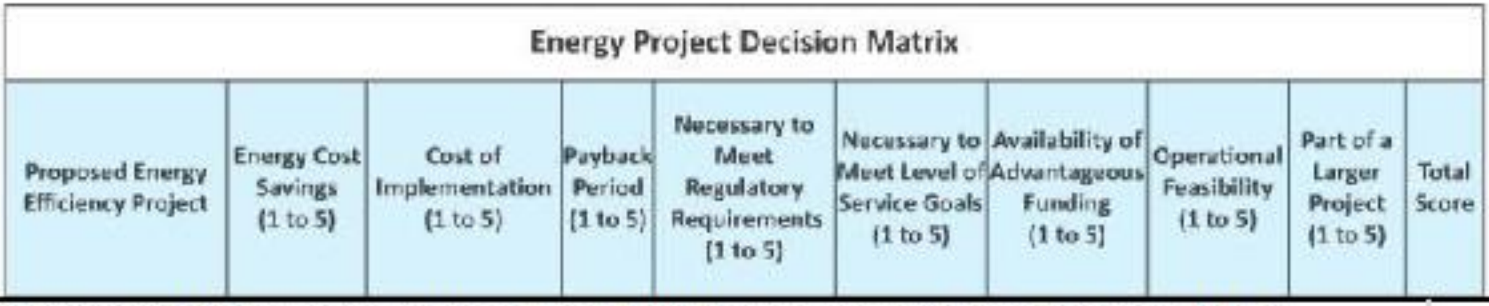
LOW

ENERGY SAVINGS

HIGH

Source: Doug Evans, Mountain Regional Water District, Park City, UT

Energy Project Decision Matrix



Energy Project Decision Matrix

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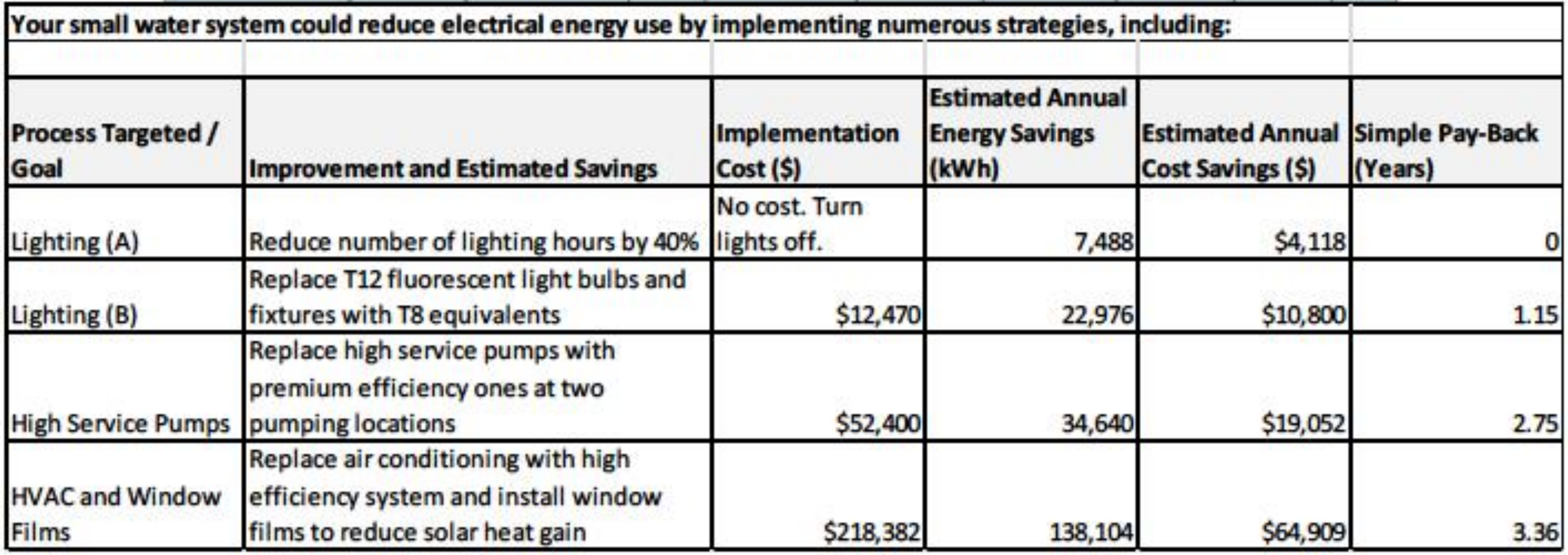


Your small water system could reduce electrical energy use by implementing numerous strategies, including:

Process Targeted / Goal	**Improvement and Estimated Savings**	**Implementation Cost ($)**	**Estimated Annual Energy Savings (kWh)**	**Estimated Annual Cost Savings ($)**	**Simple Pay-Back (Years)**
Lighting (A)	Reduce number of lighting hours by 40%	No cost. Turn lights off.	7,488	$4,118	0
Lighting (B)	Replace T12 fluorescent light bulbs and fixtures with T8 equivalents	$12,470	22,976	$10,800	1.15
High Service Pumps	Replace high service pumps with premium efficiency ones at two pumping locations	$52,400	34,640	$19,052	2.75
HVAC and Window Films	Replace air conditioning with high efficiency system and install window films to reduce solar heat gain	$218,382	138,104	$64,909	3.36

Observations about the Matrix

- Total Score: allows you to compare / rank potential energy management projects.
- Higher Scores: indicate E.M. projects that may be most advantageous to the utility.
- Caution: As all columns are weighted equally in this matrix, you may want to consider some columns as more important than others.

Tips for Using the Decision Matrix in Your Utility

- Involve your energy team and discuss evaluation criteria (You can use the matrix provided as a starting point.)
- Set weights based on the level of importance to your system.
- What’s missing? In addition to the matrix, other commonly used criteria may include:

Tips for Using the Decision Matrix in Your Utility

- Ease of implementation
- Time until solution is fully implemented
- Cost to maintain
- Support or opposition to the solution
- Enthusiasm by team members
- Potential effects on customers
- Potential problems during implementation

Tips for Using the Decision Matrix in Your Utility

- If individuals on the team assign different ratings to the same criterion, discuss this so people can learn from each other's views and arrive at a consensus. Do not average the ratings or vote for the most popular one.

Some Keys to Success

- Convert all energy efficiency opportunities characteristics to monetary terms whenever possible.
- Evaluate all energy management, including ancillary benefits when possible.
- Test the sensitivity of results to determine the impact of important assumptions (e.g. time horizons)
- Make sure that the final results make sense in terms of the utility’s capabilities.

Step 6: Develop an Implementation Plan

Energy Management for Small Water Systems

> “A goal without a plan is just a wish.”
>
> \- Antoine de Saint-Exupéry

Developing an Implementation Plan

- Step 1: Define objective(s) & target(s)
- Step 2: Identify tasks
- Step 3: Identify changes to SOPs, process control
- Step 4: Determine timeframe, resource allocation

Step 1: Define Objectives and Targets

- Objective: WHY do you want to complete these projects?

- Target: Measureable result you are aiming for
  - Figure out what steps needed to get there
  - Determine the success of project

Potential Energy Objectives

- Reduce energy cost
- Reduce petroleum consumption
- Reduce peak energy demand
- Reduce greenhouse gas emissions
- Improve reliability
- Increase use of renewable fuels

Factors to Consider in Setting Objectives and Targets

- Controllability
- Trackability / measureability
- Cost to track / measure
- Communicating progress
- Linkages to your energy policy

Step 2: Identify Tasks

- Individual steps to implement your project
- Mini-goals or achievements toward overall objective

Step 3a: Identify Changes to SOPs

- Any change to your facility will require changes to your day-to-day operations
- Changes may affect:
  - Operator duties
  - Equipment maintenance
  - Treatment process
  - Emergency response

Step 3b: Identify Changes to Process Control

- Any change to your facility will require changes to how you respond to unexpected problems
- Things to consider:
  - If your facility uses automation, will it require reprogramming?
  - What training do your operators need to address problems with any new equipment?

Step 4: Determine Timeframe, Resource Allocation

For each task:

- **Staff** – Who is responsible for completing that task?
- **Timeline** – How long until the task is completed?
- **Estimated Time** – How many hours / days will the responsible staff member spend on the task?
- **Estimated Costs** – If the task requires equipment purchase, how much will it cost?

Case Study: City of Hutchinson, KS Water and Wastewater Utilities

Target: Replace existing large capacity vertical turbine pump and motor at Well #21 with lower capacity submersible pump

Task	Deliverable	Staff	Timeline	Est. time	Est. cost
Develop project scope	Document	WTC	By June 1, 2012	1 hr	
Obtain approval from Public Works Director for project concept	Document / Email	WTC Public Works	By June 8, 2012	2 hrs	
Issue RFP for equipment and installation	RFP	WTC	By June 18, 2012	3 hrs	
Review RFP response	Document	WTC Public Works	By July 10, 2012	3 hrs	
Obtain approval from Public Works Director for project to proceed	Document	WTC Public Works	By July 12, 2012	2 hrs	
Obtain PO number	Document	WTC Purchasing	By July 19 2012	2 hrs	
Enlist contractor	Signed contract	WTC Contractor	By July 29, 2012	2 hrs	
Install equipment	Pump / motor removal and replacement, pump test, SCADA modifications	WTC Contractor	By October 2, 2012		$15,000

Project economics and financing for energy management projects

How Do We Pay For Our Great Ideas?

“This part of the plan will be funded with all the unused money we must have laying around someplace.”

Are energy projects funded the same as other water projects?

- Yes
- Larger energy projects can be treated like a capital project
- Review financial indicators and rates

- No
- Some are no/low cost
- There are funds available for energy projects that aren’t available otherwise

Energy Improvements and Capital Planning

- An energy upgrade to water or wastewater facility is really just a **capital improvement**
- You can treat energy upgrades just like any other capital improvement
- How you pay for energy improvements ties into your utility’s philosophy of how to set rates and pay for capital

Where Capital Funding Comes From

- Cash
- Grants (including State Revolving Funds)
- Debt market (including State Revolving Funds)
- Private partnerships
- Rates / Monthly bills
- System development charges (new customers)
- Special assessments (current customers)
- Transfers from the general fund (tax revenue)

Ways to Pay

- Save in advance and pay (fund balance)
- Pay as you go (current receipts)
- Pay later (someone loans you money)
- Let someone else pay (grants)

What is Performance Contracting?

- An ESCO proposes and designs a package of energy cost reduction measures, installs or implements those cost reduction measures, and guarantees the savings of the cost reductions.
- Typically, the ESCO puts up all of the capital for the energy projects.
- The ESCO pays itself back for the package over time using the stream of revenue provided by the energy reduction measures.
- Third party verifies ESCO reconciliation report.

Slide courtesy of Len Hoey, N.C. State Energy Office.

Step 7: Provide for Progress Tracking and Reporting

Energy Management for Small Water Systems

Step 7: Provide for Progress Tracking and Reporting

Progress Tracking and Reporting

- This last step is often overlooked, but critical to creating a sustainable energy management program for three main reasons:
  - Progress tracking promotes adjustments to an existing program to improve its chances for success.
  - Project reporting provides guidance for future decision making, and can help to refine planning assumptions.
  - Communicating project results provides valuable feedback for planning and implementation staff, keeping them interested in the improvement process.

NYSERDA's Specific Actions

- Assign the responsibility for tracking the progress of a project **and reporting on that progress.** The staff responsible for progress reporting should also be allocated the resources necessary to fulfill their responsibilities.
- **Set the performance metrics that will be used.**
- **Create a communication plan.** The plan should identify who needs to be included in progress reports (examples: elected officials, public, etc.), when reports should be made, and any actions that need to occur in response to reports.

Why Track Your Progress?

- Know what success looks like:
  - Completing all tasks
  - In the timeframe in your implementation plan
  - Little / no negative impact on daily operations, treatment performance, or staff activity
- Make sure projects are delivering the savings you targeted – monitor and course correct

What to Track

- Task completion
- Actual versus projected costs
- Actual savings versus projects savings

- Consider your project prioritization process and track progress toward what you prioritized:
  - Cost savings / Energy savings
  - Progress towards regulatory compliance goals
  - Progress towards level of service goals
  - Implementation cost
  - Time elapsed
  - Progress towards a larger project

What’s Important to Your Funder?

- This is a key question as to what you might track in your progress tracking.
- Does your funder care about GHG’s? Energy savings? Labor used (e.g. Davis-Bacon reporting under ARRA)? Other?
- Also, what is important to your Board?

What’s next for you?

..and what type of help do you need to do it?

Visit the EFCN Website – *www.efcnetwork.org*

for more information on upcoming events, funding, and resources.

Innovative Finance Solutions for Environmental Services

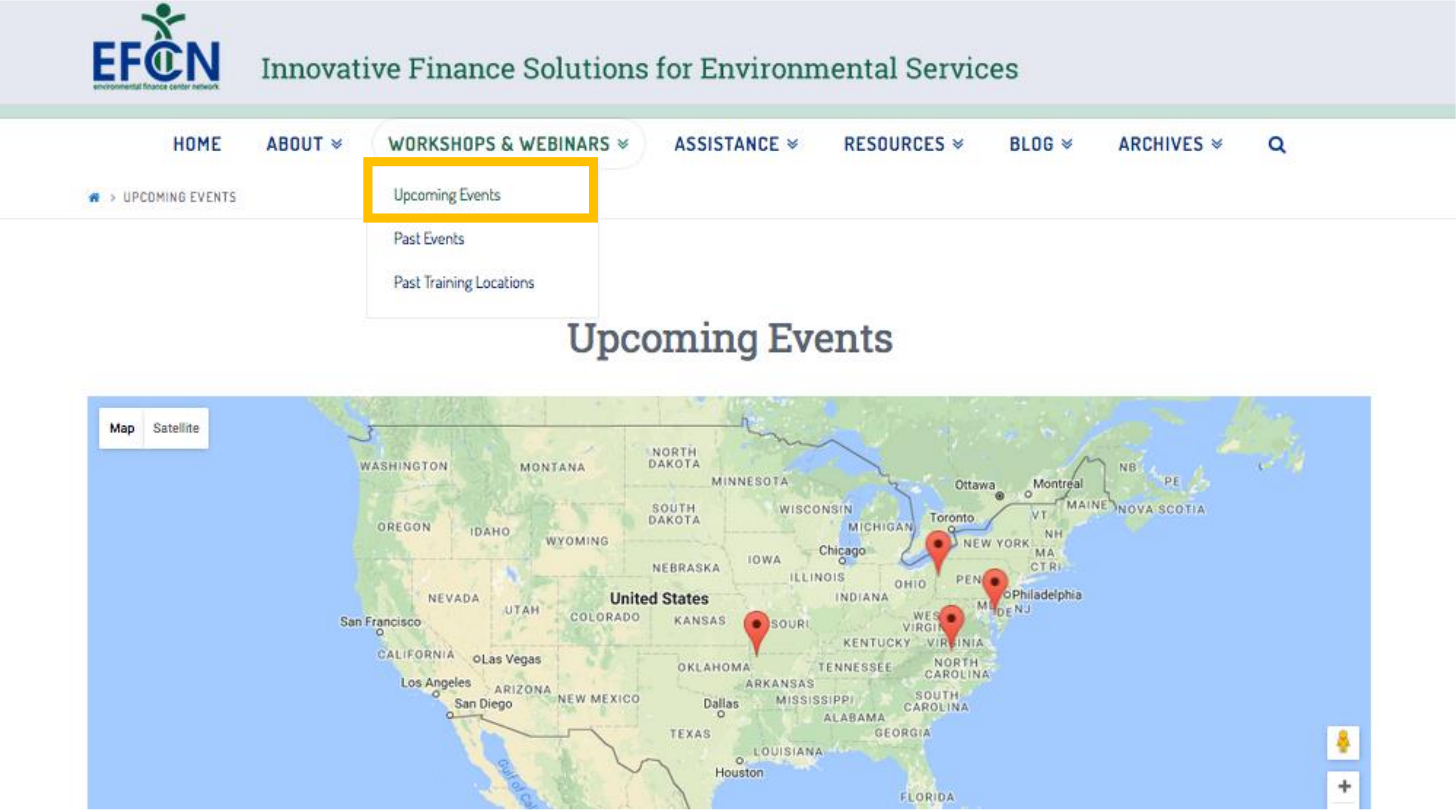
Get Free Help Now!

Small water systems can request free technical assistance from our experts on finance and management challenges.

"The thing about working with the EFCN is availability; I can call anytime with a quick question or to get outside advice."

Upcoming Events Calendar

Select “Upcoming Events” under the Workshops & Webinars Tab.



🧑‍🏫 = In Person Event 💻 = Webinar

Type	Date/Time	Event
💻	03/09/2017 2:00 pm - 3:00 pm	WEBINAR I Preparing Winning Financing Applications for Water Infrastructure Projects
💻	03/22/2017 2:00 pm - 3:00 pm	WEBINAR I Water Audits and Water Loss Control: Entering Your Data into the Spreadsheet
🧑‍🏫	03/30/2017 9:00 am - 4:30 pm	Maryland I Rates and Finance Workshop for Small Water Systems *Easton Utilities, Easton MD*
💻	04/04/2017 1:00 pm - 2:00 pm	WEBINAR: Workforce Development: An Overview of Key Components
🧑‍🏫	05/11/2017 9:00 am - 4:30 pm	Virginia I Rates and Finance Workshop for Small Systems *The Institute for Advanced Learning and Research, Danville Virginia*
🧑‍🏫	05/25/2017 9:00 am - 4:30 pm	Arkansas I Rates and Finance Workshop for Small Water Systems *Beaver Water District, Lowell AR*
🧑‍🏫	09/13/2017 9:00 am - 4:30 pm	Pennsylvania I Rates and Finance Workshop for Small Water Systems *Pennsylvania American Water Co, New Castle PA*

Upcoming Workshops and Webinars

Webinar: Water System Management and Finance for Board Members

November 29, 3:00-4:00pm

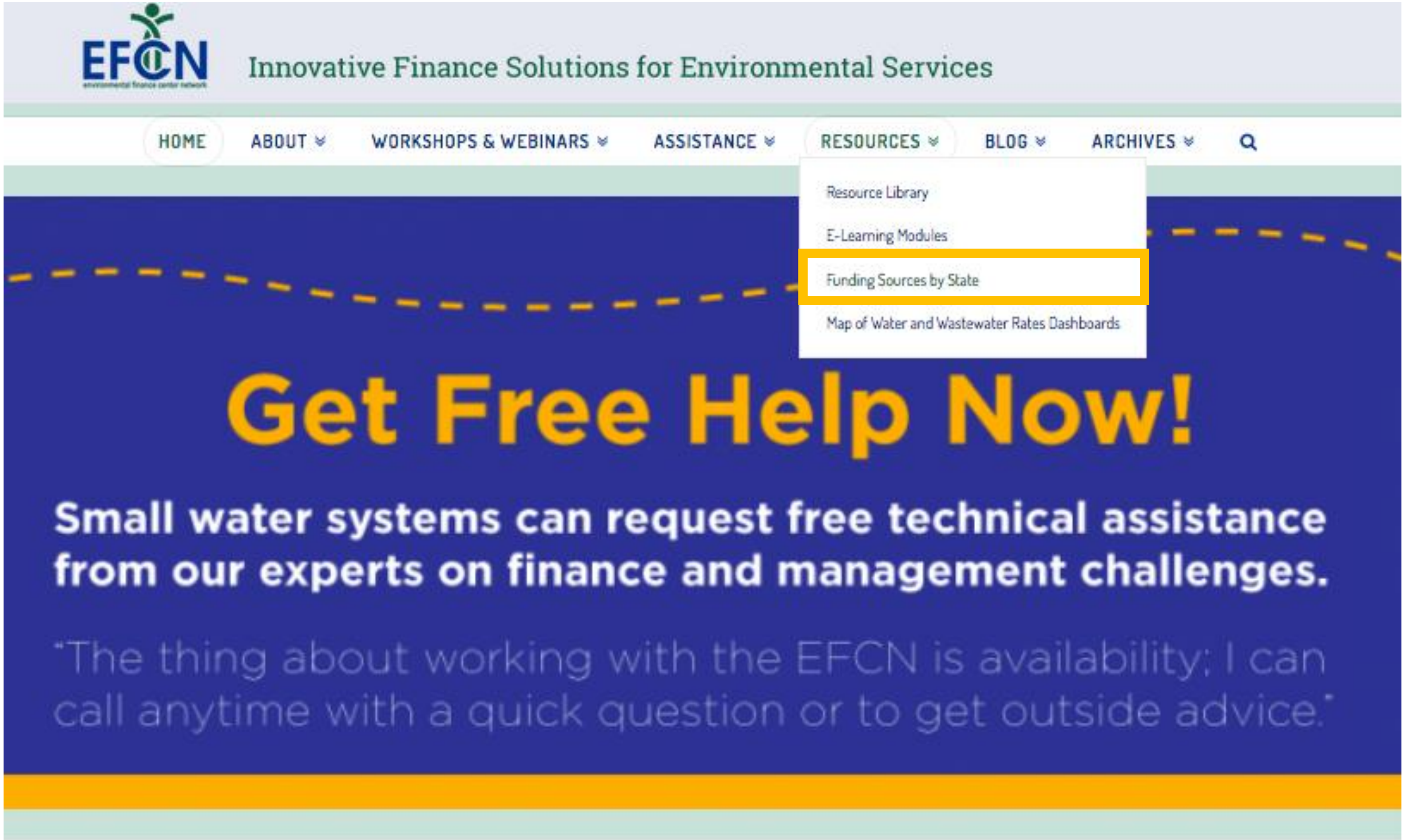
Workshop: Water System Management and Finance for Elected Officials
Wilmington, NC | December 6, 5:30-8:00pm

Workshop: Setting the Right Rates for your System
Wilmington, NC | December 7, 9:00-4:30pm

Register at www.efcnetwork.org/upcoming-events/

Funding Tables By State

Select “Funding Sources by State” under the Resources Tab.



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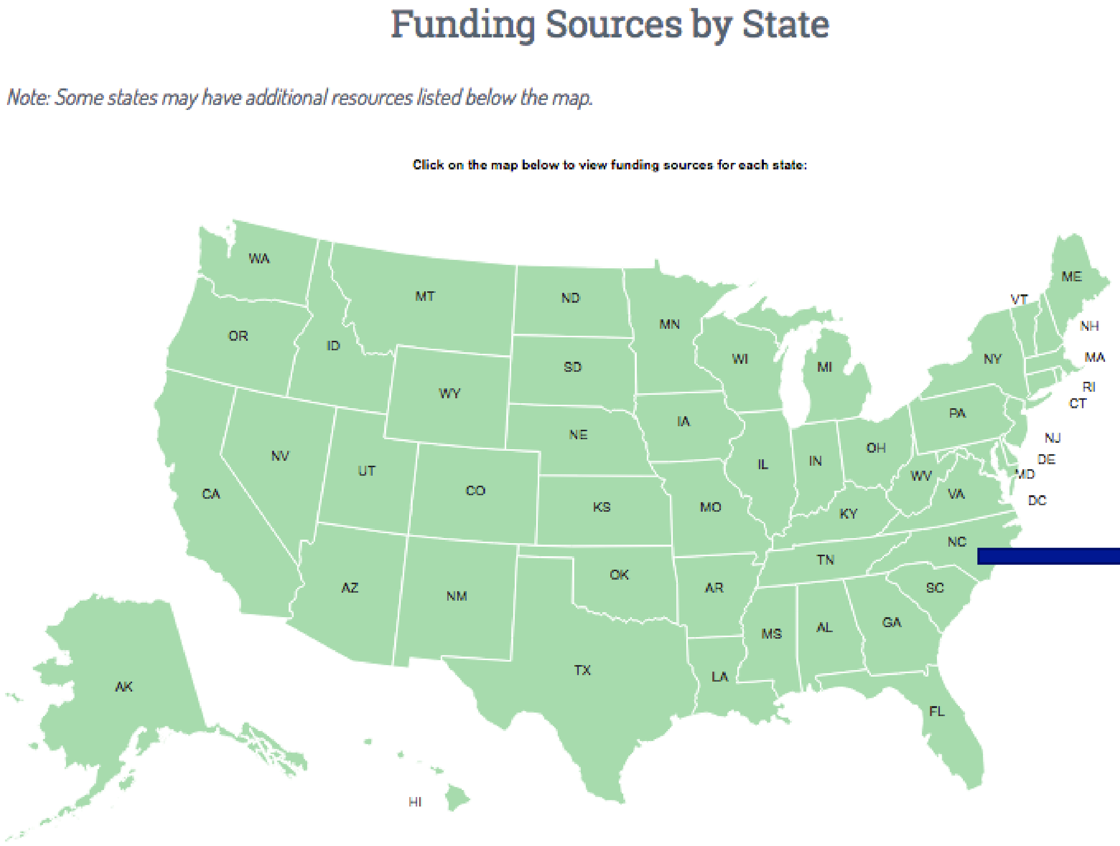
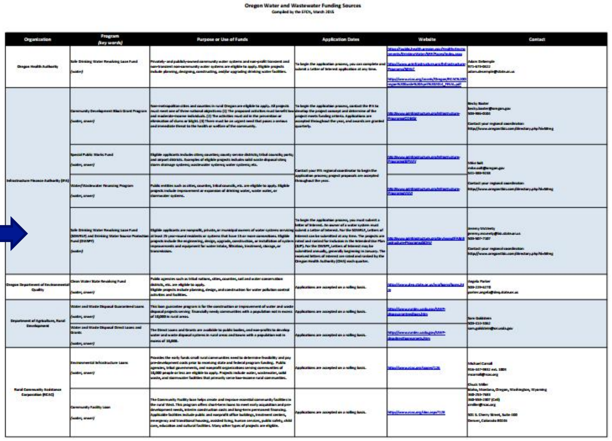


Funding Sources by State

Note: Some states may have additional resources listed below the map.

Click on the map below to view funding sources for each state:

Click on an individual state to view funding table.



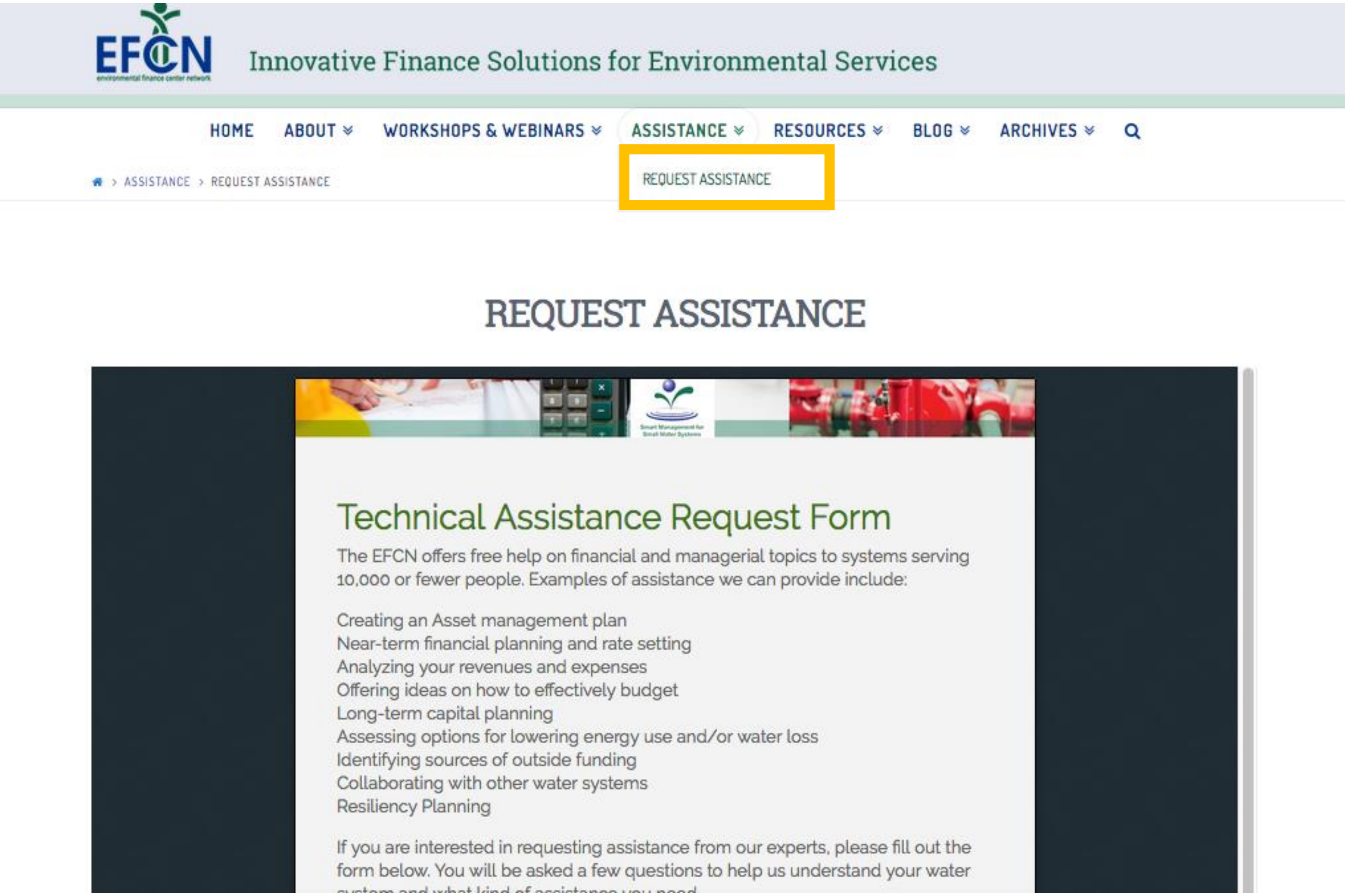
Oregon Water and Wastewater Funding Sources

Compiled by the EFCN, March 2015

Organization	Program *(key words)*	Purpose or Use of Funds	Application Dates	Website	Contact

Request Technical Assistance

Select “Request Assistance” under the Assistance Tab off the EFCN homepage to access and submit the TA request form electronically.



REQUEST ASSISTANCE

Technical Assistance Request Form

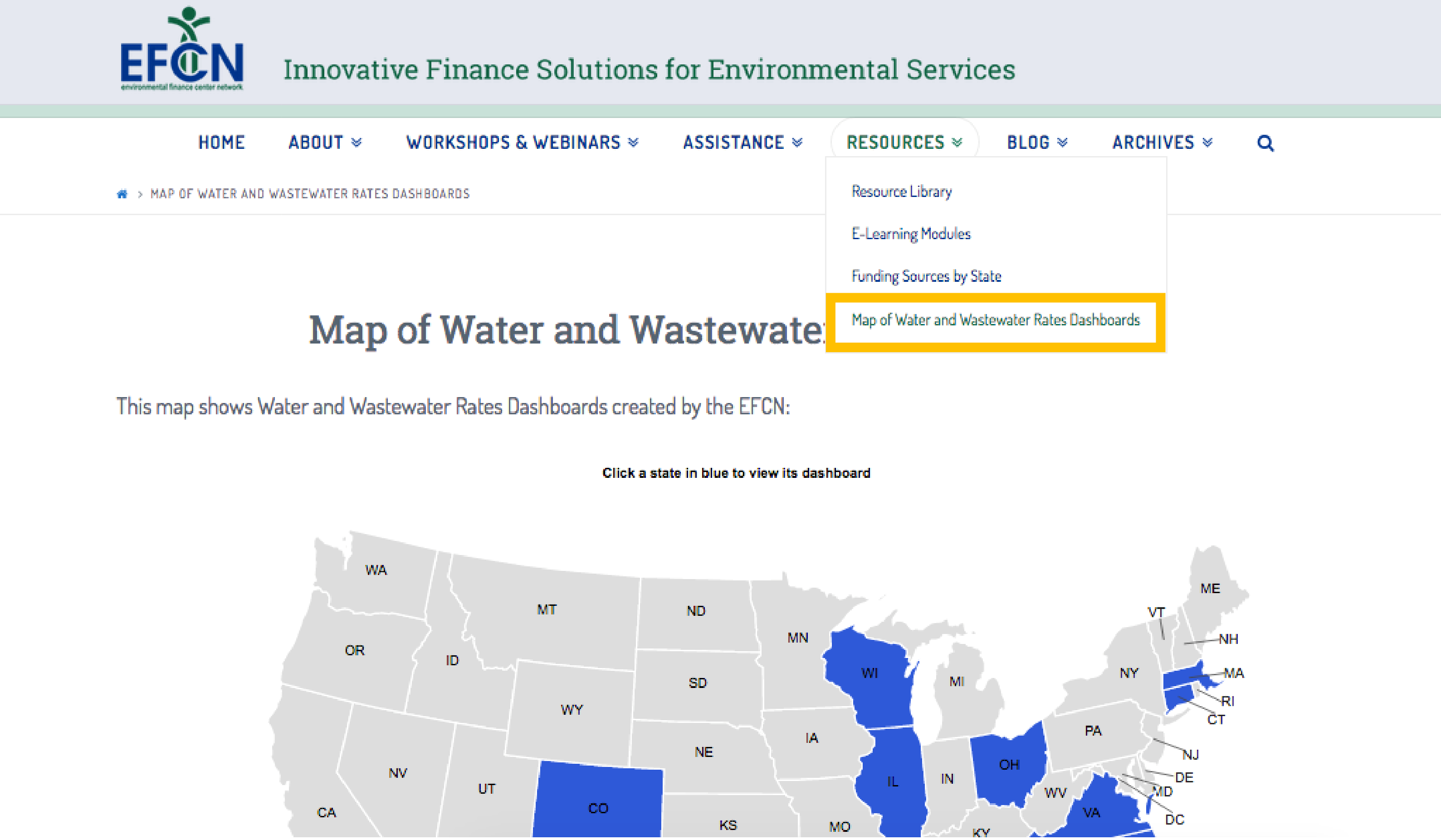
The EFCN offers free help on financial and managerial topics to systems serving 10,000 or fewer people. Examples of assistance we can provide include:

Creating an Asset management plan
Near-term financial planning and rate setting
Analyzing your revenues and expenses
Offering ideas on how to effectively budget
Long-term capital planning
Assessing options for lowering energy use and/or water loss
Identifying sources of outside funding
Collaborating with other water systems
Resiliency Planning

If you are interested in requesting assistance from our experts, please fill out the form below. You will be asked a few questions to help us understand your water

Rates Dashboards

Select “Map of Water and Wastewater Rates Dashboards” under the Resources Tab, and click on any state in blue to view its dashboard.



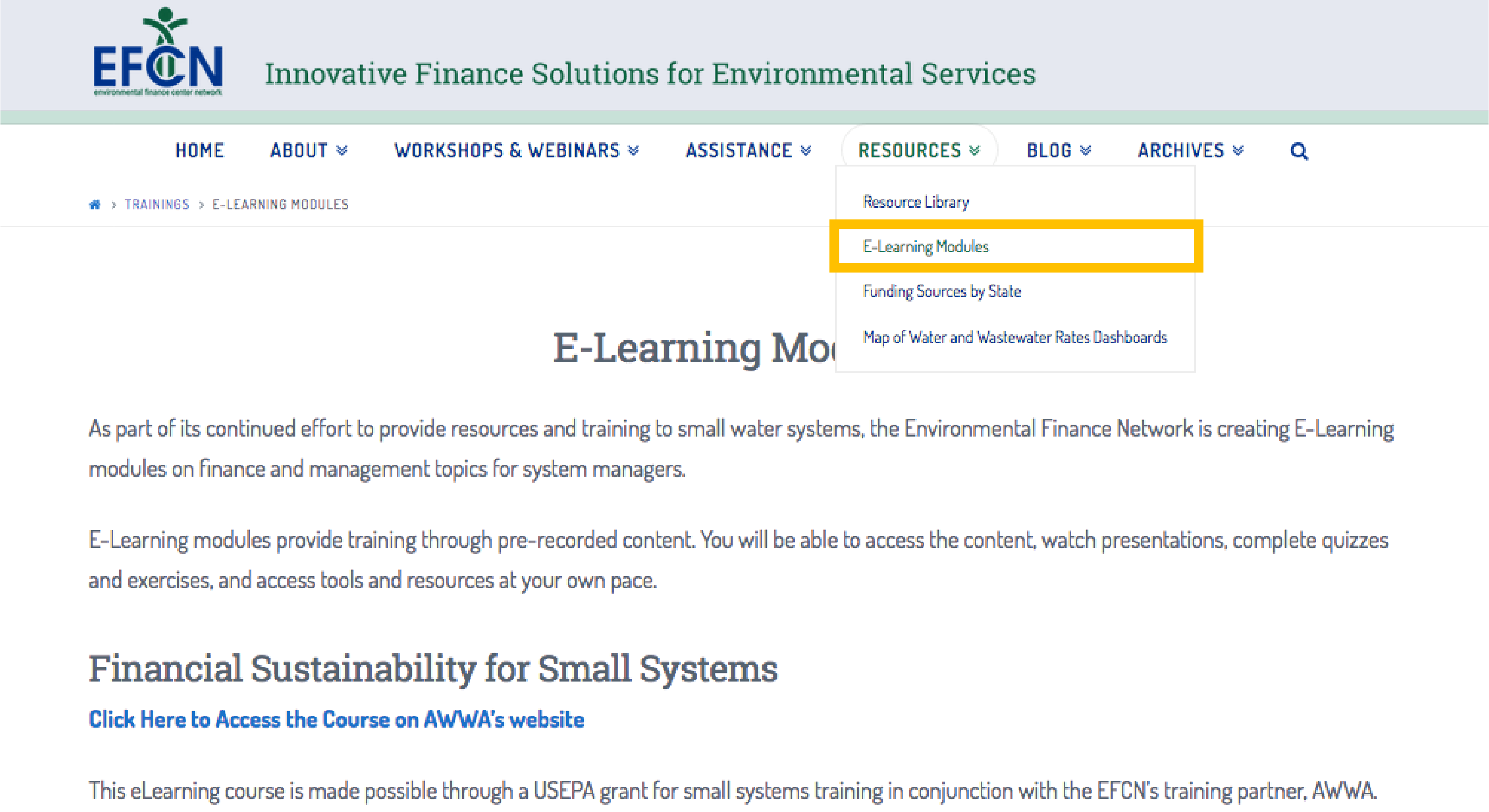
Map of Water and Wastewate

This map shows Water and Wastewater Rates Dashboards created by the EFCN:

Click a state in blue to view its dashboard

E-Learning Modules

Select “E-Learning Modules” under the Resources Tab off the EFCN homepage.



E-Learning Mo

As part of its continued effort to provide resources and training to small water systems, the Environmental Finance Network is creating E-Learning modules on finance and management topics for system managers.

E-Learning modules provide training through pre-recorded content. You will be able to access the content, watch presentations, complete quizzes and exercises, and access tools and resources at your own pace.

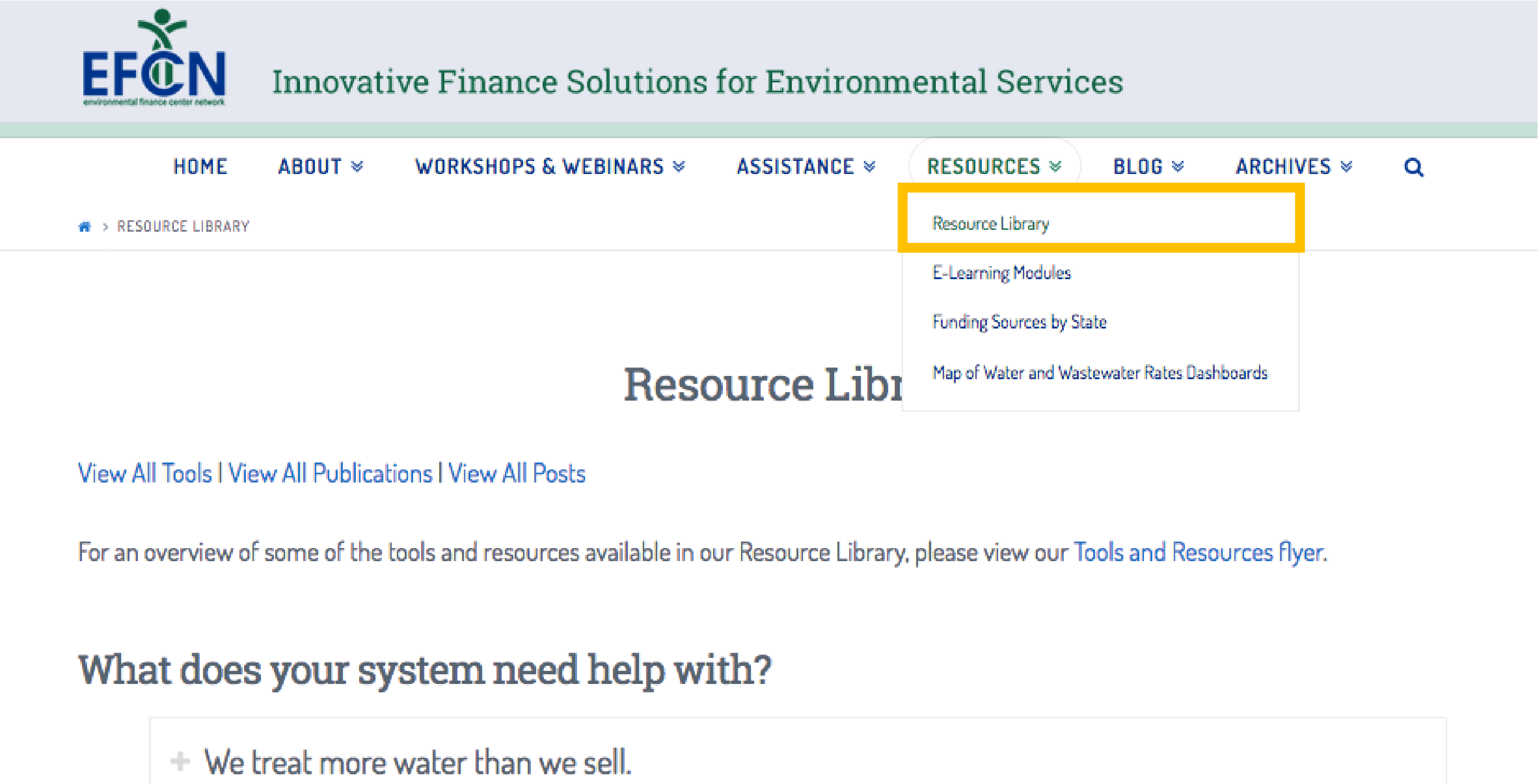
Financial Sustainability for Small Systems

Click Here to Access the Course on AWWA's website

This eLearning course is made possible through a USEPA grant for small systems training in conjunction with the EFCN's training partner, AWWA.

Resource Library

Select “Resource Library” under the Resources Tab off the EFCN homepage.



Resource Libr

View All Tools | View All Publications | View All Posts

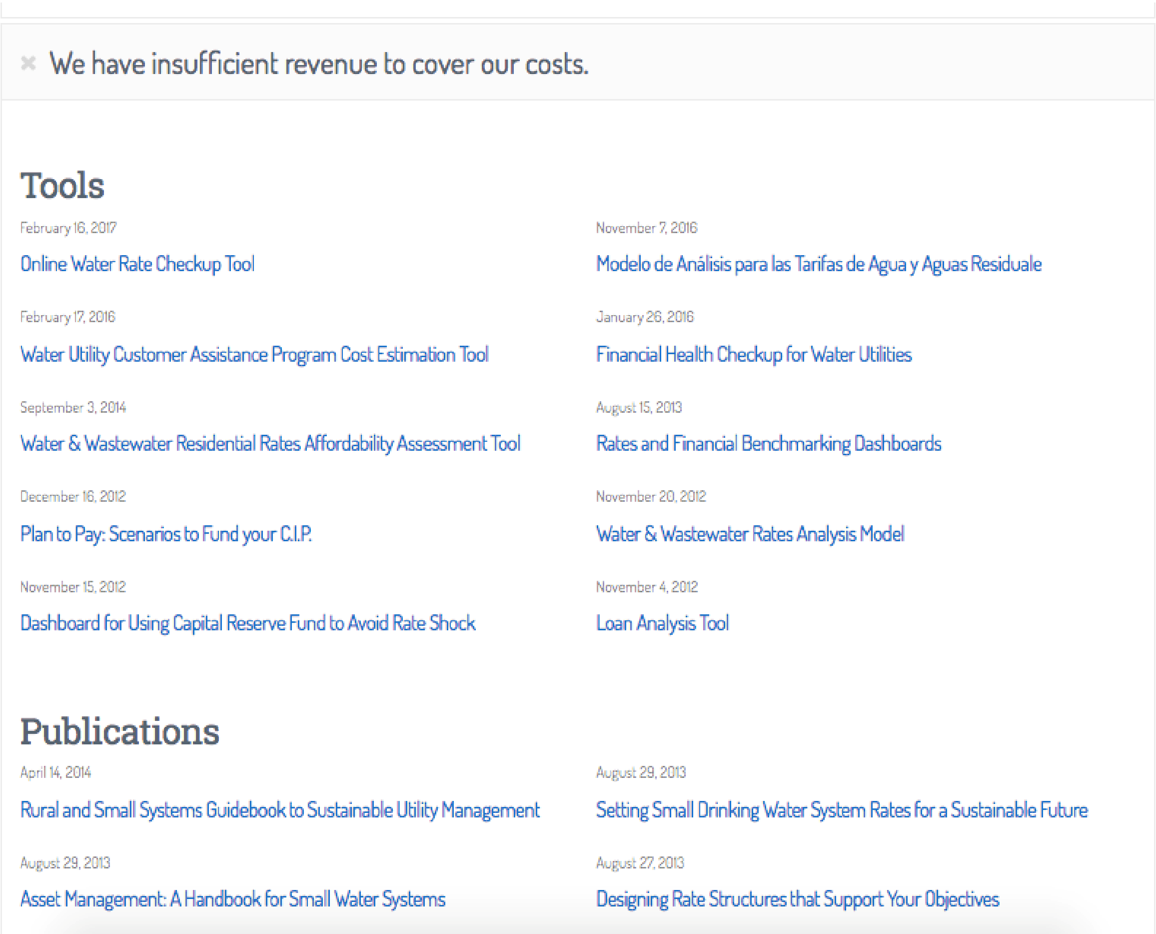
For an overview of some of the tools and resources available in our Resource Library, please view our Tools and Resources flyer.

What does your system need help with?

+ We treat more water than we sell.

Resource Library Continued…

Click on a what your system needs help with to reveal tools and publications related to that topic.



× We have insufficient revenue to cover our costs.

Tools

February 16, 2017
Online Water Rate Checkup Tool

November 7, 2016
Modelo de Análisis para las Tarifas de Agua y Aguas Residuale

February 17, 2016
Water Utility Customer Assistance Program Cost Estimation Tool

January 26, 2016
Financial Health Checkup for Water Utilities

September 3, 2014
Water & Wastewater Residential Rates Affordability Assessment Tool

August 15, 2013
Rates and Financial Benchmarking Dashboards

December 16, 2012
Plan to Pay: Scenarios to Fund your C.I.P.

November 20, 2012
Water & Wastewater Rates Analysis Model

November 15, 2012
Dashboard for Using Capital Reserve Fund to Avoid Rate Shock

November 4, 2012
Loan Analysis Tool

Publications

April 14, 2014
Rural and Small Systems Guidebook to Sustainable Utility Management

August 29, 2013
Setting Small Drinking Water System Rates for a Sustainable Future

August 29, 2013
Asset Management: A Handbook for Small Water Systems

August 27, 2013
Designing Rate Structures that Support Your Objectives

CEU Certificates

- Make sure you check in with Allison before leaving and get scanned.

Smart Management for
Small Water Systems

Thank you for participating today, and we hope to see you at a future workshop!

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Additional slides

Find Money in the Water System Budget: Energy Management Webinar 2016 Series

#1: Paying for Energy Improvements: Internal Energy Revolving Funds (04/12/2016)

#2: Where Am I Starting From? Understanding Your Water Utility’s Electric Bill + the New Energy Usage Baseline Tool (06/08/2016)

Find Money in the Water System Budget: Energy Management Webinar 2015 Series

#1: E.M. Planning for Small Water Systems and the NYSERDA Model (12/02/2014)

#2: E.M. Teams, Baselines, and Data Collection (03/03/2015)

#3: E.M. Project Ideas, Prioritization Methods, and Implementation Planning (06/09/2015)

#4: Paying for Energy Improvements (09/16/2015)