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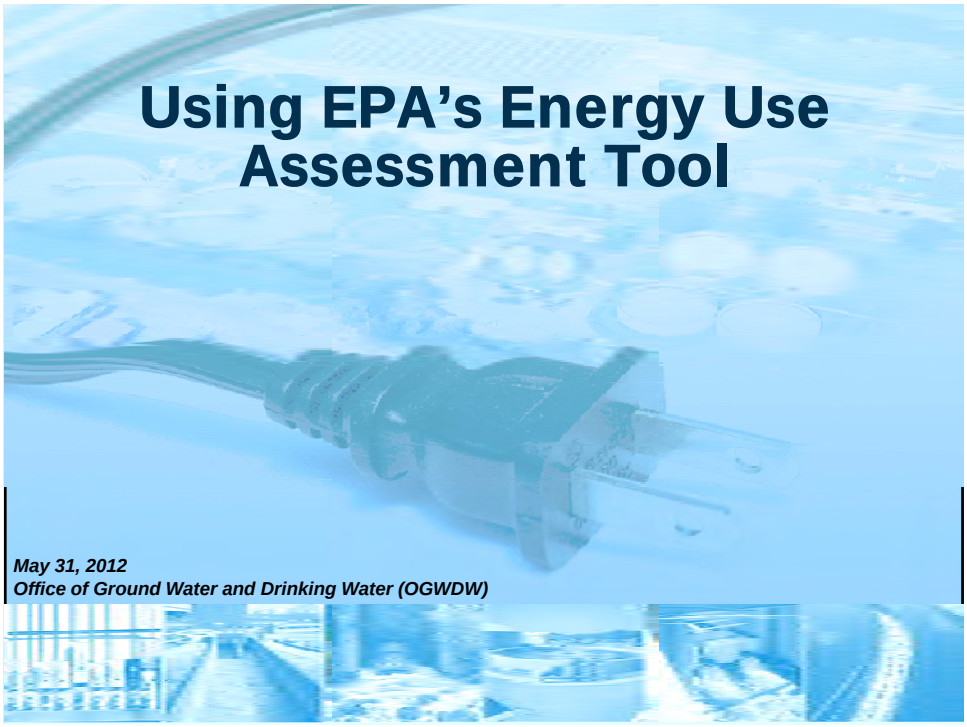
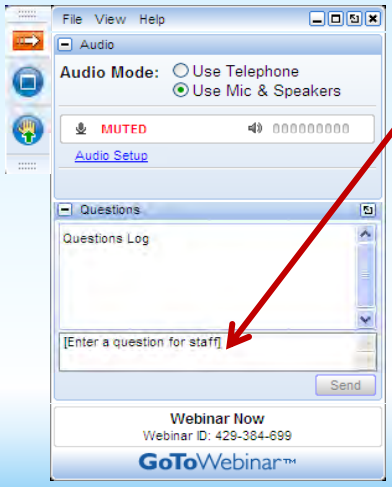
Using EPA's Energy Use Assessment Tool



May 31, 2012
Office of Ground Water and Drinking Water (OGWDW)

Questions & Answers



You can submit questions/comments any time during the presentation

Just use the question and answer pane that is located on your screen

The speakers will address as many questions as possible

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Disclaimer

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Today's Panel

EPA United States Environmental Protection Agency

Office of Ground Water and Drinking Water

Sonia Brubaker

Mike Finn

TETRA TECH

Kim Baslock

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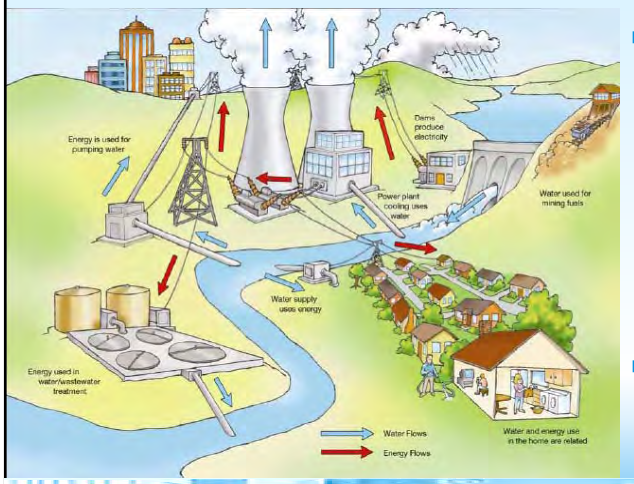
Agenda

- **Why is energy use at water and wastewater systems important?**
- What are the steps in an energy use assessment?
- How can the Energy Use Assessment Tool be used?
- What are next steps?

Energy/Water Nexus



- **Nexus between Water & Energy**
  - Producing energy needs water
  - Extracting, treating & distributing water needs energy
- **Conserving one reduces both**

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Energy Use and Water Utilities

Water and Wastewater treatment represents about 3% of the nation's energy consumption

- About $4 billion is spent annually for energy costs to run drinking water and wastewater utilities
- Equivalent to approximately 56 billion kilowatt hours (kWh)
- Equates to adding approximately 45 million tons of greenhouse gas to the atmosphere

Energy represents the largest controllable cost of providing water or wastewater services to the public

- Over 16,000 municipal treatment plants in the US and over 50,000 community water systems
- For wastewater, energy represents 25-30% of the total plant O&M
- As energy costs rise, operating costs rise

Why Focus on Management?

Energy issues are here to stay and will only get more serious—no quick fixes!

- Individual projects and technologies are fine, but something is needed to pull it all together (**a management system**)
- Systematic management will ensure **continuing** focus on energy efficiency
  - Reduce operating costs
  - Financial savings can be reinvested back into system
  - Less pressure on freshwater resources
  - Less strain on current energy grid
- The **Plan-Do-Check-Act** management systems approach has worked in many different sectors

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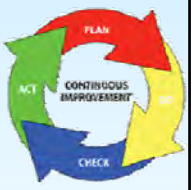
Major Steps of Improving Efficiency



*Step 1: Establish a **BASELINE***

*Step 2: **IMPLEMENT** improvement projects*

*Step 3: **TRACK and EVALUATE** improvements*

*Step 4: Share your successes and **REPEAT***

What is an Energy Use Assessment?

A means of assessing your system's baseline energy consumption and costs, in order to identify areas for improved energy efficiency and operational savings.

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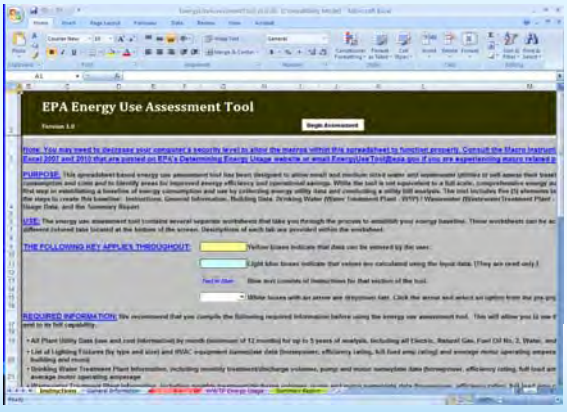
Getting Started in Preparing an Energy Use Assessment

Identified Need / Resource Gap

- **Utilities getting stuck on Step 1: Baseline**
  - High cost of hiring third-party energy auditors ($8-25K depending on system size)
  - Lack of internal energy expertise
- **Utilities getting stuck on Step 2: Implementation**
  - Not able to appropriately identify or prioritize projects (or operational modifications)
  - Not able to compare energy impacts of current technologies vs. other or new technologies
  - Systems unfamiliar with funding opportunities for energy efficiency

EPA's Energy Use Assessment Tool can Help!

- Free of charge, downloadable tool based in Excel that can be used by small and medium water and wastewater systems
- Allows a utility to conduct a utility bill and equipment analysis to assess baseline energy use and costs
- Use prior to a full-scale energy audit



http://water.epa.gov/infrastructure/sustain/energy_use.cfm

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Agenda

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Major Steps of Improving Efficiency

*Step 1: Establish a **BASELINE***

*Step 2: **IMPLEMENT** improvement projects*

*Step 3: **TRACK and EVALUATE** improvements*

*Step 4: Share your successes and **REPEAT***

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Preparing an Energy Use Assessment

Before assessing any energy use improvements you must first:

Establish a Baseline

Your individual utility baseline is an orderly and clear way to document what your energy usage and costs are and which processes and pieces of equipment are consuming that energy.

15

Preparing an Energy Use Assessment: Establish a Baseline

- **To establish a baseline you will collect utility bills and the operating data of process equipment, HVAC equipment and lighting.**
- **The more information you can collect the better your baseline is, but do not get hung up "completing" the baseline because you do not have EVERYTHING. What is a good amount to cover?**
  - Two years of utility bills are a good start for an initial baseline.
  - You will not be able to trace all of your energy usage to the responsible equipment.
  - Operation schedule is just as important as energy use and efficiency data.

16

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Preparing an Energy Use Assessment: Establish a Baseline

It is likely that this is an additional task to add to your usual duties. Break the process up into palatable chunks ahead of time.

Preparing an Energy Use Assessment: Establish a Baseline

- **What exactly am I collecting?**
  - The energy each piece of equipment consumes and its operating schedule
  - Sub-metering data
  - Equipment nameplate data on each piece of equipment to approximate the equipment's actual usage.
  - Measure the amps for each major motor (NOTE: only a trained and qualified professional should do this)

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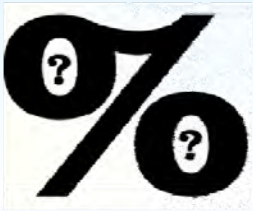
Preparing an Energy Use Assessment: Establish a Baseline

As you are filling out your baseline pay attention to a couple metrics

- Subtotal the energy use by system – as a percentage, which systems are consuming the most energy?



- Average each system's energy consumed per gallon of water treated regardless if the equipment is process or not, lights or sewage fixtures.

Preparing an Energy Use Assessment: Establish a Baseline

The point of the initial baseline is to get a general understanding of which assets are the big energy consumers.

- *These are the areas where you can get good value for making improvements.*
  - *Focus on which assets are consuming the most energy.*
  - *The point of the baseline involves working in some generalities, rough numbers, industry averages and rules of thumb.*

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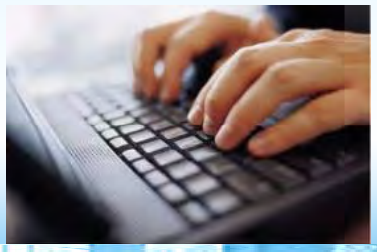
Preparing an Energy Use Assessment: Establish a Baseline

After "completing" the initial baseline, keep it up to date.



Preparing an Energy Use Assessment: Baseline Evaluation

- **Which assets are dominating your energy consumption?**

Aeration Basins

Credit: Athens, TN

Aeration Basin Pumps

Credit: Athens, TN

- **The assets that have larger percentages of the total energy consumption are where you want to focus you initial energy looking for improvement efforts.**

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Preparing an Energy Use Assessment: Baseline Evaluation

- Once there is a baseline then you will be able to easily see if an energy savings idea will actually affect the bottom line.
- Having a baseline makes day-to-day decisions easier.

Preparing an Energy Use Assessment: Baseline Evaluation

- Just having an organized baseline can help you identify improvements you may have never considered
  - You may be shocked by what percentage of your energy use is consumed by lighting, digester pumps, etc.
- A baseline allows you to quickly see the impact of changes to your budget

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Preparing an Energy Use Assessment: Baseline Evaluation

- **Energy bill usage trends can also hint towards opportunities for improvement.**
  - *Seasonal increases are expected, but drastic swings could point to a greater issue in HVAC or process design.*
  - *Increases in cost per gallon treated can show that aging major equipment is becoming ineffective.*

How the Energy Use Tool can Help Drinking Water And Wastewater Systems

Wet-well and Piping
Credit: Jackson, SC

The tool:

- Acts as a repository of up to 5 years of your energy use, cost, equipment and operational data
- Analyzes your data and displays cost and energy use trends
- Details lighting and HVAC
- Compiles equipment data

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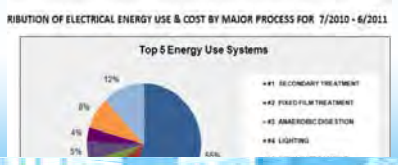
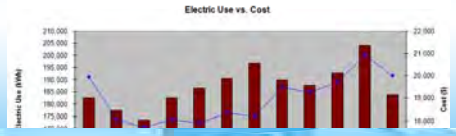
How the Energy Use Tool can Help Drinking Water And Wastewater Systems

The tool:

- Provides a summary report
  - Presentation of energy consumption and costs (broad to detail)
  - Graphs energy use over time
  - Highlights areas of energy efficiency





Agenda

- Why is energy use at water and wastewater systems important?
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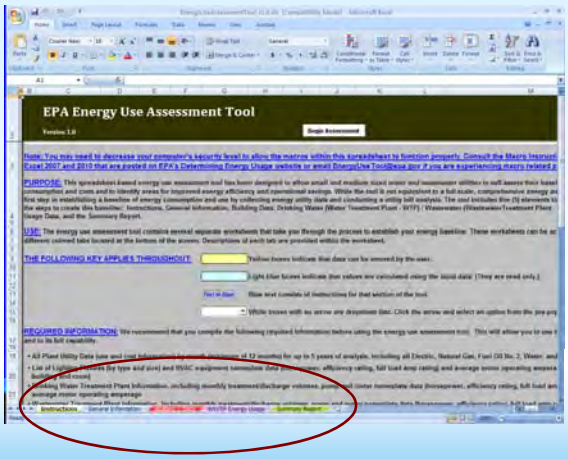
Energy Use Assessment Tool

Contains 5 tabs to walk you through the process of preparing an energy use assessment

- Instructions Tab
- General Information Tab
- Building Data Tab
- WTP / WWTP Energy Usage Tab
- Summary Report Tab



EPA's Energy Use Assessment Tool: Information Needed to Enter in the Tool

- **All plant utility data (use and cost information) by month (minimum of 12 months) for up to 5 years of analysis**
  - Collect from utility bills such as electric, natural gas, water/sewer, fuel oil, alternative energy, and other utilities
- **Non-process information (by building)**
  - List of lighting fixtures
  - HVAC equipment
- **Drinking water and/or Wastewater treatment plant information**
  - Monthly treatment/discharge volumes
  - Pump and motor nameplate data (horsepower, efficiency rating, full load amp rating)
  - Average motor operating amperage

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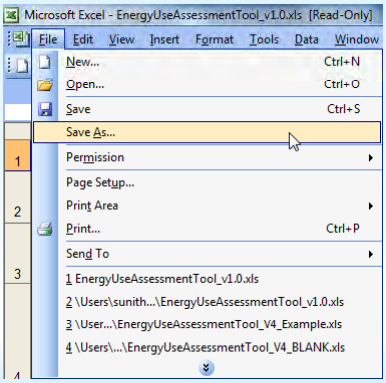
Energy Use Assessment Tool

- **Setup Instructions**
  - Saving a Copy of the Tool
  - Enabling Macros
  - Changing Security Levels
- Instructions Tab
- General Information Tab
- Building Data Tab
- WTP / WWTP Energy Usage Tab
- Summary Report Tab

Setup Instructions: Saving a Copy of the Tool

If you are using the tool in Excel 2003, from the File menu, select Save As and enter the new file name



Download the Tool at:
http://water.epa.gov/infrastructure/sustain/energy_use.cfm

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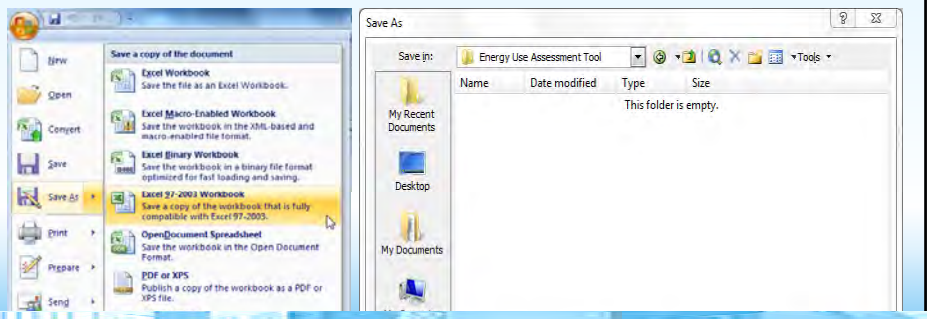
Setup Instructions: Saving a Copy of the Tool

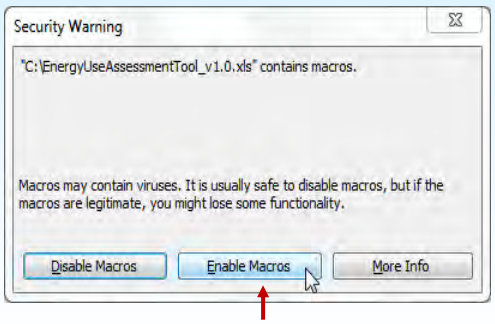
If you are using the tool in Excel 2007 (compatibility mode), click the Office button at the top left of the spreadsheet, click Save As, and click the Excel 97-2003 Workbook option.



Setup Instructions: Enabling Macros

If the security level in Excel is set to Medium, when you open the Energy Tool, a warning message appears.

To enable the macros needed for the Energy Tool to function properly, click the Enable Macros button. If you do not enable the macros, the tool will not work as designed.



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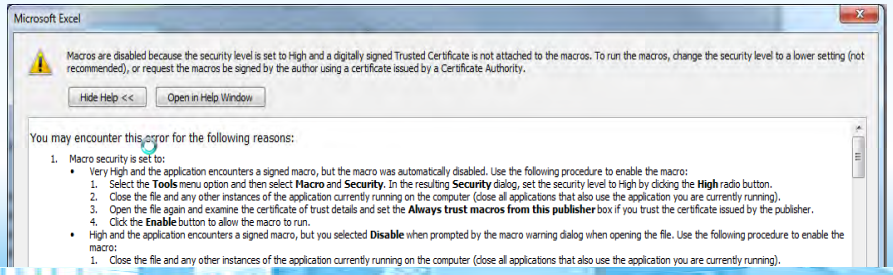
Setup Instructions: Enabling Macros

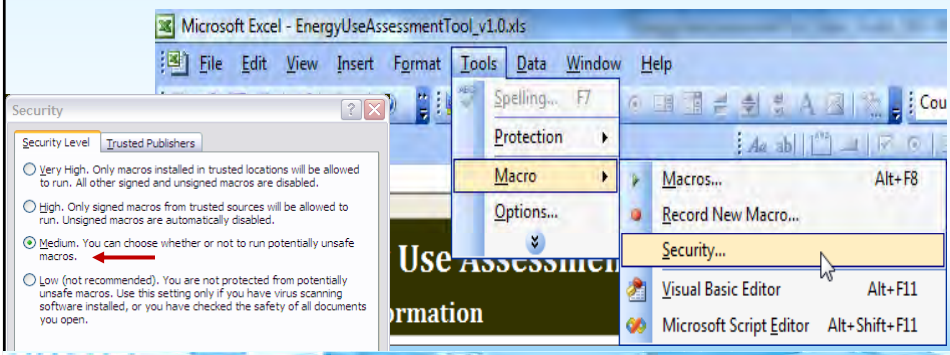
Security Warning High:

- If the security level is set to High or Very High, the security warning shown appears. Click OK, and then follow the instructions to change the security level to Medium.



Setup Instructions: Changing Security Levels in Excel 2003

From the main toolbar click the Tools menu, go to Macro, and click Security. Select Medium or Low from the security level popup.



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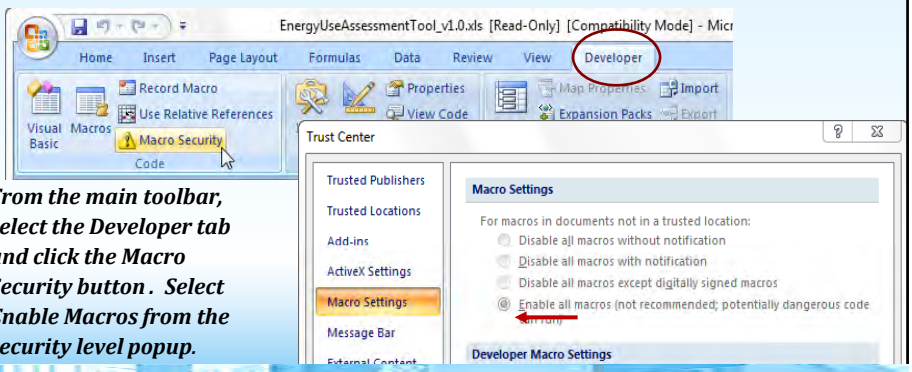
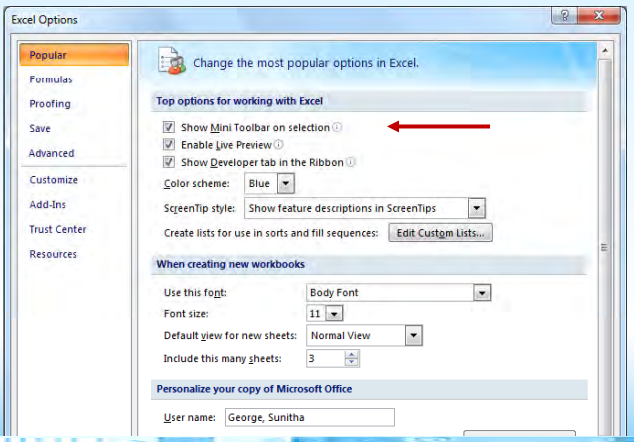
Setup Instructions:
Changing Security Levels in Excel 2007

In Excel 2007, you can change macro security settings in the Trust Center, unless a system administrator has changed the default settings.



From the main toolbar, select the Developer tab and click the Macro Security button. Select Enable Macros from the security level popup.

Setup Instructions:
Changing Security Levels in Excel 2007



Hint:
If the Developer tab is not displayed, click the Microsoft Office Button then click the Excel Options button on the bottom of the popup. In the Excel Option popup, select the Popular category. Under Top options for working with Excel, click Show Developer tab in the Ribbon .

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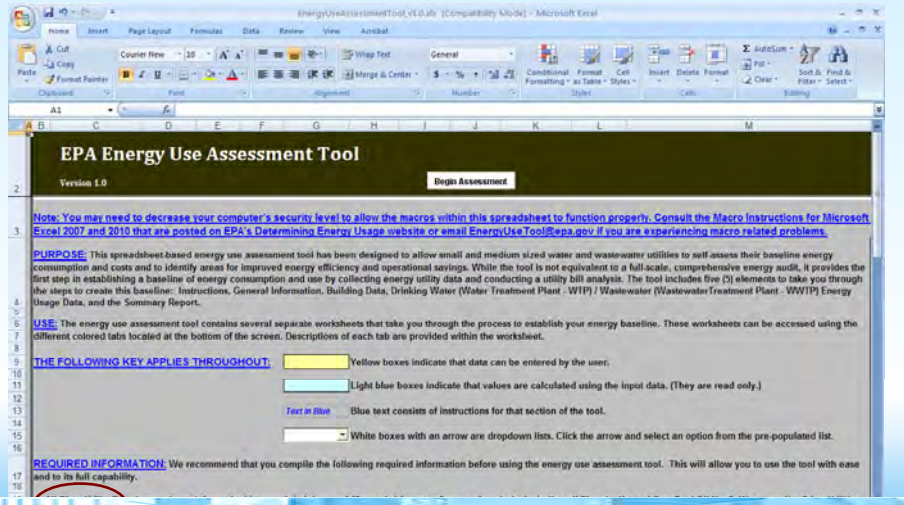
Energy Use Assessment Tool

- Setup Instructions
- **Instructions Tab**
  - Getting Started – Collect Your Information
  - Collect This Information
  - Follow Directions
  - Begin the Assessment
  - Select Drinking Water System or Wastewater System
- General Information Tab
- Building Data Tab
- WTP / WWTP Energy Usage Tab
- Summary Reports Tab

Instructions Tab



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Instructions Tab: Getting Started – Collect Information

- **Collect Your Information**
  - Gather it before using the Energy Tool and entering your data
  - Work with the data you have available
  - Enter the rest of your data later

Instructions Tab: Follow Directions

- **Read the instructions.** There are brief directions on how to use the tool, how to enter data, and how to navigate through the tool.
- Note the color-coded keys used through out the tool.

	Yellow boxes indicate that data can be entered by the user
	Light blue boxes indicate that values are calculated using the input data. (They are read only.)
Text in Blue	Blue text consists of instructions for that section of the tool.
	White boxes with an arrow are dropdown lists. Click the arrow and select an option from the pre-populated list.

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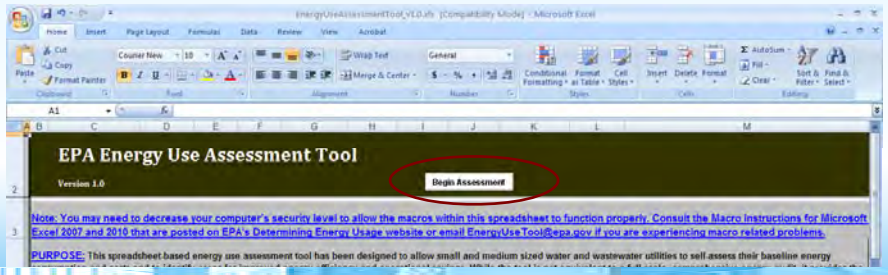
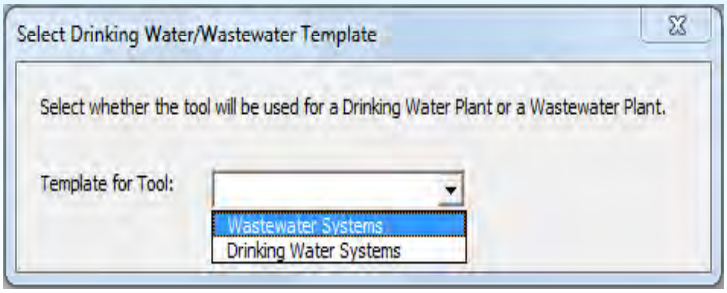
Instructions Tab: Begin the Assessment

Click the Begin Assessment button at the top and you will be automatically taken to the General Information tab or click the General Information tab at the bottom.



Instructions Tab: Select Drinking Water System or Wastewater System



*Note: if your system is both a drinking water and a wastewater system that **share the same facility information**, you can enter data for both plants within the same spreadsheet.*

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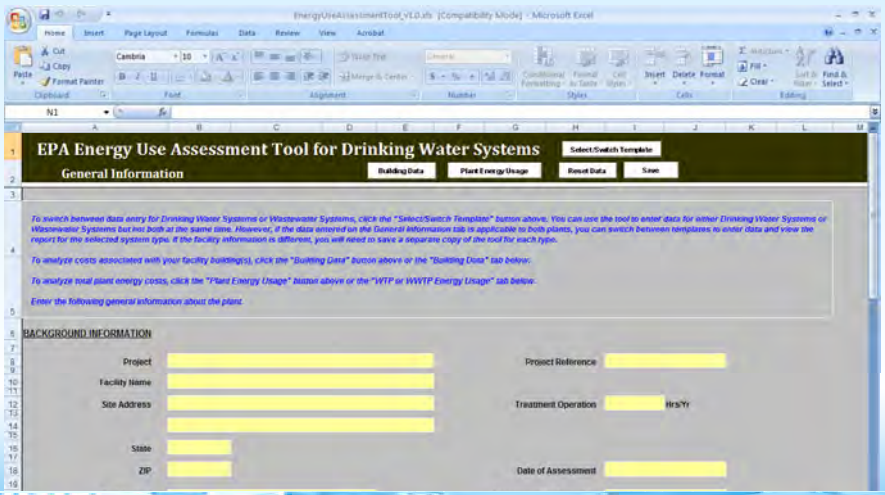
Energy Use Assessment Tool

- Setup Instructions
- Instructions Tab
- **General Information Tab**
  - Navigation Buttons
  - Entering Background Information
  - Entering Utility Bill Information
- Building Data Tab
- WTP / WWTP Energy Usage Tab
- Summary Reports Tab

General Information Tab



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General Information Tab: Navigation Buttons

The navigation buttons are at the top of the General Information tab.

*Note: if your system is both a drinking water and a wastewater system that **share the same facility information**, you can enter data for both plants within the same spreadsheet.*

General Information Tab: Entering Background Information

Use the Background Information form on the General Information tab to enter the general site information The information is displayed in the final summary report.

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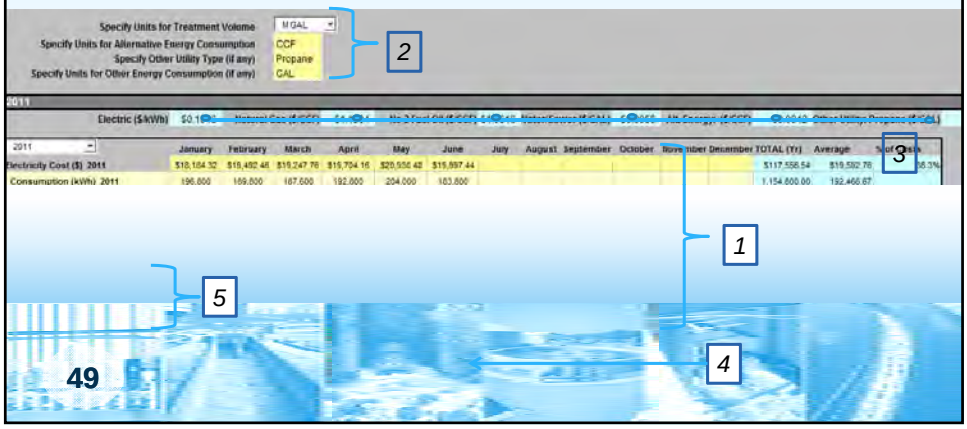
General Information Tab: Entering Utility Bill Information

The plants typical monthly energy use and cost data would fall into the different categories shown. These include the electricity, natural gas, water and sewer, oil/fuel, and so on, usage and costs.



General Information Tab: Spreadsheet Calculations

The spreadsheet calculates the sites total utility cost per treatment volumes, electrical energy use, and average utility rate per individual utility, and displays a summary for each year of data entered.

Total Utility Cost Per Million Gallons Treated ($/MGAL) 2011	$464.44
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2010	$407.67
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2009	$331.13
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2008	$279.39
Total Utility Cost Per Million Gallons Treated ($/MGAL) 2007	$239.11

Electrical Energy Utilization (kWh/MGAL) 2011	1,747.74
Electrical Energy Utilization (kWh/MGAL) 2010	1,687.25
Electrical Energy Utilization (kWh/MGAL) 2009	1,588.91
Electrical Energy Utilization (kWh/MGAL) 2008	1,487.68
Electrical Energy Utilization (kWh/MGAL) 2007	1,506.90

50

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General Information Tab: Cogeneration Data

Cogen Electricity + *Purchased Electricity* → *Electricity Consumption*

Cogen Electrical Costs + *Cogen Natural Gas Costs* + *Cogen Direct Purchased Natural Gas Costs* → *Electricity Cost*

51

Energy Use Assessment Tool

- Setup Instructions
- Instructions Tab
- General Information Tab
- **Building Data Tab**
  - Navigational Buttons
  - Total Plant Building Information
  - Building Information
  - Lighting Fixtures
  - HVAC/Non-Process Units
- WTP / WWTP Energy Usage Tab
- Summary Reports Tab

52

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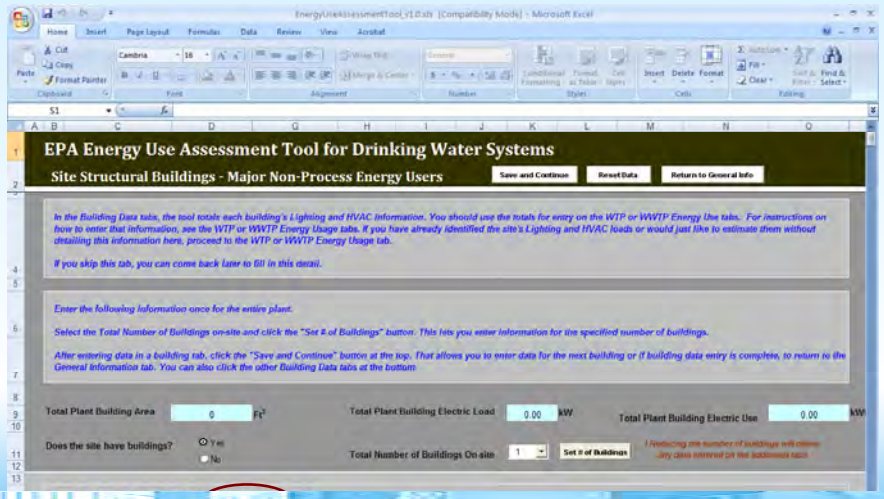
Building Data Tab



Building Data Tab: Navigational Buttons

The tool allows you to enter data for up to 10 buildings. The building data tabs are numbered from 1 to 10, and all 10 tabs follow the same format.

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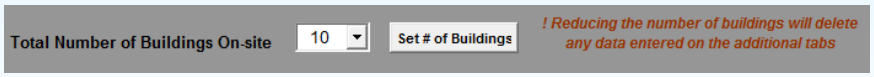
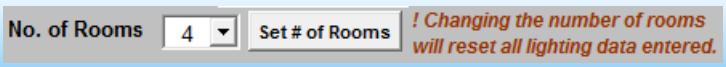
Building Data Tab: Set Number of Buildings and Rooms

- Use the Set # of Buildings button to set the desired number of rooms on-site. The Set # of Buildings button appears only on the Building 1 Data tab.

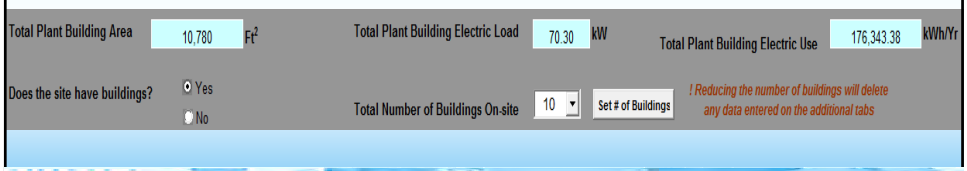


- *For each building, you must select the number of rooms for which you want to enter data.*



Building Data Tab: Total Plant Building Information

- The top section of all building tabs displays a summary of the information entered on all the building tabs.
- However, the "Does the site have buildings" and "Set # of Buildings" fields are clickable only on the building 1 tab. On all other tabs, those fields are display only.



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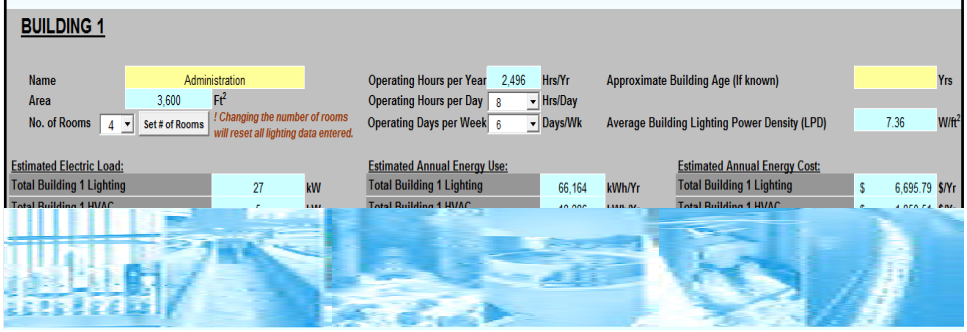
Building Data Tab: Building Information

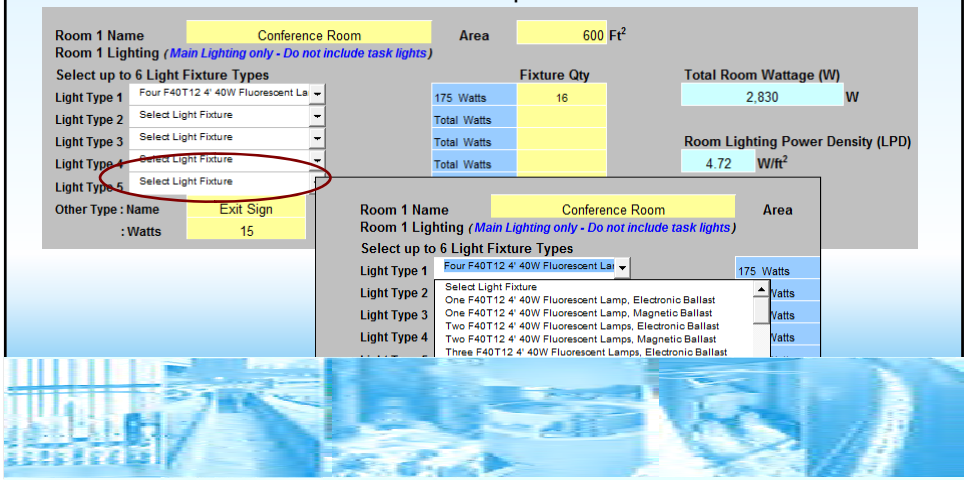
- Enter general information about each building including:
  - name of the building,
  - number of rooms,
  - operating hours

* Set the number of rooms in the building before entering any lighting data.



Building Data Tab: Lighting Fixtures

To determine the site's lighting loads and energy use, describe each room's lighting fixture types and counts by using the selectable input fields.



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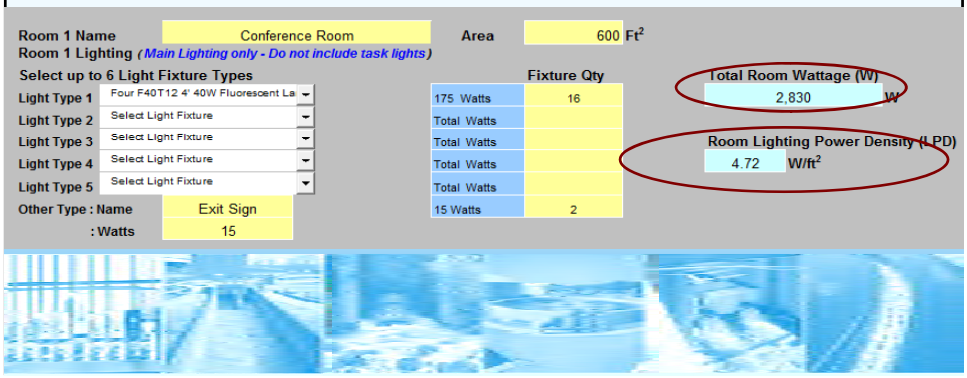
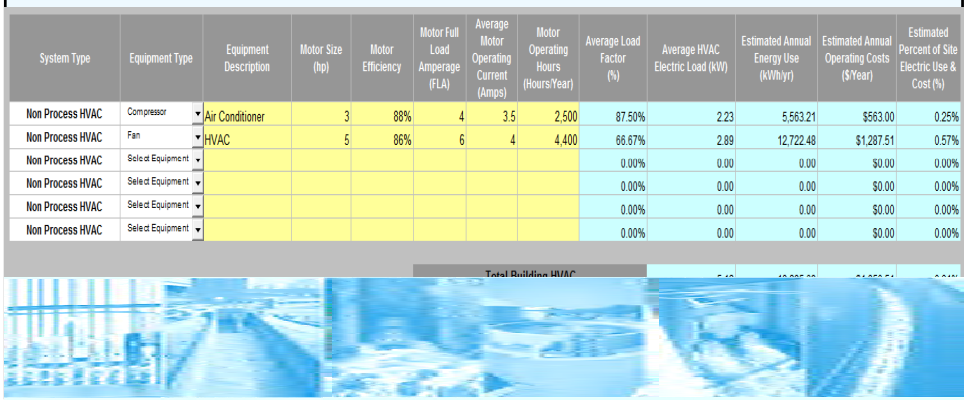
Building Data Tab: Lighting Fixtures

- Enter the area for each room, and the tool provides the Lighting Power Density (LPD) in watts per square foot for each room.
- The tool totals the rooms' lighting loads, each building's lighting energy use, and the site's total lighting energy use per year for use in other areas of this tool.



Building Data Tab: HVAC / Non-Process Units

- Non-Process HVAC is meant to include all equipment not tied to specific process operations.
- Do not provide process-related ventilation equipment, such as odor control fans here. You can include process equipment on the WTP or WWTP Energy Use tabs.



System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Motor Operating Hours (Hours/Year)	Average Load Factor (%)	Average HVAC Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Year)	Estimated Percent of Site Electric Use & Cost (%)
Non Process HVAC	Compressor	Air Conditioner	3	88%	4	3.5	2,500	87.50%	2.23	5,563.21	$563.00	0.25%
Non Process HVAC	Fan	HVAC	5	86%	6	4	4,400	66.67%	2.89	12,722.48	$1,287.51	0.57%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
							Total Building HVAC					

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Building Data Tab: HVAC / Non-Process Units

To determine the site's non-process heating, ventilating, and air conditioning (HVAC) loads and energy use, describe each building's HVAC electrical users and counts by entering them in the table as shown.

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Motor Operating Hours (Hours/Year)	Average Load Factor (%)	Average HVAC Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Year)	Estimated Percent of Site Electric Use & Cost (%)
Non Process HVAC	Compressor	Air Conditioner	3	88%	4	3.5	2,500	87.50%	2.23	5,563.21	$563.00	0.25%
Non Process HVAC	Fan	HVAC	5	86%	6	4	4,400	66.67%	2.89	12,722.48	$1,287.51	0.57%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
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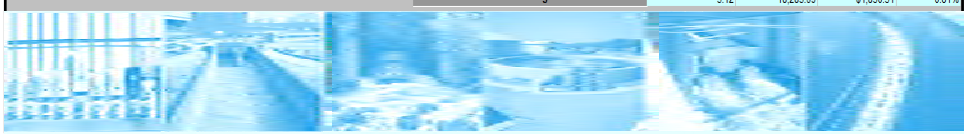
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
							Total Building HVAC		5.12	18,285.69	$1,850.51	0.81%

System Type | Equipment Type | Equipment Description

Building Data Tab: HVAC / Non-Process Units

Enter the motor's average operating current. Once the equipment's typical operating hours are entered, the tool calculates the estimated annual energy use and operating cost for the unit.

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Motor Operating Hours (Hours/Year)	Average Load Factor (%)	Average HVAC Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Year)	Estimated Percent of Site Electric Use & Cost (%)
Non Process HVAC	Compressor	Air Conditioner	3	88%	4	3.5	2,500	87.50%	2.23	5,563.21	$563.00	0.25%
Non Process HVAC	Fan	HVAC	5	86%	6	4	4,400	66.67%	2.89	12,722.48	$1,287.51	0.57%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
							Total Building HVAC		5.12	18,285.69	$1,850.51	0.81%



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Building Data Tab: HVAC / Non-Process Units

If conditions change in the plant, you can adjust the equipment size, current reading, operating hours and number of equipment in use values.

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Motor Operating Hours (Hours/Year)	Average Load Factor (%)	Average HVAC Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Year)	Estimated Percent of Site Electric Use & Cost (%)
Non Process HVAC	Compressor	Air Conditioner	3	88%	4	3.5	2,500	87.50%	2.23	5,563.21	$563.00	0.25%
Non Process HVAC	Fan	HVAC	5	86%	6	4	4,400	66.67%	2.89	12,722.48	$1,287.51	0.57%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
Non Process HVAC	Select Equipment							0.00%	0.00	0.00	$0.00	0.00%
							Total Building HVAC		5.12	18,285.69	$1,850.51	0.81%

Energy Use Assessment Tool

- Setup Instructions
- Instructions Tab
- General Information Tab
- Building Data Tab
- **WTP / WWTP Energy Usage Tab**
  - HVAC and Lighting Totals
  - Plant Equipment Electrical Energy Inventory
- Summary Reports Tab

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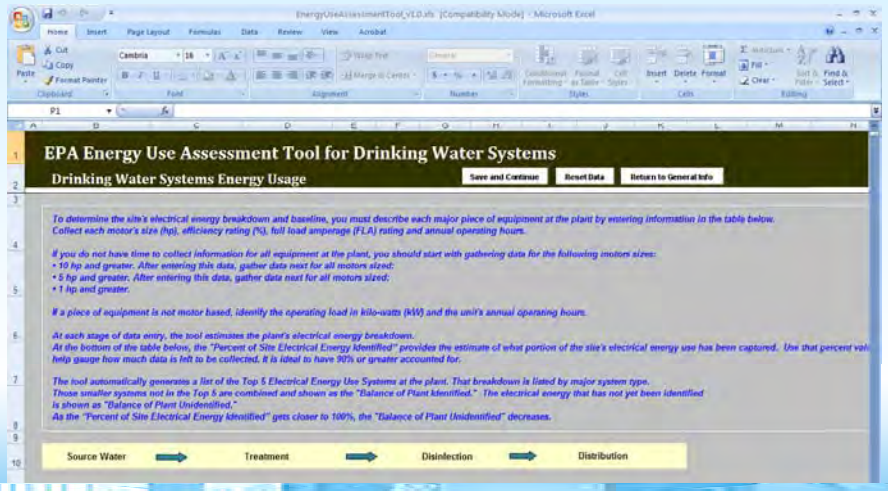
WTP / WWTP Energy Usage Tab



65

WTP / WWTP Energy Usage Tab: HVAC and Lighting Totals

- The lighting and HVAC loads, use, and cost for all the buildings entered for the facility on the Building Data tabs are totaled and displayed in the section on the WTP / WWTP Energy Usage tab.
- Use this information (i.e., the values shown in #1 & #2) to enter the HVAC and lighting into the equipment inventory table. You could enter the lighting and HVAC as separate entries or as a single entry using the combined value shown in #3.

Estimated Average Building Electric Loads:				Estimated Building Annual Energy Use:			Estimated Building Annual Energy Cost:		
Total Plant Building(s) Lighting	12.77	kW	1	Total Plant Building(s) Lighting	111,888	kWh/yr	Total Plant Building(s) Lighting	$11,323	$/yr
Total Plant Building(s) HVAC	7.36	kW	2	Total Plant Building(s) HVAC	64,455	kWh/yr	Total Plant Building(s) HVAC	$6,523	$/yr
Total Plant Building(s) Combined	20.13	kW	3	Total Plant Building(s) Combined	176,343	kWh/yr	Total Plant Building(s) Combined	$17,846	$/yr

66

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WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

- Collect each motor's size (hp), efficiency rating (%), full load amperage (FLA) rating and annual operating hours.
- If you do not have time to collect information for all equipment at the plant, you should start with gathering data for the following motors sizes:
  - 10 hp and greater. After entering this data, gather data next for all motors sized:
  - 5 hp and greater. After entering this data, gather data next for all motors sized:
  - 1 hp and greater.
- If a piece of equipment is not motor based, identify the operating load in kilowatts (kW) and the unit's annual operating hours.
- With each row of data entry, the tool estimates the plant's electrical energy breakdown.

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

1. Identify and select the System Type and Equipment Type from the dropdown menus for each piece of equipment recognized at the plant. To enter system types not listed in the list, from the **System Type** dropdown list, select '**Other**'.

EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Lighting	Other kW Load	All Site Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Non Process HVAC	Other kW Load	All Site HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%
Influent Pumping	Pump	Infl Pump Station	25	88.0 %	20	17	4,700	85.00%	18.01	84,667	$8,568	3.77%
Primary Treatment	Blower	Grit Blowers	7.5	89.0 %	8	5.5	8,760	68.75%	4.32	37,861	$3,831	1.68%
Primary Treatment	Blower	Channel Blower	10	88.0 %	10.5	6.8	8,760	64.76%	5.49	48,093	$4,867	2.14%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	8,760	82.22%	134.81	1,180,921	$119,509	52.53%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	450	82.22%	134.81	60,664	$6,139	2.70%
Secondary Treatment	Pump	WAS Pumps	7.5	86.0 %	8	4	1,460	50.00%	3.25	4,749	$481	0.21%
Fixed Film Treatment	Pump	R.Tower Pumps	60	91.0 %	65	36	8,760	55.38%	27.24	238,639	$24,150	10.62%
Anaerobic Digestion	Pump	Sludge Recir Pump	5	85.0 %	6	5	9,760	83.33%	3.66	32,034	$3,242	1.43%
Anaerobic Digestion	Mixer	Gas Mixer	10	88.0 %	12	9	8,760	75.00%	6.36	55,696	$5,636	2.48%
Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storag	Pump											

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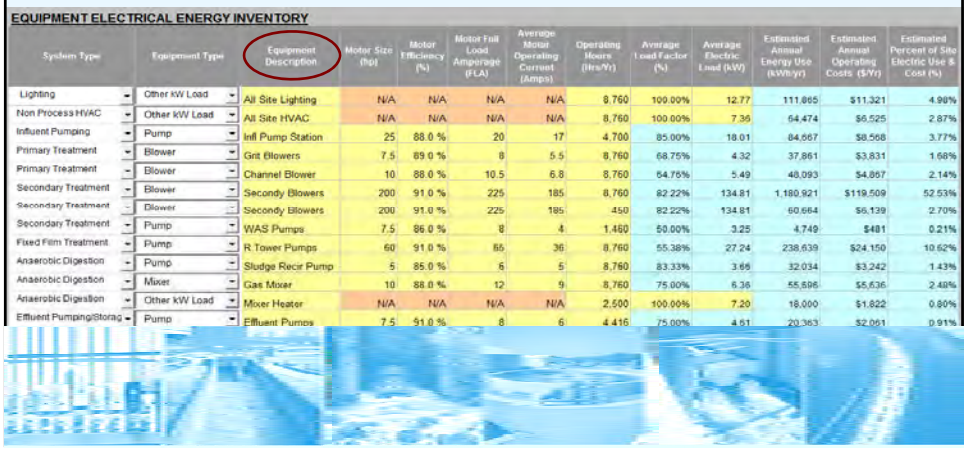
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

2. Enter a unique Equipment Description to keep track of each piece of equipment. That can be the system's identification name or number.

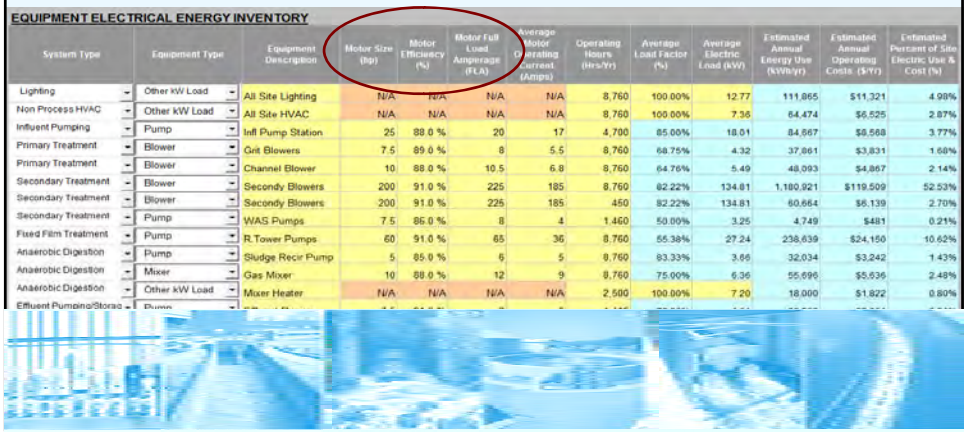


EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Lighting	Other kW Load	All Site Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Non Process HVAC	Other kW Load	All Site HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%
Influent Pumping	Pump	Infl Pump Station	25	88.0 %	20	17	4,700	85.00%	18.01	84,667	$8,568	3.77%
Primary Treatment	Blower	Grit Blowers	7.5	89.0 %	8	5.5	8,760	68.75%	4.32	37,861	$3,831	1.68%
Primary Treatment	Blower	Channel Blower	10	88.0 %	10.5	6.8	8,760	64.76%	5.49	48,093	$4,867	2.14%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	8,760	82.22%	134.81	1,180,921	$119,509	52.53%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	450	82.22%	134.81	60,664	$6,139	2.70%
Secondary Treatment	Pump	WAS Pumps	7.5	86.0 %	8	4	1,460	50.00%	3.25	4,749	$481	0.21%
Fixed Film Treatment	Pump	R Tower Pumps	60	91.0 %	65	36	8,760	55.38%	27.24	238,639	$24,150	10.62%
Anaerobic Digestion	Pump	Sludge Recir Pump	5	85.0 %	6	5	8,760	83.33%	3.66	32,034	$3,242	1.43%
Anaerobic Digestion	Mixer	Gas Mixer	10	88.0 %	12	9	8,760	75.00%	6.36	55,696	$5,636	2.48%
Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storag	Pump	Effluent Pumps	7.5	91.0 %	8	6	4,416	75.00%	4.51	20,363	$2,061	0.91%

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

3. Collect and enter the motor size, efficiency, and full load amperage ratings. That information is on the equipment's nameplate or specification datasheet.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Lighting	Other kW Load	All Site Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Non Process HVAC	Other kW Load	All Site HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%
Influent Pumping	Pump	Infl Pump Station	25	88.0 %	20	17	4,700	85.00%	18.01	84,667	$8,568	3.77%
Primary Treatment	Blower	Grit Blowers	7.5	89.0 %	8	5.5	8,760	68.75%	4.32	37,861	$3,831	1.68%
Primary Treatment	Blower	Channel Blower	10	88.0 %	10.5	6.8	8,760	64.76%	5.49	48,093	$4,867	2.14%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	8,760	82.22%	134.81	1,180,921	$119,509	52.53%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	450	82.22%	134.81	60,664	$6,139	2.70%
Secondary Treatment	Pump	WAS Pumps	7.5	86.0 %	8	4	1,460	50.00%	3.25	4,749	$481	0.21%
Fixed Film Treatment	Pump	R Tower Pumps	60	91.0 %	65	36	8,760	55.38%	27.24	238,639	$24,150	10.62%
Anaerobic Digestion	Pump	Sludge Recir Pump	5	85.0 %	6	5	8,760	83.33%	3.66	32,034	$3,242	1.43%
Anaerobic Digestion	Mixer	Gas Mixer	10	88.0 %	12	9	8,760	75.00%	6.36	55,696	$5,636	2.48%
Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%

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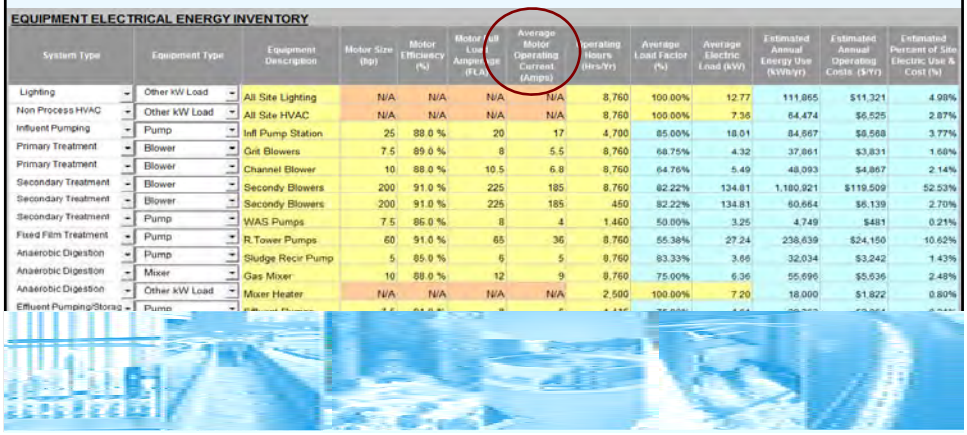
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

4. Collect and enter the motor's average operating current. If you are unable to measure the motor's typical operating current, the tool provides 75% as the default value for the unit's Average Load Factor.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Lighting	Other kW Load	All Site Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Non Process HVAC	Other kW Load	All Site HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%
Influent Pumping	Pump	Infl Pump Station	25	88.0 %	20	17	4,700	85.00%	18.01	84,667	$8,568	3.77%
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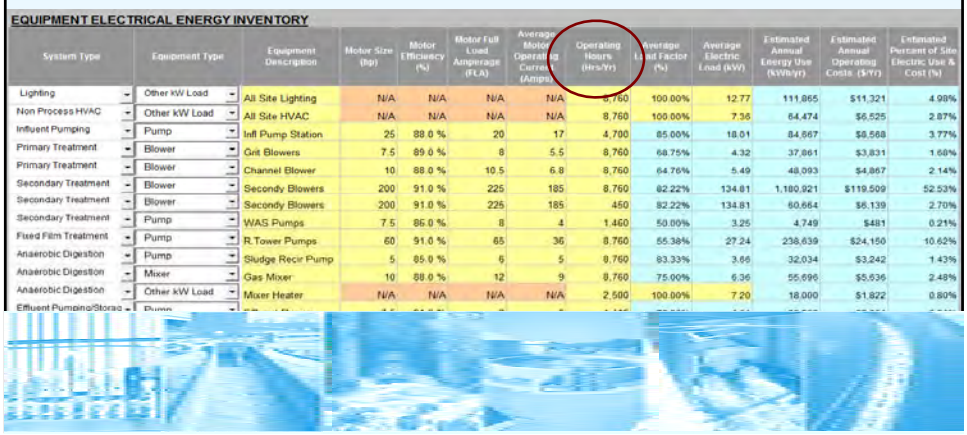
Anaerobic Digestion	Mixer	Gas Mixer	10	88.0 %	12	9	8,760	75.00%	6.36	55,696	$5,636	2.48%
Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storag	Pump											

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

5. Enter the annual operating hours. If that information is not tracked for the unit, estimate the value. You can readjust the value later.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
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Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storag	Pump											

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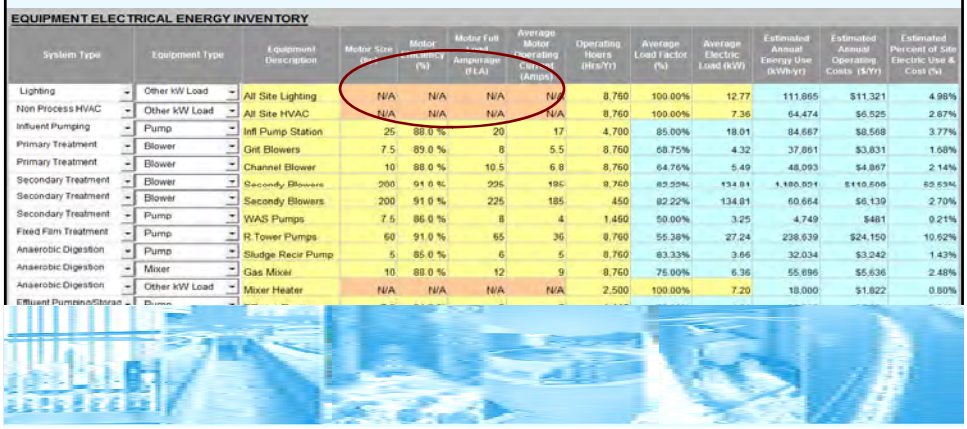
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

6a. If the piece of equipment is not motor based or if a total system load has already been identified, in the **System Type** dropdown list, select the appropriate system type and from the **Equipment Type** dropdown list, select **Other kW Load**.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

System Type	Equipment Type	Equipment Description	Motor Size (hp)	Motor Efficiency (%)	Motor Full Load Amperage (FLA)	Average Motor Operating Current (Amps)	Operating Hours (Hrs/Yr)	Average Load Factor (%)	Average Electric Load (kW)	Estimated Annual Energy Use (kWh/yr)	Estimated Annual Operating Costs ($/Yr)	Estimated Percent of Site Electric Use & Cost (%)
Lighting	Other kW Load	All Site Lighting	N/A	N/A	N/A	N/A	8,760	100.00%	12.77	111,865	$11,321	4.98%
Non Process HVAC	Other kW Load	All Site HVAC	N/A	N/A	N/A	N/A	8,760	100.00%	7.36	64,474	$6,525	2.87%
Influent Pumping	Pump	Infl Pump Station	25	88.0 %	20	17	4,700	85.00%	18.01	84,667	$8,568	3.77%
Primary Treatment	Blower	Grit Blowers	7.5	89.0 %	8	5.5	8,760	68.75%	4.32	37,861	$3,831	1.68%
Primary Treatment	Blower	Channel Blower	10	88.0 %	10.5	6.8	8,760	64.76%	5.49	48,093	$4,867	2.14%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	8,760	85.53%	134.81	1,180,851	$119,508	52.53%
Secondary Treatment	Blower	Secondy Blowers	200	91.0 %	225	185	450	82.22%	134.81	60,664	$6,139	2.70%
Secondary Treatment	Pump	WAS Pumps	7.5	86.0 %	8	4	1,460	50.00%	3.25	4,749	$481	0.21%
Fixed Film Treatment	Pump	R.Tower Pumps	60	91.0 %	65	36	8,760	55.38%	27.24	238,639	$24,150	10.62%
Anaerobic Digestion	Pump	Sludge Recir Pump	5	85.0 %	6	5	8,760	83.33%	3.66	32,034	$3,242	1.43%
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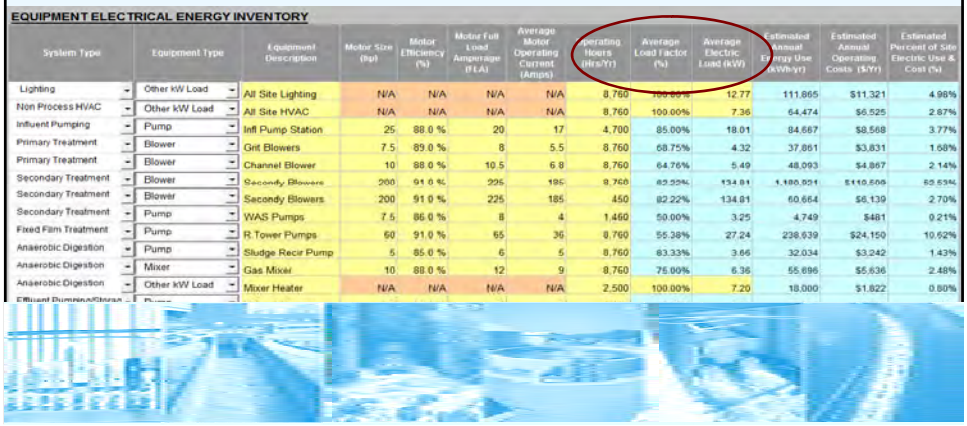
Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storage	Pump											

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

6b. You can then enter the annual operating hours into the respective cell and electrical energy load in kW into the column titled **Average Electric Load (kW)**.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

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Anaerobic Digestion	Other kW Load	Mixer Heater	N/A	N/A	N/A	N/A	2,500	100.00%	7.20	18,000	$1,822	0.80%
Effluent Pumping/Storage	Pump											

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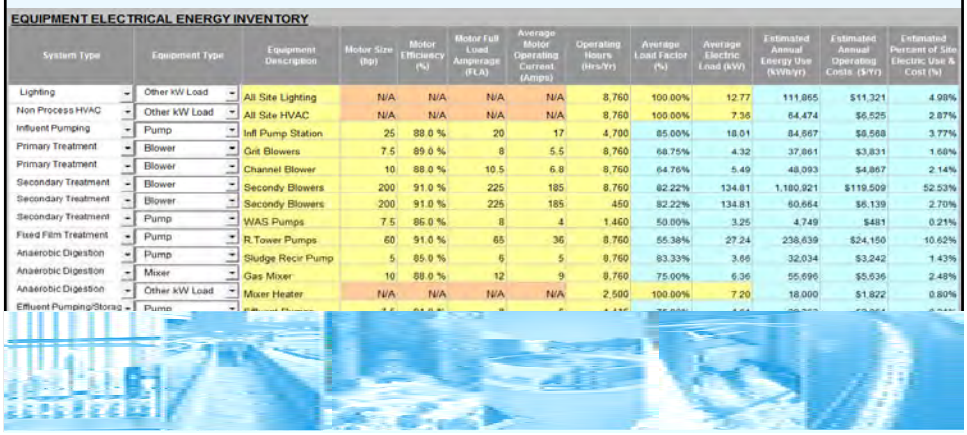
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

7. If you need to add more equipment than the table allows, click the **Add Row** button. You may add as many rows as you wish.



EQUIPMENT ELECTRICAL ENERGY INVENTORY

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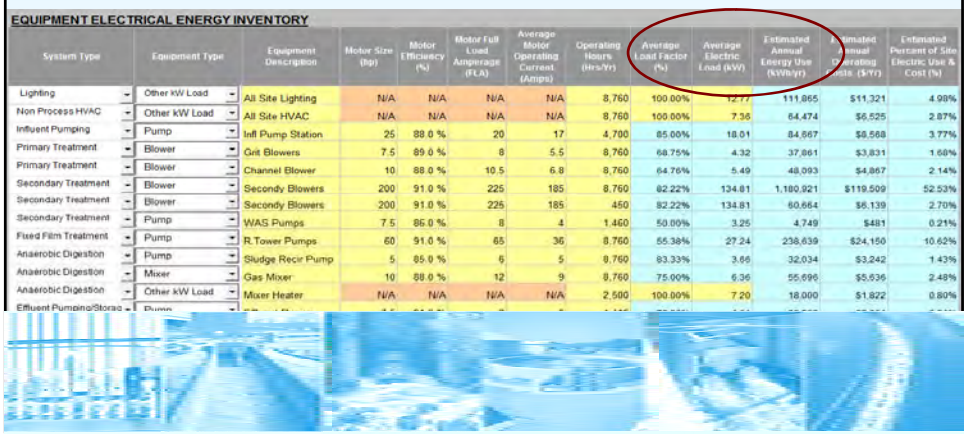
Effluent Pumping/Storag	Pump											

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

Entry Results – The Energy Tool calculates each equipment's electrical energy values for Average Electric Load (kW), Estimated Annual Energy Use (kWh/yr), and Estimated Annual Operating Costs ($/yr).



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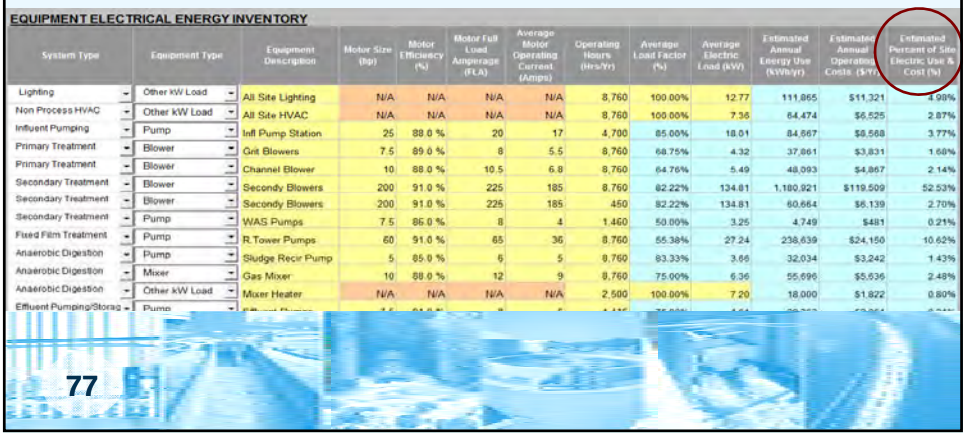
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

Entry Results –The tool also provides the Estimated Percent of Site Electric Use & Cost (%) identified as compared to the plant's Actual Annual Electric Use and Cost (actual energy billed).



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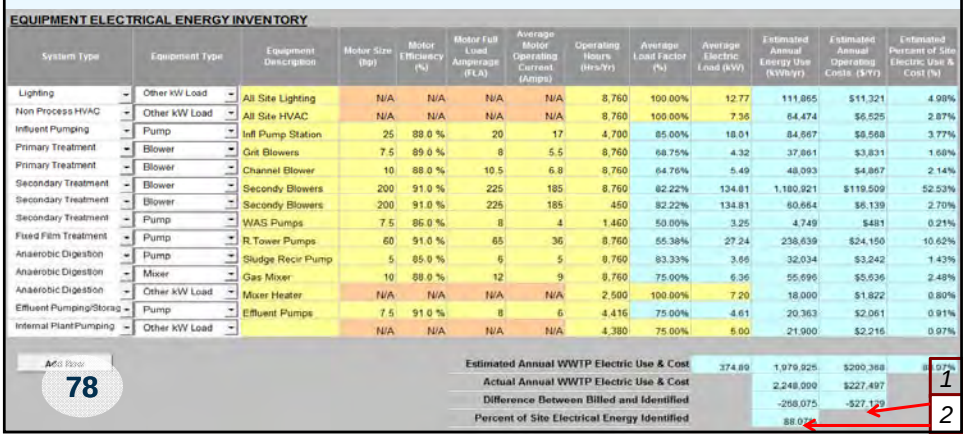
Effluent Pumping/Storag	Pump											

77

WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

Entry Results

- Any difference between what electrical energy has been identified and what has been billed is also indicated. (#1)
- The cell labeled Percent of Site Electrical Energy Identified (#2) provides the site with an estimate of what portion of the site's electrical energy use has been captured.



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Effluent Pumping/Storag	Pump	Effluent Pumps	7.5	91.0 %	8	6	4,416	75.00%	4.61	20,363	$2,061	0.91%
Internal Plant Pumping	Other kW Load		N/A	N/A	N/A	N/A	4,380	75.00%	6.00	21,900	$2,216	0.97%
		Estimated Annual WWTP Electric Use & Cost							374.89	1,979,925	$200,368	
		Actual Annual WWTP Electric Use & Cost								2,248,000	$227,497	
		Difference Between Billed and Identified								-268,075	-$27,129	
		Percent of Site Electrical Energy Identified								88.07%		

Add Row

78

1

2

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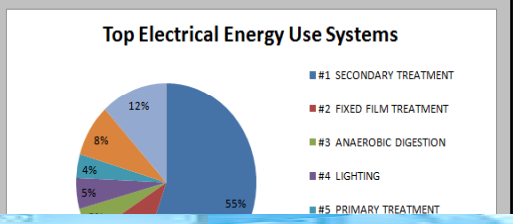
WTP / WWTP Energy Usage Tab: Plant Equipment Electrical Energy Inventory

Top Electrical Energy Use Systems – The Energy Tool generates a list of the Top 5 Electrical Energy Use Systems at the plant . The breakdown is listed by major system type.

Top Energy Use Systems:	
#1 SECONDARY TREATMENT	55.44%
#2 FIXED FILM TREATMENT	10.62%
#3 ANAEROBIC DIGESTION	4.70%
#4 LIGHTING	4.98%
#5 PRIMARY TREATMENT	3.82%
Balance of Plant Identified	8.51%
Balance of Plant Unidentified	11.93%



Energy Use Assessment Tool

- Setup Instructions
- Instructions Tab
- General Information Tab
- Building Data Tab
- WTP / WWTP Energy Usage Tab
- **Summary Report Tab**
  - Action Buttons
  - Overview of Baseline Energy Use
  - Graphical Summaries for the Latest 12 Months
  - Distribution of Electrical energy Use and Cost by Major Process
  - Equipment Inventory
  - Energy Trends for Over the Last 5 years

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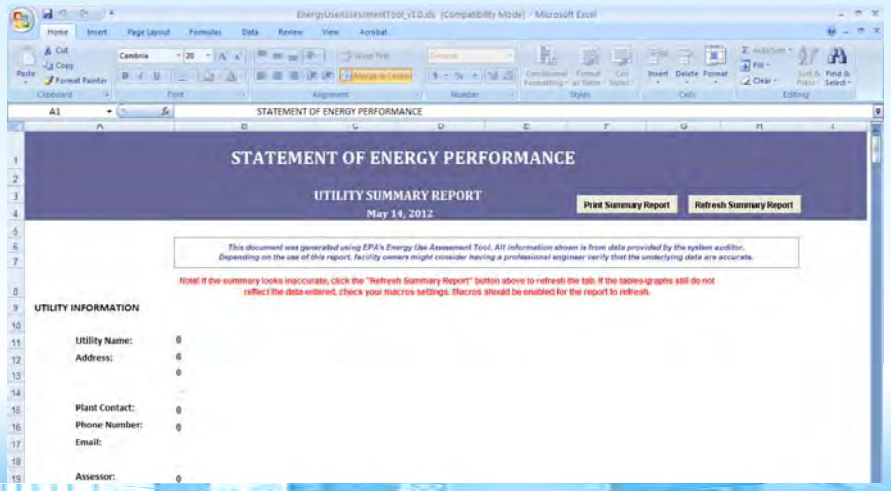
Summary Reports Tab



Summary Reports Tab: Action Buttons

The Summary Report tab contains a summary of all the information entered on the General Information, Building, and WTP/WWTP Energy Usage tabs.

- **Print Summary Report Button:** Prints the report base on the default print options in Excel.
- **Refresh Summary Report Button:** Use the Refresh Summary Report button to refresh the tables and charts on the tab.

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Summary Reports Tab: Overview of Baseline Energy Use

The Baseline Energy Use summarizes each utility's consumption and cost for the last 12 months entered on the General Information tab and the amount of water treated during that period.

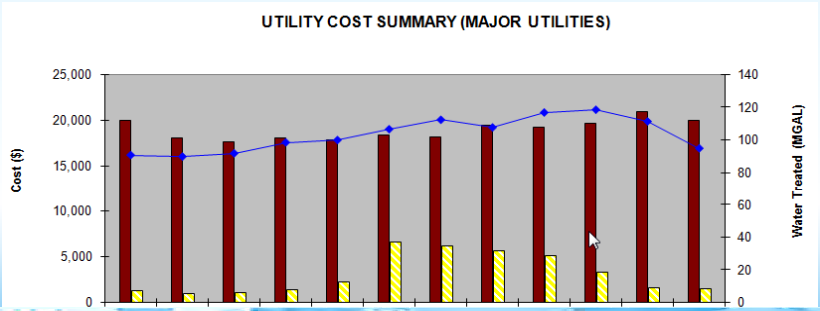
TABULATED UTILITY USE, COST AND WATER TREATMENT FLOW SUMMARY FOR 2011 (7/2010 - 6/2011)

Utility	Site Utility Use (Common Units)	Site Utility Costs	% of Costs
Electricity	2,248,000 kWh	$227,497	42%
Natural Gas*	31,683 CCF	$36,132	7%
No 2 Fuel Oil*	50,546 CCF	$53,631	10%
Water & Sewer*	28,169,069 GAL	$156,967	29%
Alternative Energy*	18,236,400 CCF	$47,186	9%
Other - Propane*	18,618,000 GAL	$21,296	4%
Total		$542,709	100%

* The values displayed for this category may be using data from previous months other than the above specified date ranges.

Summary Reports Tab: Graphical Summaries for the Latest 12 Months

- **Utility Cost Summary Graph – Major Utilities**
  - The Utility Cost Summary graph shows monthly trends in the Cost for your system in bar graph form and compares that to the amount of Water Treated in line graph form.



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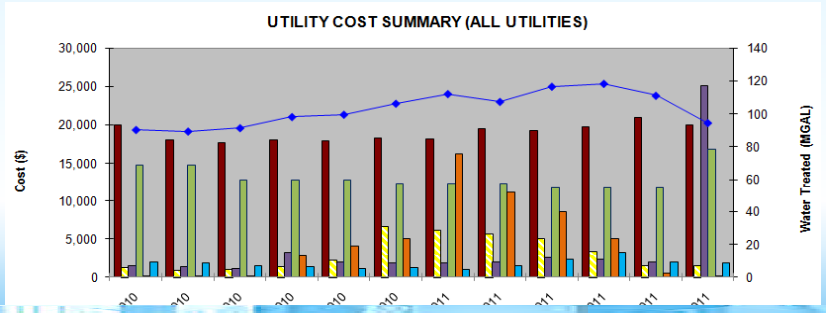
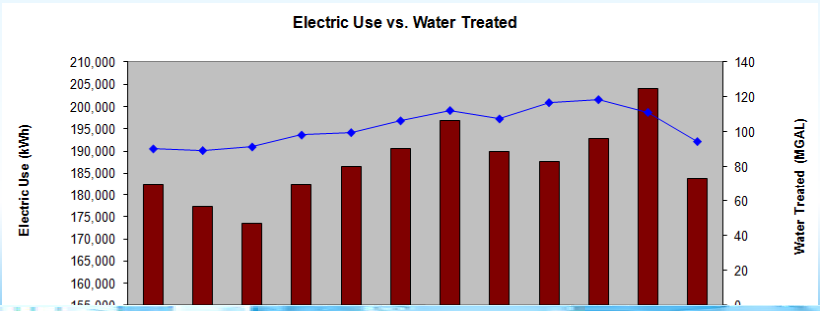
Summary Reports Tab: Graphical Summaries for the Latest 12 Months

- **Utility Cost Summary Graph – All Utilities**
  - The Utility Cost Summary graph (shows monthly trends in the Cost for your system in bar graph form and compares that to the amount of Water Treated in line graph form.



Summary Reports Tab: Graphical Summaries for the Latest 12 Months

- **Electric Use vs. Water Treated Graph**
  - The Electric Use vs. Water Treated graph compares Electric Use (electric energy consumption) in bar graph form with Water Treated volumes in line graph form.



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Summary Reports Tab: Graphical Summaries for the Latest 12 Months

- **Electric Use vs. Cost Graph**
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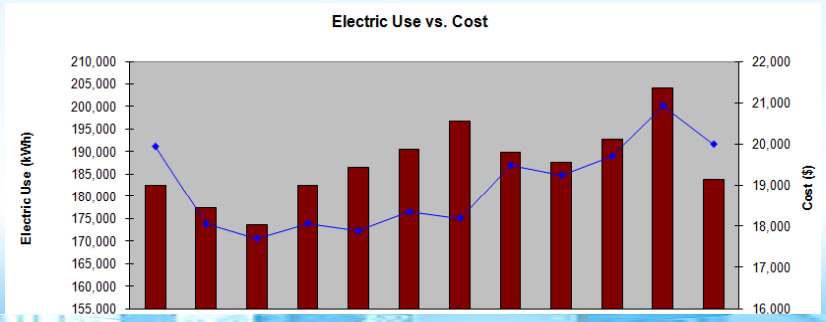
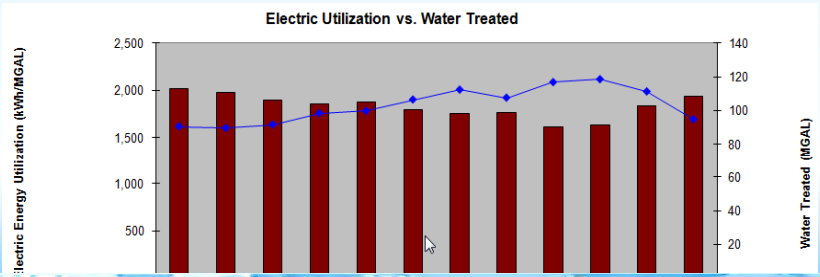


Summary Reports Tab: Graphical Summaries for the Latest 12 Months

- **Electric Utilization vs. Water Treated Graph**
  - The Electric Utilization vs. Water Treated graph shows the Electric Energy Utilization (energy consumption per amount of water treated) in bar graph form compared to the amount of Water Treated in line graph form



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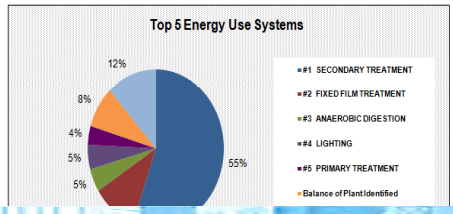
Summary Reports Tab: Distribution of Electrical Energy Use and Cost by Major Process

- **Summary Report**
  - The summary report generates a list of the Top 5 Electrical Energy Use Systems at the plant That breakdown is listed by major system type.

DISTRIBUTION OF ELECTRICAL ENERGY USE & COST BY MAJOR PROCESS FOR 7/2010 - 6/2011



Major Process/Top Energy Use Systems	Electric Energy Use (%)	Electric Energy Use (kWh)	Electric Energy Cost ($)
#1 SECONDARY TREATMENT	55.44%	1,246,334	$126,129
#2 FIXED FILM TREATMENT	10.62%	238,639	$24,150
#3 ANAEROBIC DIGESTION	4.70%	105,730	$10,700
#4 LIGHTING	4.98%	111,865	$11,321
#5 PRIMARY TREATMENT	3.82%	85,953	$8,698
Balance of Plant Identified	8.51%	191,404	$19,370
	11.93%	268,075	$27,129

Summary Reports Tab: Equipment Inventory

- **Equipment Inventory**
  - A breakdown of the electrical energy use for all the equipment entered is shown in the summary report under the Equipment Inventory section.

EQUIPMENT INVENTORY: BREAKDOWN OF ELECTRICAL ENERGY USE FOR MAJOR/ENERGY INTENSIVE EQUIPMENT

Major Process/Top Energy Use Systems	Motor Efficiency (%)	Efficiency Rating	Electric Energy Use (%)	Electric Energy Use (kWh)	Electric Energy Cost ($)
Anaerobic Digestion					
Mixer - Gas Mixer	88	Medium	2.48%	55,696	$5,636.40
Other kW Load - Mixer Heater	N/A	N/A	0.80%	18,000	$1,821.60
Pump - Sludge Recir Pump	85	Medium	1.43%	32,034	$3,241.85
Effluent Pumping/Storage					
Pump - Effluent Pumps	91	High	0.91%	20,363	$2,060.77
Fixed Film Treatment					
Pump - R Tower Pumps	91	High	10.62%	238,639	$24,150.28
Influent Pumping					
Pump - Infl Pump Station	88	Medium	3.77%	84,667	$8,568.27
Internal Plant Pumping					
Other kW Load -	N/A	N/A	0.97%	21,900	$2,216.28
Lighting					
Other kW Load - All Site Lighting	N/A	N/A	4.98%	111,865	$11,320.75
Non Process HVAC					
Other kW Load - All Site HVAC	N/A	N/A	2.87%	64,474	$6,524.72
Primary Treatment					
Blower - Channel Blower	88	Medium	2.14%	48,093	$4,866.99
Blower - Grit Blowers	89	Medium	1.68%	37,861	$3,831.49
Secondary Treatment					
Blower - Secondy Blowers	91	High	52.53%	1,180,921	$119,509.12
	91	High	2.70%	60,664	$6,139.17

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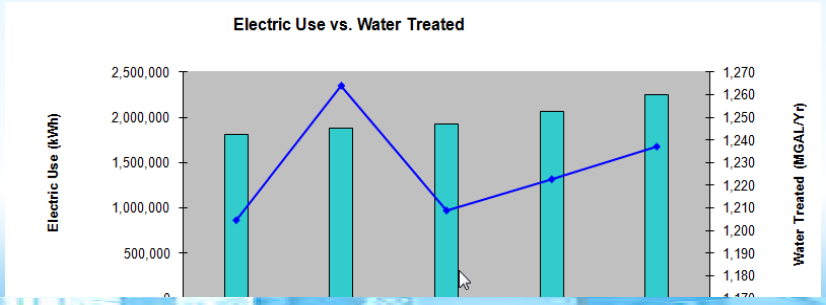
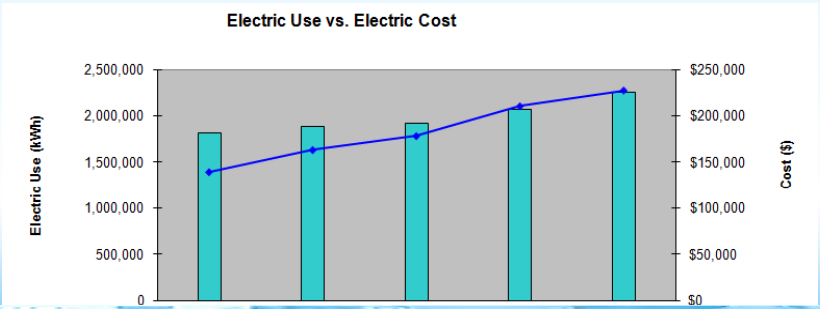
Summary Reports Tab: Energy Trends for Over the Last 5 Years

- **Electric Use vs. Water Treated Graph**
  - The 5 Year Electric Use vs. Water Treated graph shows the annual Electric Use in bar graph form compared to the amount of Water Treated in line graph form.



Summary Reports Tab: Energy Trends for Over the Last 5 Years

- **Electric Use vs. Cost Graph**
  - The 5 Year Electric Use vs. Cost graph shows the annual Electric Use in bar graph form as compared to Cost in line graph form.



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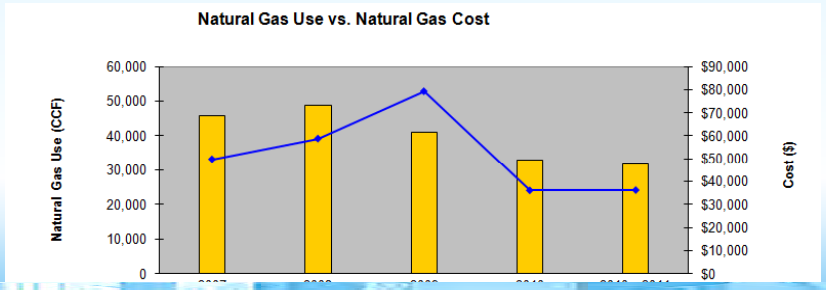
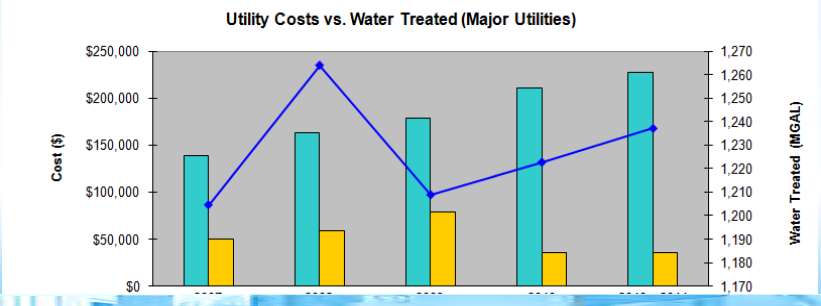
Summary Reports Tab: Energy Trends for Over the Last 5 Years

- **Natural Gas Use vs. Cost Graph**
  - The 5 Year Natural Gas Use vs. Cost graph shows the annual Natural Gas Use in bar graph form as compared to Cost in line graph form.



Summary Reports Tab: Energy Trends for Over the Last 5 Years

- **Utility Costs vs. Water Treated (Major Utilities) Graph**
  - The Utility Cost Summary graph shows annual trends in the Cost for your system in bar graph form and compares that to the amount of Water Treated in line graph form.



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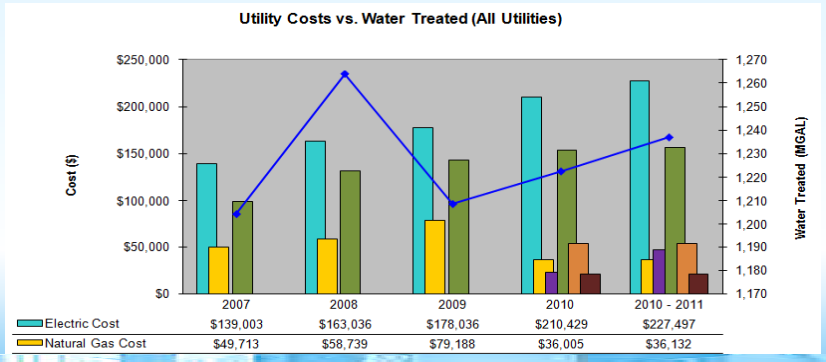
Summary Reports Tab: Energy Trends for Over the Last 5 Years

- Utility Cost Summary Graph
  - Utility Costs vs. Water Treated (All Utilities)



Demo

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Agenda

- Why is energy use at water and wastewater systems important?
- What are the steps in an energy use assessment?
- How can the Energy Use Assessment Tool be used?
- **What are next steps?**

Major Steps of Improving Efficiency

*Step 1: Establish a **BASELINE***

*Step 2: **IMPLEMENT** improvement projects*

*Step 3: **TRACK and EVALUATE** improvements*

*Step 4: Share your successes and **REPEAT***

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Next Steps: Opportunities for Improvement

1. **Prioritize further investigation of opportunities to reduce your energy use**
   - With energy evaluations the first goal is to find the "low hanging fruit." These are the changes to your operations or equipment that are cheap and/or quick to implement.
   - Look to make operational changes before capital changes.

Next Steps: Opportunities for Improvement

2. **Determine operational improvements to reduce energy use**
   - **Run time is a huge factor in the amount of energy and piece of equipment.**
     - Shut equipment down rather than leaving it idle.
     - Operate this equipment during non-peak electricity hours when the $/kWh is lower.
     - Stagger equipment startup and number or large pieces running simultaneously to avoid costly demand charges.

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Next Steps: Opportunities for Improvement

3. Determine equipment improvements to reduce energy use

- What technology is being used currently vs new alternatives that are available?
- Do we need new equipment or can we retrofit existing equipment?
- Compare current technology and equipment to alternatives that are higher efficiency (what is the opportunity cost?)

Next Steps: Opportunities for Improvement

Storage Pond and Storage Tank for Reclaimed Water

Credit: West Melbourne, FL

3. Determine equipment improvements to reduce energy use (cont.)

- Gather capital and operating/maintenance cost for new equipment and compare that to your existing operating costs.
- Actual results may not fully reach their manufacturer's claimed efficiencies.

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Next Steps: Opportunities for Improvement

3. Determine equipment improvements to reduce energy use (cont.)

- Replacing equipment that runs constantly will generally pay back faster than intermittently used equipment.
- Remember that you can have two identical pumps but different motors.
- Once high energy use equipment is identified, then the efficiency readings for that equipment should be analyzed.

Storage Pond and Storage Tank for Reclaimed Water
Credit: West Melbourne, FL

Next Steps: Opportunities for Improvement

3. Determine equipment improvements to reduce energy use (cont.)

- Can you turn an existing waste into profit, like digester gas being burnt in your boilers or a micro turbine?
- Are there any local or federal programs that will assist in funding capital improvements that increase energy efficiency?
- Are your buildings and outdoor equipment properly insulated?

Composite Water Tower
Credit: Chippewa Falls, WI

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Next Steps: Update the Tool & Seek Expertise

4. **Compare and contrast impacts (reductions or increases) of contemplated equipment upgrades or technology changes**

5. **Update the tables to confirm energy impacts (reductions or increases) as operational or equipment modifications or replacements are completed**

6. **Seek detailed engineering insight**

Overflow Valve
Credit: Chippewa Falls, WI

Next Steps: Tracking Trends & Upgrades

7. **Utilize the Summary Report to:**
   - Provide a focused snapshot of the past and current energy utilization at the plant each month.
   - Review trends to compare and contrast energy use and costs from month to month, season to season, and year to year.

8. **Track site energy information to confirm use and cost impacts from operational and equipment improvements**

Digester gas burn-off unit with sludge digester
Credit: Galion, OH

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Questions?

Contact us at:

EnergyUseTool@epa.gov

Download the Tool at:

http://water.epa.gov/infrastructure/sustain/energy_use.cfm

Like the Information in this Webinar?

Look for the *Energy Use Assessment pocket guide* coming out this summer!

http://water.epa.gov/infrastructure/sustain/energy_use.cfm

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Resources

Energy Use Assessment Tool User's Guide Appendices

- Calculations
- Unit Definitions and Conversions
- Acronyms and Abbreviations
- Troubleshooting Guide
- Cheat Sheet

Download the Tool and User's Guide at:
http://water.epa.gov/infrastructure/sustain/energy_use.cfm

Return Activated Sludge (RAS) Station and two associated Pad mounted Transformers (PMTs)

Credit: City of Lincoln, IL

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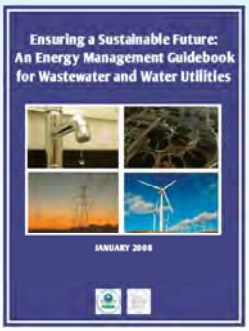
Managing to Maximize Energy Efficiency

Designed to help utilities:



- Systematically assess current energy costs and practices
- Set measurable performance improvement goals
- Monitor and measure progress over time

Uses a management system approach for energy conservation, based on the successful Plan-Do-Check-Act process [based on Environmental Management Systems (EMS)]

http://water.epa.gov/infrastructure/sustain/cut_energy.cfm

Resources: Getting Through an Energy Audit

- **Resource: EPA's EnergyStar Portfolio Manager** is a free, on-line tool public water systems can use to develop a simple energy baseline based on utility bill data and track changes in energy use and GHG emissions over time [www.energystar.gov/benchmark]
- **RESOURCE: Understanding Your Electric Bill** [http://water.epa.gov/infrastructure/sustain/upload/Understanding-Your-Electric-Bill.pdf]
- **RESOURCE: Electric Power Research Institute (EPRI) Energy Audit Manual for Water /Wastewater Facilities** [http://www.cee1.org/ind/mot-sys/ww/epri-audit.pdf]
- **RESOURCE: How to Hire an Energy Auditor** [http://www.energy.ca.gov/reports/efficiency_handbooks/400-00-001C.PDF]

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Resources: Energy Action Plans and RFPs

- **RESOURCE: EPA's Ensuring a Sustainable Future: Energy Management Guidebook for Wastewater and Water Utilities** provides guidance to utilities to develop an effective and lasting energy management program [http://www.epa.gov/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf]
- **RESOURCE: Consortium for Energy Efficiency RFP Guidance for Water-Wastewater Projects** provides recommendations and model language for solicitations for energy efficiency design services [http://www.cee1.org/ind/mot-sys/ww/rfp/index.php3]
- **RESOURCE: 5 Steps to Successful Energy Performance Contracting** [http://www.energyservicescoalition.org/resources/5steps.htm]

Resources: Best Practices

- **RESOURCE: Water and Wastewater Energy Best Practice Guidebook** [http://www.werf.org/AM/Template.cfm?Section=Home&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=10245]
- **RESOURCE: NYSERDA Water & Wastewater Energy Management Best Practices Handbook** [http://www.nyserda.org/programs/Environment/best_practice_handbook.pdf]
- **RESOURCE: SAVING WATER & ENERGY IN SMALL WATER SYSTEMS** is a training program with four 45-minute presentations and associated resource files specific to small public water systems concerning water conservation, water audit and leak detection, energy efficiency and the application of alternative energy sources [http://watercenter.montana.edu/training/savingwater/default.htm]

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Resources: A Closer Look at Pumps

- **RESOURCE: Pump System Assessment Tool (PSAT)** is a free, on-line tool developed by the U.S. Department of Energy that helps users assess energy savings opportunities in existing pumping systems. It relies on field measurements of flow rate, head, and motor power or current to perform the assessment [http://www1.eere.energy.gov/industry/bestpractices/software_psat.html]. Table 2 provides a framework for evaluating a water utility's pump system efficiency.
- **RESOURCE: Pump System Improvement Modeling Tool (PSIM)** is a free educational tool focused on helping you better understand the hydraulic behavior of pumping systems [http://www.pumpsystemsmatter.org/content_detail.aspx?id=110]
- **RESOURCE: Improving Pump System Performance: A Sourcebook for Industry** [http://www1.eere.energy.gov/industry/bestpractices/pdfs/pump.pdf]

115

Resources: A Closer Look at Motors

- **RESOURCE: DOE factsheet Determining Electric Motor Load and Efficiency** [http://www1.eere.energy.gov/industry/bestpractices/pdfs/10097517.pdf]
- **RESOURCE: CEE Motor Systems Initiative Tool Kit** [http://www.cee1.org/ind/mot-sys/mot-sys-tools.php3]
- **RESOURCE: U.S. DOE Motor Challenges Program** provides downloadable books, tips, and fact sheets on technical and economic topics related to motors [http://www1.eere.energy.gov/industry/bestpractices/techpubs_motors.html]
- **RESOURCE: Consortium for Energy Efficiency Motors and Motor Systems Industrial Program** provides technical material, links, and fact sheets under its [http://www.cee1.org/ind/mot-sys/mtr-ms-main.php3]

116

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Resources: Water Efficiency

- **RESOURCE: U.S. EPA WaterSense** is a program that sets criteria for labeling water efficient products and promoting water conservation to customers. It also allows water systems to become partners to promote WaterSense and water efficiency. Benefits to being a partner include gaining access to templates and other WaterSense-developed materials [http://www.epa.gov/watersense]
- **RESOURCE: American Water Works Association's (AWWA) Water Audit Software** is a free, on-line tool for water systems that want to conduct a standard water audit that can be downloaded on AWWA's website [http://www.awwa.org/Resources/WaterLossControl.cfm?ItemNumber=48511&navItemNumber=48158]

Resources: Green Energy

- **RESOURCE: U.S. EPA Green Power Partnerships** [http://www.epa.gov/greenpower]
- **RESOURCE: U.S. DOE Energy Efficiency and Renewable Energy Clearinghouse** [http://www.eere.energy.gov]
- **RESOURCE: SAVING WATER & ENERGY IN SMALL WATER SYSTEMS** is a training program with four 45-minute presentations and associated resource files specific to small public water systems concerning water conservation, water audit and leak detection, energy efficiency and the application of alternative energy sources. [http://watercenter.montana.edu/training/savingwater/default.htm]

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Resources: Funding

- **RESOURCE: DWSRF Green Project Reserve Guidance** [http://www.epa.state.il.us/water/financial-assistance/publications/green-project-reserve-guidance.pdf]
- **RESOURCE: DWSRF Contacts by State** [http://www.epa.gov/ogwdw/dwsrf/nims/dwagency2.pdf]
- **RESOURCE: Database of State Incentives for Renewables & Efficiency (DSIRE)** is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency [http://www.dsireusa.org/]
- **RESOURCE: Federal Energy Management Program (FEMP)** provides information on energy efficiency and renewable energy incentives, state-by-state [http://www1.eere.energy.gov/femp/financing/energyincentiveprograms.html]

Resources: Funding

- **RESOURCE: U.S. Department of Energy**
  - **Save Energy Now Program** is an initiative to reduce industrial energy intensity. Companies can participate in no-cost energy assessments. [http://www1.eere.energy.gov/industry/saveenergynow/assessments.html]
  - **Energy Efficiency and Conservation Block Grant Program** (EECBG) [http://www.eecbg.energy.gov/]
- **RESOURCE: U.S. Department of Agriculture (USDA)**
  - **Rural Energy for America Program Grants/Energy Audit and Renewable Energy Development Assist (REAP/EA/REDA)** provides grants for energy audits and renewable energy development assistance. [http://www.rurdev.usda.gov/rbs/busp/REAPEA.htm]
  - **Rural Development through the Rural Energy for America Program Guaranteed Loan Program (REAP LOAN)** provides financing for energy improvement projects [http://www.rurdev.usda.gov/rbs/busp/9006loan.htm]
- **RESOURCE: U.S. Department of Health and Human Services - Rural Assistance Center (RAC)** offers funding to help rural communities, including funds for energy audits and renewable energy [http://www.raconline.org/funding/]