Energy Efficiency for Water Utilities: A Key to Sustainability

The Path Forward

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Significance

- Electric use for moving and treating water and wastewater in the US
  - 25-30% of total plant O&M Cost
  - Consumption and costs expected to continue to rise
  - **Usually the biggest consumers of energy in communities**
- Current use of energy for wastewater treatment results in significant GHG emissions.
- Basic improvements in energy efficiency can show significant results (equipment, lighting, pumps)
- Several plants are becoming/approaching energy self sufficiency (net zero energy use)
  - Many plants in the US (Sheboygan, WI; East Bay MUD, CA, several others)
  - Internationally (Many plants - WERF Study: Strass WWTP, Austria)

Elements of Energy Self-Sufficiency

- Management motivation to implement energy efficiency initiatives—efficiency first!
- Integrated into utility's overall vision and plan
- Empowerment of staff
- Buy in from local officials (Communicate!)
- Tolerance for risk
- Audit & energy management plan
- Process optimization & operator education
- Measurable goals (linked to vision and plan)
- **High level of automation and process analysis tools**
- **Flexible and efficient designs**
- **ECMs**
- **Anaerobic digestion &:**
  - **Combined Heat & Power**
  - **pre-treatment**
  - **Co-digestion**
- **Enhanced primary sedimentation**
- **Nutrient recovery and side stream flow equalization or treatment**
- **Thermal biosolids processes**
- **Solar**
- **Wind**

Where to Start

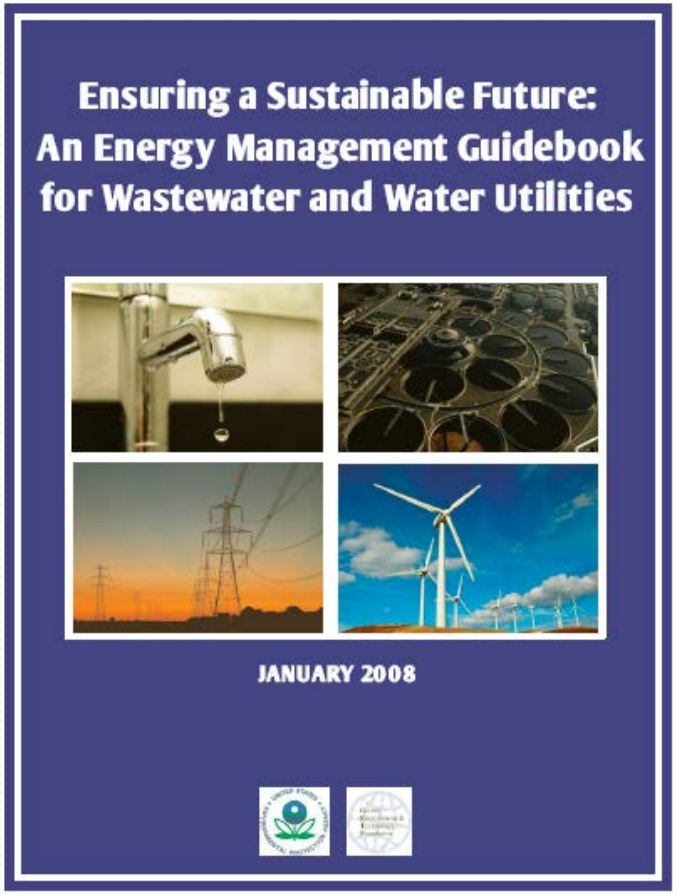
1. **Create energy team and assess energy consumption**
   - Examine and analyze bills
   - Plot energy consumption and demand for each process (recommend meters for each unit process)
   - Develop consumption baselines and compare to similar facilities, where feasible

2. **Assess energy savings opportunities (DO AN AUDIT!)**
   - Evaluate process energy consumption and operational procedures
   - Evaluate operation of each significant piece of equipment
     - Can it be turned off or run efficiently at lower capacity?
     - Are new pieces of equipment much more efficient?

3. **Develop and implement energy conservation plan starting with "low hanging fruit" projects**

4. **Contract specifications for energy efficient equipment**
5. **Measure progress, get some success under your belt, and keep moving!**

Managing to Maximize Energy Efficiency

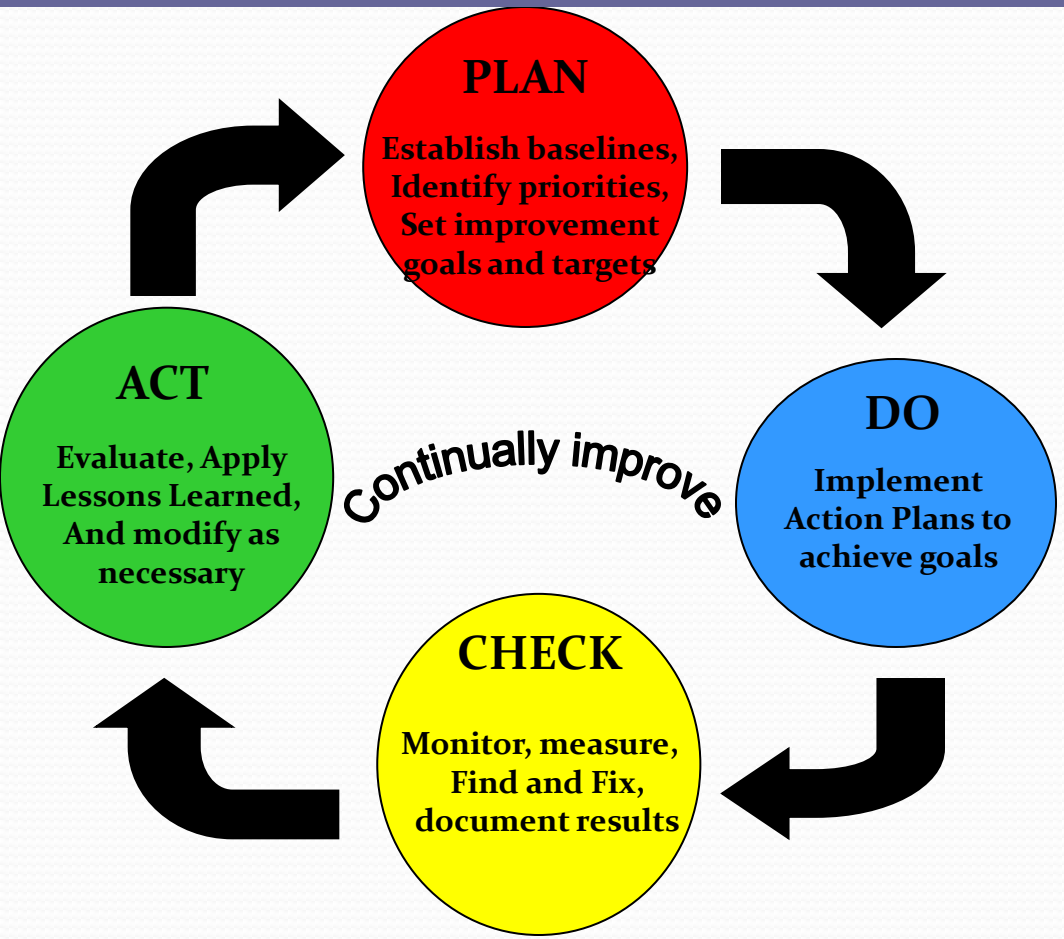


Designed to help utilities:

- 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)

The Plan-Do-Check-Act Approach

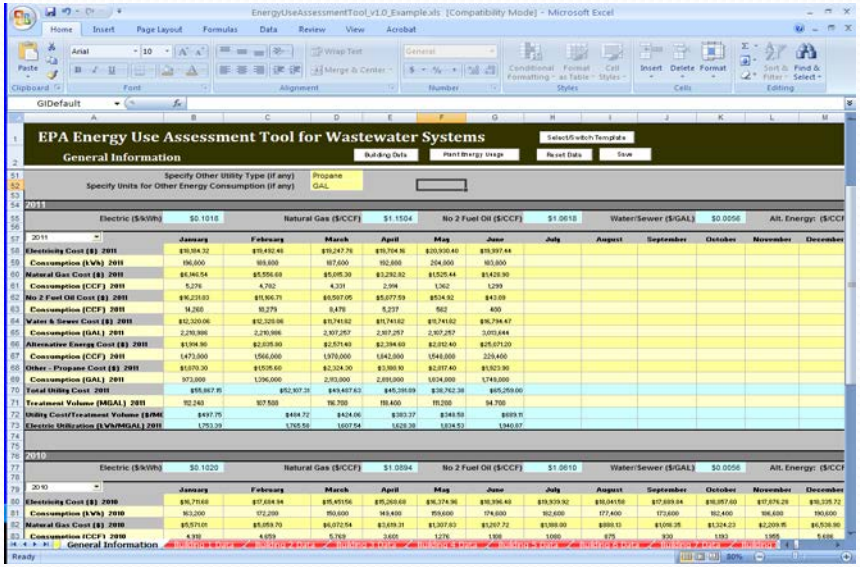


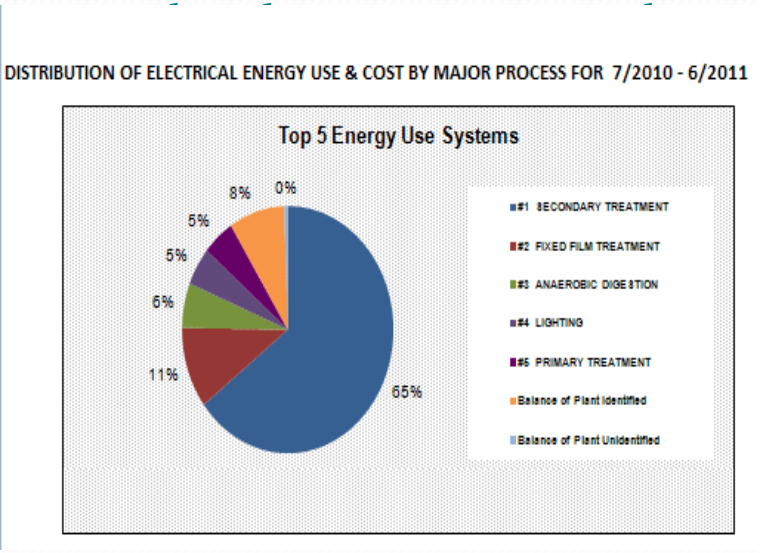
- Allows utilities to systematically assess energy usage and opportunities for efficiency
- Doesn't give you the answer—helps you get to the right answer!
- Used extensively by EPA Regions and others through workshops and training

Energy Use Assessment Tool

What is the Energy Use Assessment Tool?

- 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





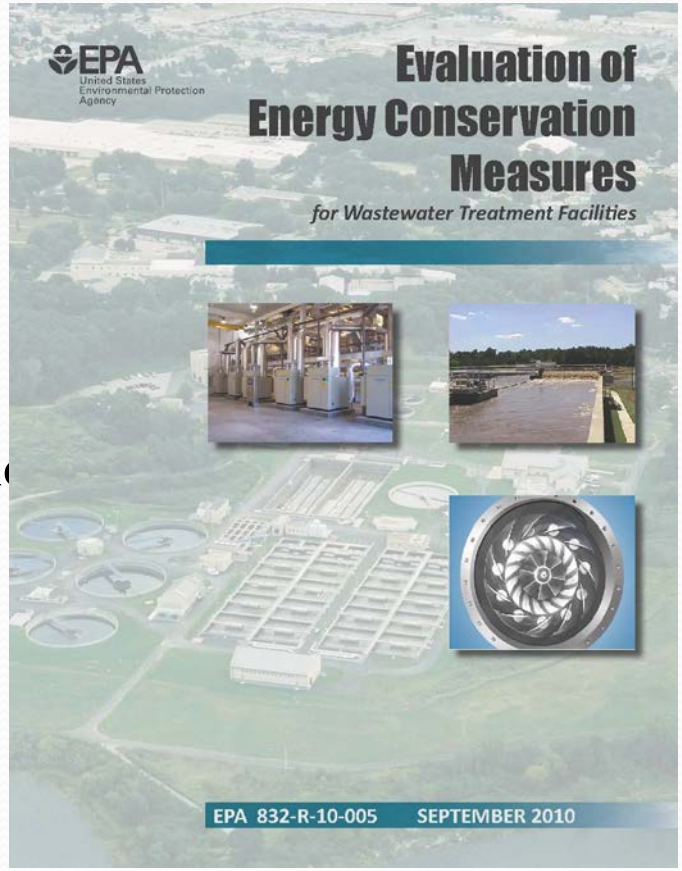
What does the tool provide?

- Drills down to equipment level
- Printable summary report
  - Presentation of energy consumption & costs (broad to detail)
  - Graphs energy use over time
  - Highlights areas of energy efficiency

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

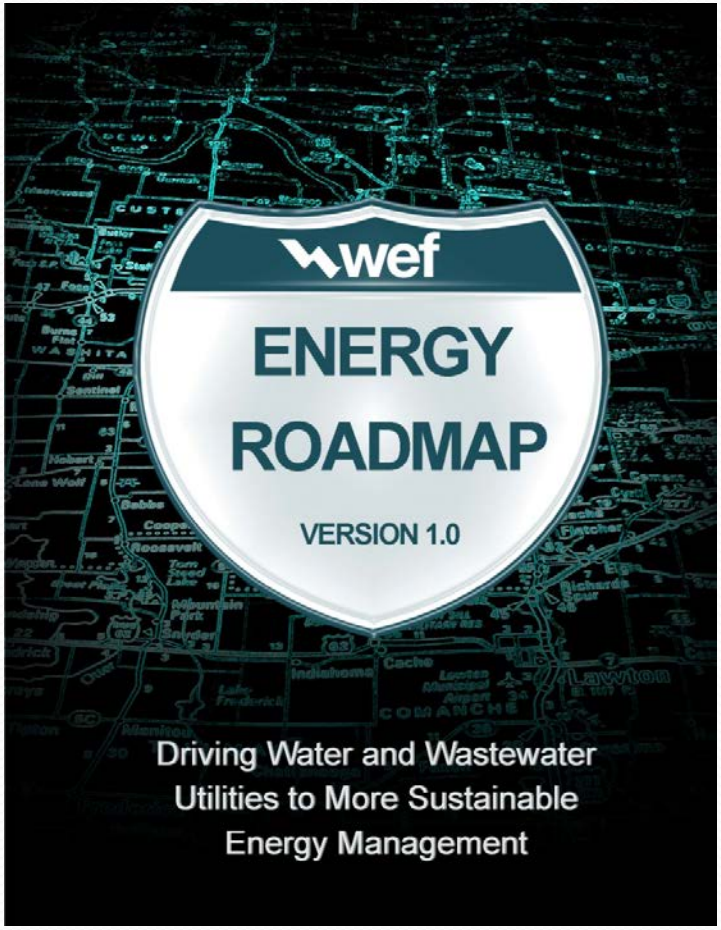
Energy Conservation Measures at Wastewater Facilities

- Main audience: Utility managers and POTW owners and operators.
- Targeted performance, cost, and savings/benefits information .
- Focus on innovative energy efficient *equipment replacements* and *operational modification* projects that result in energy savings with reasonable pay back periods.
- Nine detailed case studies.
- References info.



ECM Category	ECM Description
Mechanical Aeration	Adjustable submergence impeller mechanical aerator
	Dual impeller mechanical aerator
Aeration Control Systems	**Integrated DO and air flow aeration control**
	Automated SRT/DO Control
Blower and Diffuser Technology	**High speed turbo blowers**
	Single-stage centrifugal blowers with inlet guide vanes and variable diffuser vanes
	Ultra-fine bubble diffusers
Solids Processing	**Vertical linear motion mixer**
	Multiple hearth furnace upgrade incorporating combustion air pre-heating and waste heat recovery
	Solar drying
ECMs for Selected Treatment Processes	Low-pressure, high intensity lamps for UV disinfection
	Automated channel routing for UV disinfection
	Membrane air scour for MBRs
	Hyperbolic mixers
	Pulsed air mixing of anoxic and anaerobic zones
	BNR process automation

Industry Leadership on Energy Efficiency



Take Away Messages for Communities

- Energy efficient water utilities are critical to a community's long-term sustainability
- Probably your biggest opportunity to save energy
- A great way for you to have a major impact on GHGs/Climate
- Lots of tools to help you take on this challenge
- Do it systematically—don't jump on the next "neat project"
- **DO AN AUDIT AND MOVE FORWARD FROM THERE!**

THANKS!

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MATERIALS AVAILABLE AT:

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