



Energy Audits For Rural Water And Wastewater Systems

Neil Worthen, CEA

Why Are We Doing This?

- 4% of electricity in the U.S. is consumed by water and wastewater facilities
- U.S. energy costs are predicted to increase ***20% by 2025***
- \$4 billion current annual energy costs
- 56 billion kWh
- 44.8 million tons of greenhouse gas

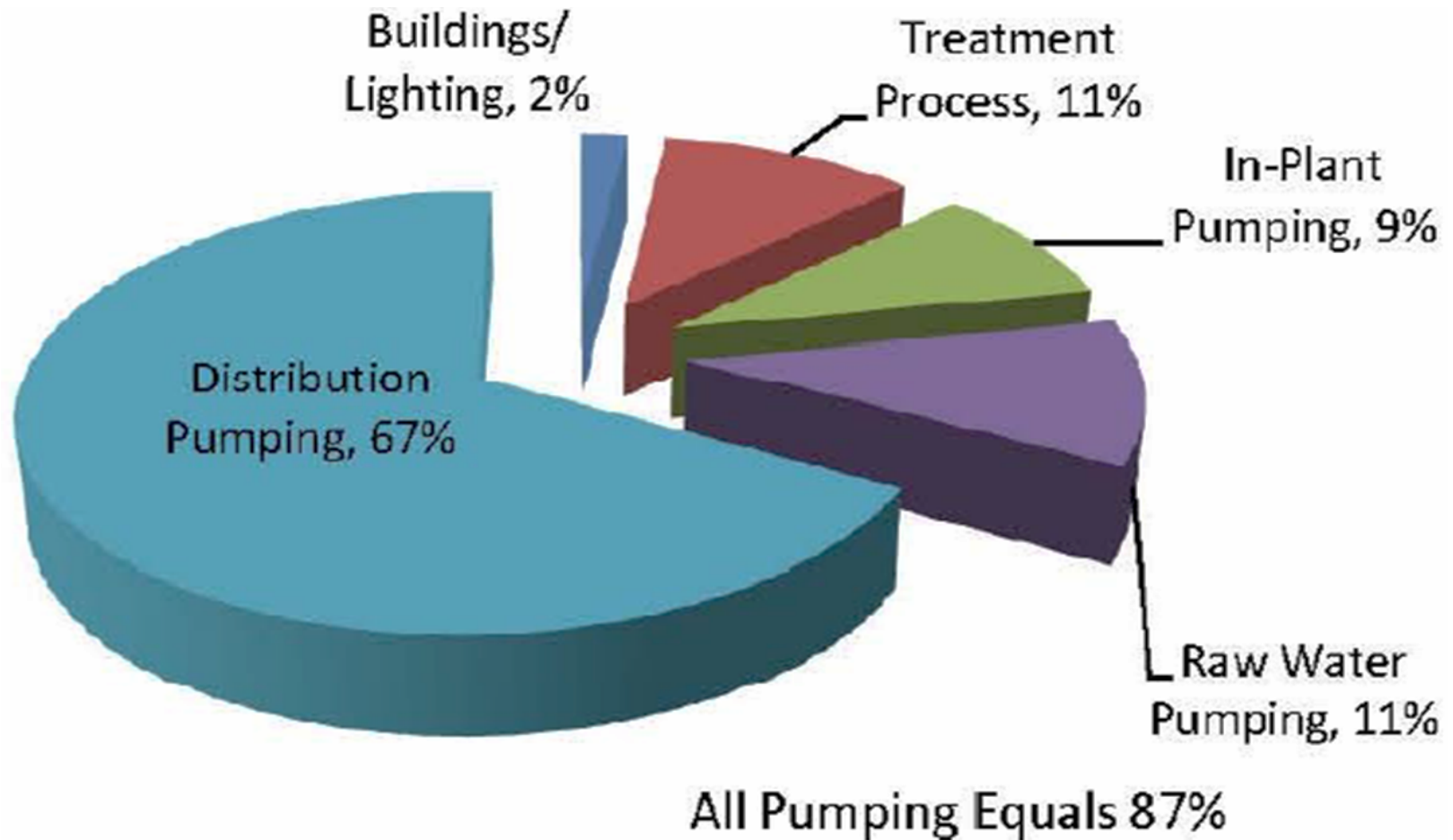


Why Does This Matter?

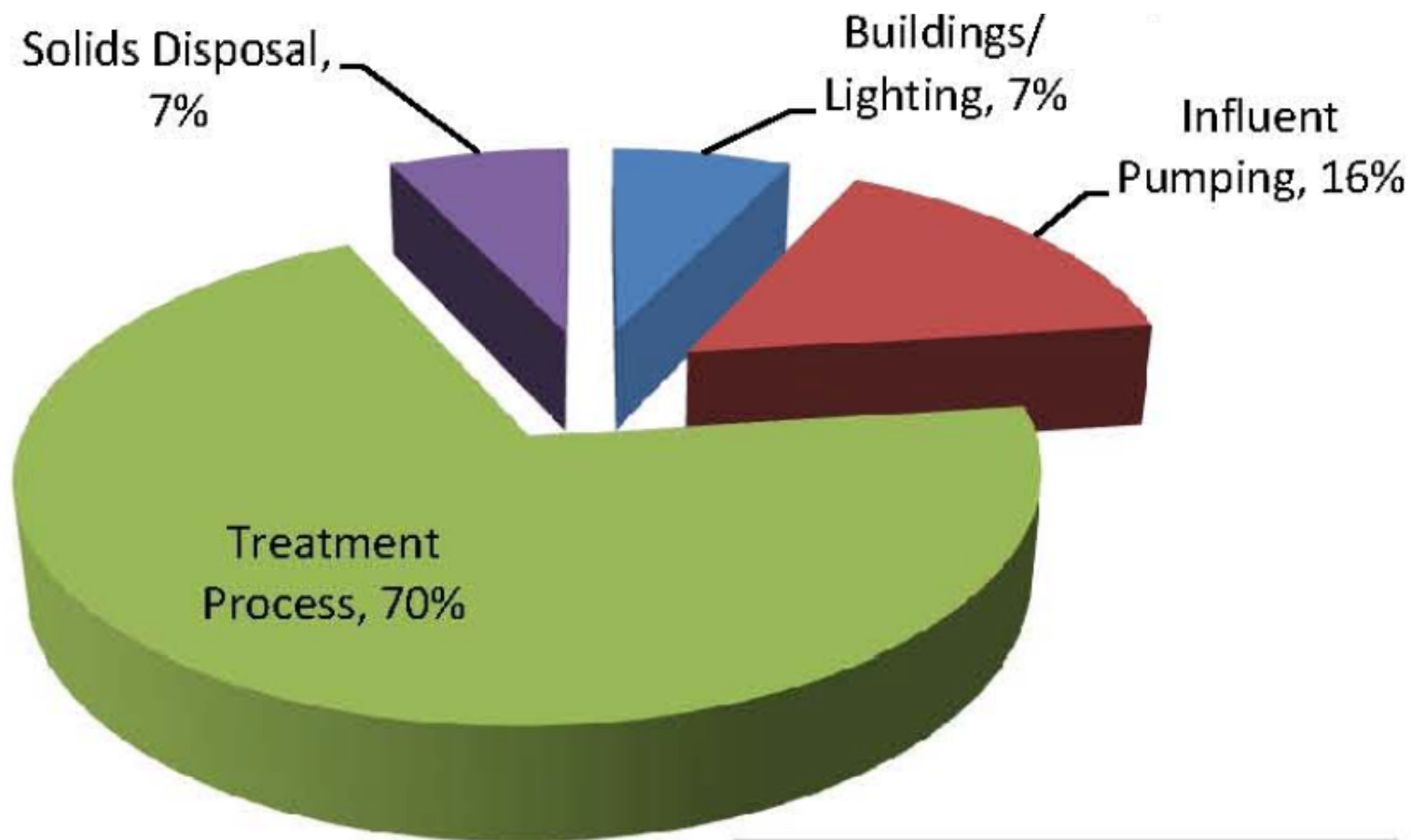
- Older facilities typically designed for peak capacity, not for efficiency
- Community demographics change
- Energy costs often consume 30% to 60% of a small/rural community budget
- 10% reduction in water and wastewater energy use could save \$400 million and 5 billion kWh annually



Typical Energy Costs To Operate a Water System



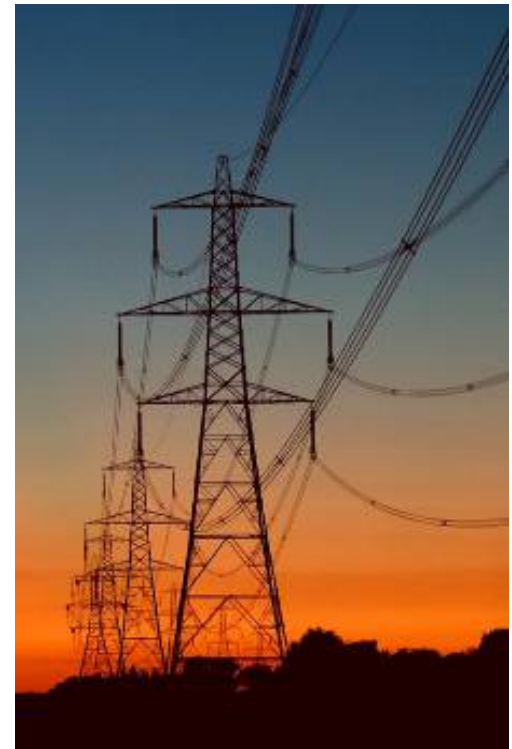
Typical Energy Costs To Operate a Wastewater System



All Pumping Equals 86%

What is Energy Efficiency?

- The process of doing **more** with **less**
- Accomplish the same tasks and functions as before, while using less energy
- Without compromising:
 - Quality
 - Safety
 - Regulatory compliance
 - Comfort



What Is An Energy Audit?

- An ***analysis*** of the energy usage for a facility or operation
- Identification of ***why***, ***how***, and ***how much*** energy is being used
- Identification of possible energy conservation opportunities (ECO's)
- Examination of billing statements and analysis of the equipment and processes

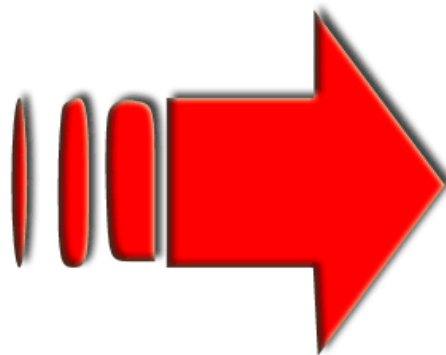
Who Can Perform An Energy Audit?

- ‘Certified’ auditors
 - AEE (Association of Energy Engineers)
 - CEA / CEM / others
- Architects
- Engineers
- “Technically proficient” persons

Benefits Of An Energy Audit

Rural
communities
keep more of....

THESE!



Benefits Of An Energy Audit

- Benchmarking
 - Key performance indicators
 - Identifying trends
- Budget planning
- Knowledge of the system
 - Water loss / leaks / waste, etc
- Error reduction
 - Billing, payments, meters



What The Auditor Does

- Understand the billing
 - Structure (classification, tariff, etc.)
 - Quantities (kW, kWh, kvar, power factor, etc.)
- Understand the facility
 - Processes
 - Flows
 - Equipment
 - Goals



Key Performance Indicators

- Determine Cursory Benchmarks:
 - Service Population
 - MG/Yr
 - Cost (\$)/kWh
 - kWh/MG
 - Cost (\$)/MG
 - Compare to similar facilities
 - Compare to similar regions



The Tools We Use

- USEPA Energy Use Assessment Tool 2.0
- US DOE tools
 - PSAT – Pumping Systems Assessment Tool
 - Motormaster 4.0
- In-house excel spreadsheets



The Ideal Energy Audit Candidate

- Less than 10,000 population
- 20+ year-old facilities and equipment
- No significant upgrades in the last 20 years
- High energy costs (\$ per kW/h)



The RCAC Energy Audit Process

1. TAPs identify potential candidates
 - Distribute brochures
 - “Pitch” the program and benefits
2. Community contacts RCAC expressing interest
3. Facility survey (questionnaire) sent
4. Data from questionnaire used to prepare simple benchmarking report (no cost)
5. If ECOs are identified – RCAC sends proposal and cost estimate for full Level 2 audit

The RCAC Energy Audit Process

- Typical cost - **\$10,000 - \$16,000**, depending on:
- Travel
- Size / type of facility
- Number of structures
- Buy-in from community
 - Facility operator(s)
 - Decision makers
- Necessity of return trip for presentation / explanation

RCAP Energy Audits – All U.S.



RCAP Energy Audits - Ohio



Alexandria, OH WWTP
 Belmont Co., OH WTP
 Belmont Co., OH WWTP
 Buckeye Water WTP
 Cadiz, OH WTP
 Cadiz, OH WWTP
 Carrollton, OH WTP
 Coshocton, OH WWTP
 Dillonvale, OH WTP
 HCWSD Piedmont, OH WTP
 HCWSD Tippecanoe, OH WWTP
 Rutland, OH WWTP
 Salineville, OH WWTP
 Tiltonsville, OH WTP
 Albany, OH (Le-Ax) WTP
 Bethesda, OH WWTP
 Holmesville, OH WWTP
 Piketon, OH WTP
 Piketon, OH WWTP
 Pleasant City, OH
 Racine, OH WTP
 Rio Grande, OH WWTP
 Rock Creek, OH
 Stockport, OH WWTP
 Tiltonsville, OH WWTP
 Trimble, OH (SCVWD) WTP
 Wellsville, OH WWTP
 West Farmington, OH



Summary of RCAC's Energy Audit Program

October 2016

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Bisbee AZ WWTP (2012)

Population	5633
Pre-audit annual energy cost	\$103,701
Average cost of energy per kW/h	\$0.093
Estimated annual energy savings from retrofits	\$6,948 (7.2%)
Estimated cost of implementing retrofits	\$41,345
Simple payback (years)	5.95

Tombstone AZ WWTP (2012)

Population	1380
Pre-audit annual energy cost	\$17,126
Average cost of energy per kW/h	\$0.104
Estimated annual energy savings from retrofits	\$1,562 (9.1%)
Estimated cost of implementing retrofits	\$3,710
Simple payback (years)	2.38

North Tahoe PUD (2012)

Population	9700
Pre-audit annual energy cost	\$195,976
Average cost of energy per kW/h	\$0.126
Estimated annual energy savings from retrofits	\$32,507 (16.6%)
Estimated cost of implementing retrofits	\$71,000
Simple payback (years)	2.2

Kunia Village HI Water & Wastewater System (2013)

Population	431
Pre-audit annual energy cost	\$656,838
Average cost of energy per kW/h	\$0.297
Estimated annual energy savings from retrofits	\$102,121 (15.5%)
Estimated cost of implementing retrofits	\$154,840
Simple payback (years)	1.52

City of Chowchilla WWTP (2016)

Population	18,720
Pre-audit annual energy cost	\$130,130
Average cost of energy per kW/h	\$0.134
Estimated annual energy savings from retrofits	\$28,665 (14.4%)
Estimated cost of implementing retrofits	\$42,529
Simple payback (years)	1.48

Hana HI Water Systems (2015)

Population	460 (est.)
Pre-audit annual energy cost	\$73,455
Average cost of energy per kW/h	\$0.403
Estimated annual energy savings from retrofits	\$4152 (5.99%)
Estimated cost of implementing retrofits	\$6500
Simple payback (years)	1.57

Cuyama CSD WWTP (2016)

Population	550
Pre-audit annual energy cost	\$14,829
Average cost of energy per kW/h	\$0.157
Estimated annual energy savings from retrofits	(too variable to calculate)
Estimated cost of implementing retrofits	\$4500
Simple payback (years)	(too variable to calculate)

Questions / Discussion?



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