Logistics

At the top right corner of your screen:

Show your control panel to submit questions and see answers

All phones/microphones are muted for the duration of the webinar.

Toggle between full screen/window screen view

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Attendee List

Audio: please choose between speakers and telephone. If you do not hear audio right now, please check your speaker volume or enter #[audio pin]# if using phone.

Submit questions in the Questions box at any time, and press [Send]. To undock and increase the size of the box, click on top right corner icon.

WEBINAR: Energy Management Planning for Small Water Systems and the NYSERDA Model

Tuesday, December 2, 2014

http://efcnetwork.org

http://efc.unc.edu

UNC

ENVIRONMENTAL FINANCE CENTER

Speakers for Today's Webinar

- Mark Decker, New York State Energy Research and Development Authority
- Silvia Marpicati, ARCADIS of New York, Inc.
- Fred Royal, Town of Pittsboro, North Carolina
- Adam Pickett, Town of Pittsboro, North Carolina
- David Tucker, Environmental Finance Center at the University of North Carolina, Chapel Hill
- Lisa Ruggero, Environmental Finance Center at Syracuse University

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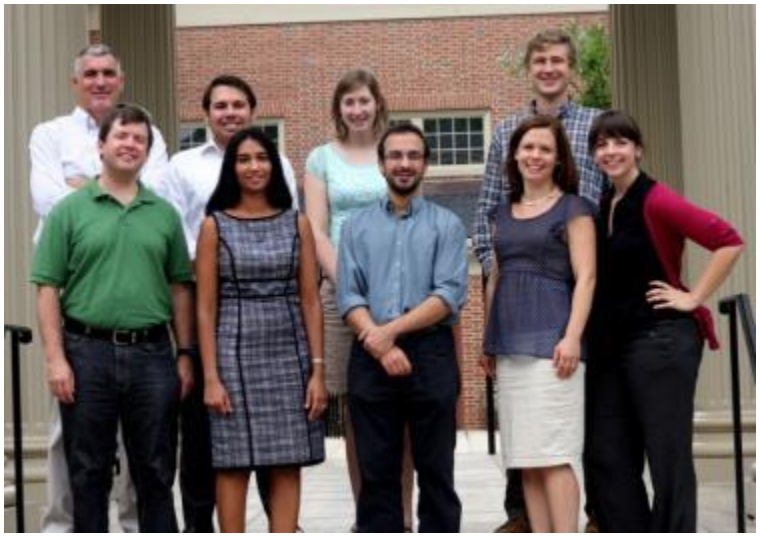

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Dedicated to enhancing the ability of governments and other organizations to provide environmental programs and services in fair, effective, and financially sustainable ways through:

- Applied Research
- Teaching and Outreach
- Program Design and Evaluation

How you pay for it matters

Smart Management for Small Water Systems

***under a Cooperative Agreement with the US EPA**

- The EFCN will provide training and technical assistance to small public water systems in all fifty states and five territories to help local water systems achieve and maintain compliance with the Safe Drinking Water Act.
- Workshops and trainings will be provided in these areas:
  - Asset Management
  - Water Loss Reduction
  - Water System Collaboration
  - Fiscal Planning and Rate Setting
  - Energy Management
  - Funding Coordination, and
  - Managerial and Financial Leadership

http://efcnetwork.org

Energy Management Webinar Series

- Webinar series designed to introduce small water systems to important aspects of energy management planning work:
  - Webinar 2: Establishing a Baseline of Energy Usage (2015)
  - Webinar 3: Energy Management Project Ideas and Prioritization Methods (2015)
  - Webinar 4: Special Financing Models for Energy Management Projects (2015)

Affordability Webinar 12/9/14

- WEBINAR: Customer Affordability Considerations in Water Rate Setting
- 1:00–3:00 PM EST, Tuesday, December 9, 2014
- Led by Stacey Berahzer, Senior Project Director, UNC Environmental Finance Center
- http://efcnetwork.org/webinar-customer-affordability-considerations-in-water-rate-setting/

Webinar 1: Agenda

Topic
Welcome and Logistics *David Tucker and Lisa Ruggero*
Energy Management Success Story from the Town of Pittsboro, North Carolina *Fred Royal and Adam Pickett*
Introduction to Energy Management Planning for Small Water Systems and the NYSERDA Best Practices Handbook *Mark Decker and Silvia Marpicati*
Question & Answer Session and Wrap-Up

Polling Question 1

What kind of drinking water utility do you represent? *(choose one)*

- For-Profit Water Utility
- Local Government (Municipal or County)
- Not-for-Profit / Cooperative / Association
- Other H2O Util. (Authority, District, School, Hotel, etc.)
- Not a Drinking Water Utility

Polling Question 2

What size drinking water system does your utility operate (by number of people served)? *(choose one)*

- Very Small (500 or fewer people served)
- Small (501 to 3,300 people served)
- Medium (3,301 to 10,000 people served)
- Large or Very Large (10,001 or more people served)
- Not a Drinking Water Utility

Polling Question 3

What energy management topic(s) are you most concerned about? *(choose all that apply)*

- Creating an energy management plan
- Assembling green team/energy team at my utility/community
- Energy audit, create energy use baseline, results tracking
- Identifying and prioritizing energy management projects
- Identifying funding options for energy management projects

Energy Management Success Story: Town of Pittsboro, N.C.

Water Treatment Plant Energy Assessment

PITTSBORO, NORTH CAROLINA 1787

North Carolina Energy Office energync.net ENERGY

Waste Reduction Partners

Town of Pittsboro, NC

Town Facts

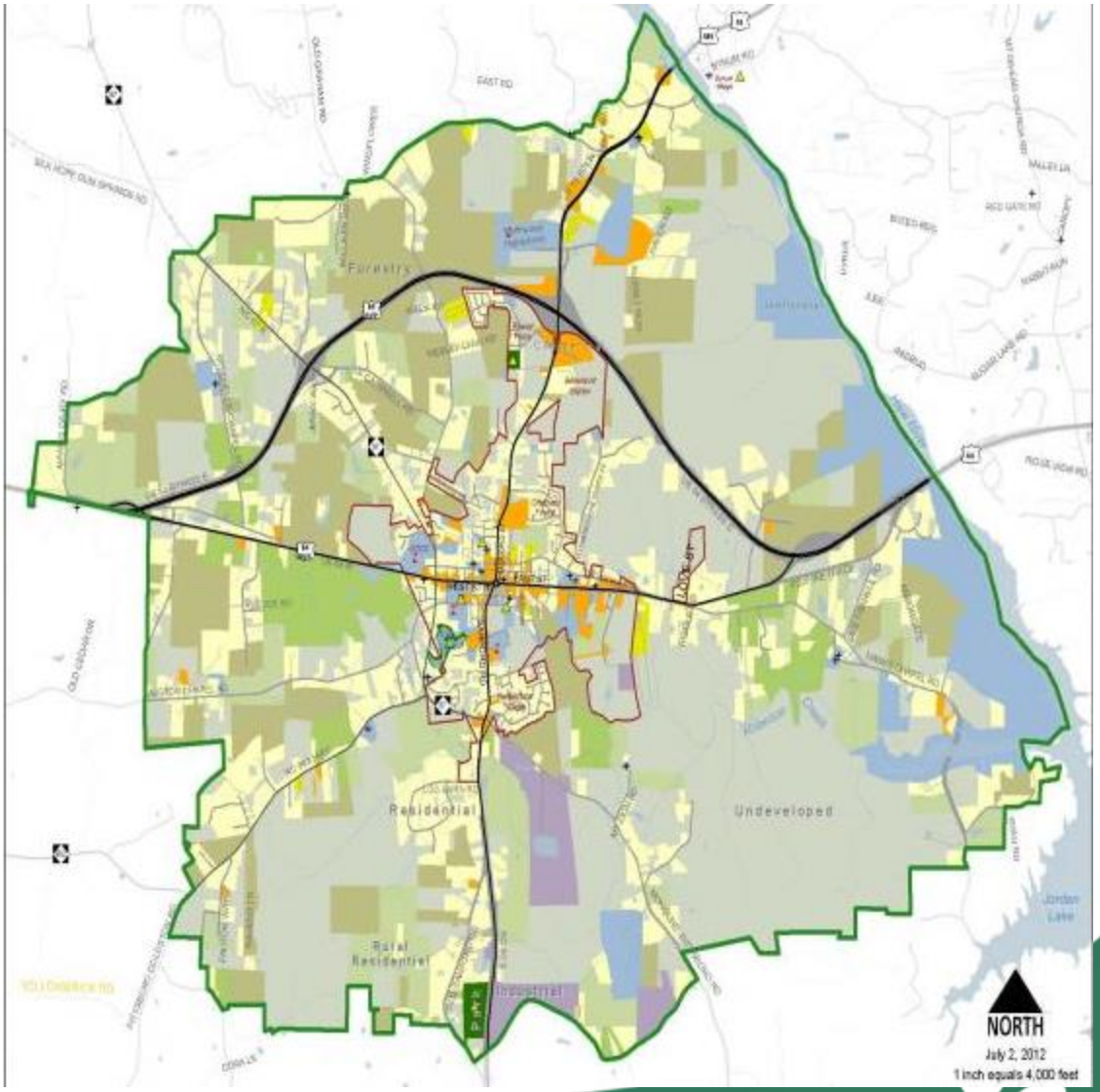
-Population: ~4,200

-Average Daily Finished Water Treated: 700,000 gallons

-Current Events: Chatham Park Development – 7,700 acres in ETJ

-Estimated population projection: 60,000 by 2045

-Infill development activity has increased significantly.

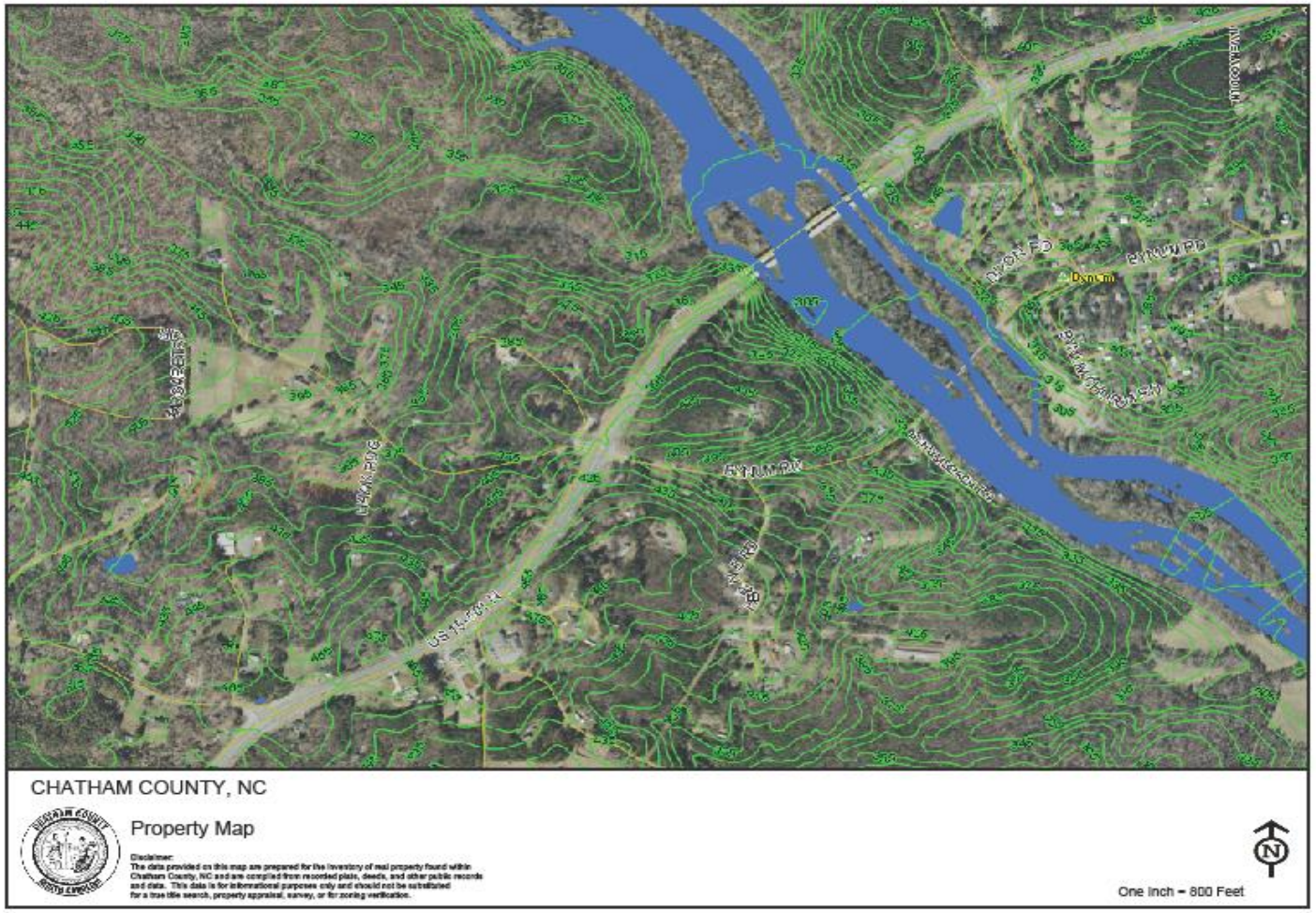


Assessment Purpose and Intent

...to convey information and guidance for identifying opportunities and options for organizational improvements, energy reduction and cost savings…

Chatham County

Highest Energy demand: Pumping 0.50 mile horizontal and 150 feet in elevation from source



Summary of Energy Benchmarks

With an annual production of 203 million gallons (MG) and usage of 567,100 kWh – this yields a metric of 2,790 kWh/MG.

Nationally, this score is in about the **75th percentile**. This means that 75% of the benchmark facilities would use less energy per million gallons than the Pittsboro facility.

Location	Kilowatt Hours	Cost	Million Btu
Intake pumps	206,700	$19,329	705.3
Plant	360,400	$31,657	1,229.7
Total	**567,100**	**$50,986**	**1,935.0**

Electricity Requirements for Surface Water Treatment Plants (*Burton, 1996*)

If intake pump usage is factored out, the benchmark drops to 1775 kWh/MG which puts it at about the 45th percentile.

Item/Plant Production	1 MGD	5 MGD	10 MGD	20 MGD	50 MGD	100 MGD
Raw Water Pumping	121	602	1205	2410	6027	12055
Rapid Mixing	41	176	308	616	1540	3080
Flocculation	10	51	90	181	452	904
Sedimentation	14	44	88	175	438	876
Alum Feed System	9	10	10	20	40	80
Polymer Feed System	47	47	47	47	47	47
Lime Feed System	9	11	12	13	15	16
Filter Surface Wash Pumps	8	40	77	153	383	767
Backwash Water Pumps	13	62	123	246	657	1288
Treated Water Pumping	1205	6027	12055	24110	60273	120548
Chlorination	2	2	2	2	4	8
Residuals Pumping	4	20	40	80	200	400
Thickened Solids Pumping	N/A	N/A	N/A	123	308	616
Total (kWh/day)	1483	7092	14057	28176	70384	140685

Today, Pittsboro is using 1553 kWh/day, including the energy for the building…so middle of the daily use range.

Pittsboro WTP has a Class D rating

This study can be found at http://www.ecw.org/sites/default/files/222-1.pdf

More recent studies suggest that the benchmark values are being lowered as water facilities implement many of the energy saving measures that will be described later.

Table ES.1

Comparison of median values between classes.

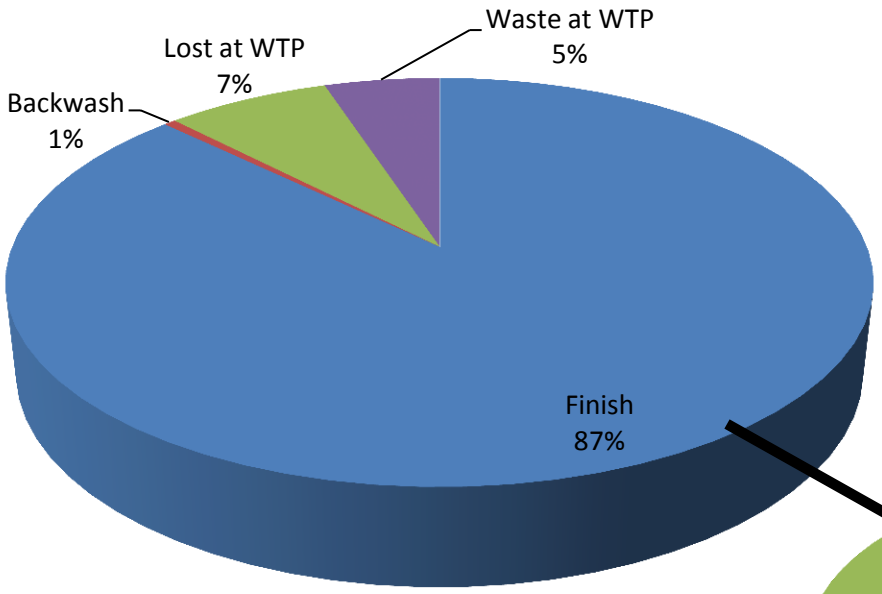
Utility Class	Number of Customers	Energy Use (kWh/1000 gal)	Energy Expenditures ($/1000 gal)	Energy Expenditures ($/kWh)	% Water Loss
AB	> 4,000	1.51	0.053	0.084	9.6
C	1,000 – 4,000	1.85	0.065	0.113	11.7
D	< 1,000	1.89	0.075	0.151	12.6

Table ES.2

Comparison of interquartile ranges between classes.

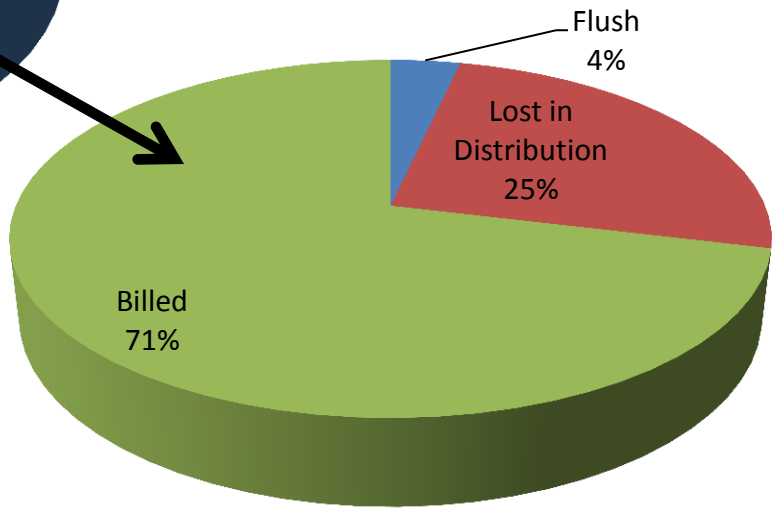
Utility Class	Number of Customers	Energy Use (kWh/1000 gal)	Energy Expenditures ($/1000 gal)	Energy Expenditures ($/kWh)	% Water Loss
AB	> 4,000	1.16 – 2.03	0.060 – 0.116	0.046 – 0.064	6.4 – 13.7
C	1,000 – 4,000	1.36 – 2.36	0.086 – 0.155	0.057 – 0.075	7.4 – 17.6
D	< 1,000	1.37 – 2.78	0.109 – 0.210	0.066 – 0.089	7.4 – 20.4

Town of Pittsboro Water



Raw Water = 212 Million Gallons

Finish Backwash Lost at WTP Waste at WTP

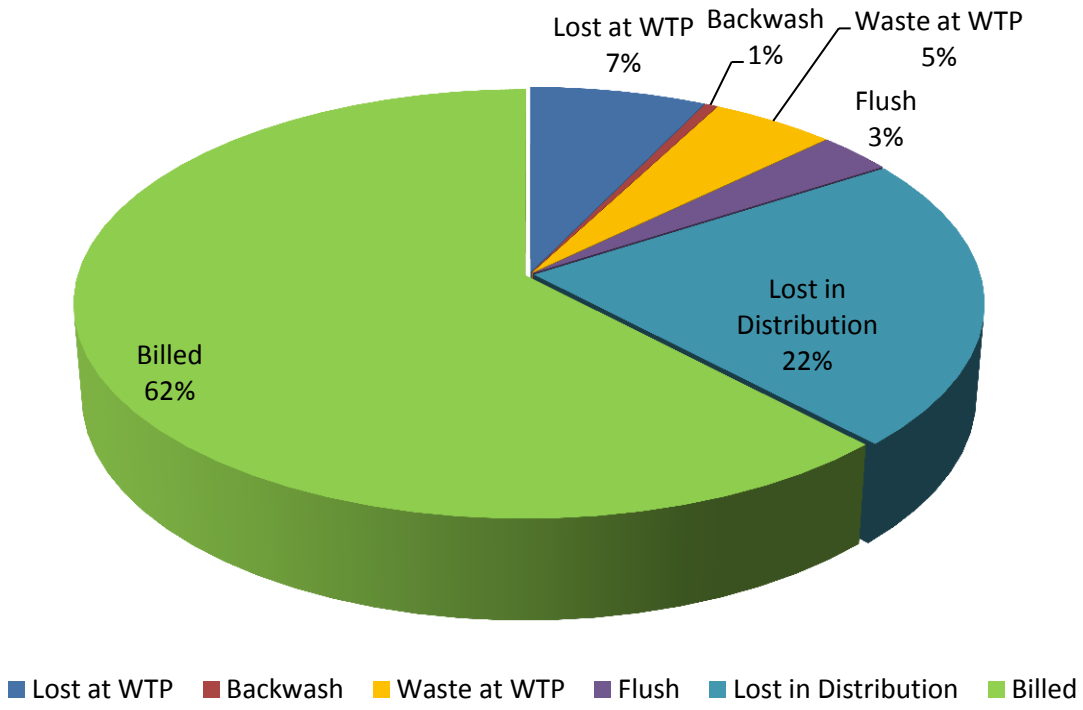


Finished Water = 185 Million Gallons

Flush Lost in Distribution Billed

22% lost in distribution

212 Million Gallons input from Haw River yields 185 Million Gallons treated water



Energy Benchmarks

Summary of Energy Benchmarks	
Total Energy Consumed:	1,935 Million Btu / yr
Total Energy Index:	671 kBtu / sq ft / yr
Total Energy Cost:	50,986 $ / yr
Total Energy Cost Index:	17.70 $ / sq ft / yr

Summary of Recommendations

Energy Efficiency Recommendations	Cost Savings/ yr.	Investment Cost	Payback Period (yr)	mmBtu Saved
Investigate additional load shifting from peak to non-peak hours	TBD	TBD		
Replace existing T12 fluorescent fixtures with T8	$506	$1490	2.9	19.6
Replace existing incandescent Exit Signs with LED	$34	$90	2.7	1.3
Reduce temperature setting on water heater from 135 to 120 degrees F	$30	$0	Immediate	1.2
Consider upgrading insulation in the building	TBD	TBD		
Consider window replacements	TBD	TBD		
Install partition to separate inside water “pool”	$550	$1000	1.8	21.7
Install air source heat pumps to replace resistance heaters and window air conditioners	TBD (>$1160)	$10,000	<9	
Setup plant in Portfolio Manager to understand benchmarks and monthly operations	TBD	TBD		
Utilize Motor Master to inventory motors and determine best operating conditions	TBD	TBD		
Further evaluate intake and distribution pump operating ranges	TBD	TBD		
Totals	$2,280			43.8

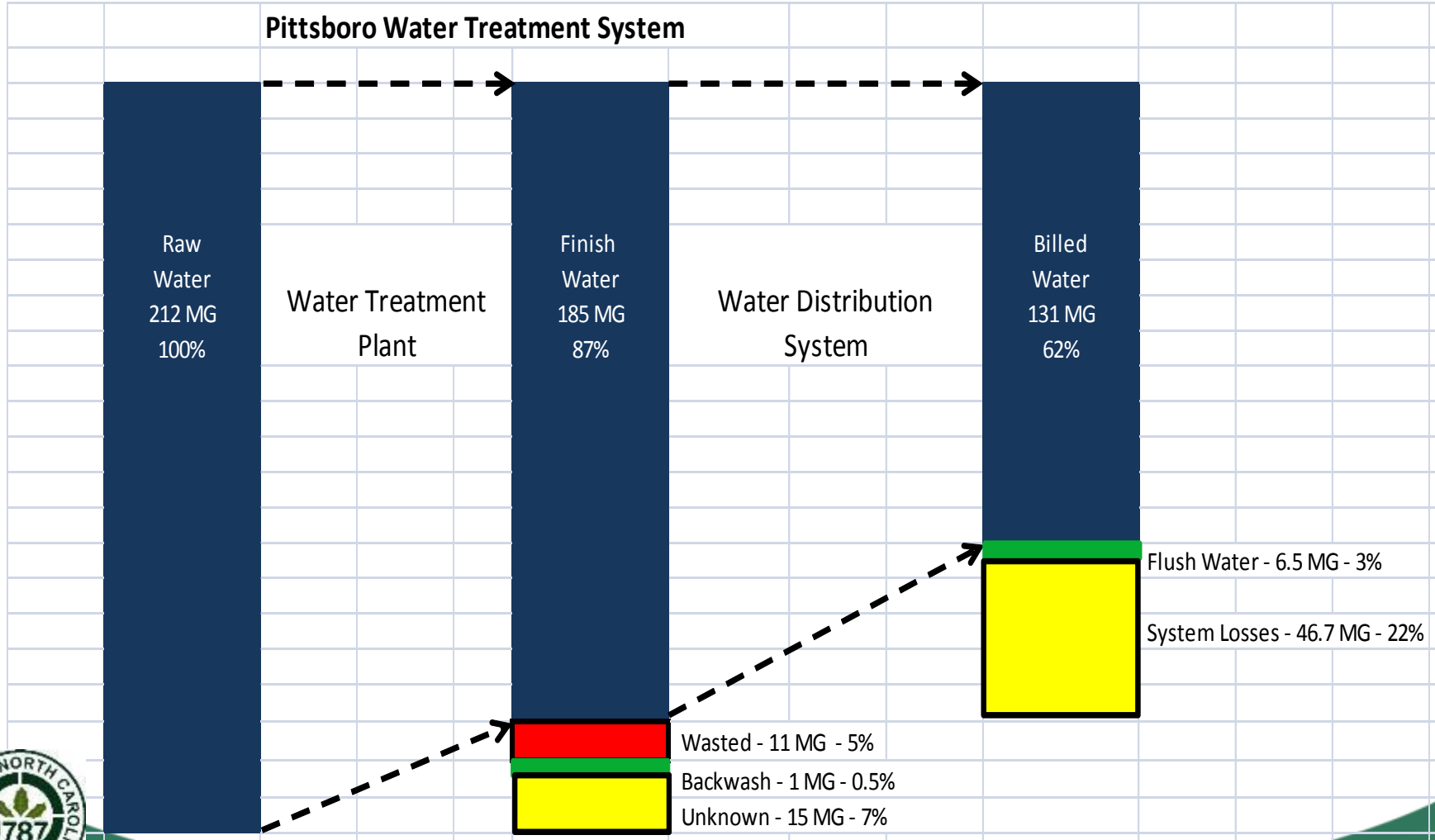
Basic Energy Savings Options

Load Shifting: Pumping time of use changes from on-peak (*$7.58 per kW)* to off-peak (*$1.56 per kW)* hours. *(Requires more staff time. Cost analysis is required*.**)**

Lighting: Change out T-12 light fixtures to T-8.

Other opportunities: Insulation, HVAC, more efficient pumps, windows.

Non-Revenue Water



Key Assessment Outcomes

- Identified energy consumption per MG
- Identified simple energy reduction methods
- Confirmed non-revenue water losses

For every 100 gallons pumped from the river, only 62 gallons are billed. The losses represent the opportunities to reduce waste, increase revenues and improve water availability.

Haw River Dam 2013, by Fred Royal

Acknowledgments

Special thanks to Waste Reduction Partners!

Waste Reduction Partners

www.wastereductionpartners.org

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NYSERDA Water & Wastewater Energy Management Best Practices Handbook: Presentation by ARCADIS and NYSERDA on 7-Step System

Small Water Systems Energy Efficiency and Management

Silvia Marpicati, PE, BCEE, CEM - ARCADIS

Mark J. Decker, PMP, CEM - NYSERDA

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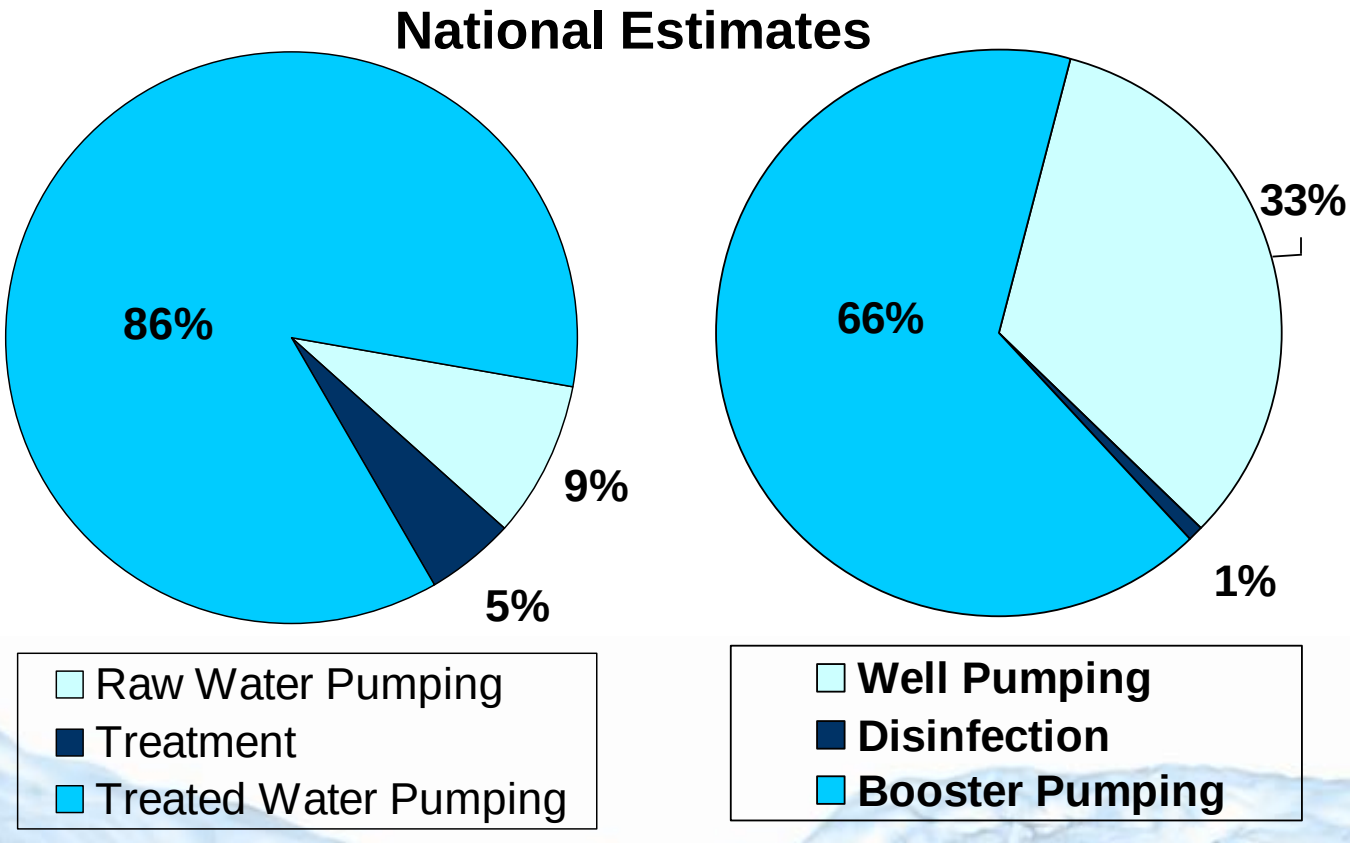
Presentation Outline

- Overview of Energy Use in Water Sector
- Steps to Energy Management Program
- NYSERDA Water & Wastewater Energy Management Best Practices Handbook
- Other Tools

The Water Treatment Process
Relative Energy Use



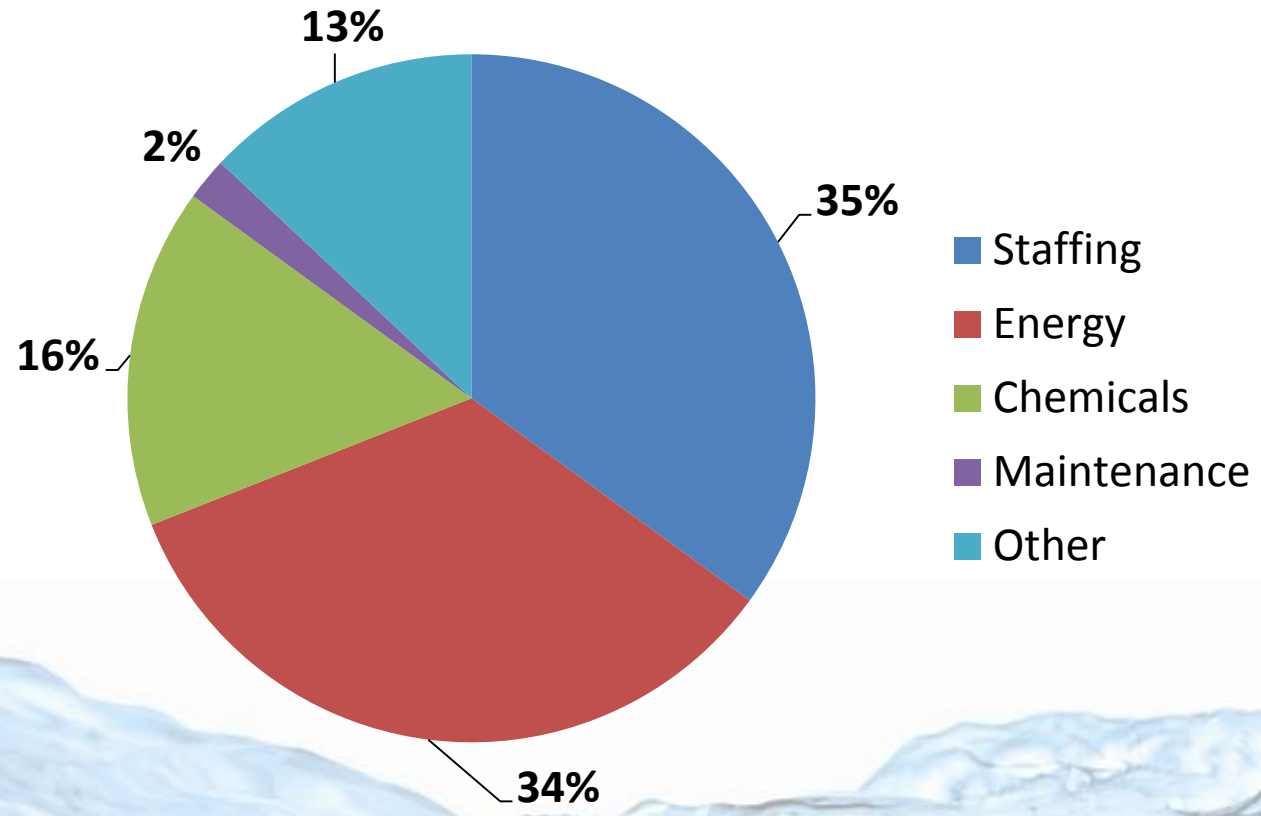
Surface Water

Groundwater

Source: Adapted from Burton 1996

How Significant is Energy Use?

Typical Water Utility O&M Costs



Source: Jones, Ted. "Municipal Water/Wastewater Breakout Session." CEE. 18 January 2007.

Implementing an Effective Energy Management Program

1. Establish Organizational Commitment
2. Develop a Baseline of Energy Use
3. Evaluate the System and Collect Data
4. Identify Energy Efficiency Opportunities
5. Prioritize Opportunities for Implementation
6. Develop an Implementation Plan
7. Provide for Progress Tracking and Reporting

Energy Audit

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1.

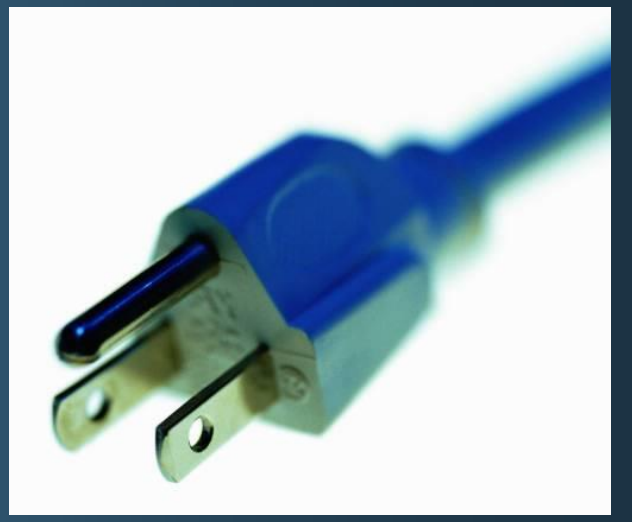
Organizational Commitment: The Energy Team

- Decision Makers
- Operations
- Engineering
- Business Management

2. Develop Baseline of Energy Use

The Electric Bill

How and where is energy used?



How are you charged for energy use?

Energy Terms & Concepts

Non-Residential electricity is generally billed as:

- **Consumption Charge** based on electricity use ($/kWh)
- **Demand Charge** typically based on peak 15-minute demand during each month ($/KW)

Both may be estimated
or actual measurements

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ABC Energy Provider

Account 000934561
March 20 – April 19. 2008

Meter Reading	Consumption	Demand
Apr 19 (Actual)	20500	56.2
Mar 20 (Actual)	10100	42.9
Difference/Peak	10400	56.2
Billed Usage	10400	56.2

Charges	
Delivery 10400 kWh @ $0.0175	$182.00
Supply 10400 kWh @ $0.105	$1092.00
Demand 56.2 kW @ $16.65	$935.73
SBC/RPS Charge 10400 kWh @$0.0025	$26.00
Total ABC Electricity Charges	**$2,235.73**

Notes: SBC is Systems Benefit Charge
RPS is Renewable Portfolio Standard

Demand charges can represent over 40% of the total bill

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2. Develop Baseline of Energy Use (cont.)

- Develop an equipment inventory
- An equipment inventory should be organized by process and include:
  - nameplate horsepower
  - hours of operation per year
  - field measured power
  - kilowatt hours per year

3. Evaluate the System and Collect Data

- Collect Data and Understand Why You're Collecting Data
- The evaluation should answer three questions:
  - How much energy is being used?
  - Where is the energy being used?
  - When is the energy being used?

3. Evaluate the System and Collect Data (cont.)

Establish Benchmarks to assess your performance:

- Internal Benchmarking
  - Energy use trends at a facility
  - Submetering, kWh/MG, etc.
- External Benchmarking
  - Comparison of system and component demands to baseline energy use and energy use of similar facilities

3. Evaluate the System and Collect Data (cont.)

Tracking Performance with Operation and Process Trends

Useful Metrics:

- Energy use based upon system flow
  - Energy used per million gallons treated (kWh/MG)
- Peak energy use based upon pumping requirements
  - Energy used per million gallons pumped (kW/MG)
- Energy use based upon contaminant removal

4.

Identify Energy Efficiency Opportunities

Reducing Energy Consumption/ Improving Energy Efficiency

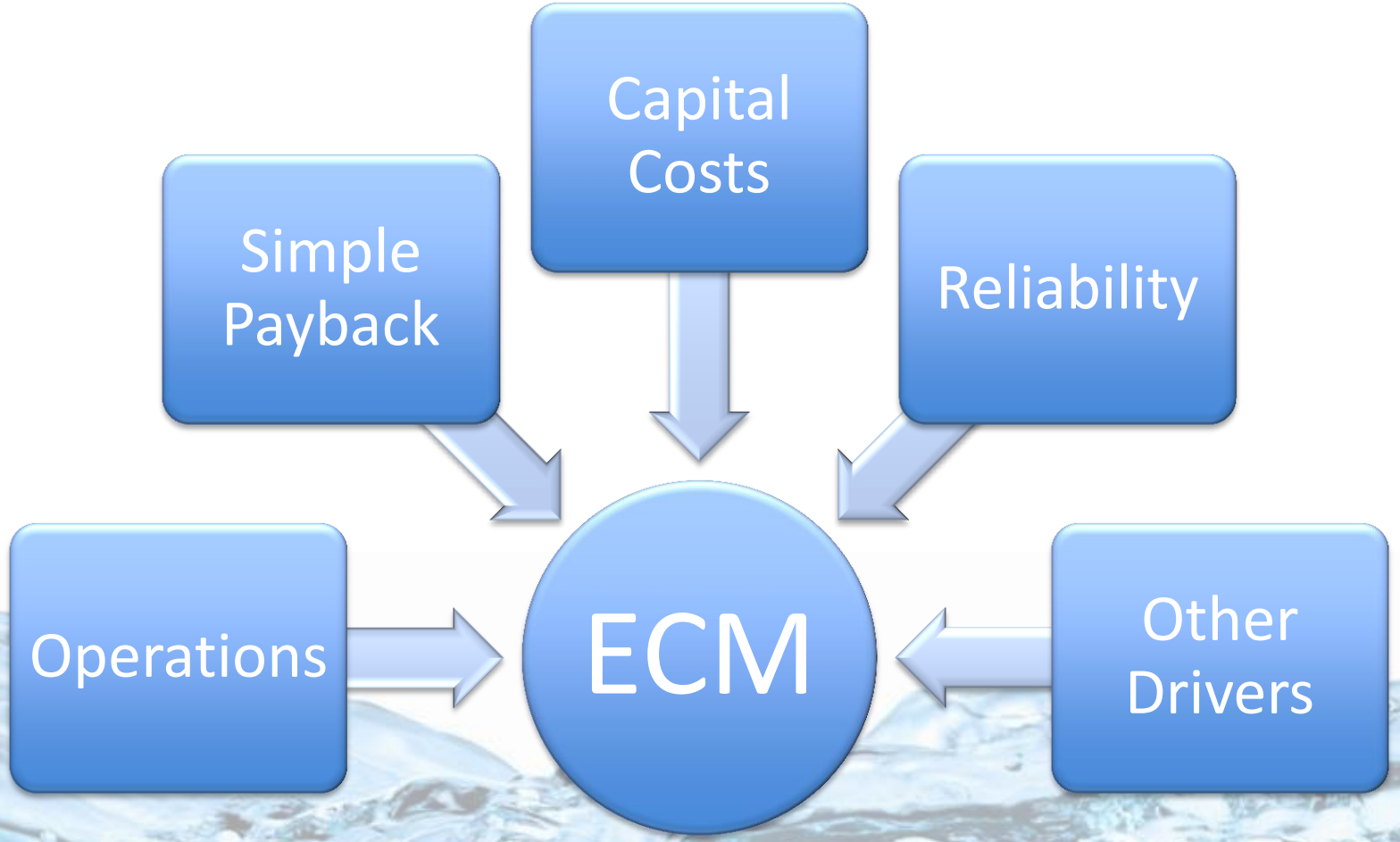
- Building operations
  - lighting upgrades
  - HVAC upgrades
- System Operations
  - equipment upgrades
  - process upgrades
  - equipment prioritization & optimization
  - automate process monitoring & operational control

4. Identify Energy Efficiency Opportunities (cont.)

- Identify savings potential by benchmarking against others:
  - Overall opportunity assessed based on plant-wide energy use
  - Focus areas prioritized based on portion of the "Energy Use Pie" and unit process benchmarking:
    - Demand reduction – focus on largest, intermittently operating motors and processes
    - Consumption reduction – focus on largest, continuous operating motors and processes – don't overlook multiple small motors/equipment of the same type
  - Evaluate what affects motor load and runtime and consider modifications with the greatest overall effect

5.

Prioritize Opportunities for Implementation



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6. Develop an Implementation Plan

- Establish a timeline
- Understand the requirements of funding and rebate programs
- Be aware of operational changes associated with equipment and process upgrades and changes in user base. Train operators accordingly
- Communicate with management and stakeholders
- Develop an education & outreach plan

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7.

Provide for Progress Tracking and Reporting

- Calculate energy and cost savings
- Compare actual savings to anticipated savings
- If anticipated savings exceed actual savings, re-evaluate and fine-tune implemented measures
- Monitor finished water to ensure quality standards are upheld
- Communicate success!

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Tools: NYSERDA Water & Wastewater Energy Management Best Practices Handbook

Available for download at:

http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Commercial-and-Industrial/Sectors/Municipal-Water-and-Wastewater/MWWT-Tools-and-Materials.aspx

Other NYSERDA Tools: Checklist, Benchmarking, Payback Analysis

Best Practices in One-page Format:

- General
- Water
- Wastewater
- Buildings

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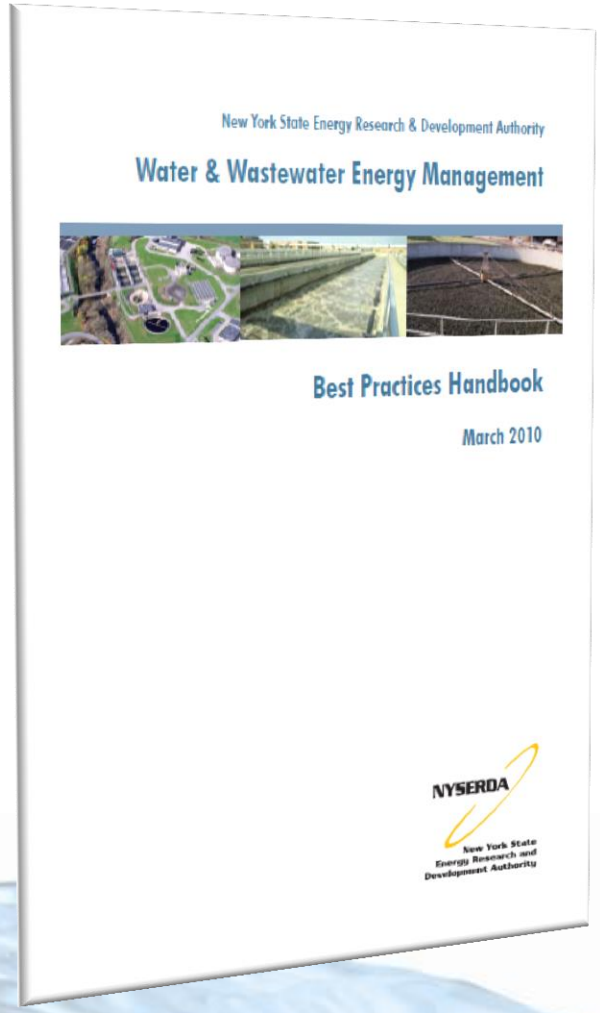

- Each BP contains:
  - Best Practice
  - Primary Area/Process
  - Productivity Impact
  - Economic Benefit
  - Energy Savings
  - Applications & Limitations
  - Practical Notes
  - Other Benefits
  - Stage of Acceptance

Other Resources

- U.S. EPA Portfolio Manager
- WEF Energy Roadmap (2013)
- WEF MOP 32 (2009)
- U.S. EPA - Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities (2008)

Thanks!

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Polling Question 4 and Evaluation Survey Link

Would you like to subscribe to the UNC Environmental Finance Center blog? *(choose one)*

- Yes
- No

Thank You

Please let us know if you have any questions!

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