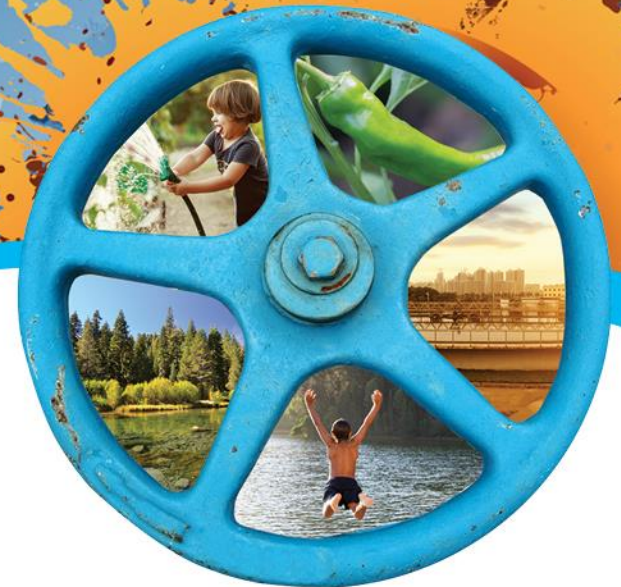




# ACE<sup>15</sup>

ANNUAL CONFERENCE & EXPOSITION

Co-hosted by



## Combining Efficiency Funding Sources to Maximize Benefit

**Pat Davis, Sustainability Manager**

Orange Water and Sewer Authority

*June 9, 2015*



# Outline



- **OWASA 101**
- **Historical Context for Energy Management**
- **Game Changers**
- **Enhancing Our Game Plan**
- **A Big Win – With Important Financial Help**
- **Going Forward...**



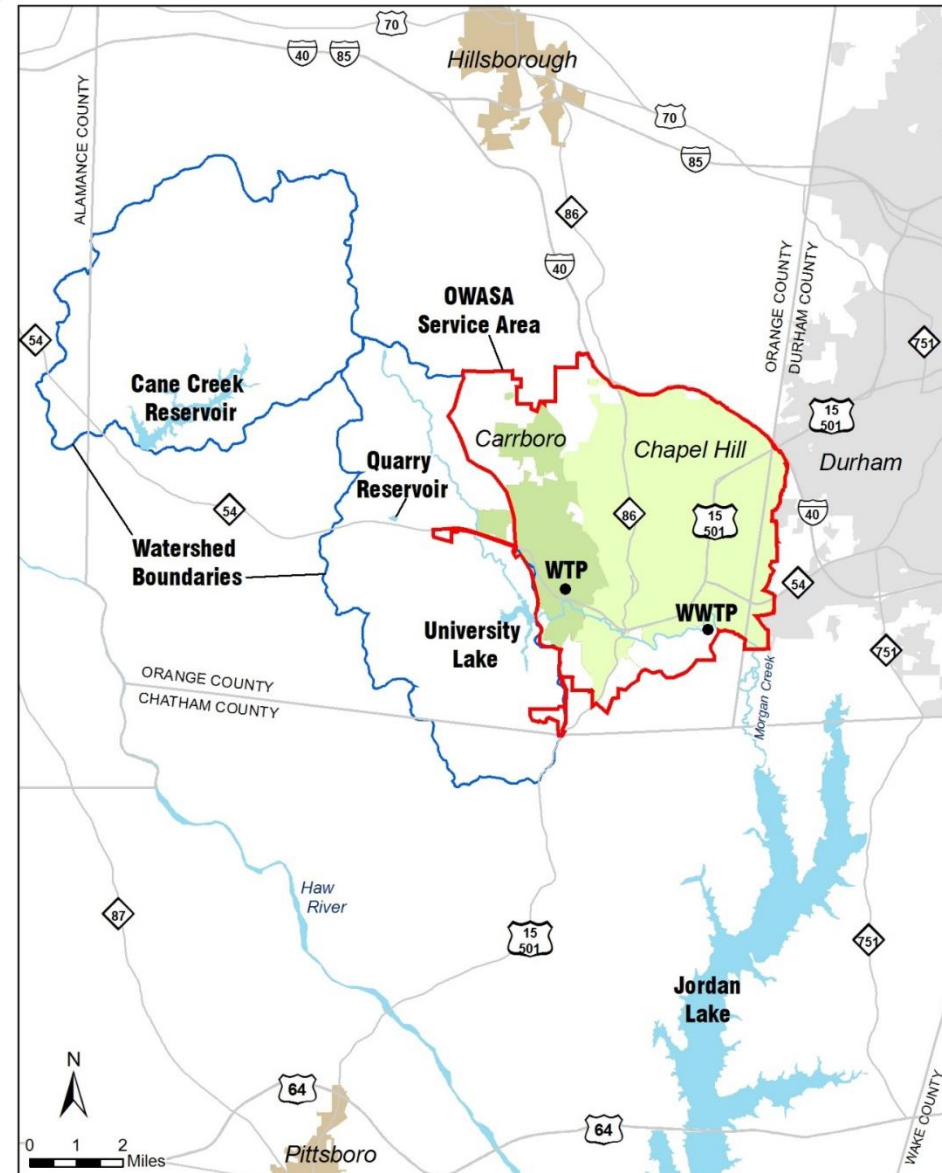
*A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill Community.*



H  
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b  
Insert Logo or type your company name (max size 2" W by .75" H)

# About OWASA

- Began operations in 1977
- To consolidate local water and sewer utility operations
- 83,000 people
- 21,300 accounts
- UNC ~22% of sales
- 20 MGD Water Treatment Plant
- 14.5 MGD Wastewater Treatment Plant
- 3 MGD Reclaimed Water System



# A Challenging Start



- **Inherited deficient water supply** – public calls for growth moratorium
- **WWTP out of compliance** – moratorium on new connections
- **No capital or financing plan**
- **A growing service area**
- **Cheap and plentiful energy**

# Meeting the Challenges



- **Built new reservoir**
- **Improved and expanded WWTP, WTP**
- **Developed a 15-year CIP and 5-year financial plan**
- ***Assumed historical growth trends would continue***

# Game Changers



- **Extreme Storm Events**
  - **Hurricane Fran** (*power lost to most our major facilities for several days*)
  - **Severe Ice Storm**
  - **Hurricane Katrina** (*were within one day of losing diesel fuel supply*)
- **Record Droughts**
  - **2001-02; 2007-08**

# More Emerging Issues



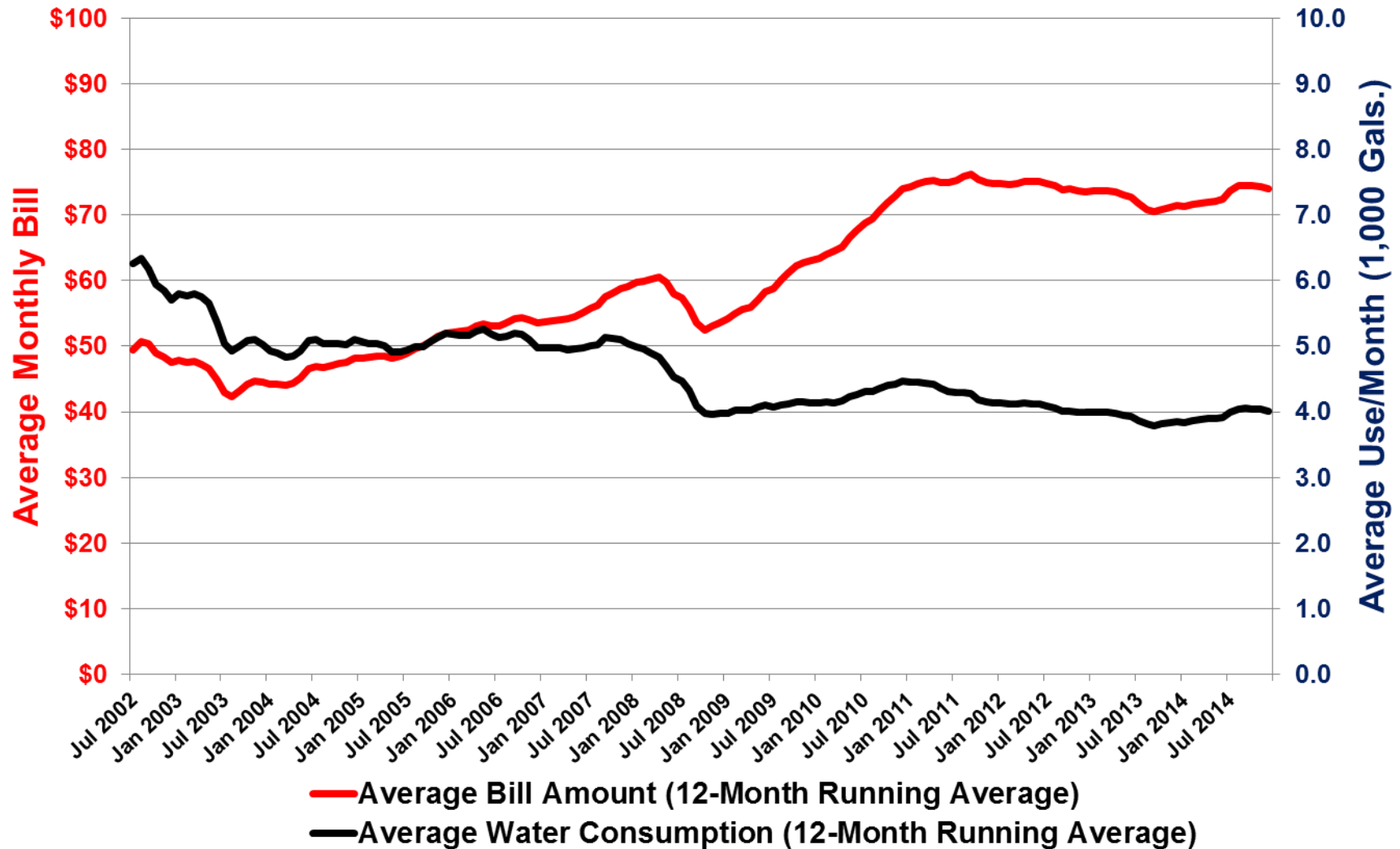
- **Duke Energy Rate Increases and Rate Structure Changes**
- **Growing Focus on Water – Energy Nexus**
- **Local GHG Emissions Inventory (2005)**
- **GHG Emission Reporting Requirements**  
*(did not directly affect us but handwriting is on the wall)*
- **Draft Clean Power Plan** *(what will be our role and opportunity?)*

# Adaptation Strategies



- **Standby power generators**
- **Bought rock quarry for future water supply**
- **Aggressive water conservation rates and drought surcharges**
- **WTP process water recycling** *(6 – 7% savings)*
- **New reclaimed water system in 2009**  
*(partnership with UNC-Chapel Hill; most use is for cooling tower make-up water)*

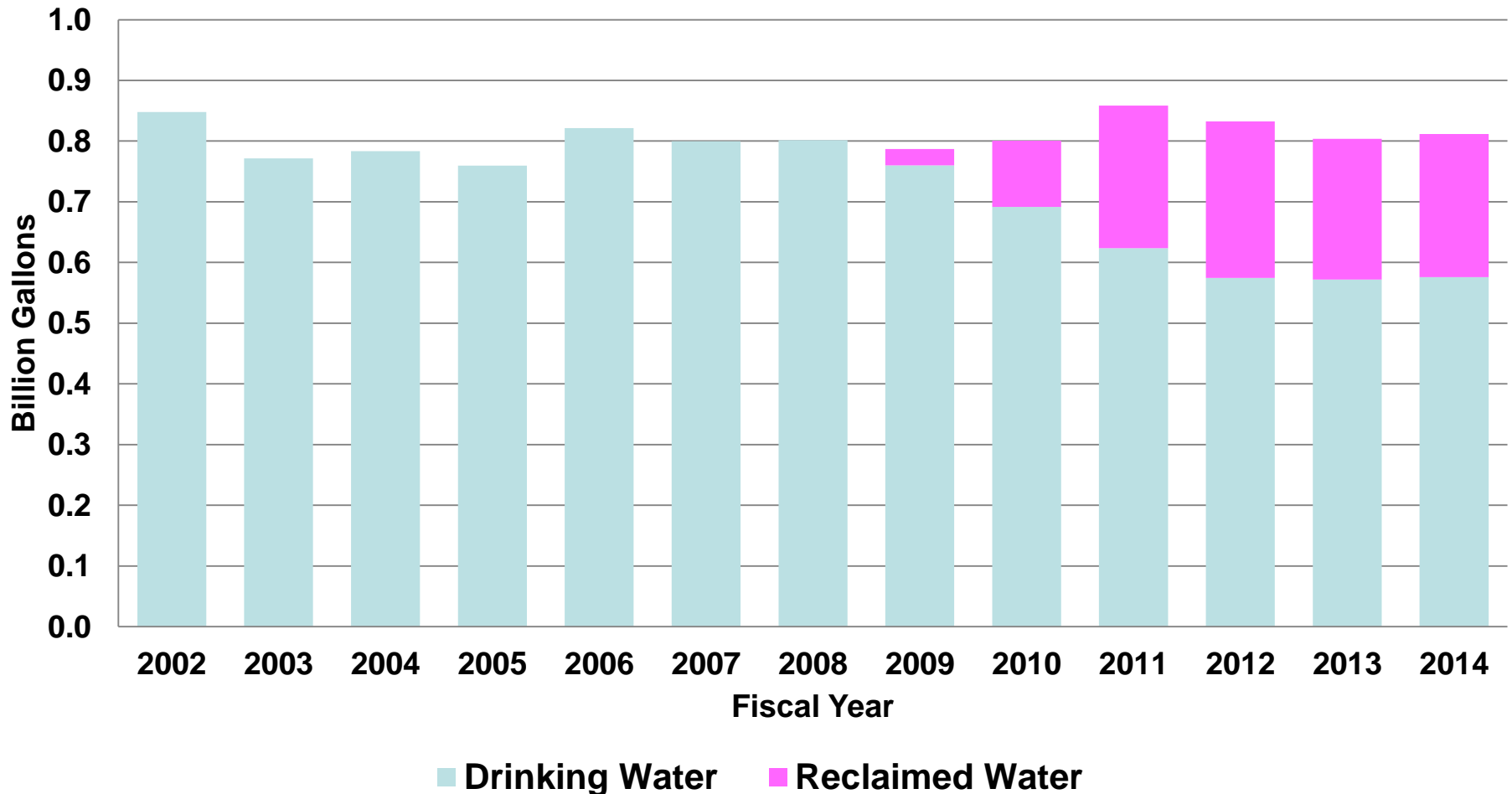
# Average Monthly Use and Bill \*



\* For individually-metered residential dwelling units billed directly by OWASA

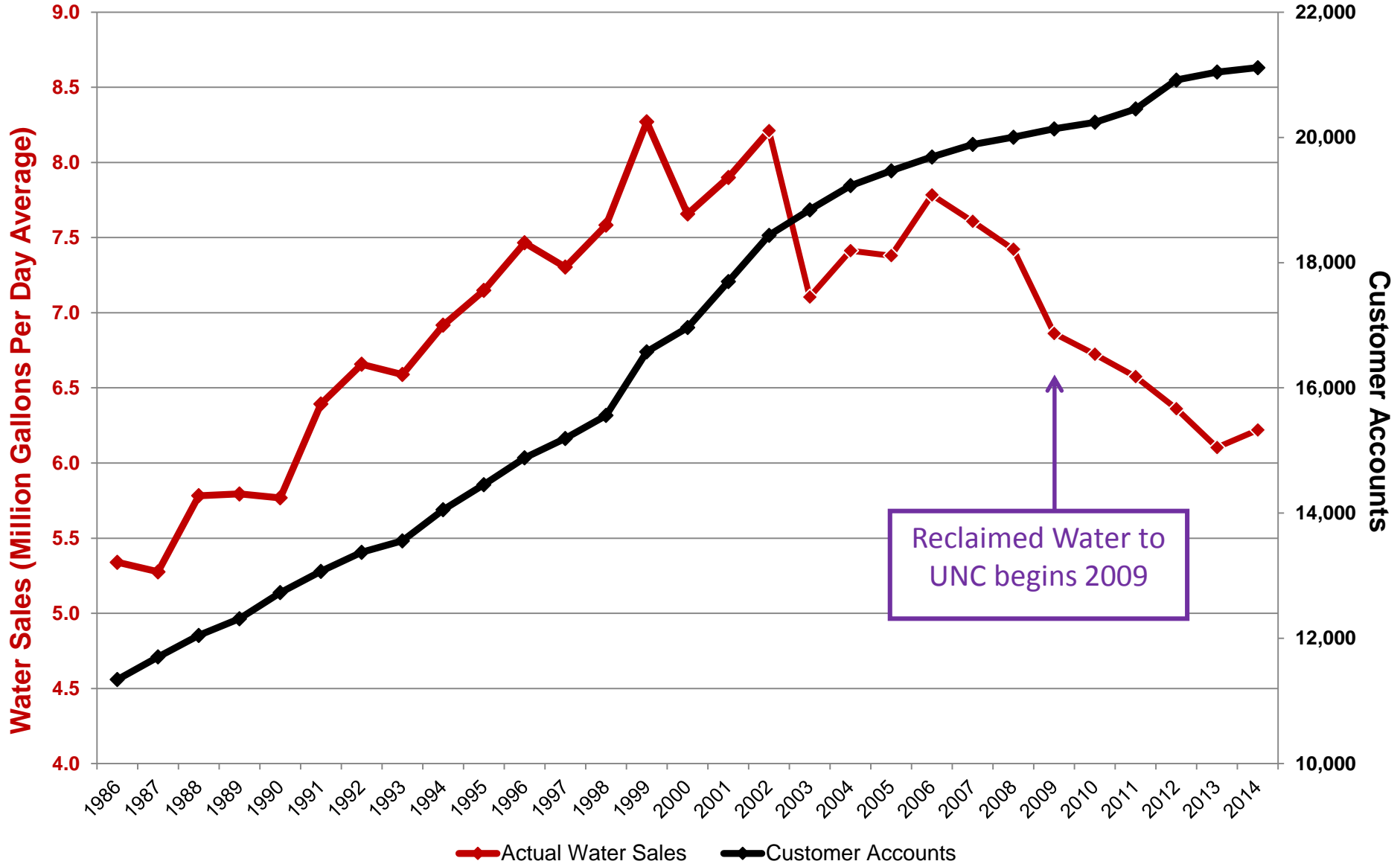
# Our Reclaimed Water System

## UNC Water Consumption



*We use about 35% less energy to provide 1,000 gallons of RCW vs. drinking water*

# Water Sales and Accounts



# Pursuing Energy Efficiency

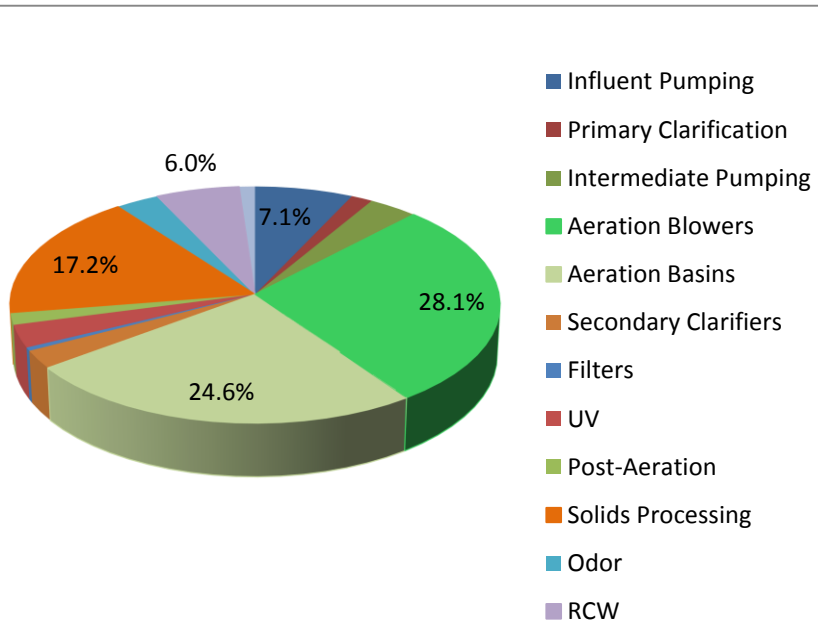
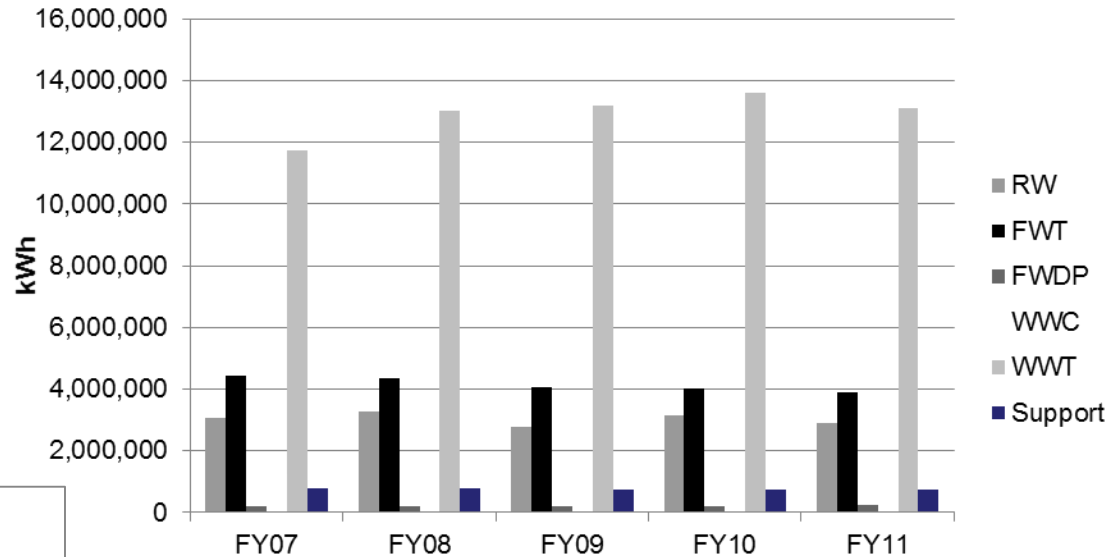


- **Water conservation and efficiency and use of reclaimed water are key**
- **Pumps, motors, lighting, HVAC, etc.**
- **Process optimization**
- **Power monitoring**
- **Integrate with CIP and O&M budget**

***Where are our best opportunities?***

# Pursuing Our Biggest Opportunity

- **WWTP our largest use of energy**



- **Aeration and mixing the largest use at our WWTP**

# WWTP Energy Efficiency Project



- **Could Substantially Reduce Power Consumption and Improve Aeration Performance**
  - Replace Jet Aeration with Fine Bubble
  - Reduce Mixing Power Consumption
  - Improve Blower Efficiency
  - Replace Air Header Pipe
- **Would Need to Complete Odor Improvements by End of 2014 per Town of Chapel Hill Odor Control Requirements**
  - Cover Nitrified Sludge Cells (NSL), Aeration Basin Influent Channel, and Aerated Cells
  - 3 New Odor Scrubbers
- **Project Would Improve Treatment Plant's Ability to Meet Future, More Stringent Nutrient Limits**

# Existing Process Equipment

- **Four NSL and Six East Aeration Cells**

- Jet Mixing / Aeration Pod(s)
- Up to 1000 scfm / pod
- 14 HP pump(s) – continuous operation

- **Six West Aeration Cells**

- Jet Mixing / Aeration Header
- Up to 3000 scfm / header
- Two 50 HP pumps – continuous operation

- **Two Aeration Cells – 5A / 5B**

- Jet Mixing / Aeration Header
- Up to 1500 scfm / header
- 50 HP pump – continuous operation

- **Multistage Centrifugal Blowers**

- Three 3600 scfm – 150 HP blowers
- Three 5600 scfm – 250 HP blowers
- Use between 500-650 HP – depending on time of the year



# Proposed Process Equipment

- **Four NSL Cells**
  - High Efficiency Mixer - < 5 HP
  - Aluminum Covers and Odor Control
- **Twelve Aeration Basin Cells**
  - Fine Bubble Diffusers – 2000 or 3000 scfm
  - High Efficiency Mixer - < 5HP (standby)
  - Aluminum Covers and Odor Control (6 cells)
- **Two Aeration Cells – 5A / 5B**
  - Fine Bubble Diffusers – 1500 scfm
  - Four High Efficiency Mixers - < 3HP (standby)
- **High Efficiency Blowers**
  - Four 5000 scfm – 250 HP blowers
  - One 5600 scfm – 250 HP Multistage (backup)
- **New SS Air Header, 3 Carbon Scrubbers**



*New Fine Bubble Diffusers*



*New Blowers*



*New Invent Mixers*

# Initial Estimate of Savings

<b>Feature</b>	<b>Existing Process</b>	<b>New Process</b>
<b>NSL Cell s Mixing</b>	20 kW	6 kW
<b>Train 1 – Aeration Mixing</b>	145 kW	6 kW
<b>Train 2 – Aeration Mixing</b>	---	6 kW
<b>Train 3 – Aeration Mixing</b>	145 kW	6 kW
<b>Cells 5A/5B – Aeration Mixing</b>	65 kW	---
<b>Aeration Blowers</b>	425 kW	300 kW
<b>Odor Control Units</b>	---	55 kW
<b>Total Power Draw</b>	800 kW	380 kW
<b>Projected Reduction in Energy</b>		420 kW (53%) or 560 HP (1.26kW/1000 gal)
<b>Annual Savings (@ \$0.06 /kW hr)</b>		\$220,000

# Project Payback?



- **~ \$8,000,000 capital cost for energy efficiency improvements**
- **Would save ~\$220,000 / year electrical energy savings**
- **Like many EE projects, decision to proceed would be based on multiple objectives**

# Energy Management and Affordability



- **Affordability and cost management one of the key themes of our Strategic Plan**
- **How can we reduce the financial impact on our customers?**

# Making it More Affordable

- **NC Clean Water State Revolving Fund – \$6.56 Million, 20-Year, No-Interest Loan**
  - NC SRF program has set-aside for “green projects” that result in >20% energy savings at WWTPs
  - State agreed to help fast-track our process
  - PER & EID prepared simultaneously with design
  - Staff prepared application, PER and EID
  - UNC EFC said loan saved us >\$1.7 million
  - Our first major SRF program loan

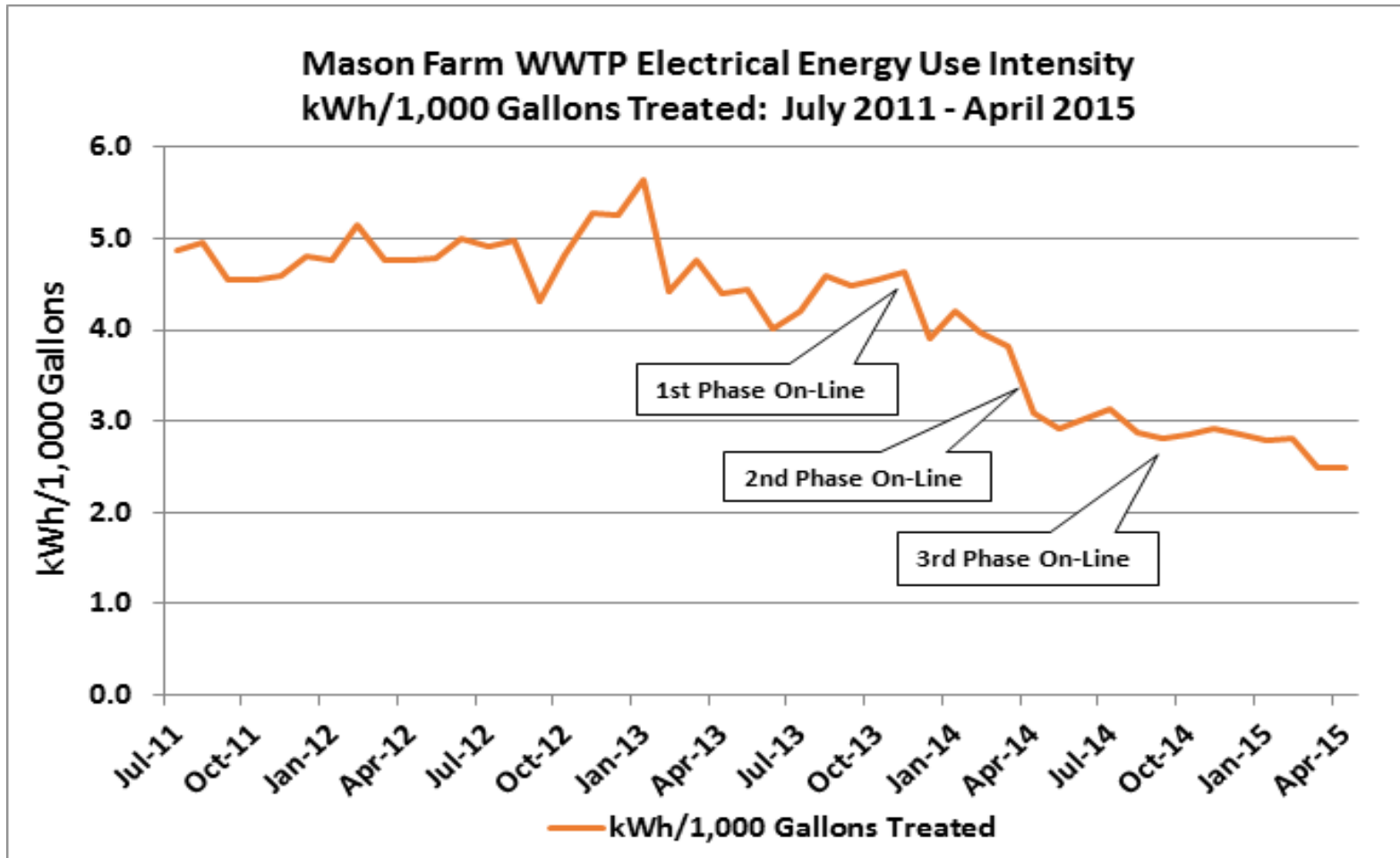


# Making it More Affordable

- **Duke Energy Custom Energy Efficiency Incentive – \$168,000**
  - Several years of discussion emphasized importance of project
  - Duke Energy was limited in what they could pay us since we were going to do project even without their financial support
  - OWASA staff prepared application

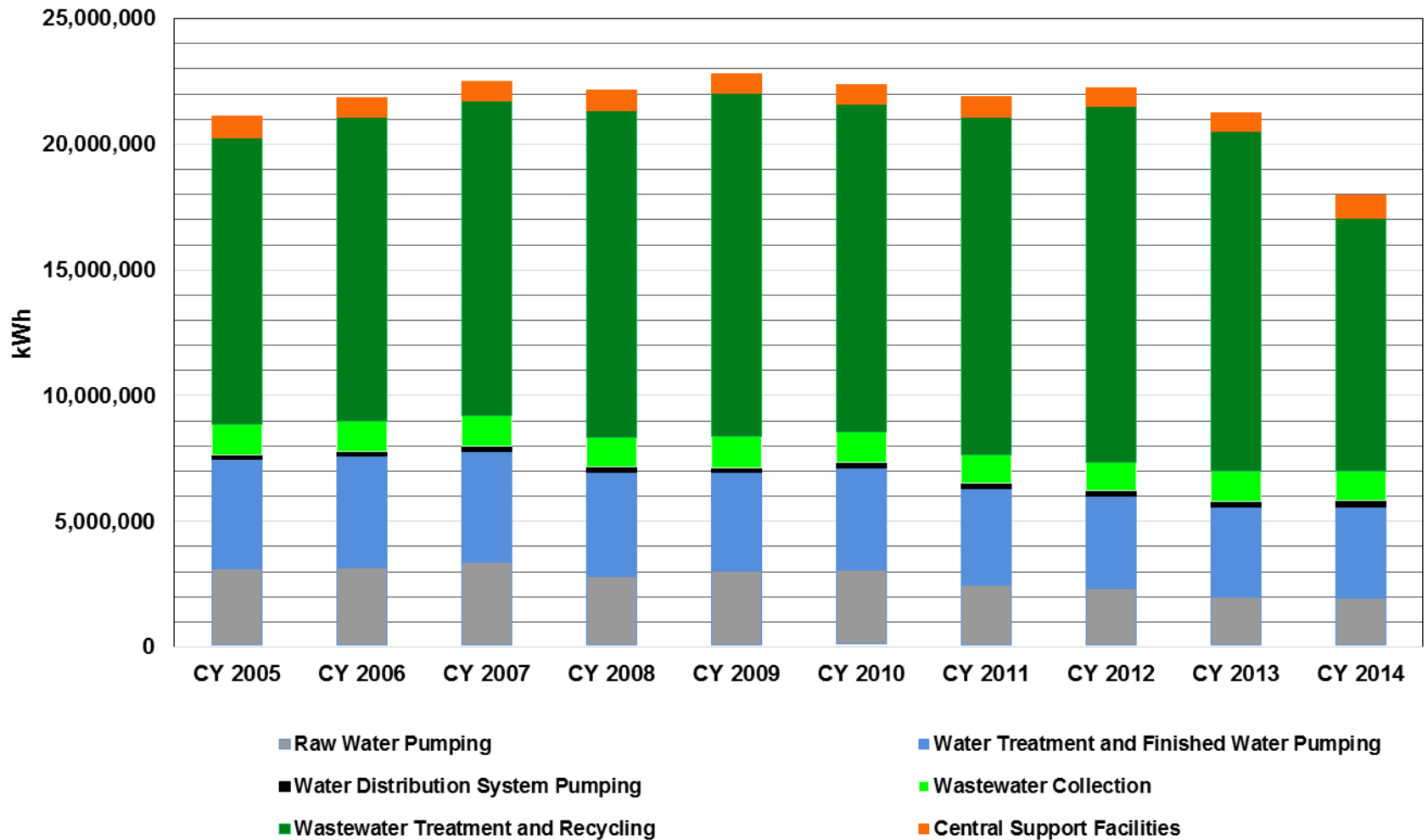


# Actual Energy Savings

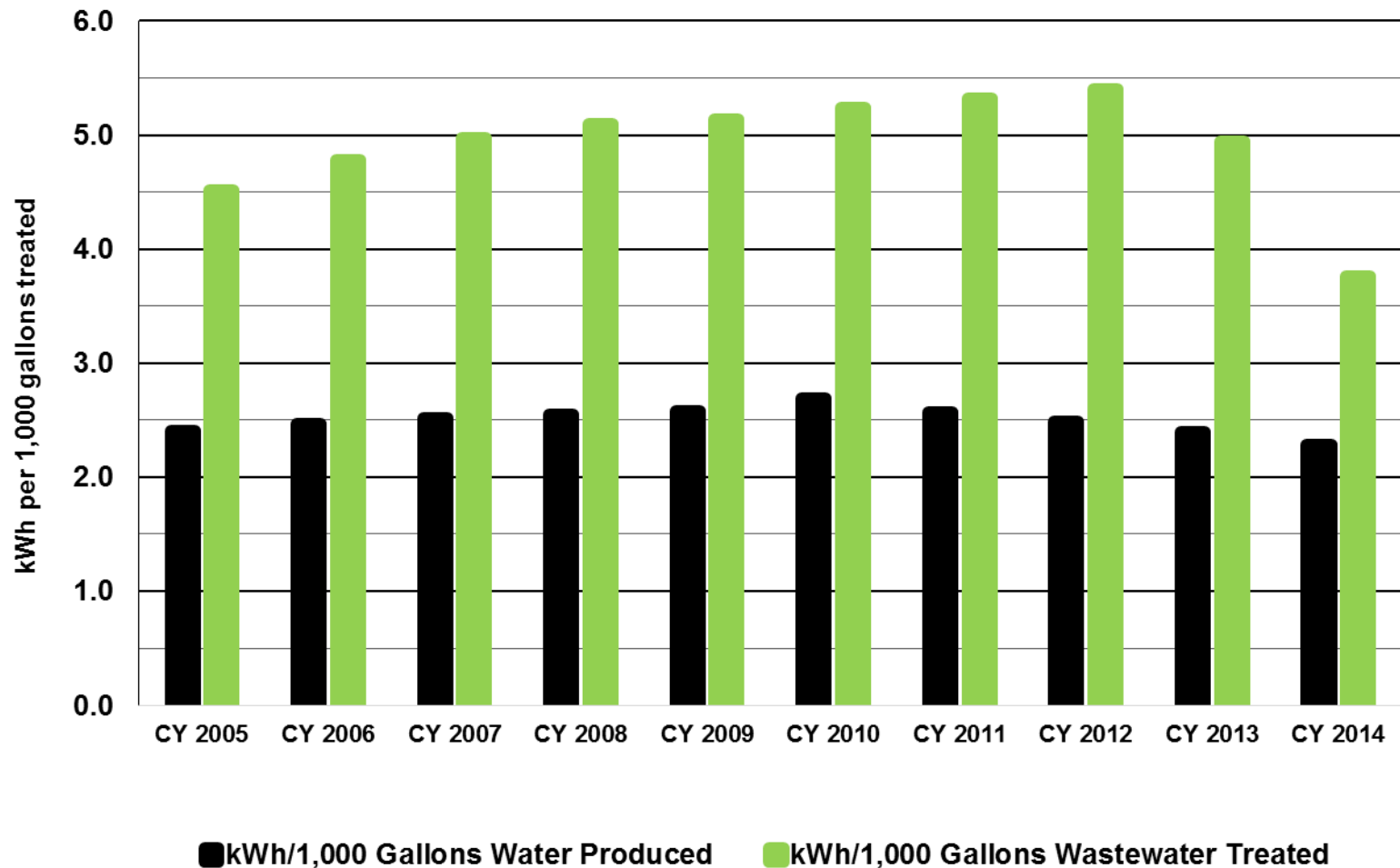


~35% savings in electricity use  
Annual cost savings >\$250,000

# Historical Electricity Use at OWASA



# Electrical Use Intensity



# Going Forward...



- **Draft Goals for Our Energy Management Plan (a work in progress)**
  - Reduce use of purchased electricity by 35% by end of CY 2020 compared to CY 2010 baseline
  - Beneficially use all WWTP biogas by 2022 provided project has payback within useful life of major equipment
- **Will seek outside funding support for our energy efficiency and GHG reduction efforts** *(biogas-to-energy will likely qualify for another 20-year, 0% loan)*

# Final Thoughts



- **We're a major energy user and contributing factor to GHG emissions**
- **Energy efficiency and renewables will be a greater part of our future**
- **Collaboration will be key**
- **Funding support will be essential for us to move ahead sooner**
- **What is the *social cost of carbon?* *(It won't soon show up as savings on our customers' bills)***

# Final Thoughts

<http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>

The screenshot shows a web browser window displaying the EPA website. The address bar shows the URL: <http://www.epa.gov/climatechange/EPAactivities/economics/scc.html>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The toolbar contains various icons for search, home, and printing. The website header features the EPA logo and navigation tabs for 'LEARN THE ISSUES', 'SCIENCE & TECHNOLOGY', 'LAWS & REGULATIONS', and 'ABOUT EPA'. The main content area is titled 'Climate Change' and includes a breadcrumb trail: 'You are here: EPA Home » Climate Change » What EPA is Doing » Economics » Social Cost of Carbon'. The main heading is 'The Social Cost of Carbon'. The text explains that the Social Cost of Carbon (SCC) is used to estimate the economic damages of CO2 emissions and the value of damages avoided by reducing emissions. It notes that the SCC is a comprehensive estimate but does not include all damages, particularly physical, ecological, and economic impacts. A table is mentioned, presenting the most recent SCC estimates for 2015-2050.

**Climate Change** [Contact Us](#) [Share](#)

**You are here:** [EPA Home](#) » [Climate Change](#) » [What EPA is Doing](#) » [Economics](#) » [Social Cost of Carbon](#)

## The Social Cost of Carbon

EPA and other federal agencies use the social cost of carbon (SCC) to estimate the climate benefits of rulemakings. The SCC is an estimate of the economic damages associated with a small increase in carbon dioxide (CO<sub>2</sub>) emissions, conventionally one metric ton, in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (i.e. the benefit of a CO<sub>2</sub> reduction).

The SCC is meant to be a comprehensive estimate of climate change damages and includes, but is not limited to, changes in net agricultural productivity, human health, and property damages from increased flood risk. However, given current modeling and data limitations, it does not include all important damages. As noted by the [IPCC Fourth Assessment Report](#), it is "very likely that [SCC] underestimates" the damages. The models used to develop SCC estimates, known as integrated assessment models, do not currently include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages and because the science incorporated into these models naturally lags behind the most recent research. Nonetheless, the SCC is a useful measure to assess the benefits of CO<sub>2</sub> reductions.

The table below presents the most recent [SCC estimates](#) (PDF, 22 pp, 780 KB) (updated in 2013) for certain years.

**Social Cost of CO<sub>2</sub>, 2015–2050 <sup>a</sup> (in 2011 Dollars)**

Discount Rate and Statistic
-----------------------------

# Final Thoughts



- **Thank You**
  - *NCCWSRF Team*
  - *Duke Energy*
  - *Brown and Caldwell*
  - *Hazen and Sawyer*
  - *OWASA Team*
- **Thanks to other utilities for sharing your information and experience**
- **Thanks to AWWA and other associations**

For More Information



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**[www.owasa.org](http://www.owasa.org)**

# New Diffusers and Mixers



# Aerial View of WWTP



# Power Monitoring at WWTP

