

Overview of Energy Use at Water Infrastructure Facilities

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Significant Infrastructure Reinvestment is Needed

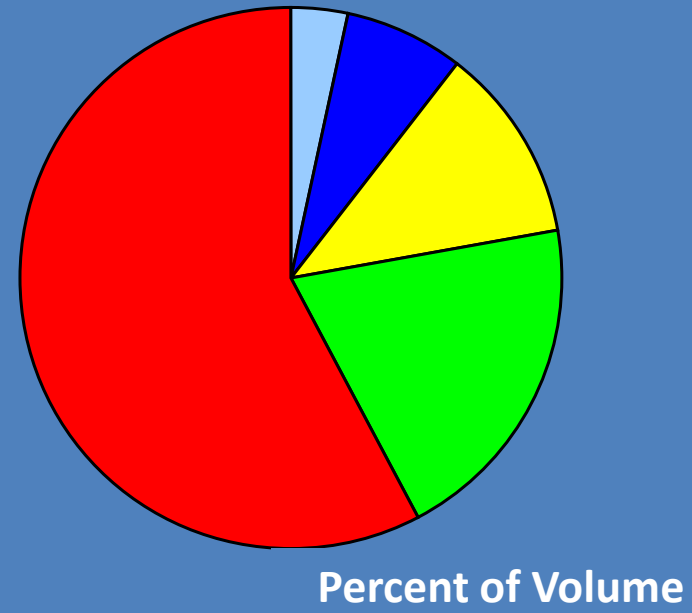
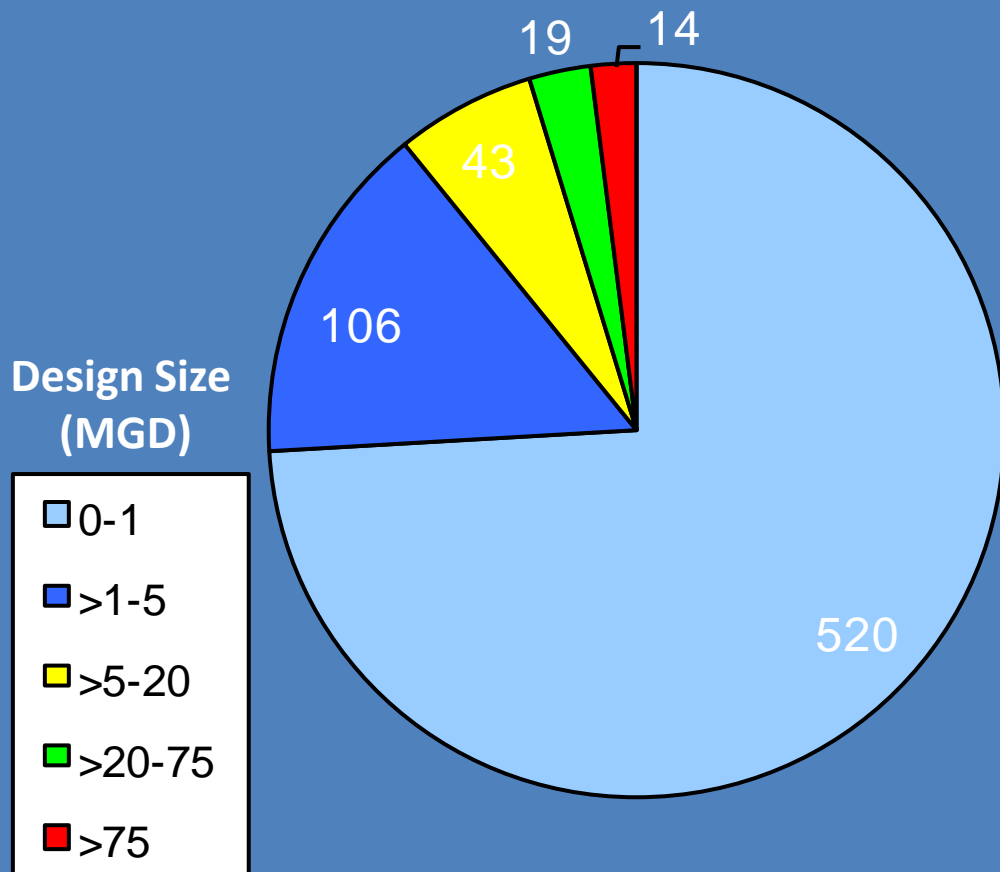
- NY's Water and Wastewater infrastructure will require an investment of **\$70+ billion** over the next 20 years (DOH & DEC)
 - Aging infrastructure
 - Increasingly stringent regulations
 - New, more energy intensive technologies will replace outdated treatment systems
- Energy costs continue to rise and no end is in sight



NY's Water/Wastewater Sector

- Includes approximately 700 WWTPs with a combined design capacity of 3.7 billion gallons per day (NYSDEC, 2004)
- Includes approximately 2,860 community water supply systems with an estimated production of 3.1 billion gallons per day (NYSDOH)
- Includes roughly 7,000 additional non-community water supply systems (NYSDOH)

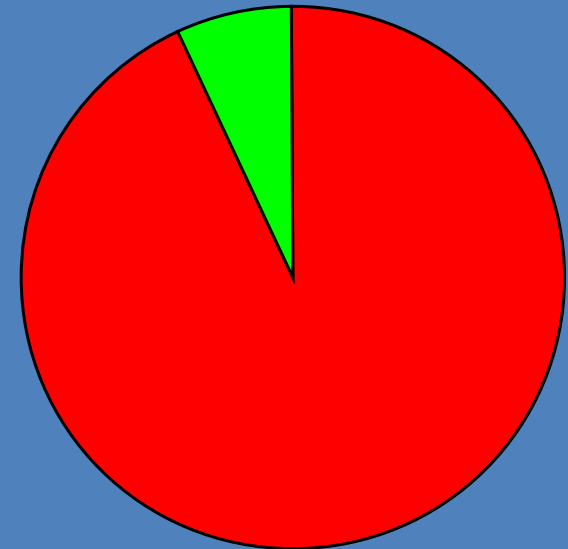
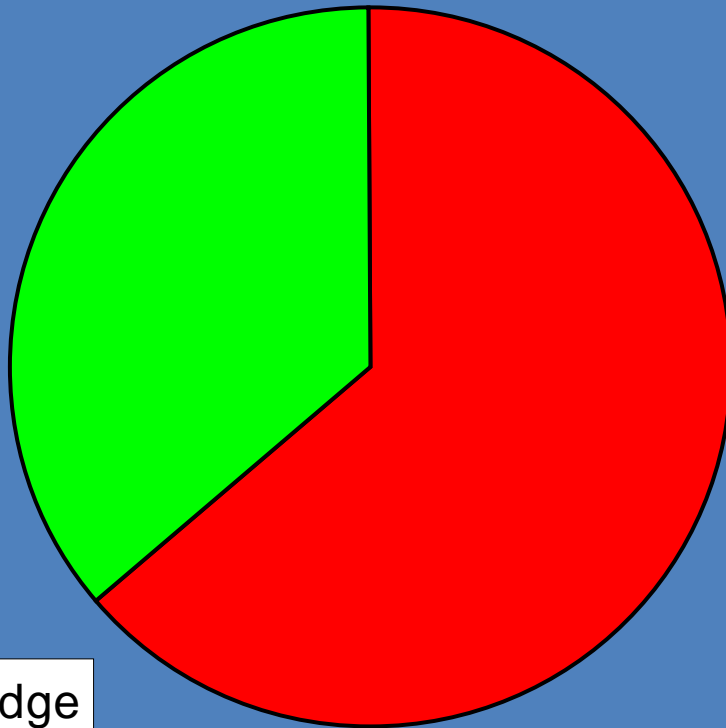
WWTPs in New York State



Data Source: NYSDEC 2004 Descriptive Data

Secondary Treatment Technologies

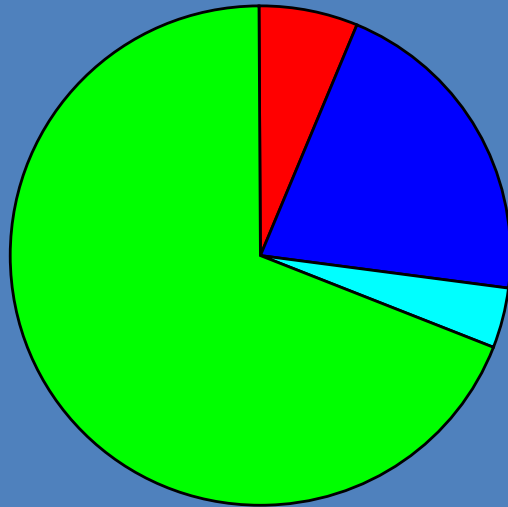
Number of WWTPs



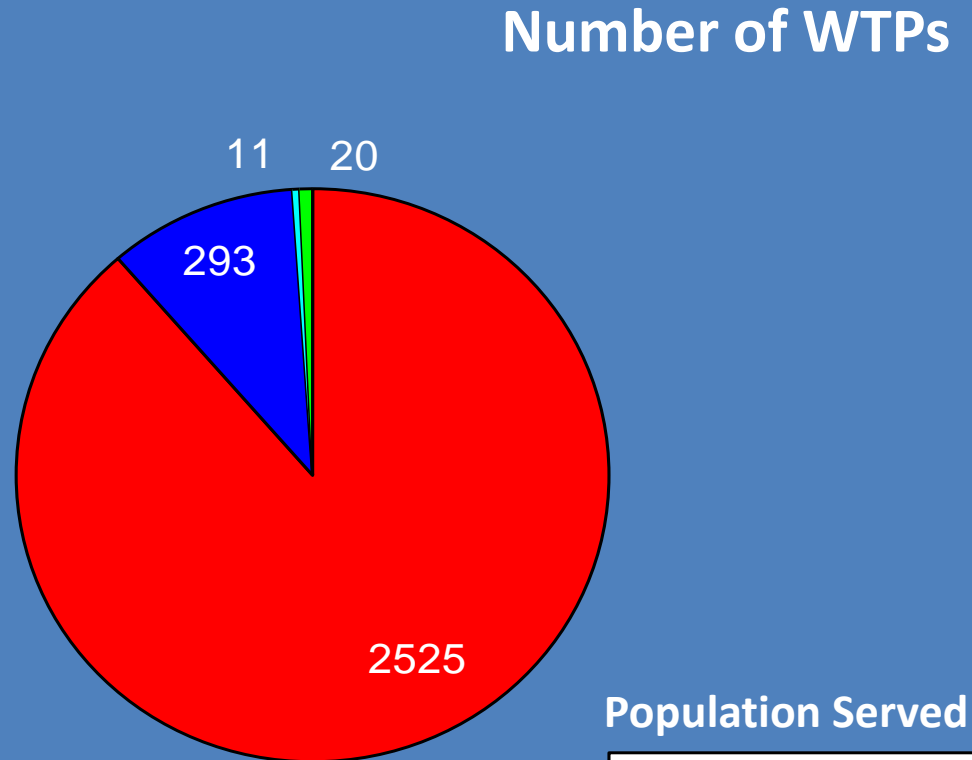
Design Capacity

- Activated Sludge
- Fixed Film

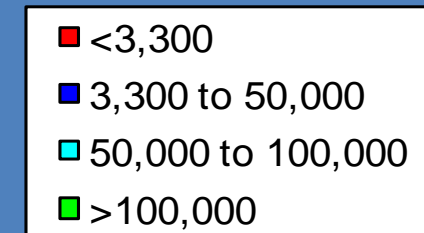
Community WTPs in NY State



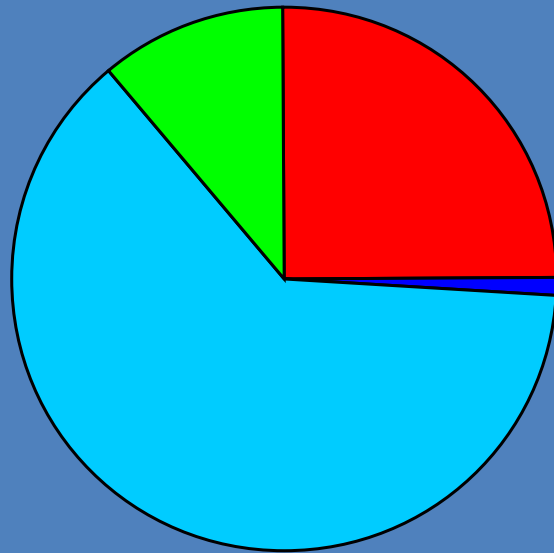
Percent of Volume



Number of WTPs

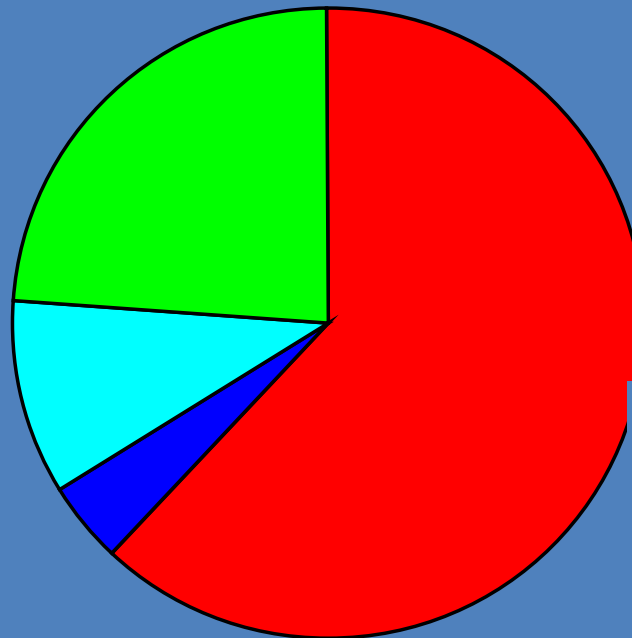


Community Systems Source of Supply



Volume Supplied

Number of WTPs



Water Supply Source

- Groundwater
- Purchased GW
- Surface Water
- Purchased SW

Data Source: USEPA SDWIS
Volume based on 175 gpcd

Electricity Use in the Wastewater Sector is Significant

- NYSERDA Statewide Energy Assessment
- Baseline Energy Use:
 - Drinking Water Sector – 0.75 to 1.0 billion kWh/year
 - Wastewater Sector – 1.75 to 2.0 billion kWh/year
 - Consumes as much electricity as 500,000 NY households
 - \$250-300 million per year in electricity costs

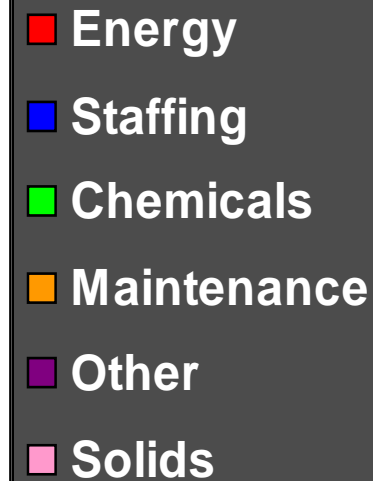
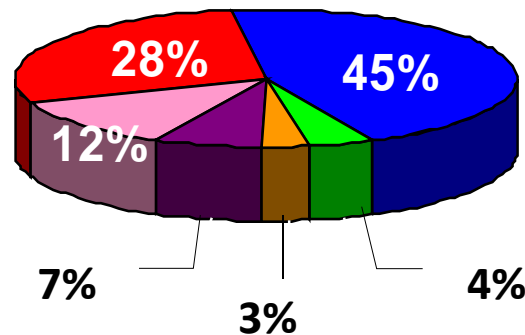
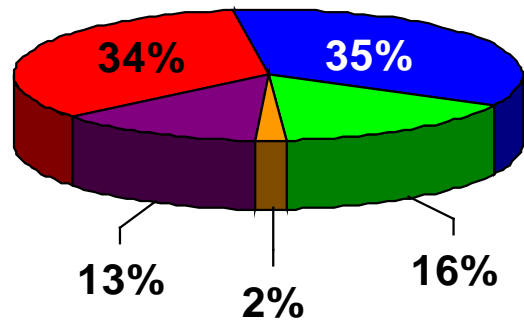


Typical Operation and Maintenance Budget Breakdown

Energy accounts for a significant portion of utility O&M budgets.

Water Utility

Wastewater Utility



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

Key Energy Statistics for Sector

- NY WWTPs use more electricity than the national average
 - More stringent effluent limits and greater use of activated sludge
- NY WTPs use less electricity than the national average
 - Availability of high quality water sources and presence of large gravity systems
- Smaller systems use more kWh/MG than larger systems



Additional Findings

- When energy usage for WWTPs is evaluated based on Biochemical Oxygen Demand (BOD) removal instead of flow, the largest plants are no longer the most efficient size category
 - In part due to combined sewers
- Advanced treatment requirements have a significant effect on energy usage
 - 30 to 100% more energy usage for the same size category



New Regulations Will Increase Electricity Use in the Sector

- Swimmable Hudson Initiative
 - Seasonal effluent disinfection
- Increased Focus on Advanced Treatment
 - Phosphorus removal
 - Nitrogen removal
 - Microfiltration in NYC Watershed
 - Emerging Contaminants
- Increased Focus on CSOs/SSOs
 - Maximize flow through WWTPs

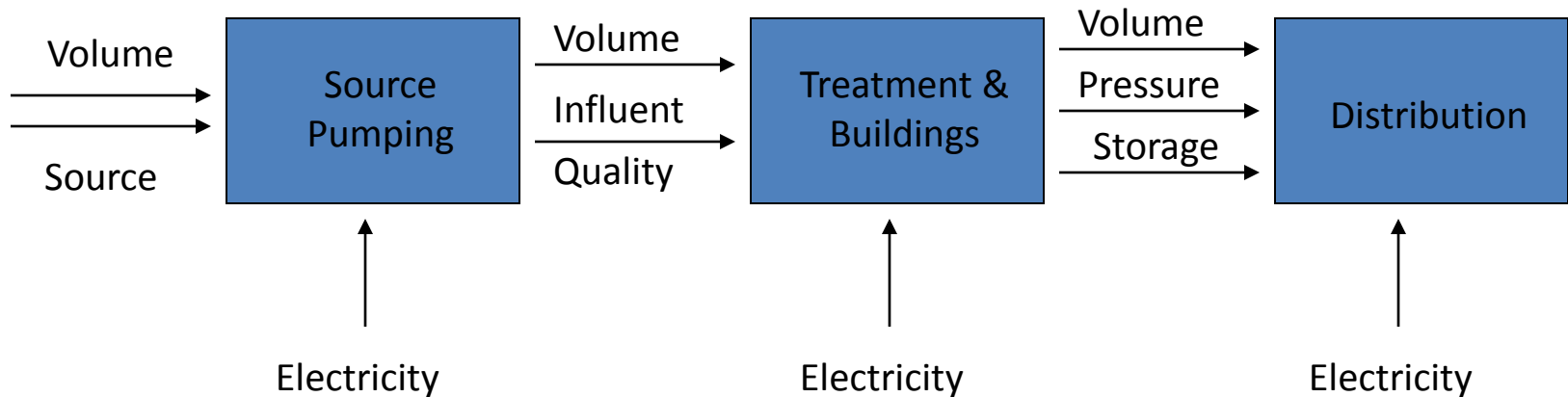


Electricity Use Impacts – Nutrient Removal Requirements

- Electricity use at affected WWTPs may increase 30 to 80 percent
- Watershed Initiatives:
 - Long Island Sound
 - Chesapeake Bay
 - Great Lakes
 - Lake Champlain
 - Onondaga Lake
 - Others...
- Advanced Treatment at WWTPs >75MGD
 - Electricity use – 200,000 to 500,000 MWh/yr
 - Impact to sector-wide energy use is 10 to 25 percent

Water Treatment Process

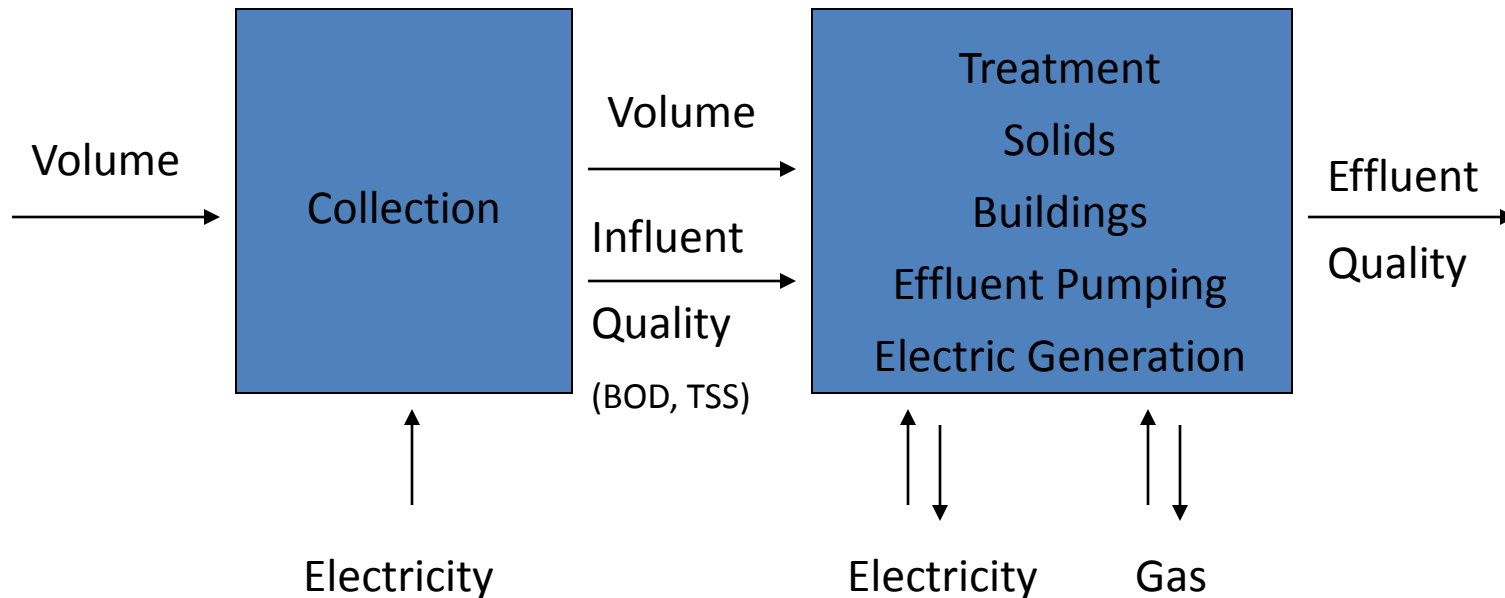
Factors Affecting Energy Consumption



Source: Carlson, Steven. "Water and Wastewater Utility Energy Index Project Overview." CDH Energy.

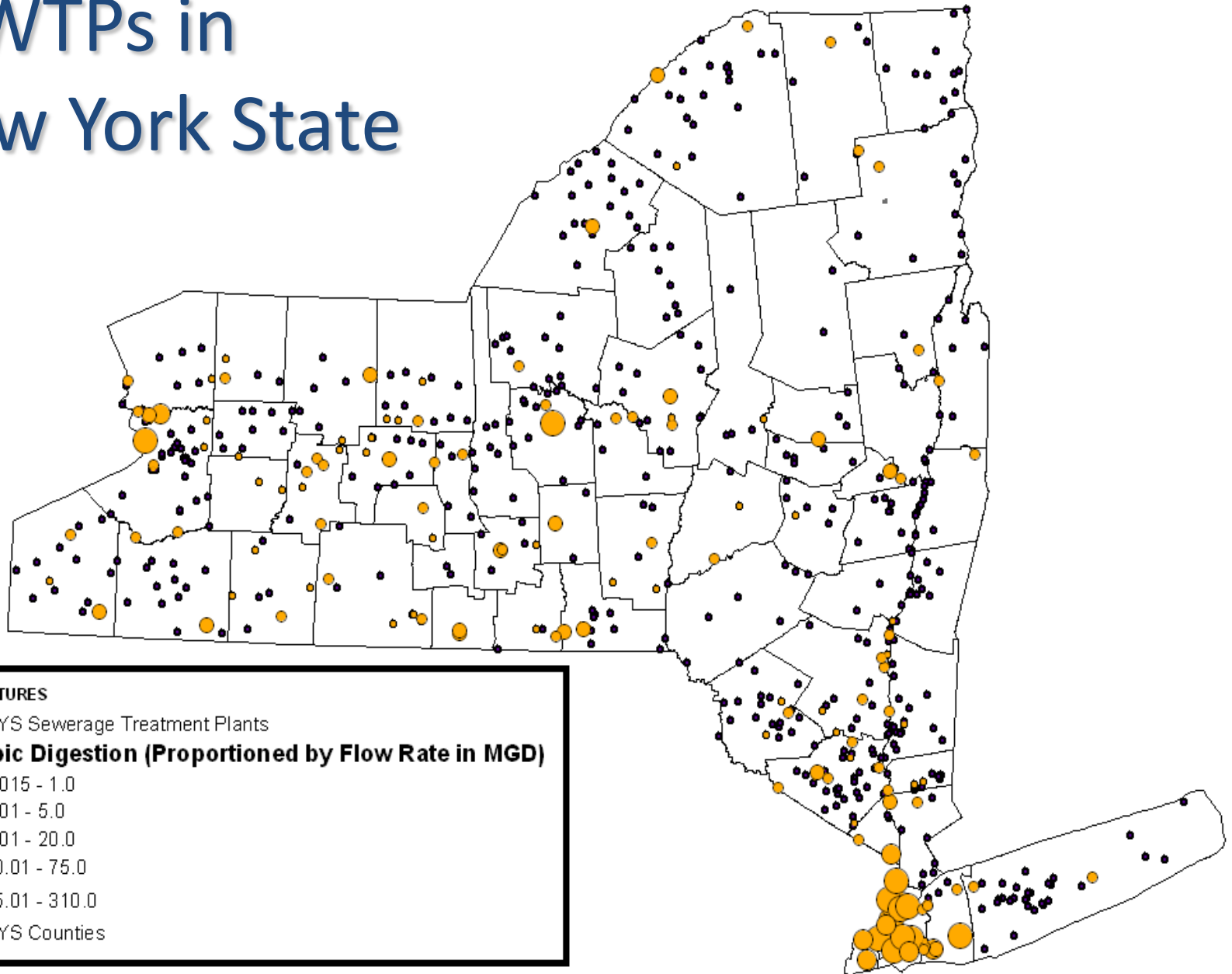
Wastewater Treatment Process

Factors Affecting Energy Consumption



Source: Carlson, Steven. "Water and Wastewater Utility Energy Index Project Overview." CDH Energy.

WWTPs in New York State



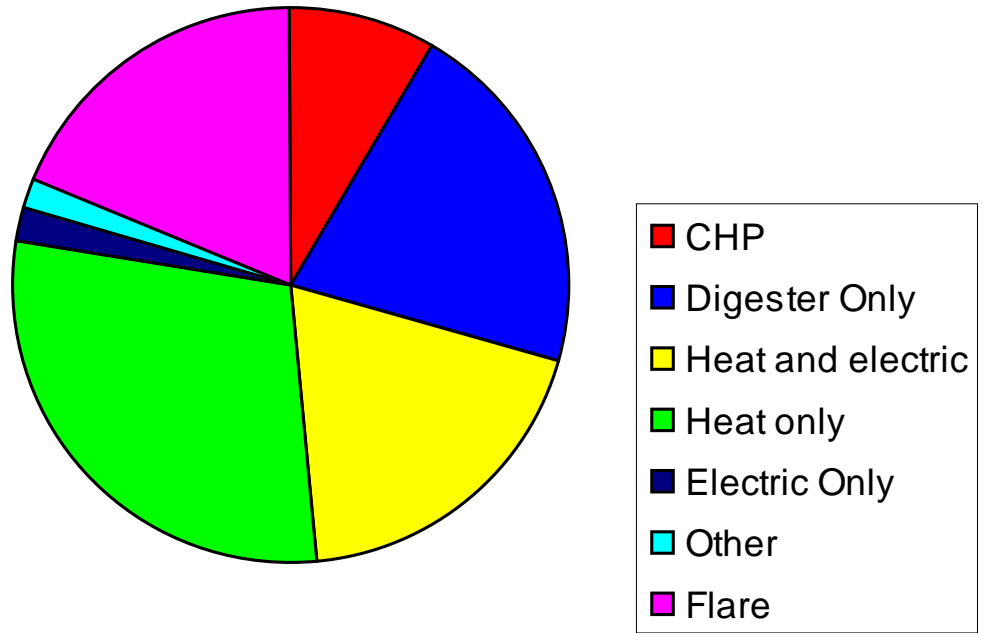
Biogas Production

- WWTPs in New York have a theoretical biogas production of 5.1 billion cubic feet per year (approx. 28 million therms or over 90 MW)
- Facilities currently with AD have a theoretical biogas production of 3.4 billion cubic feet per year (approx. 18.8 million therms or 60 MW)

Biogas Use in NYS

- 58 of 145 WWTPs with AD responded to survey:
 - Represent approximately 90% of current theoretical gas production potential (16.7 million therms or 55 MW)

- Difficult to determine the actual percentage of biogas that is produced that is being used



Development of Energy Efficiency Plan

1. Understand Your Energy Use
2. Evaluate the System
3. Identify Energy Efficiency Opportunities
4. Prioritize Opportunities for Implementation
5. Implement Measures
6. Monitor Results

Monitoring Energy Performance

- External benchmarking
 - Compare yourself to your peers
 - Consider process differences
- Internal benchmarking
 - kWh/MG treated or pumped
 - kWh/pound BOD removed
 - kWh/pound biosolids produced
 - Peak KW
 - Air supplied/pound BOD removed



Typical Areas of Opportunity

WTPs Areas for Savings

- pumps
- motors
- rapid mixing of coagulant chemicals
- lighting and HVAC
- disinfection
- water distribution system
- load shifting
- filter backwashing

WWTPs Areas for Savings

- pumps
- motors
- lighting, HVAC and odor control
- primary clarifiers
- secondary process
- plant water systems
- anaerobic digestion
- biosolids thickening and dewatering
- load shifting

Other Opportunities

- Water conservation
 - Demand and supply side
- Peak shaving
- Industrial pretreatment



O&M Improvements

- Equipment maintenance
 - Pumps
 - Blowers
- Waste pretreatment or segregation
- Sensor/control equipment calibration
- Process optimization
- Peak flattening



Asset Management

- Equipment/motor inventory
- Minimum efficiency standards
- End of life replacement with more efficient equipment
- Infrastructure condition assessment



Capital Projects

- Regulatory compliance
- Capacity adjustment
- Equipment/process age

**Make Energy Efficiency a Consideration for
All Capital Projects**

**Use Life-Cycle Costs to Select Preferred
Alternatives**

Conclusions

- Our water and wastewater infrastructure remains the backbone of our communities
- New regulations and aging infrastructure will require significant reinvestment over the next decade
- With increasing energy costs and an emphasis on sustainability, energy efficiency must be a consideration with all infrastructure investment
- Resources and funding are available...get engaged in New York's energy culture!

*Energy efficiency is the key to compliance,
sustainability & savings*

Questions and Discussion



NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY'S

Focus on Water and Wastewater

For more information,
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