Coping With an Increase in Energy Usage at Drinking Water Facilities

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American Water Works Association
September 15, 2009
Today’s Presentation

• Energy usage at drinking water utilities
• Data sets:
  – Annual O&M expenses
  – Cost comparisons
  – Detailed energy usage
• Utility case studies
• Risks and benefits of energy optimization
Energy Use at Water Utilities

• Water and wastewater utilities spend about $4 billion a year to pump, treat, deliver, collect, treat and clean water

• For drinking water utilities, electricity consumption by pumping systems constitutes 90% of total energy use

• Energy consumption by water and wastewater utilities will increase 20% in the next 15 years
  – Increased populations
  – More stringent regulations
Data Analysis

• 10 drinking water utilities (+1,000,000)
  - California – 3; Virginia – 2; Arizona – 1; Colorado – 1; Florida – 1; Ohio – 1; Texas – 1

• Self-reporting

• Provided O&M cost breakdown for:
  - Supply/transmission
  - Treatment
  - Distribution
  - Other (administration)

• Includes energy, contracts, chemical and labor
Details of Electricity Usage

Breakdown of Electricity Costs at Drinking Water Utilities

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Details of Electricity Usage

Breakdown of Electricity Costs at Drinking Water Utilities

- Other: 0%
- Distribution: 10%
- Treatment: 20%
- Supply/Transmission: 70%

Percentage of Electricity Cost

- Category 1: 10%
- Category 2: 20%
- Category 3: 30%
- Category 4: 40%
- Category 5: 50%
- Category 6: 60%
- Category 7: 70%
- Category 8: 80%
- Category 9: 90%
- Category 10: 100%
Utility #2: Miami-Dade Water

- High energy costs for water treatment (70%)
- Serves most residents of Miami-Dade County, FL
- Supplies water to 1.8 million customers
- Draws approximately 347 millions gallons a day from the Biscayne Aquifer
- Facilities:
  - Three major treatment plants plus five smaller plants (South Dade Water Supply System) with treatment capacity of 452 mgd
  - 7,500 miles of distribution piping
Utility #2: Miami-Dade Water

- Energy = $3.5 million
  - $1,200,000 transmission
  - $4,800,000 treatment
  - $633,000 distribution

- Why so high?
  - Five different plants with identical processes
  - Distribution costs handled elsewhere

- Energy reduction methods
  - Not too much to consider
  - Changes in operating scheme
  - Reduction of water usage by customers – less water to treat

- Costs only going up due to increased use of desalination technology
Utility #10: Washington Aqueduct

- High distribution energy costs (60%)
- Supplies DC, Arlington County, and Falls Church
- Serves 1.1 million customers
- Facilities:
  - Intakes located on Potomac River and Little Falls
  - Two 12-mile long gravity conduit systems with a combined 200 mgd capacity
  - One 450-mgd raw water pumping station (Little Falls)
  - One 480-mgd finished water pumping station
  - Two major treatment plants with 400-mgd capacity
  - Three booster pumping stations
  - Seven finished storage reservoirs (44 mg capacity)
Utility #10: Washington Aqueduct

- Energy = $3.5 million
  - $411,000 transmission
  - $601,000 treatment
  - $2,200,000 distribution

- Why so high?
  - Very large finished water PS (no gravity lines)
  - Several booster pumping stations

- Energy reduction methods
  - More efficient pumps
  - Revised operating scheme
Water-Related Energy Conservation and Production

- **Improve Energy Efficiency at Water Utilities**
  - Includes:
    - Energy performance benchmarking programs,
    - Use of energy audits and energy tracking systems,
    - Use of alternative energy sources within plants (e.g., solar, wind, hydro),
- **ENERGY STAR program**
- Produce energy to offset purchases from local power utilities
- Installation of alternative energy power production facilities, such as including solar, wind, and hydro
- Energy efficient lighting and adequate installation
- Acceptance of simple energy saving measures can launch the next step of alternative energy production
Water Conservation – General

• Benefits from more efficient use of water:
  – Extension of the water supply
  – Reduction of greenhouse gasses
  – Since water usage by customers is reduced, less water will be pumped and treated
  – Reduced energy usage = water savings at power plants

• Areas of opportunity on both the supply and demand sides
  – Supply – Better planning, maintenance, and operation of water delivery systems
  – Demand side – Promotion of conservation programs can also effectively increase water and energy savings
WaterSense Program

- Goal of program to decrease indoor and outdoor nonagricultural water use through more efficient products, equipment, and programs
- Label helps consumers identify water-efficient products
- Water utilities promote the WaterSense program to their residential customers
  - Opportunity to save both water and energy by installing water-efficient fixtures and appliances
- Many utilities have rebate programs to encourage participation, ramped up during drought situations
Water Conservation and Management for Drinking Water Systems

• Implementing water and energy efficient fixtures and appliances result in a reduction in water demand
  – Climate change mitigation opportunities through lower energy usages for water treatment and distribution and fewer greenhouse gas emissions.
• Utilities have been implementing conservation programs (more than WaterSense)
• Developing alternative sources of water
  – Desalination, indirect water reuse, brackish GW
Water Conveyance Leak Detection and Remediation

• Identify and address leakage from water pipes
  – Leakage rates can be very significant
  – Major opportunity to recover water that would otherwise be lost from the system
  – Investments can result in significant water savings
  – Need continued development of technologies that are more precise and adaptable to utilities of all sizes
  – Anticipated that much of stimulus funds could go to ater main replacement
    • Survey of utilities had this project at top of list
Industrial Water Conservation
Reuse and Recycling

- Industrial facilities consume large amounts of water
- Companies are becoming more and more aware of the importance of measuring, managing, and controlling water use
  - Water scarcity is a limit to growth.
- Economic incentive exists for facilities to use as little water as possible
- Utilities are working to reduce the amount of potable water provided to industrial facilities
- Reducing water usage in the industrial sector leads to savings in treatment costs:
  - Chemical consumption
  - Energy usage
“Green Building” Design and “Smart Growth”

- Previous activities focused on mitigating greenhouse gases by increasing the water and energy efficiency of water utilities.
- May have short term effects because customers can revert to previous behaviors after a water crisis has passed.
- Need to focus on long-term sustainability of water and energy efficiencies.
- Commitment to water and energy efficiency must be incorporated into building codes and community design. 
  - “Green building” principles and “smart growth” policies.
“Green Building” Design and “Smart Growth”

- Green Building Council’s LEED program and ANSI promote the “green buildings” concept and LEED rating systems within State and local governments.
- Practices that are recognized as “green” within the various rating systems include:
  - Reduced use of energy and water;
  - On-site (decentralized) energy generation (e.g., solar power, geothermal); and,
  - Water retention (e.g., green roofs).
- LEED has begun to expand their traditional ratings to include other characteristics of sustainable cities such as smart growth and low impact design.
Questions?

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