New York City Water Summit

Future Water/Wastewater Issues
Utility Perspective

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Heritage dates back to 1886
Largest water services provider in U.S.
Serves approximately 16 million people in more than 1,600 communities
Operations in 35 states and Ontario, Canada
More than 7,000 employees
Facts & Figures

• More than 500 individual water systems
• 48,000 miles of distribution mains
• 96 surface water treatment plants
• 750 groundwater treatment plants
• 1,120 groundwater wells
• 294 wastewater treatment plants
Number of Water Systems by Type

**1963**

- **Total Number of Water Systems:** 19,236
- **Very Small:** 28%
- **Small and Medium:** 59%
- **Very Large and Large:** 13%

**U.S. Population Served by Water System Type**

- **Very Small:** 1%
- **Small and Medium:** 18%
- **Very Large and Large:** 81%

Population served: 150 million

Sources:
EPA, Drinking and Ground Water Statistics, 2005; Public Health Service, 1965

**2008**

- **Total Number of Water Systems:** 53,000
- **Very Small:** 1%
- **Small:** 27%
- **Medium:** 9%
- **Large:** 7%
- **Very Large:** 45%

**U.S. Population Served by Water System Type**

- **Very Small:** 56%
- **Small:** 27%
- **Medium:** 9%
- **Large:** 7%
- **Very Large:** 1%

Population served: 273 million

Sources:
EPA, Drinking and Ground Water Statistics, 2005; Public Health Service, 1965
Various geographic areas have different water drivers:

- Aging Infrastructure
- Flat Population
- Budgetary Issues

- Population Growth
- Water Supply

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- Aging Infrastructure
- Flat Population
- Budgetary Issues
Water/Wastewater Sector Utility Challenges

- Aging infrastructure
- Ensuring adequate, long-term water supply
- Increasing operating and capital costs
- Changing customers
- Reduced availability of state/federal funding
- Rates under stress
- Regulatory Requirements
- Workforce complexities
- Increased security and emergency preparedness needs
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The US Water & Wastewater Industry is the Most Capital Intensive Among Infrastructure Sectors

Capital Invested per $1 of Revenue

- Gas Distribution: $0.83
- Telephone: $1.15
- Electric: $1.63
- Water: $3.48
Aging US Infrastructure Investment Remains Critical

US EPA Estimated 20 Year Total Needs of US Public Water Systems

- **Total:** $334.8 Billion
  - **Storage:** $36.9
  - **Treatment:** $75.1
  - **Transmission & Distribution:** $200.8
  - **Source:** $19.8
  - **Other:** $2.3

• 2009: $335 billion
• 2005: $277 billion
• 2002: $154 billion

American Society of Civil Engineers (ASCE) grades US infrastructure

- **2009 Grade:** D-
- **2005 Grade:** D-
- **2001 Grade:** D


US EPA estimates upwards to $1 trillion needed of US public water and wastewater systems

www.amwater.com
Aging pipe infrastructure network propels need for Capital Expenditures

Percentage of Pipes by Classification

Without renewal or replacement of existing systems, pipe classified as poor, very poor or life elapsed will increase from 10% to 44% by 2020

USEPA Plan for Sustainable Water Infrastructure

- **Vision:** Seek innovative approaches and new technologies to help ensure that the Nation’s water infrastructure is sustainable

- **Accomplish this through collaboration with external stakeholders and conducting research, in the following 4 “pillar” areas:**

  1. Water Efficiency
  2. Full Cost Pricing
  3. Watershed-Based Approaches
  4. Better Management
Attributes of Effectively Managed Utilities

- Product Quality
- Customer Satisfaction
- Employee and Leadership Development
- Operational Optimization
- Financial Viability
- Infrastructure Stability
- Operational Resiliency
- Community Sustainability
- Water Resource Supply Adequacy
- Stakeholder Understanding and Support
U.S. Water & Wastewater Utility Industry Overview

Population Growth

- Driest regions in the United States continue to be fastest growing
  - Top 2 states rank last in precipitation
  - Water supply shortfalls threaten continued economic prosperity
- Supplemental methods of water supply (i.e. desalination, reuse, water transfers, conservation) need to be aggressively explored

Ten Fastest Growing U.S. States (Population)

<table>
<thead>
<tr>
<th>State</th>
<th>Annual Precip. (Rank)</th>
<th>Population Growth (Rank)</th>
<th>AW Population Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>NV</td>
<td>49</td>
<td>1</td>
<td>NA</td>
</tr>
<tr>
<td>AZ</td>
<td>50</td>
<td>2</td>
<td>741,285</td>
</tr>
<tr>
<td>GA</td>
<td>9</td>
<td>3</td>
<td>192,712</td>
</tr>
<tr>
<td>UT</td>
<td>44</td>
<td>4</td>
<td>NA</td>
</tr>
<tr>
<td>ID</td>
<td>46</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>FL</td>
<td>7</td>
<td>6</td>
<td>150,000</td>
</tr>
<tr>
<td>TX</td>
<td>28</td>
<td>7</td>
<td>11,452</td>
</tr>
<tr>
<td>CO</td>
<td>43</td>
<td>8</td>
<td>NA</td>
</tr>
<tr>
<td>NC</td>
<td>15</td>
<td>9</td>
<td>91,500</td>
</tr>
<tr>
<td>DE</td>
<td>19</td>
<td>10</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: World Almanac and US Census Bureau
Integrated Water Resource Management

Providing “safe”, “reliable” and “cost effective service” increasingly means a more holistic approach to water resource Management. (The better all the elements are managed, the better the impact on safety, reliability and cost.)
Water Reuse in the U.S.

- Water reuse in the U.S. is a large and growing practice

- An estimated 1.7 billion gallons per day is reused

- Reclaimed water use on a volume basis is growing an estimated 15% per year

- In 2002, Florida reclaimed 584 mgd; California ranked a close second with 525 mgd used everyday

- Florida has an official goal of reclaiming 1 billion gallons per day by the year 2010
Sewer Mining vs. Conventional Reuse Planning

Conventional Reuse

Sewer Mining

Reduced Pumping + Tailored Treatment = Enhanced Sustainability
Added Desalination Capacity by State (U.S.) 1995-2006

- > 500 mgd
- > 200 mgd
- > 100 mgd
- > 50 mgd
- > 10 mgd
- > 5 mgd
- > 1 mgd
- > 0.1 mgd
- < 0.1 mgd
Costs of Water by Source

Convergence of Costs

Source: Global Water Intelligence 10/06
Emerging Technologies Use More Energy

New regulations are increasing the use of the following, energy intensive treatment processes:

<table>
<thead>
<tr>
<th>Added Technology</th>
<th>Additional Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV Disinfection</td>
<td>70-100 kWh/MG</td>
</tr>
<tr>
<td>Ozone</td>
<td>170 kWh/MG</td>
</tr>
<tr>
<td>Membranes</td>
<td></td>
</tr>
<tr>
<td>Nano and RO</td>
<td>1,800 kWh/MG</td>
</tr>
<tr>
<td>Ultrafiltration</td>
<td>1,000 kWh/MG</td>
</tr>
<tr>
<td>Microfiltration</td>
<td>100 kwh/MG</td>
</tr>
</tbody>
</table>
Water Resource Challenges

Drought, Saltwater Intrusion, Unpredictable Weather Patterns

Climate Change

Increased Energy Consumption

Technology Solutions

Innovative Solutions are needed to break this cycle!
How Much Electricity Does the Water Industry Use?

• Drinking water and wastewater consume:
  - 3% of domestic electricity\(^1\)
  - 7% of worldwide electricity
  - 19% of California electricity\(^2\)

• Water utility energy use varies widely from 0.25 to 3.5 kWh per 1,000 gallons of drinking water produced and delivered\(^3\)

• The median 50% of water utilities serving populations >10,000 had electricity use between 1.0 and 2.5 kWh/1,000 gallons\(^3\)

1. Electric Power Research Institute (Burton 1996)
2. Energy Down the Drain: The Hidden Costs of California’s Water Supply
3. AwwaRF 91201. Energy Index Development for Benchmarking Water and Wastewater Utilities
# Inventory of AW’s 2007 Green House Gas Emissions

<table>
<thead>
<tr>
<th>Emissions Source</th>
<th>Emissions (tons Carbon Dioxide Equivalents)</th>
<th>Emissions (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Emissions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stationary combustion: boilers, generators, …</td>
<td>35,010</td>
<td>3.9%</td>
</tr>
<tr>
<td>Mobile sources: fleet</td>
<td>27,156</td>
<td>3.1%</td>
</tr>
<tr>
<td>Process/fugitive: biogas leakage from WWTPs(^2)</td>
<td>56</td>
<td>0.0%</td>
</tr>
<tr>
<td>Refrigerant: leakage from A/C units(^2)</td>
<td>1,754</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Indirect Emissions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>824,779</td>
<td>92.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>888,755</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

1. Emissions in metric tons CO\(_2\)e includes CO\(_2\), N\(_2\)O and methane emissions
2. Emissions from flared methane gas and HVAC were both <0.5%
Conclusions

• **Addressing climate change makes good business sense**

• **Water utilities are not just the recipients of the effects of climate change, they are also part of the problem!**

• **Multiple mechanisms exist for water systems to control impact of climate change**
  
  ▪ **Reduce electrical use**
    
    ◆ **Remember:** 80-90% of water treatment plant electric consumption goes to pumping
  
  ▪ **Look beyond just reducing electrical use – be creative!**
Changing Customer Base

- Customers are better educated and more demanding
- Customers require more information and more tools
- The US Population is aging and living longer
  - Elderly and immuno compromised consumers are more concerned over contaminants
  - Elderly tend to be more politically involved
  - Affordability becomes an issue for fixed income customers
The Relative Cost for Water Service

- U.S. water and wastewater rates are still relatively low in comparison to other traditional utilities

- Consumers are more attuned to the price of heating, telephonic services and electric bills rather than the price of their water

(1) Source: 2004 Bureau of Labor Statistics (assumes four person household)
(2) Source: United States Department of Labor – Consumer Expenditures Survey, 2004-2005 assumes four person household)
Ability to Pay vs. Prioritization of Expenditures
Consumer Expenditure Survey Results - Income: $20 - $30k per year

- Vehicle purchase ($3,076)
- Food away from home ($1,652)
- Apparel and services ($1,696)
- Total Entertainment ($1,238)
- Gasoline and motor oil ($1,686)
- Electricity ($1,178)
- Phone ($935)
- TV, radio and & sound equipment ($608)

- Combined alcoholic/non-alcoholic beverages ($516)
  - Non-alcoholic beverages ($273)
  - Alcoholic beverages ($243)
- Tobacco and smoking ($340)
- Personal care products ($496)
- Natural Gas ($408)
- Water & other public services ($299)
- Pets, toys and playground equipment ($281)

Questions?