The Water Resources Utility of the Future: A Blueprint for Action

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A Word About Process

- Collaborative effort of NACWA, WEF, WERF
- Pretty quick turnaround – started in Sept. finished late Dec.
- Steering Committee and Task Force to provide structure and industry input, respectively
- Steering Committee – 9 members, 3 from each sponsoring organization
- Task Force – 48 members from across the industry: 31 utilities (mostly public, but couple of IOUs), 9 consultants, 4 academics, 4 technology firms
- An initial characterization -- each sponsoring organization will take it further
**Bottom Line: Major Paradigm Shift**

**PAST:** collect wastewater, move it quickly downstream, treat it to acceptable standards, and dispose of waste without harming the environment.

**FUTURE:** manage resources to generate value for the utility and its customers, improve environmental quality at least cost to the community, and contribute to the local economy.
Utilities Today: World Class Sophistication

- Deliver services to 90+ percent of the US population
- Manage more than $500 billion in net assets
- Finance some $25 billion a year capital investments
- Manage combined budget of more than $55 billion/yr
- Responsible for a workforce of about 50,000
- Remove more than 90% of organic inputs, estimated 55% of nutrients, and nearly all harmful bacteria.
- Account for less than 10% of remaining water quality impairment of the nation’s rivers, streams, lakes, reservoirs, and coastal shoreline and only about 30% of impaired estuaries.

But...its not all good
What’s Behind the Paradigm Shift?

• We’re way out on the unit removal curve
• Traditional inter-governemental partnership that recognized public goods nature of clean water has nearly disappeared
• The CWA regulatory regime was built for an economy and an ecology that’s now 40 years old and out of date
• With deleveraging balance sheets and an environment of “no new taxes” clean water agencies struggling to make ends meet
**Welcome to the “Utility of the Future”**

<table>
<thead>
<tr>
<th>PAST</th>
<th>Motivation</th>
<th>Activity</th>
<th>Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect, Remove, Treat, Dispose Safely</td>
<td>Water Reuse</td>
<td>• Industrial Cooling, Recharge, Landscape, Golf Course Irrigation</td>
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<tr>
<td>Increase Revenue</td>
<td>Materials Recovery</td>
<td>• NH₄, P Compounds, N Compounds, Metals</td>
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<td></td>
<td>Materials Conversion</td>
<td>• Bioplastics, Pyrolysis Fuel Oil, Algal Biomass, Solid Fuels, Fertilizers</td>
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<td></td>
<td>Biosolids Reuse</td>
<td>• Liquid Fertilizer</td>
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<td></td>
<td>Energy Generation</td>
<td>• Photovoltaics, Wind Turbines</td>
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<table>
<thead>
<tr>
<th>FUTURE</th>
<th>Motivation</th>
<th>Activity</th>
<th>Innovation</th>
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</thead>
<tbody>
<tr>
<td>Reduce Cost</td>
<td>Energy Efficiency</td>
<td>• Energy Efficient Equipment &amp; Networks</td>
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<tr>
<td></td>
<td>Energy Recovery</td>
<td>• Methane &amp; Hydrogen Recovery, Heat Recovery</td>
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<td></td>
<td>Operating Efficiency</td>
<td>• Automation and Smart Operations, Asset Management, Sourcing</td>
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<tr>
<td>Support Community &amp; Economy</td>
<td>Growth Planning</td>
<td>• Sectoral Expansion, Targeted Upgrades, Managed Package Plants</td>
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<td></td>
<td>Green Infrastructure</td>
<td>• NPS Controls, Biowaste Conversion To Methane, Green Infrastructure</td>
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<td>Community Partnering</td>
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### Delivering Triple Bottom Line Results

<table>
<thead>
<tr>
<th>Activity</th>
<th>Environmental Effects</th>
<th>Utility Effects</th>
<th>Community Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>Fossil fuels</td>
<td>Carbon credits</td>
<td>Technology jobs</td>
</tr>
<tr>
<td>Energy Recovery</td>
<td>Greenhouse gases</td>
<td>Energy demand</td>
<td>Household incomes</td>
</tr>
<tr>
<td>Operating Efficiency</td>
<td>Air pollution</td>
<td>Operating cost</td>
<td>R&amp;D investment</td>
</tr>
<tr>
<td>Water Reuse</td>
<td>Fresh water</td>
<td>New revenue</td>
<td>Local GDP</td>
</tr>
<tr>
<td>Materials Recovery</td>
<td>Ecosystems</td>
<td>Biosolids disposal cost</td>
<td>Tax receipts</td>
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<tr>
<td>Materials Conversion</td>
<td>Loadings to waters</td>
<td>Compliance cost</td>
<td>Balance of trade</td>
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<tr>
<td>Biosolids Reuse</td>
<td>Saltwater intrusion</td>
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<tr>
<td>Energy Generation</td>
<td>Landfilling</td>
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<tr>
<td>Growth Planning</td>
<td>Net CO₂</td>
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<tr>
<td>Green Infrastructure</td>
<td>Groundwater</td>
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<tr>
<td>Community Partnering</td>
<td>Pollution and Runoff</td>
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- **Environmental Effects**:
  - Fossil fuels
  - Greenhouse gases
  - Air pollution

- **Utility Effects**:
  - Carbon credits
  - Energy demand
  - Operating cost

- **Community Effects**:
  - Technology jobs
  - Household incomes
  - R&D investment
  - Local GDP
  - Tax receipts
  - Balance of trade
  - Manufacturing jobs
  - Household incomes
  - Local GDP
  - Tax receipts

- **Utility and Community Effects**:
  - Net CO₂
  - Community partnerships
  - Tipping fee revenue
  - Maintenance cost
  - Energy costs
  - Manufacturing jobs
  - Household incomes
  - Local GDP
  - Tax receipts
Case: FOG Methane at East Bay MUD

• Accepts sewage, food scraps and grease from local restaurants, and waste streams from wineries and poultry farms
• Reduces volume of food waste by 90%
• Saves $3 million a year in electricity costs
• Plant is energy independent and sells electricity back to the grid – first of its kind
• Prevents significant methane releases to the environment
• Qualifies for carbon reduction credits
Case: Phosphorus Recovery at Hampton Roads

- Ostara Nutrient Recovery Technologies’ Pearl process
- Recovers 85% N and 40% P
- Converts to Crystal Green slow release fertilizer
- No additional costs to HRSD
- Significant savings to ratepayers
- Increases plant efficiency
- Replaces mined P fertilizer at fraction of its cost
- Significant reduction in carbon footprint
- Also at Clean Water Services, OR, York PA, Saskatoon BC, London UK
Case: Solar PV – Its Everywhere

- Boulder, CO
- Pueblo, CO
- Telluride, CO
- Corvallis, OR
- Raleigh, NC
- Phoenix, AZ
- Pima County AZ
- San Diego County, CA
- Tulare, CA
- Charlotte, NC
- Hackettstown, NJ
- Philadelphia, PA
- Oroville, CA
- Nantucket, MA
Case: Wind Turbines – They’re Everywhere

- Atlantic County, NJ
- Bayshore, NJ
- Browning, MT
- Guthrie, OK
- Narragansett Bay, RI
- Muskegon County, MI
- Fall River, MA
- Falmouth, MA
- Cascade, WI
- Evansville, WI
- El Dorado, KS
- Perry, IA
- MWRA, MA
- Ashtabula, OH
Case: Wastewater Reuse Growing Fast

Wastewater Reuse (BGD)

Source: USGS and other sources
A Look at Florida’s Reuse Program

- 420 wastewater reuse systems
- 465 BGY capacity, 263 BGY reused (2011)
- 40% landscape, 25% aquifer recharge, 15% agricultural, 15% industrial cooling, 5% fire protection, toilet flushing, car washes
**Emerging Technologies**

- CNG from biogas for vehicles and CHP
- Solar algae harvesting to recover nutrients and generate biogas
- Microbial fuel cells using algae to generate electricity from wastewater
- Constituent-specific storm water filtration and local reuse
- Various forms of solid fuel from biosolids as coal substitutes
Great Story, So Why Do We Need Help?

- Fundamentally the market is working and will likely continue to work, but in a slow, clunky, and geographically uneven way.
- Without help, transaction costs will be needlessly high, technology adoption rates will be needlessly slow, communities and politicians will be under-informed, and the benefits shown here won’t be captured.
- The UOTF is being held back by certain structural barriers and resistance to change: regulatory pressure, fiscal pressure, political pressure, and risk of technology failure.
Blueprint: Create Environment of Innovation

Creating a vision for the future of our industry

- Identifies a range of changes to legislation, administrative practices, and programmatic structures.
- Identifies things clean water agencies are already doing and suggest more of it as well as more widespread adoption, and
- Calls for some bold, transformative thinking around new ways of doing business.
#1: Encourage Clean Water Agencies to Lead Innovation at the Watershed Scale

Regulatory flexibility on discharge limits linked to environmental results using modified TMDL or alternative watershed-based solutions.

- Trading (good models in Ohio River Valley, LI Sound, and maybe emerging in Chesapeake watershed)
- Adaptive management (good model in Wisconsin)
- Alternative approaches to ecosystem and habitat restoration (good model trying to emerge in Narragansett Bay)
- Use USDA and state resources for conservation programs to help bring other sources, mainly Ag to the table.
#2: Remove Barriers and Provide Incentives for Technology Developers to Partner with Utilities

A few logical, enabling initiatives we can take today to push the UOTF agenda and capture triple bottom line results:

- Reform federal/state renewable energy credit and similar programs
- Amend the SSI rule (March 2011): use multi-media risk assessment instead.
- Relax the private-use test for tax-exempt bonds that finance public energy recovery/production projects.
- Amend state RPS eligibilities to include energy recovery projects from biosolids.
- Clarify state water use rights for reclaimed wastewater
- Amend SRF eligibilities to include wastewater reuse.
#3: Speed Up the Pace of Innovation and Rate of Technology Adoption.

*Help push us over the edge of innovation by de-risking a conservative industry*

- ARPA-W: high-risk, high-reward R&D
- An ARPA-W risk offset facility
- 50-state program of reciprocal technology certification
- Wastewater reuse investment tax credits for private firms that invest in rural or low income communities
- Water markets to define rights for recycled water
#4: Organizing and Managing Our Own Future

Since we don’t have all the answers, prepare for change

- Congressional Caucus
- Continued advocacy from Task Force
- Knowledge management: create the “Industry of the Future”
- New intergovernmental partnership on Resilience of Clean Water Infrastructure
- 21st Century Watershed Act