Breaking Down Barriers to Energy Efficiency and Renewable Energy Deployment in Water and Waste

May 27, 2015
Our Water System infrastructure:

- Service Area (473 sq. miles)
- About 697,100 water service accounts
- About 7,260 miles of distribution mains
- 114 local tanks / reservoirs
- 9 LAA reservoirs
- 88 pump stations
- 421 regulator stations
- 23 chlorination stations
- 7 fluoridation stations
- 60,400 fire hydrants
- Advanced water treatment facility uses ozone as disinfectant
Much of the hydraulic head required for water distribution is provided by gravity.

The average energy intensity for LADWP water distribution is approximately 196 kWh/AF.
ADDRESSING THESE CHALLENGES, EARLY ACCOMPLISHMENTS, AND WHAT’S AHEAD

To Date:

- Use of energy efficient pumps and motors
- Planned start-up and testing to reduce grid and bill impacts

The Future:

- Optimizing equipment selection
- Time of day pumping
- Set realistic pricing structures
- Reduce overall water usage
Sources of Water for Los Angeles

- Sierra Mountains
- Bay Delta
- State Water Project
- LA Aqueduct
- Colorado River Aqueduct
- Local Groundwater, Stormwater, Conservation & Recycling
The 233-mile long LAA provides water from the Eastern Sierra watershed and is entirely gravity fed.

14 Hydro-generation plants along the aqueduct system. On average, the LAA system generates approximately **2,456 kWh/AF**
State Water Project (SWP)

- Water supplies are conveyed along the 444-mile California Aqueduct
- Energy intensity of the West Branch is **2,614 kWh/AF**
- Energy intensity of the East Branch is **3,263 KWh/AF**

Highest Single Pump Lift: 1,926 ft.
Colorado River Aqueduct (CRA)

- Water supplies are conveyed along the 242-mile CRA Aqueduct
- CRA Energy Intensity is **2,027 kWh/AF**

Net Pump Lift: 1,617 ft; Highest Single Lift 441 ft. at Hinds PP.

Lake Matthews, 1,390 ft. elev.

Colorado River, 450 ft. elev.
- City has 115 groundwater production wells
- More than 50% of the wells are inactive due to GW contamination
- The average energy intensity is approx. 580 kWh/AF
Power costs can be a key component of water costs, depending on source.

Most local and sustainable sources come with energy costs.

Sustainability in Water and Power resources can oppose each other when it comes to energy usage.
LADWP Water Supply
Energy Consumption

Energy (MWh)
- MWh (Local and MWD supply)
- 10-year rolling average

Year
- 1980
- 1982
- 1984
- 1986
- 1988
- 1990
- 1992
- 1994
- 1996
- 1998
- 2000
- 2002
- 2004
- 2006
- 2008
- 2010
- 2012
- 2014

260 % increase

10-year rolling average
Local Water Supply Goals

FYE 2012 - 2013 Average
Total: 568,694 AFY

- LA Aqueduct: 113,411 (20%)
- Local GW: 61,252 (11%)
- Conservation: 2,122 (0.5%)
- Recycled Water: 7,513 (1.5%)
- MWD: 388,402 (68%)

Fiscal Year 2023 - 24
Total: 658,214 AFY

- LA Aqueduct: 161,017 (24%)
- Local GW: 111,500 (17%)
- Conservation: 46,823 (7%)
- Water Transfers: 40,000 (6%)
- Recycled Water NPR: 20,686 (3%)
- Recycled Water IPR: 30,000 (5%)
Cumulative water conserved from FY 2007/08 to FY 2013/14 by LADWP customers is 578,141 acre-feet.

Equivalent to:
- Powering over 308,000 homes in L.A. for 1 year
- Eliminating 1.48 billion pounds of CO2 emissions
- Eliminating 134,772 passenger vehicle emissions for 1 year
- Avoiding GHG emissions by recycling over 244,000 tons of waste instead of sending it to the landfill
Summary Comparison of Energy Intensity

**FY 2014 Energy Intensity***

- Los Angeles Aqueduct: 34 kWh/AF
- Local Groundwater: 580 kWh/AF
- Recycled Water: 1,347 kWh/AF
- Colorado River Aqueduct: 2,027 kWh/AF
- State Water Project - West Branch: 2,614 kWh/AF
- State Water Project - East Branch: 3,263 kWh/AF

**FY 2035 Projected Energy Intensity***

- Los Angeles Aqueduct: 62 kWh/AF
- Local Groundwater: 580 kWh/AF
- Recycled Water: 2,078 kWh/AF
- Colorado River Aqueduct: 2,031 kWh/AF
- State Water Project - West Branch: 2,642 kWh/AF
- State Water Project - East Branch: 3,267 kWh/AF

*including treatment
In contrast to other forms of energy efficiency typically addressed by local or state governments, meaningful savings in the water sector brings into question:

- Large scale energy efficiency
- Reliability of energy supply
- Substantial cost impacts to an historically cheap commodity
- Absorbing energy needs of new water sources
LADWP directly receives recycled water from three WW treatment plants operated by the City of Los Angeles, Bureau of Sanitation (LASAN).

The weighted average of recycled water energy intensity is approximately 1,347 kWh/AF.
LAA and SWP (west branch) water is treated at the Los Angeles Aqueduct Filtration Plant (LAAFP)

The average LAAFP treatment energy intensity is 37 kWh/AF
Projected Water Supply Energy Demands

Status Quo
Based on 2010 UWMP Projections (average hydrologic conditions)

Based on ED5 goals (average hydrologic conditions)

* including MWD estimates

Year
LADWP – Power System
Increasing Renewable Energy and Energy Efficiency

2013:
- Renewable: 23%
- Natural Gas: 16%
- Coal: 42%
- Nuclear: 10%
- Hydro: 4%
- Other: 4%
- Energy Efficiency: 1%

2020:
- Renewable: 33%
- Natural Gas: 16%
- Coal: 23%
- Nuclear: 9%
- Energy Efficiency: 15%
- Hydro: 4%

2030:
- Renewable: 40%
- Natural Gas: 34%
- Coal: 0%
- Nuclear: 7%
- Energy Efficiency: 15%
- Hydro: 0%
Less Obvious Energy Savings In Operations

- Filtration Media
- Data Mining and Operational Intelligence
Shade Balls
Infrastructure Replacement and Upgrade

Mainline Replacement Levels and Leaks
(Fiscal Year)

- Cumulative Miles of Water Main Replaced
- Annual Water Main Breaks

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<tr>
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<th>Cumulative Miles Replaced</th>
<th>Annual Leaks</th>
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<td>2007-2008</td>
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Energy Efficiency and Renewable Energy in the Wastewater Treatment Sector

Better Buildings Summit

May 27, 2015

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities
Agenda

- Project Description
  - Why this project
  - How could it work
- Partnerships
  - Introductions
  - Organizational strengths to leveraged
- Timeline/Milestones
Why This Project?

- Continue beyond grant
- Have high energy impact
- Bring additional benefits
- Engage partners
- Seeking a project that would...
- Relevant for entire state
- Utilize strengths
Project Goal

Decrease energy use in Minnesota municipal wastewater facilities and scope opportunities for energy generation
Project Objectives

Motivate energy efficiency in MN WWTP

Assess opportunity for energy generation

Provide plan for energy generation at select sites
## Approach

Capitalize on the strengths of state and local resources

<table>
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<td>PCA Water</td>
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<td>Municipalities</td>
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Develop Partnerships

- Agency Partners
- Technical Partners
- Model Sites
- Target Facilities
- Community Partners
Implementation Plan

Develop partnerships for E2
- Engage wastewater community
- Identify TA resources
- Leverage state resources

Conduct E2 assessments
- Identify prospective sites
- Train for self assessment
- Complete site evaluations

Facilitate site investment
- Develop impact story
- Identify and apply resources
- Promote and encourage success

Assess renewable energy opportunity
- Conduct preliminary evaluations
- Partner for detailed assessments
Anticipated Project Outcomes

**WWTP E2**
- Engage Minnesota WWTP on E2 and DG
- 50 operators trained on E2
- 10 energy efficiency assessment conducted

**Implement E2**
- 2-5 million kWhr/yr identified conservation opportunity
- 10 regional discussions on WWTP E2 implementation planning

**Distributed Generation**
- 5 distributed generation screening evaluations
- 1-2 detailed distributed generation assessments
- 1-2 stakeholder discussions on DG implementation opportunity
## Project Timeline

<table>
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<th>Task</th>
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<td>Task 1: Strategic Planning</td>
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<td>Task 2: Develop Partnerships</td>
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<td>Task 3: Conduct Energy Efficiency Assessments</td>
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<td>Task 4: Facilitate Site Investment</td>
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<td>Task 5: Identify Renewable Energy Opportunities</td>
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<td>Task 6: Action Plan Implementation Model</td>
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<td>Task 7: Disseminate Results</td>
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[Image: Energy Efficiency and Renewable Energy Generation]

[Logo: Minnesota Department of Commerce]

[Logo: Minnesota Pollution Control Agency]

[Logo: Minnesota Technical Assistance Program]
Next Steps

• Continue developing partnerships
• Engage model sites for informational interviews
• Promote project opportunities
• Identify/engage candidate assessment sites
• Compile publicly available site data
• Develop WWTP benchmarking capabilities
• Establish training opportunity and curriculum
Jessica Burdette  
Minnesota Department of Commerce  
Jessica.burdette@state.mn  
612-839-6659

Adam Zoet  
Minnesota Department of Commerce  
Adam.zoet@state.mn.us  
612-539-1798

Laura Babcock  
University of Minnesota – MNTAP  
lbabcock@state.mn.us  
612-624-4678

AJ Van den Berghe  
University of Minnesota – MNTAP  
vand0576@umn.edu  
612-624-4653
Arizona Facts

- 6th Largest State
- 15 Counties
- 30 State Parks
- 22 National Parks
- 22 Native American Indian Tribes
- Lack Hwy Infrastructure
- 4 IECC Climate Zones
Community Energy Program

Top 5 Problems for the Next 50 Years

1. Energy
2. Water
3. Food
4. Environment
5. Poverty
What’s the Energy Cost in Water

EPA estimates **3-4 percent of national electricity consumption.** Water and wastewater utilities are typically the largest consumers of energy, accounting for **30-40 percent of total energy consumed.**

Energy costs make up the majority of an annual operating budget within a community, typically **second only to labor costs.**

Energy costs have a direct impact on an area’s economic health through inefficient energy use and high utility rates.
Future Energy Demand

• Energy demand increase » 20% - 30% in 15 years
  • *In water and wastewater*
• Population & more stringent regulations
  • *Aging infrastructure*
  • *Increasing threats to watersheds and aquifers*
  • *Changing compliance and public health standards*
  • *“Rising cost” industry*
  • *Higher customer expectations*
  • *Emerging contaminants (pharmaceuticals)*
  • *Increasing competition for raw water sources*
GOEP Action

In February 2012 the U.S. Department of Energy (DOE) issued a funding opportunity announcement (FOA) to state energy offices. GOEP received 3 years of funding to:

- Benchmark wastewater facilities into EPA Portfolio Manager
- Identify Energy Efficiency Opportunities and match facilities with funding
- Conduct Energy Efficiency Training
Water Energy Partnership in Arizona

INVESTIGATION
- Facility Identification
- Benchmarking
- Education/Training

TECHNICAL ASSISTANCE
- Needs Assessment
- Funding Options
- Education/Training

IMPLEMENTATION
- Project Upgrades
- Education/Training

Coordination/Collaboration
Water Energy Partnership in AZ

Status:

- 72 WWTP Benchmarked into Portfolio Manager
- Preliminary Analysis
  - Visits to 6 facilities and 3 EPA Energy Audit
  - Technical Assistance to 15 facilities
- Developed WWTP Benchmarking curriculum and presented 10 energy education trainings
- Developing resource guide for facilities
Portfolio Manager WRRF Factors

• Average Influent Flow (MGD)
• Average Influent BOD (mg/l)
• Average Effluent BOD (mg/l)
• Plant Design Flow Rate (MGD)
• Fixed Film Trickle Filtration Process
• Nutrient Removal
• Heating Degree Days
• Cooling Degree Days
## Portfolio Manager Scores

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### SCORE vs. Ratio

![Graph showing the relationship between Portfolio Manager Score and Ratio. The graph illustrates a downward trend as the Portfolio Manager Score increases.]
Grant Application Partners

State:
- Arizona Department of Environmental Quality
- Water Infrastructure Finance Authority

Federal:
- U.S. Department of Agriculture Rural Development

Private:
- Arizona Public Service
- Honeywell
- Lincus Energy
- Rural Community Assistance Corporation
Partners Market Network (2012)
Current Partners (2015)

**State:** AZ Department of Environmental Quality, Water Infrastructure Finance Authority, AZ Department of Water Resources, AZ State Parks, AZ Department of Transportation, Arizona Corporation Commission

**Federal:** USDA Rural Development, EPA, U.S. Bureau of Reclamation

**Utility:** Arizona Public Service, Unisource, Salt River Project, Sulphur Springs, AZ Electric Power Cooperative, Mohave Electric Co-op

**Private:** Honeywell, Lincus Energy, AMERSCO, TRANE, Chelsea Group, Border Environment Cooperation Commission (BECC)

**Professional Organizations:** AZ Water Association, Rural Water Association, AZ Electric Co-op Association
Challenge

PICK UP THE PHONE AND MAKE SOMETHING HAPPEN

Get Out of the office
Thank You

Lisa Henderson
Community Energy Program Manager
State of Arizona | Office of Grants and Federal Resources
100 N. 15 Ave, Suite 202, Phoenix, AZ 85007
P: 602.771.1134 | M: 602.903.8211
Lisa.Henderson@azdoa.gov

Barry Liner, Ph.D., P.E.
Director, Water Science & Engineering Center
Water Environment Federation
bliner@wef.org