Unlocking Energy Savings in Wastewater Treatment Plants

Josh Bachman
11/30/18
### 3 Rules...

1. You’re either in the club or not.

2. You want to be in the club!

3. The more people the more fun.

...let’s go hit the town!
Cascade Energy
You’re not in the club!
After you get through the door...
...challenges remain
Why is this market hard to reach?
Why is this market hard to reach?
Why is this market hard to reach?

- Lighting
- HVAC
- The plant
I know what you’re thinking...
You want to be in the club!
You want to be in the club!

30 & $100M

7% + 14%
Why wastewater?

30 & $100M
Why wastewater?

7% + 14%
Why wastewater?
Why wastewater?
Rough numbers

### Rules of Thumb

<table>
<thead>
<tr>
<th>Daily Volume</th>
<th>130 gal/person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Intensity</td>
<td>1,600 kWh/M gal</td>
</tr>
</tbody>
</table>

### Estimated Annual Energy Use

<table>
<thead>
<tr>
<th>State</th>
<th>Population</th>
<th>Energy Use (GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>7,000,000</td>
<td>530</td>
</tr>
<tr>
<td>Colorado</td>
<td>5,600,00</td>
<td>430</td>
</tr>
<tr>
<td>Nevada</td>
<td>3,000,000</td>
<td>230</td>
</tr>
<tr>
<td>New Mexico</td>
<td>2,100,000</td>
<td>160</td>
</tr>
<tr>
<td>Utah</td>
<td>3,100,000</td>
<td>240</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20,800,000</strong></td>
<td><strong>1,590</strong></td>
</tr>
</tbody>
</table>

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Wastewater

From *State of U.S. Urban Water: Data and the Energy-Water Nexus*
Where are the plants?

<table>
<thead>
<tr>
<th></th>
<th>Major WWPT &gt; 1 MGD</th>
<th>Minor WWPT &lt; 1 MGD</th>
<th>Total WWTPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ</td>
<td>54</td>
<td>57</td>
<td>111</td>
</tr>
<tr>
<td>NV</td>
<td>13</td>
<td>15</td>
<td>28</td>
</tr>
</tbody>
</table>

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Saving Energy at Wastewater Plants

Remember 2 things!
If it’s out there, it’s on
If it’s on, it’s at full power
More is Better!
Some of the measures...

**Capital**
- Advanced aeration control
- Real time water quality feedback
- Better diffusers
- Better blowers
- Smart pumps and mixing

**Low/no-cost**
- Optimize DO control
- Optimize blower discharge pressure
- Control your odor control
- Free water isn’t free
The more people the more fun
Typical cohort program

2 Years
5 Workshops
Treasure Hunt
Energy model and tracking
Organizational and Technical Help
Year 2 Maintenance

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Why the SEM cohort approach?

<table>
<thead>
<tr>
<th>Benefit</th>
<th>End User</th>
<th>Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer to peer</td>
<td>More learning</td>
<td>More accountability</td>
</tr>
<tr>
<td>Economy of scale</td>
<td>More resources</td>
<td>Lower cost</td>
</tr>
<tr>
<td>Diversity</td>
<td>More perspective</td>
<td>Lower risk</td>
</tr>
</tbody>
</table>
Who attends
Spread of wastewater cohorts

2012
Puget Sound
Puget Sound Energy and BPA

2015
Salt Lake
Rocky Mtn Power

2017
Puget Sound
BPA

2019
Vancouver, BC
BC Hydro
Chicagoland
ComEd

2011
Oregon ACWA
Energy Trust of Oregon and BPA

2014
Southern Idaho
Idaho Power

2016
Mid-Columbia Basin
BPA

2018
New York
NYSERDA
City of Phoenix
Self Funded
### Cohorts

The following is a list of states and their participants along with the average savings for active participants:

<table>
<thead>
<tr>
<th>State</th>
<th>Participants</th>
<th>Ave 1st Year Savings for Active Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>25</td>
<td>9.4%</td>
</tr>
<tr>
<td>OR</td>
<td>10</td>
<td>9.5%</td>
</tr>
<tr>
<td>UT</td>
<td>19</td>
<td>7.2%</td>
</tr>
<tr>
<td>WA</td>
<td>20</td>
<td>7.3%</td>
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Low/no-cost drives capital projects

Over 5x increase in savings

Energy Savings (GWh/year)

<table>
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<th>3 Years Pre-SEM</th>
<th>3 Years Post-SEM</th>
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<tbody>
<tr>
<td>SEM 4.6</td>
<td>26.4</td>
</tr>
<tr>
<td>Completed 9.4</td>
<td></td>
</tr>
<tr>
<td>In-Process 12.6</td>
<td></td>
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What makes a good cohort?

<table>
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<tr>
<th>Participants</th>
<th>8 to 10 facilities</th>
</tr>
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<tbody>
<tr>
<td>Diversity in sizes</td>
<td>5 to 25 MGD sweet spot</td>
</tr>
<tr>
<td>Big sites</td>
<td>Lots of inertia to overcome</td>
</tr>
<tr>
<td>Small sites</td>
<td>Lack people resources</td>
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Thank you!

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