Business Case for Satellite Onsite Reuse Systems: Bridging the Gaps

WateReuse Association NorCal Chapter Meeting
AUGUST 23, 2019

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“For utilities and developers, ONWS can be a means of complying with new regulations while maximizing the social, environmental, and economic benefits of each project.”

– US Water Alliance, Making the Utility Case for Onsite Non-Potable Water Systems
1: THE ONWS OPPORTUNITY
Food for Thought...

1. On-site non-potable water systems can be a transformative opportunity...but there is a risk that the benefits may not be realized, so...

2. Consider all driving forces...because a one-size-fits-all approach does not work!

3. Changes to market demands are driving developers away from “business-as-usual” thinking.
Satellite water systems are district and building scale water treatment systems that are connected to the central system.

These systems are designed to treat varying qualities of water sources to meet the quality needs of the ultimate demand as “fit for purpose” reuse.
**What is the opportunity?**

<table>
<thead>
<tr>
<th>RESIDENTIAL BUILDING:</th>
<th>COMMERCIAL BUILDING: Precipitation can be harvested, treated, stored and reused as makeup for evaporative cooling applications.</th>
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</thead>
<tbody>
<tr>
<td>graywater can be separately drained, filtered and reused for subsurface irrigation.</td>
<td>SITE: Wastewater from buildings can be treated and reused to irrigate landscapes, flush toilets and provide cooling makeup.</td>
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<tr>
<td>DISTRICT: Wastewater can be mined from a nearby sanitary sewer, treated and reused to irrigate crops and golf courses.</td>
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</table>
Location + Scale

Urban (satellite)
Remote (decentralized)
Water infrastructure is spatially sensitive

<table>
<thead>
<tr>
<th>Scale/Location</th>
<th>Treatment Energy</th>
<th>Distribution Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>On-site</td>
<td>85%</td>
<td>15%</td>
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</table>
A region that optimizes the system to take advantage of the ideal scale will reap benefits in terms of system resilience, costs, greenhouse gas emissions, and water security.
A robust network balances redundancy and cost.

(A) Fully redundant networks are expensive.

(B) Optimizing a system for CapEx cost yields tree-like networks.

(C) Considering the costs of outages yields hybrid networks.

Source: Hines et. al, 2015
2: PROJECT DELIVERY CONSIDERATIONS
Ownership Typologies

Terminology

- **Project Delivery**: Design (D), Bid/Build (B), Finance (F)
- **On-going**: Operate (O), Maintain (M),

Development

- Owner-Builder → Owner-Occupied (campuses)
- Developer-Builder → Ownership Transfer (everything else)
- Public-private partnerships (P3)
The regulatory framework is simplifying...

- **STORMWATER**
  - Building Code CPC Chapter 15 ("graywater")
  - County Departments of Public Health
  - Developed on a case-by-case basis
  - Risk-Based Framework State Division of Drinking Water
  - Local Program Onsite Treated Non-Potable Water Systems

- **WASTEWATER**
  - CA Code of Regs CCR Title 22
  - State Division of Drinking Water
  - Regional Water Quality Control Board

- **Today 2019**
  - Treatment Requirements
  - Public Health + Drinking Water Protection
  - Monitoring + Reporting

- **SB 966 2020**
  - Estimated start of local program development

- **2022**
  - Local Programs established
...while novel funding and governance frameworks are under-explored.
There is an innovation deficit in urban water systems.

Responding to [climate change, increasing urbanization, and the decay of existing infrastructure] will require **SUBSTANTIAL TECHNOLOGICAL AND MANAGEMENT CHANGES** for which major changes in regulations or funding for operation and maintenance may not be available.

- Kiparsky et al. 2013
3: CRITICAL NATURE OF TIMING
Distributed systems are deployed on a rapid cycle.
An expense deferred today has value TODAY.

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<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sanitary Sewer Upgrades</td>
<td>Avoided cost of expanding sewer and/or avoided upgrades to system to carry additional volume</td>
</tr>
<tr>
<td>Central Wastewater Treatment</td>
<td>Operational savings for volume diverted to satellite facility</td>
</tr>
<tr>
<td>Recycled Water Network</td>
<td>Avoided cost of expanding recycled water network and operational savings from reduced pumping</td>
</tr>
</tbody>
</table>
Optimizing centralized and decentralized infrastructure to work together to benefit the ENTIRE system

Developers
1. Insulation from market volatility
2. Potential for return on investment
3. Increase allowable density (FAR)
4. Demystify water entitlements process for predictable outcomes and to meet permitting schedules

Utilities
1. Bolster regional infrastructure
2. Contribute to a diverse future water supply (reuse as conservation)
3. Avoid upgrading capacities of existing water and wastewater networks (and potentially wastewater treatment plant)
4. Avoid additional operating costs at wastewater treatment plant
5. Avoid extending recycled water networks
6. Avoided additional operating costs of recycled water systems
How will I pay for this investment?

1. Review true delta between “business as usual” and ONWS
2. Assess whether lifecycle costs are important for your development
   • If not, what costs can be recovered via water purchase agreement?
3. Determine first cost offsets
   • Identify incentives, connection fee discounts
4. Articulate less tangible benefits
   • Community benefits
5. Review water, sewer, stormwater rates
   • Create business case
Water Reuse in Atlanta
District-Scale Reuse Concepts

**Alt 1**
- Harvest wastewater from sanitary system
- Treat in central treatment plant
- Supply from: O+C & Multi-Family Buildings
- Reuse for: Site & Park Irrigation
  - Office and Residential Cooling

**Alt 2**
- Harvest wastewater from sanitary system
- Treat in central treatment plant
- Supply from: O+C & Multi-Family Buildings
- Reuse for: Site & Park Irrigation
  - Office Cooling
  - All Toilets

Alt 2 includes water reuse for toilet flushing.
Financial Comparison

Total cash flow includes CapEx, OpEx, savings from water and sewer bills compared to no reuse
Financial Comparison

5.95% Historic Water Escalation Rate

- **Total Cost - ALT 1**
  - $28,800,000 Saved for a 5-year payback

- **Total Cost - ALT 2**
  - $25,300,000 Saved for a 5-year payback

- **Total Cost - ALT 1**
  - 3-4 Year Payback

- **Total Cost - ALT 2**
  - 4-5 Year Payback
5: WHAT’S NEXT FOR THE INDUSTRY?
Rate forecasting as a risk framework.

Credit: content compiled by Ember Strategies and Arup
Stressors direct risk tolerance.

**CLIMATE CHANGE**
- Multi-year droughts
- Sea level rise (WWTPs)
- Storage constraints (snowpack, reservoirs)

**INCREASING URBANIZATION**
- Population growth
- Construction constraints

**DECAY OF EXISTING INFRASTRUCTURE**
- ASCE Report Card (Cs and Ds)
- Earthquakes (shocks)

**REGULATORY RESTRICTIONS**
- Groundwater (SGMA)
- Nutrients
- Potable reuse

**What projects should be built in response?**
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<th>Actions</th>
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<td>1. On-site non-potable water systems can be a transformative opportunity</td>
<td>Engage in an engineering assessment early to inform decision-making</td>
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<td>2. Consider all driving forces</td>
<td>Timing is critical</td>
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<td>3. Changes to market demands are driving developers away from &quot;business-as-usual&quot; thinking</td>
<td>Create a project-appropriate business case framework that considers water risk factors</td>
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THANK YOU!

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