Understanding our Water Footprint:
De-risking Operations

Ed Kirk, Johns Hopkins University

Jonathan Lanciani, Sustainable Water
Water Apocalypse

Only 5-10% of “drinking” water produced will be used for consumption.
http://www.virginiaplaces.org/watersheds/drinkwater.html

History of drought in region

Risks: Rates, Availability, Infrastructure, Environmental Pressure
Water: The Lynchpin to JHU’s Way of Life

Solutions for a Range of End Users
Johns Hopkins University

- Est. 1876
- 20 M GSF of Buildings
- 21 MW of CHP across 5 systems
- 50,000 tons of cooling and steam
- 320 M Gallons of water annually

Mission: Ensure JHU is sustainable and remains strong and vibrant
From the Committee:

- Possible to reduce GHG by 141,600 MT CO2e
- No one way to reach the goal.
- Business as Usual growth rate: 0.3% annually.
- Result = 51% reduction in GHG by 2025.
Since 2008:
- Reduced GHG Emissions by 23% while the campuses have grown by 9%
- Sustainable Purchasing initiatives
- LEED certification on 12 buildings
- Waste diversion increased more than 50%
- Already conserving and treating stormwater

But what about water?? Water use ROSE 9% in 2010
3 Cogeneration Plants (18MW)
• Increases Plant EE & Reduces carbon footprint

Trigeneration Plant (1.5MW)
• 85% better than grid electricity

Small CHP (75KW Modules)

Results:
• Displace High Carbon content grid electricity
• Capture & use waste heat
National Recognition

Cogeneration & On-Site Power Production

John Hopkins University takes on Cog of green initiative

John Hopkins Installs CHP System at Student Housing Building

Setting Standards for Efficiency and Reliability
Risks to Water

Rising Rates

Maryland’s Aging Infrastructure
$13 billion Infrastructure Investment Needs Through 2030

Baltimore: Rates set to rise 11% over next 2 years
Risk Mitigation

Campus water objectives:

- Redundant Water Supply
  - Drought
  - Municipal infrastructure failures
- Additional On-Site Storage
- Flexibility & Resilience
- Independence
- Availability in the event of failure
- Minimum recovery time
- Insulation from rising water costs

N+1: Reliable and Safe Alternatives to Potable Water
Solution: Reuse Water
A logical extension to conservation efforts

Operational
• De-risks operations with an alternative water source
• Protects against mandatory conservation programs

Cost Savings
• Discounted water rates
• Reduced potable water intake
• Reduced sewer fees

Environmental & Social
• Decreases diversion of water from ecosystems
• Decreases wastewater discharge
• Net energy efficiency gains
• Reclaimed water shows no danger to public health

Eliminate Risks, Save Money and Increase Sustainability
Centralized vs. Decentralized Reuse

The Embodied Energy of Water

Wastewater

Reclaimed Water

Water Treatment Facility ~10+ miles End User

Impractical for Baltimore, MD
Overview

Utility Water Assessment
- Equipment inventory
- Program admin.
- Water quality needs
- Reclaimed water modeling

Water Footprint Assessment & Economic Validation
- Water balance & use
- Non-potable demand
- WW flow projections
- Economic assessment

Site & Infrastructure Assessment
- Infrastructure review
- Regulatory review
- Prelim. siting & design
- Lifecycle Savings

Validating Impact & Developing a Plan
Utility & Sewer Data

Non-potable Process Water Demand

- Gallons per Day

8% Irrigation
36% Utility
56% Domestic

Predictable Demand
Some Independent Power Producers Currently Using Reclaimed Water

Water Reuse is Prevalent Amongst IPPs
Utility Assessment

- Biological studies
- Corrosion studies
- Automation
- Treatability studies
- Equipment Integrity

Feasibility and treatability studies
- Scale inhibitors
- Sludge dispersants
- Treatment specifications
- Purity studies
- Corrosion studies
- Fuel conservation studies

Superior Program Oversight: Unparalleled Collaboration
Water Purchase Agreement

Flexible project financing arrangements utilizing:
~ Performance Contracts ~ Operating Leases ~ Design-Build Agreements

Benefits

• No up-front capital
• Innovative Technologies
• Leverages superior credit rating
• Immediate, Guaranteed Savings
• Long Term Pricing Stability $2,000,000
• No O&M Responsibilities
• SW bares majority of risk

Cumulative Savings

- $2,000,000
- $4,000,000
- $6,000,000
- $8,000,000
- $10,000,000
- $12,000,000

Yr 1  Yr 5  Yr 10  Yr 15  Yr 20

200K GPD  300K GPD  400K GPD  500K GPD

Water is Principal to Facility Operations
The WaterHub™

Student Engagement: Functional, but also a Living, Learning Classroom
### Water Reuse in Urban Spaces

Decentralization Creates New Dynamics: Safety, Aesthetics & Footprint

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Complex, Adaptive Ecosystems

Increased Biodiversity, Reduced Energy Requirements
Adaptive Ecological Solutions

- Paired ReCip Cells
- Primary Tank
- Filtration & Disinfection
- Reuse Tank
- Mechanical Room
- Root Zone
- Artificial Media
- Aeration
- Plants & Supporting Media
QUESTIONS?

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