

Panel Discussion: Data Science at the Energy-Water Nexus



Adlinger Center for Energy and the Environment
Annual Meeting
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The Water Research Foundation





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Water
Research
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Leading not-for-profit research cooperative that advances the science of water to protect public health and the environment.

Learn more at www.waterrf.org

\$700 Million
in Research

2,300
Projects

1,200
Subscribers

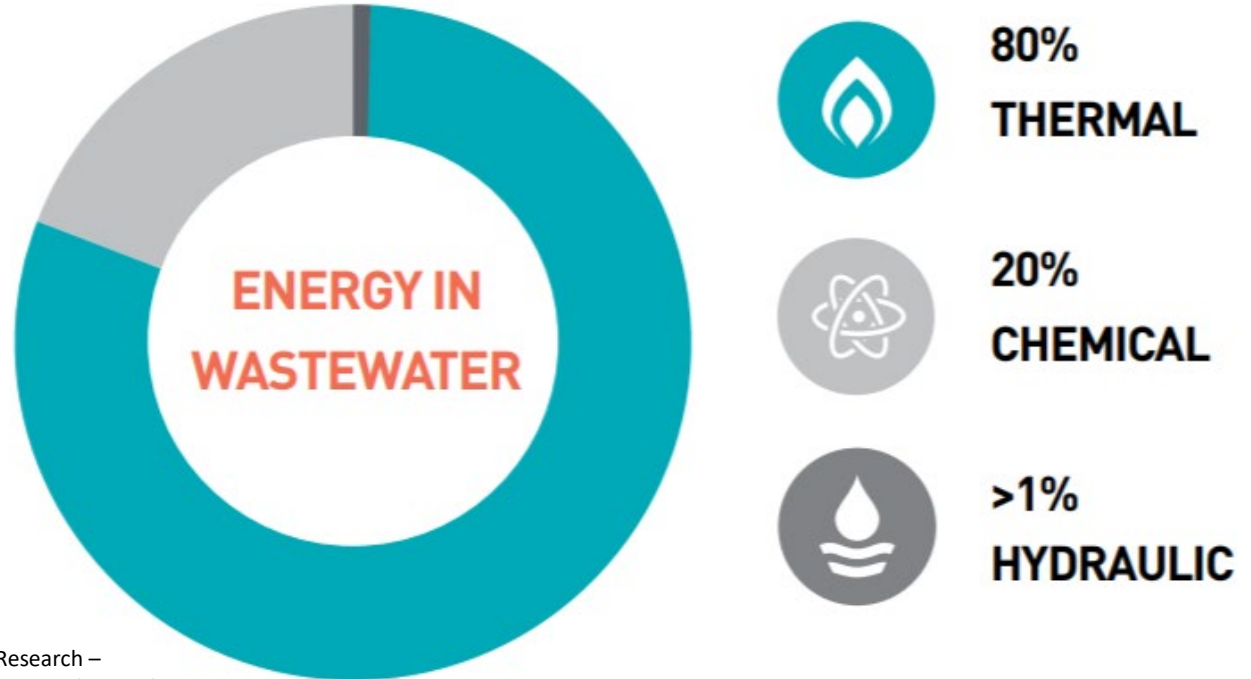
WRF Priority Research Areas

1. Compounds of Emerging Concern (CECs)
2. Cyanobacterial Blooms and Cyanotoxins
3. Disinfection By-products
4. Energy Production & Efficiency
5. Intelligent Water Systems
6. Lead & Copper
7. Watersheds/Receiving Water Quality
8. PFAS
9. Nutrients
10. Water Reuse
11. Co-Digestion
12. Stormwater and Flood Management
13. Waterborne Pathogens

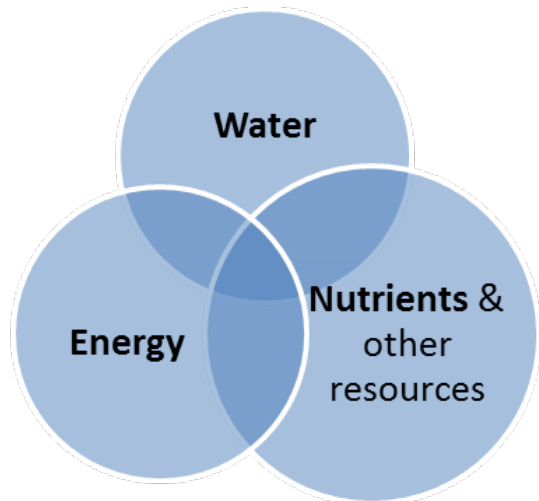


Energy in Wastewater

Wastewater contains 5-10 times the amount of energy needed for the wastewater treatment.



Paradigm Shift: Wastewater as a Re-NEW-able Resource



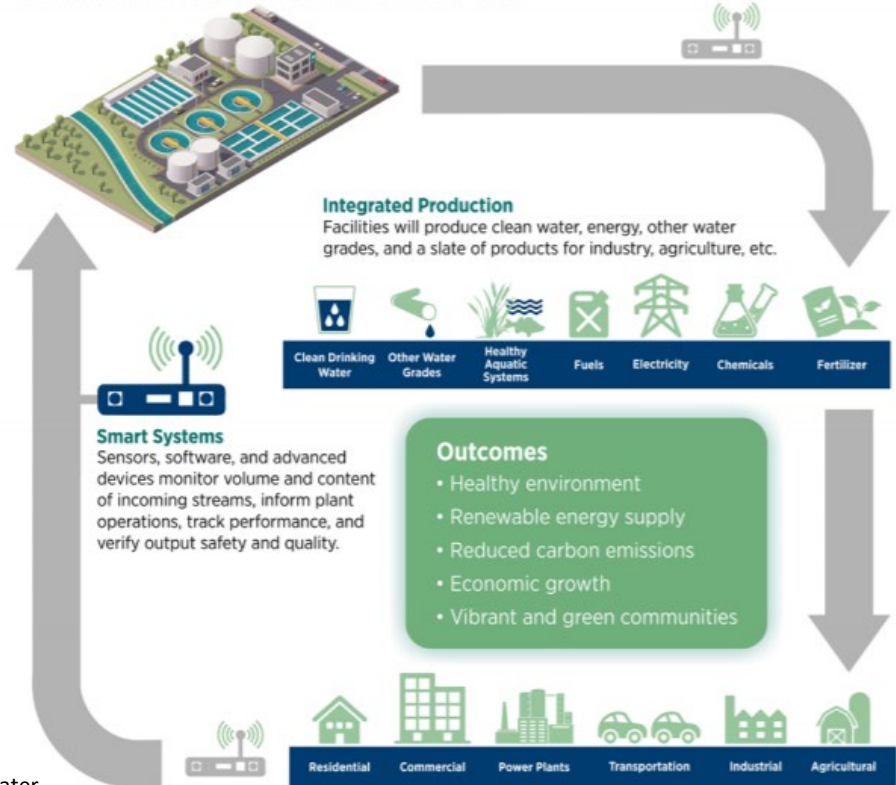
Source: Energy-Positive Water
Resource Recovery Workshop Report, 2015
Co-sponsored by NSF, DOE, EPA

Water Resource Recovery Facility of the Future


Energy Positive and Beyond: The Vision for Transforming Wastewater Treatment

Energy Efficiency and Resource Recovery

Facilities will use energy-efficient operations to recover water, energy, and nutrients as well as to produce clean water and other products.








Example Ongoing and Completed WRF Research Projects

Managing Water and Wastewater Utility Data to Reduce Energy Consumption and Cost (4668, in publication)

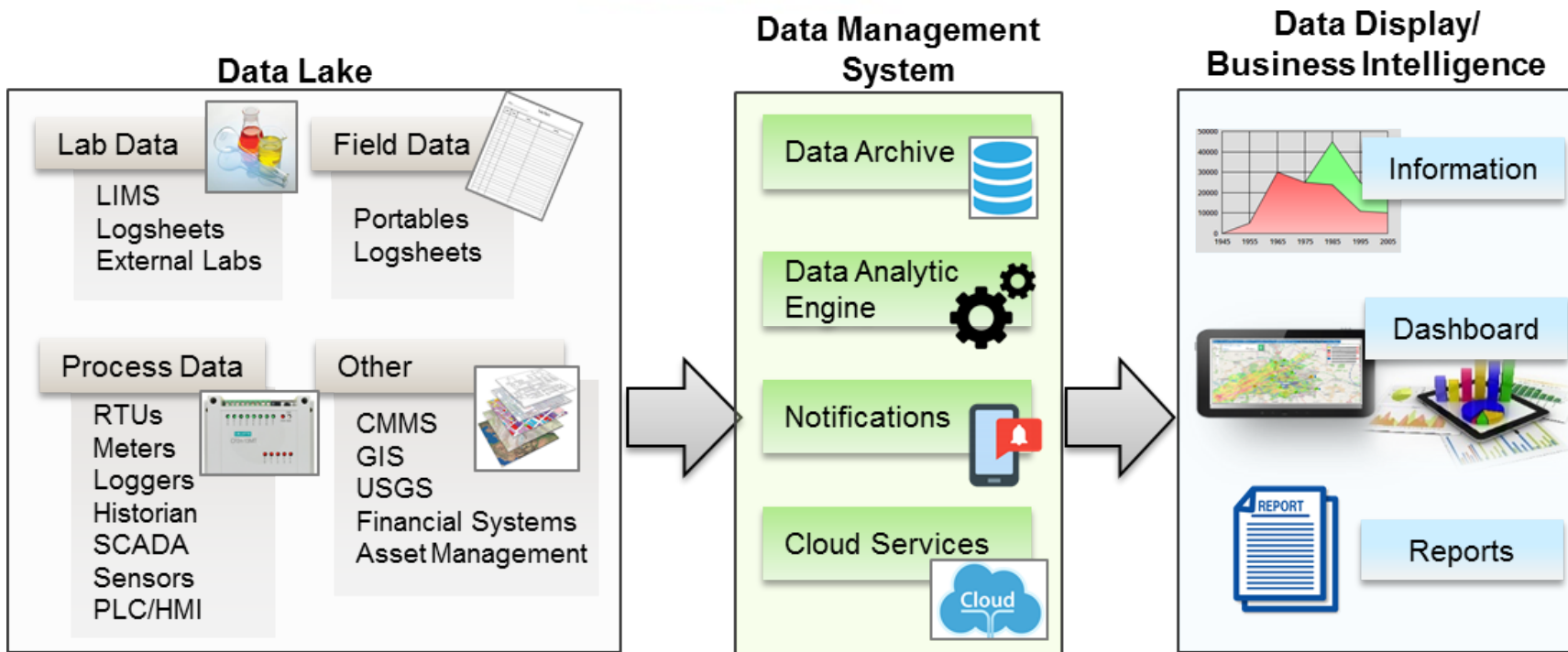


Provides guidance on effective strategies, approaches, and practices for energy data management at water and wastewater utilities, by focusing on the identification of:

- Data sets of value to reduce energy consumption and cost of pumping operations and treatment processes;
- Data acquisition, transmission, communication, and storage requirements from various information technologies and energy management systems;
- Data analytics, platforms, and display methods that will support energy management decisions and provide business intelligence insights.

Also explores the associated benefits and challenges of data management by highlighting successful energy data management utility case studies.

Conceptual Schematic of a Holistic Data Management Solution



Example WRF Research Projects (cont.)



- Application of Big Data for Energy Management at Water Utilities (#4978, new project will be published in Dec. 2020)
- Definition of Smart Utility - How to be a Digital Utility and the Framework for an Intelligent Water System (#5039, proposal selection)

LIFT

WRF/WEF initiative to accelerate innovation and help move new water technologies into practice



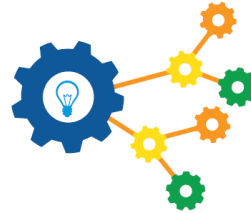
Example LIFT Innovation Program Activities



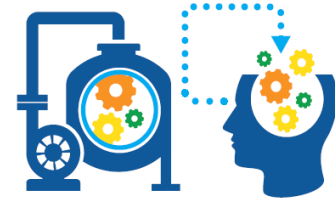
**Utility Peer
Network**



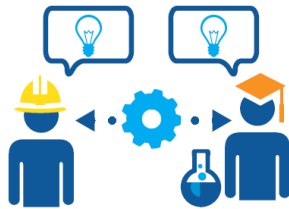
Technology Scans



LIFT Link



SEE IT



**University-Utility
Partnership**



**FAST Water
Test Bed Network**



**Collaborative
Demonstrations and
Challenges**

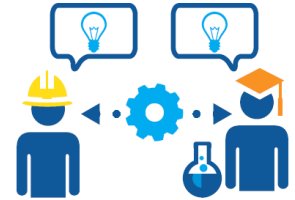
Program to Better Connect Universities and Utilities

Potential University Benefits:

- Real-world training for students, and increased employment potential
- Synergies with practitioners in developing new technologies and processes
- Additional patent and publication opportunities
- Improved understanding of end user R&D needs
- Better outcomes and higher likelihood of solutions being adopted by industry

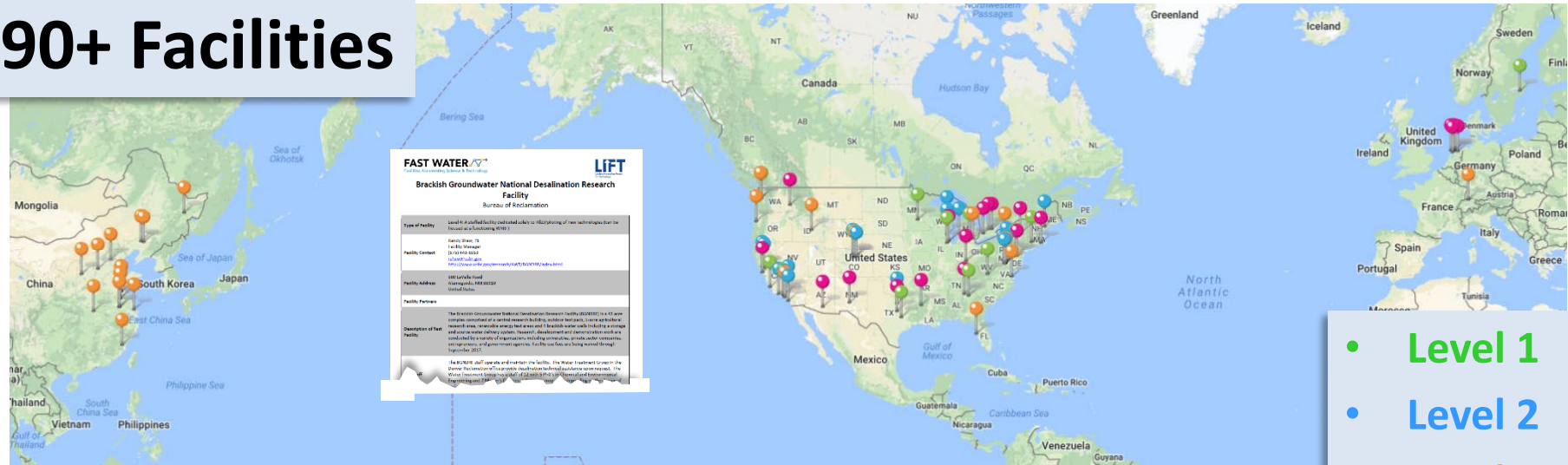
Potential Utility Benefits:

- New solutions and insight into utility problems
- Low-cost technical problem solving
- Identification of new talent for staffing and/or contracting
- Proactive and progressive approach to problem solving
- Minimized risk for innovative technologies (e.g., through research and piloting)



FAST Water Test Bed Directory

90+ Facilities



<https://www.waterrf.org/fast-water-network>

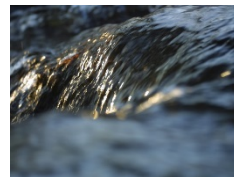
- Level 1
- Level 2
- Level 3
- Level 4



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Intelligent Water Systems Challenge

- Focus on leveraging data using the best available tools to help utilities better understand the dynamics of complex systems for making better decisions.
- Give students, professionals and technology aficionados the opportunity to showcase their talents and innovation.



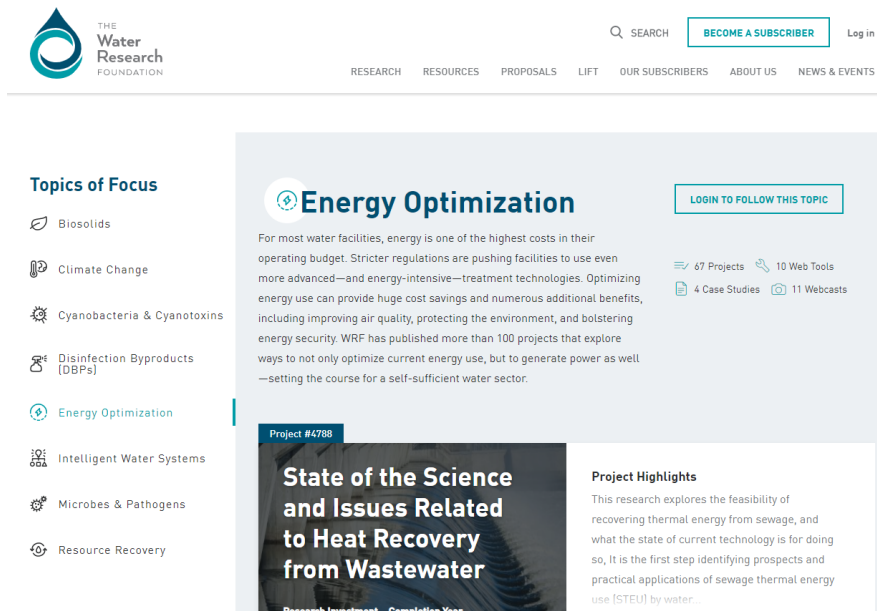
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Contact Information



The screenshot shows the homepage of The Water Research Foundation. At the top is the logo and navigation links: SEARCH, BECOME A SUBSCRIBER, and Log in. Below the navigation bar are links for RESOURCES, PROPOSALS, LIFT, OUR SUBSCRIBERS, ABOUT US, and NEWS & EVENTS. The main content area features a 'Topics of Focus' sidebar on the left with icons for Biosolids, Climate Change, Cyanobacteria & Cyanotoxins, Disinfection Byproducts (DBPs), Energy Optimization (highlighted), Intelligent Water Systems, Microbes & Pathogens, and Resource Recovery. The central section is titled 'Energy Optimization' and includes a 'LOGIN TO FOLLOW THIS TOPIC' button. Below this, there is a paragraph about energy costs in water facilities, followed by statistics: 67 Projects, 10 Web Tools, 4 Case Studies, and 11 Webcasts. A featured project card for 'Project #4788' is titled 'State of the Science and Issues Related to Heat Recovery from Wastewater' and includes a 'Project Highlights' section.

Topics of Focus

- Biosolids
- Climate Change
- Cyanobacteria & Cyanotoxins
- Disinfection Byproducts (DBPs)
- Energy Optimization**
- Intelligent Water Systems
- Microbes & Pathogens
- Resource Recovery

Energy Optimization

LOGIN TO FOLLOW THIS TOPIC

For most water facilities, energy is one of the highest costs in their operating budget. Stricter regulations are pushing facilities to use even more advanced—and energy-intensive—treatment technologies. Optimizing energy use can provide huge cost savings and numerous additional benefits, including improving air quality, protecting the environment, and bolstering energy security. WRF has published more than 100 projects that explore ways to not only optimize current energy use, but to generate power as well—setting the course for a self-sufficient water sector.

67 Projects 10 Web Tools
4 Case Studies 11 Webcasts

Project #4788

State of the Science and Issues Related to Heat Recovery from Wastewater

Research Investment Completion Year

Project Highlights

This research explores the feasibility of recovering thermal energy from sewage, and what the state of current technology is for doing so. It is the first step identifying prospects and practical applications of sewage thermal energy use (STEU) by water...

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