Playing catchup—the slow and steady march of water reuse in New England

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ABSTRACT | Expansion of water reuse has been slow in the Northeast, where the foremost driver, water scarcity, has been less broadly felt than in other regions. Areas with the most critical need have led the way in adopting both the infrastructure and regulatory structures to enable the growth of this increasingly valuable water conservation practice. As states in New England establish water reuse programs and guidelines, stakeholders can learn from established programs in other regions as well as from those in the Northeast. Examples from Florida, Connecticut, and California illustrate some of the obstacles and approaches to overcome them used across the country.

KEYWORDS | Water reuse, recycled water, water reuse permitting, New England water reuse, water reuse funding, Water Reuse Action Plan

Water reuse has been formally practiced in the United States since California passed the first regulations in 1918. However, expansion has been slow, especially in the Northeast where the foremost driver, water scarcity, has been less broadly felt than in other regions. It stands to reason that areas with the most critical need have led the way in adopting both the infrastructure and regulatory structures to enable the growth of this increasingly valuable water conservation practice.

There are no national regulations for water reuse, although EPA provided guidelines in 1992, so each state must develop its own regulatory structure and determine its own allowed uses (e.g., landscape irrigation, food crop irrigation, toilet flushing, groundwater recharge). As states in the Northeast establish programs and guidelines, water reuse project stakeholders can learn from other regions to guide implementation.

The number of water reuse projects has grown sporadically, with the strongest growth in recent years. According to the Bluefield Research April 2017 Market Insight report, *U.S. Municipal Wastewater Reuse: Project Pipeline Segmentation & Analysis, 2017–2030*, at the time nearly 600 water reuse projects were being developed; that did not include all the projects already online then.

Water reuse in the United States has been led by Arizona, California, Florida, and Texas. Several factors explain the differences between states, including water scarcity, state-level policy, funding availability, and historical experience.

A multi-agency federal group has taken on the task of advancing water reuse across the nation. The group's first action was to develop the National Water Reuse Action Plan (WRAP) published in February 2020, with a set of actions "to advance the consideration of reuse to improve the security, sustainability, and resilience of our nation's water resources, especially in the face of a changing climate" (EPA). Some actions are as simple as compiling state policies and approaches to water reuse (Action 2.1) and establishing a water reuse champion award program for private sector companies (Action 8.4). The latest information on the WRAP's progress can be found through quarterly updates by EPA or from the federal group's online portal: epa.gov/waterreuse/national-water-reuse-action-plan-online-platform.

DRIVERS OF REUSE PROJECTS

The necessary drivers for successful water reuse projects are intuitive, but it is worth stating them clearly. Perhaps the most obvious driver is water scarcity stemming from limited water resources, frequent droughts, or weather variability. Recycled water provides water purveyors with a reliable, drought-resistant, locally controlled supply.

A joint project between the city of Orlando and Orange County, Florida, Water Conserv II was the first water reuse project permitted by the Florida Department of Environmental Protection to irrigate crops produced for human consumption

The second driver is economic conditions that make water reuse attractive. A key factor is high or increasing costs for new water supplies, which often align with limited water resources, but can also arise where significant residential or industrial development is underway. Population growth creates more demand for water, places more pressure on water infrastructure, and increases the burden on the local water utility. Likewise, manufacturing or technology facilities require high-quality water to operate, driving up demand and putting upward pressure on water prices. Funding availability can also greatly influence the economic viability of water reuse. Often this takes the form of grants or low-interest loans to encourage reuse.

The third driver of successful reuse projects is a regulatory framework that encourages water recycling. This can include restrictions on water withdrawals, permitting limitations on effluent discharge, or a requirement to include reuse as part of water resource recovery plans. California is the leading example here, with strong policy drivers that make water reuse essential in municipal water resource planning and use.

When all three of these drivers align, the necessary and sufficient conditions for water reuse projects are in place. If only two are present, it is still possible to implement a project, but it requires a strong fourth driver: political will. With enough political support, the absence of one of the other three drivers can be overcome. Nationally, one outcome of the WRAP (Action 1.1) is a federal policy statement that supports and encourages water reuse in watershed-scale planning. With this policy statement, the federal agencies have signaled unified support for water reuse.

WATER REUSE ACROSS THE UNITED STATES

There is clearly an appetite for more water reuse, but because the regulatory, historical, and financial drivers vary so much from state to state and project to project, owners must be creative to move projects forward. Examples from Florida, California, and Connecticut illustrate some of the obstacles and approaches to overcome them used across the country.

Water Conserv II: Irrigation and Aquifer Recharge in Florida

Constructed in 1989, Water Conserv II is one of the largest water reuse projects in the world that combines irrigation and aquifer recharge via rapid infiltration basins. Launched as an innovative joint water reclamation project between the city of Orlando and Orange County, Florida, Water Conserv II pushed the state to become the first water reuse project permitted by the Florida Department of Environmental Protection to irrigate crops produced for human consumption.

Water Conserv II is a useful example for project stakeholders in areas like New England where most of the drivers for reuse are in place

The plant was designed to provide irrigation water to local orange groves. Water Conserv II was commissioned as an answer to the local water scarcity problem driven by agriculture, a growing population, and aquifer withdrawal limitations. The citrus groves provided an economic opportunity, with customers nearby willing to use reclaimed water for their crops. These drivers were bolstered by momentum at the city, county, and state level to explore reuse.

While Florida had not established water reuse permitting prior to Water Conserv II's construction, there were regulatory drivers that enabled water reuse policies to develop more broadly there. At the time, Florida required the elimination of discharges to surface waters at the water resource recovery facility serving the area—a mandate that water reuse helped satisfy.

Water Conserv II is a useful example for project stakeholders in areas like New England where most of the drivers for reuse are in place, but a state-level regulatory framework may not yet include these facilities. Water Conserv II paved the way for many other reuse projects in Florida and continues to provide a cost-effective, year-round supply of reclaimed water more than 30 years after it was built.

In partnership with the cities of Modesto and Turlock, Del Puerto Water District has delivered tertiary recycled water to California's agricultural lands since 2017

Del Puerto Water District Delivers Drought Resistance in California's Central Valley

While exciting advancements in potable reuse are happening in San Diego and Los Angeles, one of the largest recent non-potable recycled water projects in California came online in 2017 through a partnership of urban and agriculture needs in California's Central Valley. The cities of Modesto and Turlock partnered with an irrigation water district, Del Puerto Water District (WD), to bring 25,000 ac ft/year (3,084 ha m/year) of tertiary recycled water to agricultural lands through the North Valley Regional Recycled Water Program (NVRRWP).

The Delta-Mendota Canal is a constructed facility, but it is also listed as a Water of the United States and subject to Clean Water Act National Pollutant Discharge Elimination System permitting

The Del Puerto WD manages irrigation water for 45,000 acres (18,000 ha) of productive farmland parallel to a major federal canal, the Delta-Mendota Canal. Typical crops grown in the Del Puerto WD service area include tree crops such as almonds and apricots, feed crops such as oats and barley, and various others including tomatoes, broccoli, and wine grapes. Del Puerto WD has experienced major shortages and decreased reliability in the water it receives under its federal water service contract, so the need for reliable, drought-resistant, and locally controlled water was there. And with a federal nexus and a multi-year California drought, 1 percent loan interest financing and millions of dollars in grants were available as well.

The NVRRWP appeared to have elements of all three key drivers, but there was a regulatory twist waiting. While California has regulations covering recycled water use on food crops, the project fell outside the typical regulatory structure for recycled water. The Delta-Mendota Canal is a constructed facility, but it is also listed as a Water of the United States and subject to Clean Water Act National Pollutant Discharge Elimination System (NPDES) permitting. The project partners worked with the regional entity responsible for NPDES permitting and the U.S. Bureau of Reclamation to approve the new discharges to the Delta-Mendota Canal and the right to extract the recycled water from existing agricultural turnouts.

"The project has been an unqualified success," said Del Puerto WD General Manager Anthea Hansen. "We crafted an approach that allowed it to be permitted despite no real precedent for this kind of project. We are now delivering recycled water to our landowners, thanks to the creativity, organization, collaborative spirit, and hard work of the entire project team."

UConn Paves the Way for Water Reuse in Connecticut

The University of Connecticut (UConn) continues to expand approved uses of water reuse that reflect the challenges of implementing them in states where the regulatory framework has not been established. Similar to how Water Conserv II served as a regulatory pilot program for Florida, the UConn Reclaimed Water Facility (RWF) is driving regulatory progress with the State of Connecticut, as the university collaborates with the Connecticut Department of Energy & Environmental Protection (CTDEEP) to develop standards for water reuse in the state.

UConn has grown rapidly since the mid-1990s, thanks to substantial state investment to expand the campus. In turn, water demand has risen sharply, affecting not only UConn but several public schools, municipal buildings, businesses, and private residences that rely on a shared public water supply.

Two wells provide potable water for the campus. During drought conditions in 2005, the wells could not meet peak water demands. In response, the State of Connecticut and UConn collaborated to reduce water withdrawal rates.

In 2006, UConn began planning construction of the reclaimed water facility to reduce potable water demand and provide water for non-consumptive uses

To meet these new reduced withdrawal rates, UConn implemented additional conservation measures, including increased outreach to promote water conservation, sustainable design guidelines for any new on-campus construction, streamflow monitoring of the Fenton River, and withdrawal management protocols based on streamflow. However, the university recognized that conservation alone was not enough to meet the mandate and provide long-term protection of the community's water resources. In 2006, UConn began planning construction of the RWF to reduce potable water demand and provide water for non-consumptive uses.

Connecticut is one of the few states in the nation with no regulatory framework for water reuse, presenting a major obstacle. However, cooperation among university and state agency stakeholders has enabled the university to divert much of its wastewater for reuse.

Treated wastewater enters the RWF from the adjacent water pollution control facility (WPCF) and receives further treatment that includes auto-strainers, microfiltration, and UV disinfection. The recycled water then travels via a campus-wide distribution system to facilities engaging in approved uses.

Next door at the WPCF, recycled water is used for tank filling and cleaning. The campus central utility plant uses it for steam generation and cooling tower operations. Recycled water feeds the cooling system in UConn's Innovation Partnership Building, a campus hub for research and industry collaboration. To bring things full circle, this tertiary-treated effluent is used for toilet flushing in all campus facilities constructed since the RWF came online.

This system has enabled UConn to further its goals to reduce potable water use, relieve demand on its wellfields, and provide resources for future campus development, and it has underscored the university's sustainability mission. The RWF produces approximately 400,000 gpd (1.5 ML/d) of treated tertiary wastewater; the facility has the capacity to produce up to 1 mgd (3.8 ML/d).

Cooperation between UConn and CTDEEP has enabled the university to divert much of its wastewater to reuse

The existing recycled water distribution system on the campus can accommodate irrigation, and project stakeholders hope to use recycled water for lawns and landscaping soon. The university continues to work closely with CTDEEP to expand approved uses and establish permitting standards for recycled water in Connecticut, creating a path for other water reuse projects.

DISCUSSION

Programs like the WRAP signify strong momentum for reuse projects around the country. As more public and private organizations turn to water recycling to address water scarcity issues and improve operational sustainability, the regulatory landscape will continue to evolve to accommodate this shift. The preceding case studies outline several means of improving project outcomes and advancing water reuse that correlate with key drivers. As we look forward to additional reuse projects, we should:

Solve problems creatively. Given that reuse projects often involve multiple parties responsible for wastewater treatment and water resources management, there can be a lot of creative space to develop unique solutions. Employing water reuse to address discharge restrictions or to provide a new water supply when scarcity or mandates are limiting availability can provide a win-win solution for multiple parties.

Secure funding. With its ability to provide multi-party, multi-benefit solutions, water reuse is popular with funding agencies and politicians. The Infrastructure Investment and Jobs Act provided funds specifically for water reuse—$1 billion for programs in the western United States and $48 billion for nationwide water programs that can support water recycling projects (WateReuse 2022). California is combining its Drinking Water and Clean Water State Revolving Fund programs to finance recycled water projects targeted for potable reuse. Alternative water supply funding programs, like those offered in Florida, can fund recycled water projects. Drought-resiliency grants, green infrastructure grants and bonds, and community revitalization funds all have the potential to meet a state's primary goals with water reuse solutions. Look for unusual opportunities; if in doubt, ask the funding program administrator to clarify what is allowed.

Collaborate with regulators. Expanding into water reuse can be uncharted territory when your state has not developed its own regulations. When starting conversations with regulators, bringing a proposed solution instead of only asking questions can help get your proposed uses approved. Lean on the states that already have regulations to give your regulators vetted examples to build from. One great new tool out of the WRAP, the REUSExplorer, is an online resource for exploring reuse regulations by state and by proposed end use. Available on the internet, this tool can give you a place to start to understand your own state regulations and other examples you can use to initiate conversations with local regulators (see the water reuse section of epa.gov for more information).

CONCLUSION

While many states have not yet established clear roadmaps for water reuse projects, where there is a will, there is a way. Every water reuse facility that exists today began as a water scarcity or effluent management issue. As referenced in the WRAP, water utilities and private stakeholders across the United States can expect water scarcity to be an increasingly prevalent driver due to climate change—a factor that will likely introduce greater economic benefit to reusing water. Meanwhile, greater adoption of this technology and initiatives like the WRAP will help to fulfill the third driver—a supporting regulatory framework.

Just as non-potable reuse has grown over recent decades, many areas that have installed non-potable systems are now looking to potable reuse as a method to conserve water resources. California, Arizona, Florida, Colorado, and Texas are developing regulations for direct potable reuse to meet the ever-growing demand while many areas of the country are starting to experience water scarcity, leading to the creation or expansion of reuse projects in places like Georgia, Oklahoma, Nevada, and New Mexico.

Fortunately, water scarcity is still a distant threat for most of the Northeast. As potable and non-potable water reuse technology, funding, and regulations progress, New England will continue to benefit from the paths laid by those in drier climates.

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