Potential for Expansion of Potable Reuse

QUICK FACTS

- Potable reuse is gaining attention from utilities looking beyond traditional water sources.
- The lack of U.S. federal regulation has led to a patchwork of state-specific regulations.
- Case studies detail successful projects—from developing treatment schemes to improving public perception and support.

OVERVIEW

Water supply pressures are leading to a tipping point where new supplies will need to be developed. Worldwide, potable reuse is increasingly being considered as a water supply option. More utilities are seeking a diversified portfolio of water sources, driving them to look beyond traditional surface and groundwater sources. In some communities, local control and access to water supplies is important, and potable reuse can be an attractive alternative to importing water from elsewhere. Advanced treatment technologies and increased public acceptance are advancing potable reuse schemes, although public acceptance will remain a challenge in some locations. Numerous United States and international organizations are working to advance the science of potable reuse.

DIFFERENT TYPES OF REUSE

Non-potable reuse

Non-potable reuse refers to water that is not treated or intended to be part of the potable supply. Depending on its purpose (e.g., irrigation or industrial use), it may be treated to different standards or water quality parameters. While non-potable reuse systems reduce demand on potable water supplies, they can be cost-prohibitive due to the need for a separate distribution system. WRF’s
**Dual Water Systems: Characterization and Performance for Distribution of Reclaimed Water** reviews the performance of non-potable distribution systems from 37 utilities in the United States.

**Indirect potable reuse**
With indirect potable reuse, water is extensively treated then spends time in an environmental buffer, which may be a reservoir or aquifer. After additional treatment, it enters the potable distribution system.

**Direct potable reuse**
This system eliminates the environmental buffer and relies on more robust and redundant treatment that eliminates the environmental buffer’s time delay. More aggressive potable reuse systems are being explored, such as blending the reclaimed water directly into the distribution system.

**De facto reuse**
In many places, water is already being used many times over. De facto (or un-planned) reuse occurs when a downstream com-
To date, most water reuse in the United States has been indirect potable or non-potable.}

Community utilizes a surface water supply downstream of treated wastewater discharges.

This process has not been comprehensively studied. However, research updating a 1980 EPA study focusing on 25 cities showed an increase in the amount of sewage discharged, as well as increased wastewater to downstream drinking water facilities (Rice et al. 2013).

**SOURCES OF WATER FOR REUSE**

Utilities may reuse water from a variety of sources, including municipal wastewater effluent (the most common), stormwater, and graywater from domestic or commercial buildings. WRF is a funding partner to a National Research Council study, Beneficial Uses of Graywater and Stormwater: An Assessment of Risks, Costs and Benefits.

**KEY ISSUES ASSOCIATED WITH POTABLE REUSE**

**Regulations**

No U.S. federal regulations specifically address reuse. Utilities rely on state regulations, documented in the EPA’s 2012 Water Reuse Guidelines. The Clean Water Act and Safe Drinking Water Act provide a foundation for reuse schemes that protect public health. California is leading the way in developing guidelines for direct and indirect potable reuse regulations (CDPH 2014).

**Public perception**

Using treated wastewater effluent as a drinking water source may not be popular with customers, which can present a challenging hurdle for utilities. Successful public outreach examples can be found on the web, at Pure Water San Diego and the Groundwater Replenishment System of Orange County, California.

**Advanced treatment challenges**

To treat wastewater effluent to the quality of drinking water, advanced treatment is required. Treatment technologies must be robust, redundant, resilient and reliable.

**Residuals management**

Many potable reuse processes result in concentrated residuals that utilities must dispose of properly. The challenges are similar to desalination.

**Blending**

Due to the highly-treated nature of potable reuse water, it may be a more aggressive water source and utilities need to consider blending and water conditioning as part of their planning. WRF’s Characterizing Microbial Water Quality in Reclaimed Water Distribution Systems offers guidelines and a case study with Tampa Bay Water addresses the challenges from blending several sources.

**CONTAMINANTS OF EMERGING CONCERN (CECs)**

Certain types of CECs prevalent in wastewater may raise concerns for reuse schemes that reclaim wastewater effluent. These CECs may not be removed by the wastewater treatment process and have potential, but unknown, health effects.

**RESEARCH NEEDS RELATED TO POTABLE REUSE**

The 2012 National Research Council report, Water Reuse: Potential for Expanding the Nation’s Water Supply Through Reuse of Municipal Wastewater, identifies 14 overarching research needs.

**Health, social, and environmental issues**

Research needed includes a range of topics such as addressing critical gaps in understanding human health impacts from reclaimed water, and strengthening waterborne disease surveillance.

**Treatment efficiency and quality assurance**

Research is needed for issues such as developing a better understanding of pathogen removal efficiencies, and contaminant attenuation in environmental buffers.

**HELPING UTILITIES TO PURSUE POTABLE REUSE**

Extensive research by WRF and other organizations is ongoing. WRF’s past projects reflect a long history of research supporting utilities considering potable reuse. Upcoming direct potable reuse projects include “Blending Requirements for Water from Direct Potable Reuse Treatment Facilities,”
and “Assessment of Techniques to Evaluate and Demonstrate the Safety of Water from Direct Potable Reuse Treatment Facilities.”

**WHERE POTABLE REUSE CURRENTLY OCCURS**

Reuse has been implemented across the United States, with projects utilizing various water sources. The diversity includes:

- Montebello Forebay Spreading Grounds/California. Stormwater runoff, recycled water (Johnson 2008)
- Upper Occoquan Service Authority/Virginia. Highly treated wastewater (NRC 2012, Rice et al. 2013)
- Prairie Waters Project/Colorado. Groundwater recharge utilizing riverbank filtration (ASCE 2014)
- Big Springs/Texas. Highly treated wastewater blended with a raw surface water supply (NRC 2012, Weissman 2014)
- Additional case studies can be found in EPA’s 2012 Water Reuse Guidelines and the 2012 NRC report.

**REFERENCES**


REFERENCES (CON’T.)


