



Direct Potable Reuse

A Key Part of California's Water Supply Solution

DPR Initiative — Part of the Solution to California's Water Supply Challenges

The national WaterReuse Research Foundation and WaterReuse California have launched the California Direct Potable Reuse (DPR) Initiative to establish DPR as a new water supply option that is both sustainable and protective of public health. DPR projects treat wastewater, including sewer water, that has been cleaned for return to the environment and actually further clean or purify it to meet all drinking water standards. This purified water will be regulated by state water quality and health officials and implemented by water utilities in a safe, cost-effective and environmentally responsible manner. Scientifically proven advances in water purification technologies allow communities to reuse water for many different purposes depending on the use for the water. This includes purifying water to distilled quality for industrial process use, as well as purifying water for drinking.

The California DPR Initiative was

undertaken in 2012 as a means of establishing DPR as a water supply option that can be implemented by water utilities. The DPR Initiative's primary objective has been to address the regulatory, scientific, technical, and attitudinal issues surrounding DPR projects by late 2016. This is being accomplished through funding independent and rigorous scientific research and communicating the research findings and data through public outreach and awareness programs.

The WaterReuse Research Foundation initiated 26 independent DPR-related research projects in 2014 (or before), totaling over \$11.5 million to evaluate and demonstrate the feasibility of DPR opportunities. The research revolves around developing a robust monitoring and redundant water purification system. The SB 918 Expert Panel must provide a report to the Legislature about feasibility of developing DPR regulation by December 2016.

“California needs more high quality water and recycling is key to getting there.”

— Governor Jerry Brown



What is DPR? (Direct Potable Reuse)

DPR is the introduction of highly purified recycled water directly into the raw water supply immediately upstream of a water treatment plant, or into the distribution system downstream of a water treatment plant. To date, proposals have been to introduce DPR water into a water treatment plant intake rather than into the distribution system. While identical in many aspects to indirect potable reuse (IPR) with highly purified recycled water, DPR eliminates the need to pass purified water through an environmental buffer—such as a groundwater aquifer or a reservoir. The direct conveyance of purified recycled water to the drinking water system is the main characteristic distinguishing it from the indirect path of IPR.



At locations like Orange County Water District (above) and West Basin Municipal Water District, indirect potable reuse plants are operating and visitors can taste the highly purified water.

Multiple Benefits of Potable Reuse

California's growing population and chronic water shortages continue to stretch the limits of our state's water supplies. But each California community is different and has its own unique reason to develop new water supplies, including potable reuse. Here are just a few:

Safe, reliable water supply

Potable reuse uses proven technology to purify recycled water to provide a safe water source. Multiple treatment barriers separate pollutants from water. The purification process produces water that is cleaner than most bottled water.

Sustainable water supply option

Potable reuse provides a sustainable and cost-competitive water supply option that is less energy intensive than many alternative options.

Environmental benefits

Potable reuse allows us to leave more water in rivers, lakes and streams for the fish, plants and wildlife, while reducing discharges to these water bodies and the ocean.

Drought proof

Potable reuse is a drought proof water supply. It can help ensure safe, sustainable water now and into the future.

Responsive to climate change

Potable reuse is part of a diversified water portfolio and is independent of climate or weather.

Water Reuse Happens Naturally

Recycled water is water that is used more than one time before it passes back into the natural water cycle. It is wastewater, including sewage, which has been treated or purified to a level that allows for reuse for beneficial purposes.

Potable Reuse — Direct and Indirect

Potable reuse refers to reused water that meets all federal and state drinking water standards and is safe for human consumption. Potable reuse may be characterized as either indirect potable reuse (IPR) or direct potable reuse (DPR). In IPR, wastewater that has been highly purified is introduced into an environmental buffer for a specified period of time before being withdrawn for potable purposes. The environmental buffer may be a groundwater aquifer or a surface water reservoir. The purpose of the environmental buffer is to provide an additional barrier for the protection of public health.

In DPR, highly purified recycled water is introduced with or without the use of an engineered buffer into the raw water supply feeding a water treatment plant, or into the distribution system downstream of a water treatment plant. To date, proposals have been to introduce DPR water into a water

treatment plant intake rather than into the distribution system.

The way in which potable reused water is delivered determines whether it is called indirect potable reuse or direct potable reuse.

Water reuse, including potable reuse, happens naturally all over the planet.



Water reuse happens daily on rivers and other water bodies everywhere. If you live in a community downstream of another, chances are you are

reusing its water and likewise communities downstream of you are most likely reusing your water. This has been called "de facto" or unacknowledged/unplanned potable reuse.

The amount of water on the planet does not change, so through nature all water has been used and reused since the beginning of time. Using advanced technology to purify recycled water merely speeds up a natural process. In fact, potable reuse provides a needed water supply that is of higher quality than what occurs naturally.

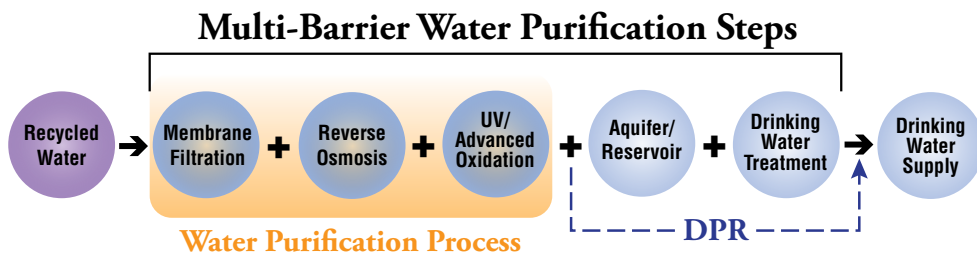
Building Trust is Key to Public Acceptance

Understanding and addressing community and stakeholder concerns can be a significant challenge toward fostering acceptance for potable reuse projects in a community. Research activities have included gauging a general understanding of perceptions of recycled water use, identifying primary concerns, and developing educational and communication tools that can provide greater assurance, awareness and education.

Research in this area includes various assessments; in-depth interviews, focus groups, surveying, and communication

research (message testing and evaluation) with a focus on fostering awareness, education and acceptance by:

- Identifying and clarifying health and safety concerns
- Identifying and addressing concerns about reliability and the ability to stop production
- Developing a public outreach framework and communication tools that address concerns in layperson terms and in ways that can be adapted by utilities for a variety of community audiences.



Advanced Purified Water is on the Rise

Using purified water for drinking is not new. In California, advanced water purification projects are currently operating throughout the state. These projects include:

Orange County Water District, Groundwater Replenishment System

— Operational since January 2008, this state-of-the-art water purification project can produce up to 70 million gallons of high-quality water every day. The agency has been providing purified recycled water for a seawater intrusion barrier since the mid-1970s.

West Basin Municipal Water District, Edward C. Little Water Recycling Facility

— Operating since 1995, the facility supplies 16.5 million gallons a day and produces five different qualities of customer-desired, “designer” water that meet the unique needs of the municipal, commercial and industrial customers.

Santa Clara Valley Water District, Silicon Valley Advanced Water Purification Center

— Began deliveries of advanced purified water for non-potable uses in 2014. The District

also began conducting a potable reuse demonstration and piloting effort in September 2014 that is demonstrating highly purified water that can be used for various purposes, including expanding future drinking water supplies.

City of San Diego — The city began operating a one million gallon a day Advanced Water Purification Facility (AWPF) in 2011. The project successfully evaluated how purified water could be blended with imported and local water supplies in San Vicente Reservoir before going to a drinking water treatment plant. The AWPF is open for tours and is testing additional equipment for direct potable reuse research.

Advanced purified water has also been used since the early 2000s for the seawater barriers in Southern California (Dominguez Gap Barrier and the Los Alamitos Barrier).

In other states, indirect potable reuse has been in place since the 1970s. And communities in Texas and New Mexico are now implementing direct potable reuse projects.

DPR’s Potential for a Sustainable, Cost-Effective Water Supply

This new path forward is very timely given the decline in traditional water supply sources along with growing demand and the uncertainty of climate change.

The California DPR Initiative will provide information for regulators, utilities, and communities as they consider the implementation of potable reuse in the State of California.

For communities that have limited or no groundwater basins or limited reservoir augmentation options, DPR may be an additional approach to large-scale recycled water use. Other factors include:

- Technologies to purify wastewater are well established and proven through existing potable reuse projects;
- DPR may offer a cost-effective approach to diversifying a water portfolio;
- DPR may require less energy than other alternatives; and
- DPR avoids potential water quality issues associated with groundwater and surface water sources.

DPR would provide communities with another viable water supply alternative to increase water supply reliability, diversify water portfolios, and provide maximum flexibility in managing water supply choices.

Legislative Action

Another key driver for DPR success is legislative action. The State of California’s Recycled Water Policy established aggressive goals to increase recycled water production in order



Santa Clara Valley Water District’s Silicon Valley Advanced Water Purification Center

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People who tour City of San Diego's demonstration project learn about the various stages of water purification.

How Does the Advanced Water Purification Process Work?

Currently*, the advanced water purification process used in California involves a multi-stage process of micro-filtration, reverse osmosis, and ultra-violet light with advanced oxidation:

- The water first goes through micro-filtration, a pretreatment process, where water is either pushed or pulled through tiny tube-like membranes. Each membrane is like a straw with microscopic holes in the sides of the straws, 1/300th the width of a human hair! As the water moves through the tubes, protozoa, solids and bacteria are removed from the water.
- The water then is treated through reverse osmosis where it's forced

through the molecular structure of membranes. Things like fertilizers, pharmaceutical, viruses and finally salts or minerals are removed. The result is near distilled quality water.

- Now the water is purified, but one more step provides a safety barrier: The water is exposed to ultraviolet light with advanced oxidation to cause any remaining organic molecules to break down into safe simple elements, like oxygen, nitrogen, carbon, etc.

After this process the water is cleaner than most bottled water.

(*Alternative processes are being evaluated.)



West Basin's Water Reliability 2020 program is designed to shift their future water supplies to more locally controlled and reliable sources of water. Their Edward C. Little Water Recycling Facility produces five different qualities of "designer" or custom-made recycled water that meet the unique needs of West Basin's municipal, commercial and industrial customers.

"DPR's Potential" continued from page 3...

to help meet the State's overall water supply goal (by 2020, increase recycled water use by 1 million acre-feet per year over 2002 levels). While recycled water for agriculture, landscape, industrial and other purposes will always be needed in California, we will probably not be able to meet our recycled water goals without fully expanding our potable reuse options.

Significant legislation promoting DPR has been SB 918 (Pavley 2010), which requires the State to evaluate the feasibility of DPR by the end of 2016.

"...providing independent, peer-reviewed research..."

The California DPR Initiative aims to contribute to this effort by providing independent, peer-reviewed research for regulators, utilities and communities as they consider the implementation of potable reuse in various communities in the State of California. Subsequent legislation, SB 322 (Hueso 2013), directed the Department of Public Health, in consultation with the State Water Resources Control Board, to develop a public review draft of the DPR report available by September 2016 and established an advisory group representative of the public to provide a forum for public discussion and to assist the expert panel in its deliberations.

In his SB 322 signing message, Governor Jerry Brown wrote "This information is past due ... California needs more high quality water and recycling is key to getting there."



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