

# Desalination could provide O.C. an infinite water supply, but at a steep cost

Aaron Orlowski, Orange County Register, 4-18-15

Desalination promises a world with no limits. Or at least fewer of them.

If water – for your lawn, for your shower, for the orchards of almond trees – were as inexhaustible as the Pacific Ocean, there would be no more rationing, no edicts from the governor to cut consumption.

And it's right there, along Orange County's 42 miles of coastline. All 353 quintillion gallons of saltwater, ripe for the taking.

As California's four-year drought forces the state to grapple with the possibility that growth and consumption face hard limits, technology that separates salt from water offers a tempting alternative.

That promise is driving the \$1 billion desalination plant that Poseidon Water is set to open in Carlsbad this November. And it has brought Poseidon within one permit of building a plant in Huntington Beach. If completed as proposed, it would supply Orange County with 7 percent of its water.

But critics fighting the project say the desalination promise doesn't align with reality.

The technology requires so much electricity, they point out, that the resulting water costs twice as much as water from other sources.

That's not to mention the ecological impact of sucking in millions of gallons of seawater everyday packed with fish larvae and microorganisms. Or the dead zones created when brine twice as salty as ocean water is discharged after treatment.

## OTHER WAYS TO SAVE

Most crucially, says water expert Conner Everts, zeroing in on desalination as an endless source of water distracts from other less costly and more immediate ways of saving water and increasing supplies: recycling wastewater, capturing and storing storm water underground and redesigning landscapes to drink less.

"If you take away the illusion that desal is an endless source of new water, and we don't have to change lifestyle or our water efficiency levels, if you take that away from the picture, you start making the right choices," says Everts, chair of the Desal Reponse Group.

Still, experts agree that desalination is probably coming to Orange County. It's just a matter of when, and how much water users will pay for it.

Human ingenuity has already surmounted the technological barriers. More than 14,000 desalination plants of all sizes operate in 100 countries around the world. Test and pilot projects dot the California coast.

On a recent day, the waters of the Pacific glimmered as Scott Maloni, vice president of project development at Poseidon, surveyed the construction in Carlsbad. Workers in yellow vests balanced on

scaffolding, and the shouts of instructions from one worker to another rose above the din of buzzing saws, pounding hammers, grinding equipment and beeping trucks.

When the plant is finished, 50 million gallons a day of saltwater will pass through sand filters and microfilters. Then it will be forced at 1,000 pounds per square inch through the tiny holes of reverse-osmosis membranes loaded into 2,000 neatly stacked white pressure vessels, tubes about a foot in diameter containing eight reverse-osmosis membranes each.

The membranes are the heart of the system. They contain holes so small that water can get through but salt, minerals and other materials can't.

“To push water through such a small hole, you need big power and big pumps,” says Chris Stiedemann, the plant project engineer in Carlsbad.

The plant will require 35 megawatts of electricity. Solar panels installed on the roof will produce a tiny fraction of that. The rest will come from the grid. Roughly 70 percent of the power in San Diego County comes from nonrenewable sources.

It takes 6,100 kilowatt hours to pump a million gallons from the Colorado River, and 7,900 to 14,000 kilowatt hours to transport that same quantity of water from Northern California via aqueduct, according to the Pacific Institute, an environmental research group. Desalination takes 12,000 to 18,000 kilowatt hours to produce a million gallons.

## **TWICE THE COST**

As a result, desalinated water costs just under \$2,000 per acre foot to produce, according to studies and Poseidon. That's compared to roughly \$1,000 for treated water from the Metropolitan Water District of Southern California, the wholesale seller of water from Northern California and the Colorado River.

And that's one of the problems with desalination as it's currently proposed in California. It would solve one aspect of the drought while exacerbating greenhouse gas emissions from increased electricity production.

Poseidon says it is offsetting carbon emissions by purchasing renewable energy credits and reforesting a state park, among other measures.

If desalination could run on renewable energy, of course, it would be far more eco-friendly.

“That's something the state should be looking at – not just with desal, but with all water projects. We should be looking at how we can power that on renewable energy,” Maloni says.

Both of Poseidon's California desalination sites sit next to old natural gas-powered power plants, but that's so they can borrow the plants' ocean-water intake pipes.

Marine creatures as small as a single cell are sucked through the intake pipes, killing them. Alternative intake methods that bury the pipes in the sand and force water to infiltrate through the sand are less harmful.

## **SPREADING THE BRINE**

Such subsurface intake methods may be required for Poseidon's Huntington Beach project, pending a review by an independent scientific advisory panel.

Technology can mitigate the impact of discharged brine, too. Diffusers can spread the brine over a wider area with minimal harm to sea life. To offset harm to marine life, Poseidon is restoring 66 acres of wetlands in San Diego Bay.

The high costs have made it difficult to find a buyer for Poseidon's water in Orange County.

After other local water agencies rebuffed Poseidon, it is poised to sign a 50-year contract with the Orange County Water District.

Mike Markus, general manager at OCWD, compares desalinated water to a water-recycling project his agency built. It treats sewer water using the same reverse-osmosis technology as desalination and pumps it underground.

## **PAYING A PREMIUM**

When OCWD started the recycling project, the water it produced cost more than imported water. Today, it costs less.

"The question is will that happen with desalinated water, and if it does, when?" Markus says.

But even if desalinated water becomes cheaper to produce than water imported through Metropolitan, OCWD won't pay less. The way the preliminary agreement is written, OCWD will be obliged to pay Poseidon a rate 10 percent higher than Metropolitan water over the life of the plant.

Since the cost of producing desalinated water is about twice that of imported Metropolitan water, Poseidon would initially lose money. As the price of Metropolitan water increases and the cost of desalinated water decreases – which many water managers expect – Poseidon would start making money.

OCWD would be paying a premium for a stable supply, which wouldn't be curtailed by drought or supply restrictions from Metropolitan.

"You don't have to worry about being cut back or restricted as to the amount of water. You have that water-supply reliability," Markus says.

That desalinated water could be sold directly to retail water agencies or pumped underground as part of OCWD's current effort to halt intrusion of seawater into the freshwater basin. OCWD's board will vote on a preliminary term sheet in May.

Water managers predict that population growth in south Orange County – a region that doesn't benefit from the north and Central County's aquifer – will drive an increase in demand there. That has prompted Santa Margarita Water District to signal it will buy 5,000 acre-feet, or 1.7 billion gallons, of Poseidon water per year.

"The idea is really looking at the water supply very similar to how someone looks at their investment

portfolio. You want to diversify in case there's a problem," says Dan Feron, general manager of Santa Margarita Water District. "Desal is an element of that."

## **COMPARING COUNTIES**

But the route from Huntington Beach to south Orange County runs through Metropolitan pipes, and Metropolitan doesn't currently allow water other than its own in them. OCWD would need to hammer out an agreement to change that.

Orange County environmentalists point to key differences they say make Orange County less viable for desalination than San Diego.

San Diego imports more than 90 percent of its water, has no viable aquifer and has a tense relationship with Metropolitan. Orange County imports less than 50 percent of its water, has an aquifer that's ideal for storing water in the north and center, and has a workable relationship with Metropolitan.

People are already shifting to less water-consumptive lifestyles, lessening the need for additional water sources such as desalination, says Ray Hiemstra, associate director at Orange County Coastkeeper, an environmental group. Hiemstra's lawn-obsessed baby boomer generation is giving way to a generation of younger homeowners who don't think twice about a drought-tolerant landscape.

"People are thinking that's the way things should be, and maybe we should be getting back to more balanced situation," Hiemstra says.

## **TECH ADVANCES**

Desalination's proponents say that advancing technology and diminishing supplies of water from elsewhere make adoption of desalination inevitable.

Poseidon believes another 15 percent to 25 percent of energy efficiency can be wrung out of its system, but some of the greatest promise is in technologies that haven't yet been built.

EconoPure, an Orange County company, is working on a method to reduce the electricity consumption of desalination by harnessing gravity. Rather than pump water through reverse-osmosis membranes, EconoPure proposes drilling 1,200 feet into the earth and allowing gravity to push saltwater through membranes.

The clean water would still have to be pumped out, but Daniel Bertram, CEO of EconoPure, believes the process would be 65 percent more efficient.

Gains like that could keep the promise of limitless water alive – even if some, like Garry Brown, director of Orange County Coastkeeper, think the promise is a fable.

"There's a romance of looking out to the ocean and thinking there's a big reservoir and we'll never have a water problem again and we can use water however we want," says Brown.