

California tries one solution to water problems — treating seawater

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In this April 25, 2014, photo, Joshua Haggmark, interim resources manager for Santa Barbara, California, stands next to a desalination plant, which removes salt from ocean water, in Santa Barbara. The city is considering restarting the plant as California withers in a drought. AP Photo/Alicia Chang

CARLSBAD, Calif. — Along this patch of the Pacific Ocean, construction crews nearly outnumber the surfers and sunbathers. Workers are busy assembling what some hope will make water scarcity a thing of the past.

They are building the Carlsbad Desalination Project. When it is completed, the huge plant will turn as many as 56 million gallons of seawater each day into drinking water for San Diego County. The project is expected to cost \$1 billion.

The desalination plant is being built by Poseidon Water, a private company. Customers in the city of San Diego will help pay for the plant through their water bills, which could go up by \$5 a month.

The building will house more than 16,000 reverse-osmosis membranes — salt filters, essentially. They will turn Pacific Ocean water into drinking water suitable for making coffee and watering lawns.

It's Expensive To Guarantee Water

Reverse-osmosis desalination was invented in California in the 1950s, but since then it has mostly been used outside the United States. When the Carlsbad plant begins operating in 2016, it will be the largest desalination project ever built in the Americas.

The San Diego County Water Authority, which serves 3.1 million people, is buying all of the plant's freshwater production. "It's drought-proof — that's one of the most important" features, said Bob Yamada, a manager with the water authority. "It will be the most reliable water source we have."

The water authority's 30-year contract with Poseidon illustrates both the promise and peril of this water source. San Diego County agreed to pay for 48,000 acre-feet of water from the plant every year — whether it needs the water or not. It is doing so to ensure a guaranteed long-term supply. The water will cost \$2,257 per acre-foot, about double the price of the authority's most expensive supply now.

One acre-foot is enough to serve two average homes for a year. At a total output of 56,000 acre-feet, the plant will meet 7 percent of San Diego County's annual water needs.

Environmental Risks To Consider

Many conservation groups are critical of desalination. They argue that it comes not only with unjustifiably high costs, but with a lot of environmental risks as well.

Based on its cost and the environmental damage it causes, desalination should always be last among possible choices, environmentalist Conner Everts said. "It's kind of an engineer's dream, but there's a lot of challenges to it."

Desalination involves two basic stages: seawater intakes and outfalls.

Desalination plants operate by drawing in seawater. Unless that intake is carefully designed, it can harm marine life. Reverse-osmosis filters are so fine that they allow only water to pass — everything else entering the desalination plant is killed.

One solution is fish screens, similar to those widely used at water-treatment plants along California rivers. Carlsbad, for example, will use fish screens with tiny openings. These will strain out at least 95 percent of small fish, but only 20 percent of organisms. The remaining 80 percent of tiny organisms — including fish eggs — will be sucked into the desalination plant and killed. Many small lifeforms that fish depend on for food would be destroyed.

The desalination industry worldwide largely favors screened intakes, despite the damage they cause. They are cheaper to build than the alternative favored by the water board — so-called subsurface intakes.

Returning The Water Is Tricky

With subsurface intakes, ocean water is drawn through perforated pipes buried in the seafloor. Mud and sand filter out nearly all lifeforms. However, such intakes are far more expensive to build.

The second major environmental concern with desalination is discharge water. That is water that's released back into the ocean. Most desalination plants take in two times more seawater than the fresh water they produce. To produce 50 million gallons per day of fresh water, Carlsbad will draw in 100 million gallons of seawater. The rest is returned to the ocean, but with its salt level doubled.

The discharge water is so salty that it does not dissolve well in the ocean.

"It's like oil and vinegar — they stay separate," said Victoria Whitney of the state water board. "You end up with these very large dead zones ... where you have really salty water just sitting on the ocean bottom."

Carlsbad will deal with this problem by mixing the salty water with water used to cool a nearby power plant. As a result, the discharge water will be only about 20 percent saltier than the ocean.

Another approach is to use spray nozzles to spread the discharge water under the ocean surface. This encourages mixing of the salty discharge. The water board currently recommends this approach. MacLaggan of Poseidon says, however, that the force of such sprayers is so great that it can kill some sea life.

Other Cities, Other Approaches

Some cities in California are taking an entirely different approach to the water crisis.

Los Angeles Mayor Eric Garcetti announced last month an aggressive program to expand water conservation. He also ordered the city to cut its use of imported water in half by 2024. He named almost every possible option to reach that goal, including storm-water capture, water recycling, groundwater treatment and even new storage facilities. Desalination was missing from the list.

"We believe in being innovative and open-minded when it comes to tackling the water crisis," mayoral spokeswoman Marie Lloyd said. "At the same time, we do understand that desalination is quite expensive today."