Why Isn't Desalination the Answer to All California's Water Problems?

The California American Water Company plans to desalinate water from Monterey Bay. This drill site near the town of Marina is meant to prove they can access seawater from under the beach. (Luke Gianni/California American Water Co.)

Nowhere near enough water has fallen on California in years, and there's nothing you can do to make it rain.

So where else can we get water? One idea gaining traction is desalination: converting seawater into drinking water. While desal has long been confined by steep costs and environmental concerns, even some critics now say it merits a place in the state's water portfolio.

South of Los Angeles, in the city of Carlsbad, what will be the nation's largest desalination facility is nearly ready. For roughly a billion dollars, the plant will produce 7 percent of San Diego County's water. In Santa Barbara, a plant built amid the drought of the early 1990's, and idled by the return of rain, could come back online soon and provide 30 percent of the community's water.

Farther north, another desalination plant is expected to serve several towns in Monterey County. Jason Burnett, the mayor of Carmel, sometimes acts as a kind of spokesman for the planned project — but he's hardly an evangelist.

"I'll say at the outset, I am not a fan of desal generally," says Burnett.

Apart from concerns about the expense, Burnett has a personal stake in desalination's environmental challenges. He's the son of two marine biologists, and his grandfather David Packard's Silicon Valley fortune was integral to founding the Monterey Bay Aquarium. Burnett himself worked on climate rules for the U.S. Environmental Protection Agency before becoming Carmel's mayor.

“I’ve dedicated my professional life to working on climate change,” Burnett says. “My family is very dedicated to the health of our oceans. So here I am advocating a project that has a large carbon footprint, and, if not done correctly, can hurt the oceans.”

Carmel Mayor Jason Burnett gestures toward the Carmel River, near its mouth at the Pacific. Burnett says he’s not a fan of desalination, but the Monterey Peninsula is out of alternatives. (Daniel Potter/KQED)

Burnett met me on a beach where the Carmel River flows out to the Pacific Ocean. Nearby, ladies in straw hats were hauling easels and paints out to the sand to capture the picturesque landscape. Wearing designer sunglasses and a crisp blue shirt, Burnett told me desalination was the community’s last resort.

“We’ve explored a wide range of options,” he says. “Everything was on the table — harnessing icebergs and bringing them down, filling up huge balloons of water from up north and bringing them down.”

It came to desal because the area’s for-profit water supplier, California American Water Company, was told it had to find a new source. For decades Cal Am had relied on the Carmel River, but then came a cease-and-desist order intended to protect the river’s threatened steelhead trout. There were years of wrangling and competing designs. A deadline was set for the end of next year –- a deadline Cal Am’s proposed desal plant will not hit. All the same, a plan is moving forward.

“This is, at its core,” says Burnett, “an environmental project.”

Intakes and Outfalls

There are three main environmental considerations when building a desalination plant: how seawater is brought in, how the drinkable water is separated out, and what happens to the salt afterward.

The simplest intake is essentially a straw in the ocean -– a design that risks trapping and killing sea life. One solution is to affix a grate to the end of such a pipe, but even then, tiny larvae and fish eggs can still be sucked in. Instead, regulators tend to prefer what’s known as a “subsurface intake.”

At a cement company’s beachside site on Monterey Bay, California American is currently working on a proof-of-concept for this approach. They’re using directional drilling, similar to the technology oil companies use to extract fossil fuels. The idea is to run a slant well hundreds of feet out, passing beneath the dunes to a spot under the waves. From below 200 feet of sand, and well insulated from any vulnerable sea life, Cal Am hopes to suck up a couple thousand gallons of water per minute.

It will take a huge amount of power to pump that much water, that far.

“Our energy bill is going up, no question,” an engineer on the project told me.

This is the second concern with desalination: once the seawater gets to the plant, it has to be pushed through membranes fine enough that salt can’t pass through them. That requires immense pressure – on the order of a pressure-washer.

An official at a smaller desal facility told me it took $25,000 of electricity per month to produce enough water for 1,200 homes. In Cal Am’s case, they’re hoping to reach a deal to power the plant using methane from a nearby landfill.

One other still-tentative design element addresses the third challenge of the desalination process: all that salt has to go somewhere.

California American is using directional drilling extend a pipe some 735 feet under the beach, in hopes of sucking in a couple thousand gallons of seawater per minute from below the ocean floor. (Luke Gianni/California American Water Co.)

Only about half of the saltwater piped into a desal plant is made drinkable. All the salt that's separated out ends up concentrated into the other half, in a kind of brine that's much denser than seawater. As a result, it doesn't easily mix back in.

If it's just dumped carelessly back into the ocean, it sinks, and can kill any marine life having the misfortune of dwelling on the seafloor below.

Blending the briny byproduct back into the ocean may involve sprayers, or in Cal Am's case, an existing outfall that the nearby Monterey Regional Water Pollution Control Agency uses to dispose of wastewater. It's a pipe that runs thousands of feet out to sea, with small holes spaced ten feet apart, so not too much brine would pour out in any one place.

The desal facility isn't expected to start delivering water to customers for several years, and in the meantime, it has to navigate a regulatory thicket of needed approvals.

Optional or Inevitable?

In recent years, desalination projects were considered in places like Marin County and Santa Cruz, only to end up sidelined amid skepticism. Between the environmental headaches and the cost of engineering work-arounds, critics argued the technology is often more trouble than it's worth.

To the extent that conservation's an option, it's much simpler and cheaper to do. Mayor Burnett says the towns along the Monterey Peninsula have just about wrung out that sponge for all it's worth: people there get by on 60 gallons per day — less than half what many Californians use.

Susan Jordan with the California Coastal Protection Network is a longtime critic of desal. She says, indeed, communities should first exhaust their other options.

"If you're going to do something like desal," Jordan says, "you want to make sure you're doing everything you can in terms of conservation, water recycling, water re-use, and you don't want unsustainable development that just perpetuates your problem, or the state's problem."

That question of what constitutes sustainable development underpins the debate around desal. The counter-argument I heard from Scott Maloni, vice president at Poseidon Water, is: what if there are no alternatives?

“The larger concern is climate change, and what happens ten years from now and twenty years from now,” says Maloni, whose company is building the big plant outside San Diego and hopes to add another like it in Huntington Beach. “Can you really count on the Colorado River or Northern California to continue to supply the vast majority of the state’s population with water?”

I asked several people what percentage of California’s overall water portfolio desalination might someday make up, and only Maloni was willing to venture a guess. He says such plants are most efficient when they’re built big, thereby reaping economies of scale. Between that and the stringent permitting process, he says, you could probably count the number of viable sites on two hands.

“And so I think you could be looking at somewhere between 10 to 20 percent of the state’s municipal and industrial demand,” Maloni says.

It’s worth noting that would seem to leave out agriculture; Maloni envisions desal serving the state’s coastal urban populations.

Maloni and several others I spoke with also made the point that, while the technical challenges of designing and constructing an environmentally sound desalination plant are serious, the permitting process is lengthy and could well last longer than the drought itself.

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