Floating Solar Farms Catch on in California

Sonoma and San Diego test the waters for a new source of renewable energy.

July 05, 2017 Corey Binns

Floating solar energy farms, like this one in Huainan, China, could power upwards of 20 percent of California's total energy needs. Imagine China/Newscom

In Sonoma, California, the most important renewable resource will always be grapes. Sonoma's vineyards, framed by picturesque rolling green hills, produce some of the best wines on the planet; tourists flock to the region to sample the latest pinots and admire the scenery. "People like the rolling, grassy hills," says local resident Dale Roberts. But as principal engineer at the Sonoma County Water Agency, Roberts is focused on another homegrown renewable: clean energy. So behind the scenes in Sonoma, he's been busy "juicing" the landscape in a way that's quite different from the neighboring vintners' activities.

To be specific, Roberts and his colleagues have begun to launch floating solar panels on six of the agency's ponds, which hold recycled water saved for irrigation during drought years. When all panels are up and running, by the end of 2018, the project is expected to generate 13 megawatts—or 23,000 megawatt-hours of energy in a year, enough to power 3,500 homes in the area.

A similar project has begun on San Diego's 200-acre Olivenhain Reservoir. There, 24,000 solar panels will cover a sliver of the reservoir's surface and make 144,000 megawatt-hours of power annually, enough to run 21,500 homes. These floating solar fields operate more efficiently than those in the Mojave Desert at Ivanpah—the world's biggest solar-thermal power plant, which was nearly shut down last year because of poor performance. The water on which they float can easily clean them. They run cooler. What's more, they are often located near power transmission lines.

The panels sit atop floating plastic, and in addition to their contributions to the power grid, they offer some benefits to the ponds they cover. For one, they slow down water evaporation into the atmosphere—a particular boon to drought-prone California. Even more important, says Troy Helming of Pristine Sun, the solar company installing panels in Sonoma, they reduce the growth of algae, which can clog up filters and pumps at water treatment facilities and spoil water quality. (The panels limit the amount of direct sunlight striking the water, slowing the algae's photosynthesis.)

That said, what's good for a water treatment plant isn't necessarily right for natural waterways. Vignesh Gowrishankar, who researches clean energy technologies for NRDC, sees a bright future for floating solar farms at man-made sites, such as lakes that are formed in mining quarries and irrigation reservoirs similar to those in Sonoma. But he cautions that vibrant lakes and ecologically sensitive waterways should be off-limits to this burgeoning industry.

Even with that caveat, a surprising amount of water is suitable for solar. In California alone, more than 20 gigawatts of floating solar could be added to otherwise unused bodies of water, according to an analysis by Pristine Sun. That figure excludes recreational areas and the expanse of the Pacific Ocean. "We're not suggesting putting it on Lake Tahoe," says Roberts.

But if done properly, panels on water could power 20 to 30 percent of the state's total energy needs, by Helming's estimates. "It's a huge amount of potential," he says, particularly in California, which has passed some of the most ambitious climate policies in the world.

Outside the Golden State, floating solar has surfaced on a campus pond at the University of Central Florida in Orlando, and another installation bedecks a reservoir on the outskirts of London, where it powers one of the city's key water treatment plants. China recently announced the largest array to date, a farm made of 160,000 panels on a lake in Anhui province that rose after the collapse of a coal mine. And in Japan, where land is especially scarce, the Kyocera Corporation has already built three floating solar farms, with plans to develop more, including a 13.7-megawatt plant on the Yamakura Dam reservoir in Chiba prefecture, scheduled to launch in early 2018. Its 51,000 panels will generate enough electricity to power almost 5,000 local households and offset about 8,170 tons of carbon dioxide emissions annually. That's equal to saving 19,000 barrels of oil per year.

Kyocera has taken precautions to ensure its equipment will not become an environmental concern, says Hina Morioka, a company spokesperson. "That is one reason why we have chosen floating platforms that are 100 percent recyclable and made of high-density polyethylene that can withstand ultraviolet rays and corrosion."

Although Gowrishankar cites limited aquatic space and the potential for weather damage as hindrances to how far floating solar can take us, it is an important addition, particularly at the community level, he says. He envisions solar panels on rooftops of homes surrounding a lake that is also covered in panels. Harnessed together, electricity from such an array could run a community solar plant that feeds a small group of homes.

As the world faces new urgency to amp up climate action in the face of President Trump's abandonment of the Paris Agreement, initiatives like these represent increasingly crucial components in the shift away from fossil fuels. "The consensus and the expert analysis is that we should be slashing our greenhouse emissions by four-fifths between now and 2050," Gowrishankar says, and we have many hundreds of gigawatts of renewable energy to build to make up the difference.

CaliforniaGeo Responds—
Floating solar photovoltaic panels in currentness and near-waveless bodies of water are a great use of presently un-maximized space. The cooling effect of the water on which they float makes their electrical capture more efficient than attached closely to a roof or mounted above the ground, surrounded by warm air. In the case illustrated by the Sonoma County Water District, these restricted bodies of water are close to population density and adjacent to medium voltage transmission lines because of nearby industrial pumps.

An added potential bonus for sewer effluent ponds is that geo heat pump exchange loops can deploy near the bottom of such ponds, while solar panels float on top.

A geo heat exchanger "raft" being assembled on a sewer plant effluent pond (Sonoma County Water District)

The completed (20 ton thermal) raft, ready for filling with water that will sink it (Sonoma County Water District)

The combination of geo loops on the bottom and floating solar above would be a double-whammy of renewable benefits from a facility that is otherwise not productively usable, but permanent.

—Bill Martin