Pilot water conservation project

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LLNL Engineer Ruben Ocampo (left) and Sustainability Manager Michael Cowen discuss the features of a reverse osmosis system that could potentially save 7 million gallons of potable Hetch-Hetchy water. Credit: Don Johnston/LLNL

The Laboratory has launched a pilot project to reduce potable water use by using treated groundwater to cool equipment and research facilities at the main site.

Water from one of LLNL's treatment wells is being run through a reverse osmosis filtration unit and used as an alternative to the Hetch-Hetchy water used in the Bldg. 133 cooling tower on the west side of the Lab near Bldg. 132. Use of the treated groundwater reduces the need for water from the Hetch-Hetchy Reservoir operated by the San Francisco Public Utilities Commission and the associated cost.

"This is part of an ongoing effort to conserve water, reduce costs and help the Laboratory meet its environmental goals," said Michael Cowen, LLNL sustainability manager. "At a time when water conservation is a matter of public concern and discussion, we continue to strive to identify innovative ways to improve water efficiency."

LLNL operates about 25 treatment wells around the main site that reduce the contaminants in groundwater to levels acceptable for discharge to the site's storm sewer system. The average discharge rate is about 600 gallons per minute. Most of the contaminants—called volatile organic compounds—are legacy waste from the time when the site was a US Navy air station.

In January and February the Environmental Restoration Division pumped some 711,000 gallons of well water through a pilot reverse osmosis unit at the Bldg. 133 cooling tower, replacing 498,000 gallons of potable Hetch-Hetchy water that would have been required. In 2014 the unit could potentially save 7 million gallons of potable water. Cleaning the ground water from the wells also makes economic sense because reverse osmosis produces better water at a cost that is lower than the potable water it replaces.

Cooling towers work by circulating cool water to facility heat exchangers or condensers to absorb heat. That water is then returned to the cooling tower to release the heat through evaporation. "Make up" water is required to replenish the water lost to evaporation and to reduce the

concentrations of minerals, such as calcium, circulating as dissolved solids in the cooling water. Mineral concentrations can cause "fouling" of heat exchangers and interfere with the ability to transfer heat resulting in poor performance and higher costs. To maintain the appropriate water quality water is released from the tower in a process called "blowdown." Because the well water that passes through the reverse osmosis unit is cleaner than Hetch Hetchy water, less blowdown is required.

This approach to water conservation has the potential to reduce potable water consumption at each of LLNL's five cooling towers, which account for more than 40 percent of Lab potable water consumption, approximately 100 million gallons annually. F&I is looking to expand the pilot project to the Bldg. 454 cooling tower that serves the High Performance Computing (HPC) facility, also called B-453 Livermore Computing (LC).

Anna Maria Bailey, facility manager of the LC facilities, notes that the return of water-cooled supercomputers, such as Sequoia, makes it important to use water efficiently. "Some of the high performance computing systems we deploy in the coming decade will no doubt be water cooled, so we need to be looking at ways to make the best use of the water resources we have on site," Bailey said. "Any resource and cost savings in facility operations are returned to scientific research."

The main expense in using treated groundwater is the piping required to move the water from the well to the reverse osmosis (RO) unit at the cooling tower.

While RO is a well-established technology, its application to the Lab's cooling system required some adaptation. LLNL Mechanical Utilities Engineer Ruben Ocampo customized the water delivery and RO unit, which is self-cleaning. Ocampo says that RO units can easily be added to increase the amount of water available to the cooling towers.

"Applying the innovative thinking that is so much a part of LLNL's science culture to operations ultimately helps science," Cowen said. "We're putting water back into scientific research rather than into the arroyos."

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