

WATER DESALINATION REPORT

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California

RFP ISSUED FOR SEAWATER STUDY CONSULTANT

A request for proposals (RFP) has been issued by the Los Angeles Department of Water and Power (LADWP) as it seeks to explore the feasibility of available and emerging seawater desalination technologies to augment its water supply portfolio. The selected consultant will support this effort by preparing a conceptual feasibility study that identifies implementation and regulatory requirements, environmental considerations, and evaluates potential project concepts, prepares a site layout, and develops a cost estimate for a potential desalination project.

A pre-proposal meeting will be held on 22 October, with participation either in-person or virtual. Proposals must be submitted by 13 November, with oral interviews to be held 1-5 December, if necessary. A notice of intent to award is expected to be issued in January 2026.

The project is expected to take 18 months to complete, with a budget ranging from \$450,000 to \$500,000.

The key contact person responsible for this RFP is:

Utility Buyer: Araz Khachikian

Email: SCS4Purchasing@ladwp.com

RFP Number: 90866

Chile

UPGRADE INCREASES SWRO RECOVERY

Aguas Antofagasta S.A. (ADASA), the northern Chilean water and wastewater company, has awarded Florida-based BW Water a contract to supply a bolt-on RO system to increase production of an existing SWRO system to be installed at the Taltal SWRO plant in Antofagasta, Chile.

According to Jerry Ross, BW Water's Latin America sales director, the fully containerized system will concentrate 1,176 m³/d (330,700 gpd) of brine produced from one of three existing SWRO trains using a two-stage SWRO system with a Fedco BiTurbo energy recovery configuration.

"ADASA's existing SWRO desalts seawater from a beach well and produces a concentrate with a TDS of approximately 53,000 mg/L. We will use our 'Brine Positive' approach, employing a two-stage SWRO system, that incorporates LG

Chem's UHP-RO membranes and two turbochargers, with one boosting the first-stage feed pressure and the second turbocharger boosting interstage pressure," explained Ross, who is also the current president of ALADYR, the Latin American Association of Desalination and Reuse.

The system is projected to operate at a 42.85% recovery, while producing 504 m³/d [133,157 gpd] of permeate with a TDS of less than 500 mg/L and a guaranteed maximum specific energy consumption of less than 4.71 kWh/m³ [17.83 kWh/kgal], for the entire containerized system, including cartridge filters, lighting, and HVAC systems.

Concentrate from the unit will have a TDS of approximately 94,000 mg/L. However, when blended with the concentrate from the other two existing SWRO trains, the TDS will be lower than the plant's permitted discharge limits and will not require any modification to the discharge system.

The system is expected to be operational in Q1 2026.

California

FRRO UPGRADE INCREASES OUTPUT/RECOVERY

Santa Monica's Arcadia Treatment Facility has been the city's primary source of drinking water for over 100 years. The plant has undergone several upgrades, the most recent of which included the restoration of the Olympic Well Field to remove industrial contaminants from groundwater, and the expansion of the facility's RO system production capacity from 10 MGD (37,850 m³/d) to 13 MGD (49,200 m³/d).

Besides adding two new wells, upgrades to the pretreatment system were also made. These included the addition of two additional greensand filters for iron and manganese removal, and a 2-train UV-H₂O₂ advanced oxidation process (AOP) to reduce low concentrations of 1,4-dioxane, trichloroethylene (TCE), and perchloroethylene (PCE) below their detection limits, after which a new 4-train granular activated carbon (GAC) system quenches excess hydrogen peroxide from the AOP effluent, and acts as a barrier for the removal of any 1,2,3 trichloropropane (TCP) that may be present.

Treated water from the Olympic wells is then blended with water from other groundwater sources for treatment via RO.

The existing RO system had been operating at an 83% recovery; however, based on the results of a 2022 pilot study that compared a semi-batch RO process and ROTEC’s flow reversal RO (FR-RO) process, the city chose to proceed with retrofitting its existing 4-train RO system with the FR-RO process, which demonstrated the ability to successfully operate at 90% recovery.

The FR-RO technology is based on periodically—usually every 60 to 75 minutes—changing the flow direction of the feed stream in the RO pressure vessels and alternating which vessels act as the final stage. This is the membrane equivalent of ‘rotating the tires’ and has been shown to mitigate membrane scaling that typically prevents traditional RO units from operating at higher recovery rates.

The original trains were configured in a 39:19:9 array and operated at a flux of 14.5 gfd (242 Lmh). After the ROTEC FR-RO retrofit, they were configured in a 43:21:9 array, operating at a flux of 12.8 gfd (21.8 Lmh). ROTEC also supplied additional static first-stage and second-stage vessels, and the necessary pneumatic valves, pressure transmitters, flow meters and permeate/conductivity probes, and a new PLC. The interstage booster between the first and second stages was replaced, and a new interstage booster was installed between the second and third stages.



Post-retrofit FR-RO Skids

RO permeate is then decarbonated in a 3-train, packed bed decarbonator system to remove CO₂ and increase the pH.

Bruce Alderman, ROTEC USA’s CEO, said that the project was commissioned in August and is now fully operational. It is the first full-scale municipal FR-RO project in the US, and was designed to fit in the same footprint as the original RO.

Knowing that the FR-RO configuration involves significant modifications of an existing system, *WDR* asked Max Finder, ROTEC’s head of sales, how the installation process went. He said, “The original plan involved a phased commissioning,

but the city opted for a full system shutdown to streamline installation. Because of the design flexibility, individual treatment systems were brought in as they were completed, and the RO was initially operated in a conventional RO mode to meet production needs without regulatory delays. This is a unique attribute of our technology: if a plant doesn’t actuate the valves, the system runs as a conventional RO. This allowed water production to begin promptly, while FR-RO testing and validation took place in parallel.”



The upgraded and expanded Arcadia plant with its original footprint

According to Sunny Wang, Santa Monica’s water resources manager, the project not only eliminated harmful trace contaminants to improve water quality, it increased recovery and water production, and reduced costs. Wang told *WDR*, “The new system’s water production costs are about \$1,000/AF [\$0.81/m³], while our imported water costs are currently about \$1,400/AF [1.13/m³] and climbing every year. The RO retrofit also reduced the specific energy consumption of the original RO system, from 1.09 kWh/kgal [0.29 kWh/m³] to 0.95 kWh/kgal [0.25 kWh/m³].”

Brown and Caldwell designed the system, and the project was delivered under a progressive design-build contract by the Walsh Group. The \$72 million project was partially funded by a \$10 million Bureau of Reclamation grant and a \$19.1 million California Department of Water Resources-provided Proposition 1 grant.

Technology

NOBEL’S WATER CONNECTION

Three chemists—Omar Yaghi (University of California, Berkeley), Susumu Kitagawa (University of Japan), and Richard Robson (University of Melbourne)—will share this year’s Nobel Prize in Chemistry for their work in developing metal-organic frameworks (MOFs), a new form of molecular architecture.

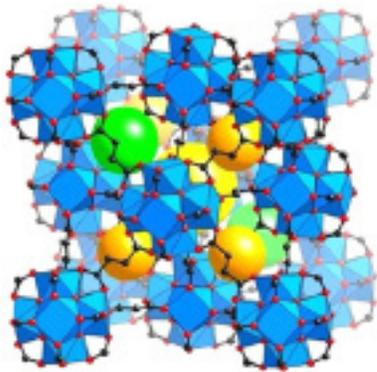
According to the Nobel Committee, Robson first considered the concept of developing a crystalline framework, with sizeable cavities that could be filled with freely moving sol-

vents, in the late 1980s. In the late 1990s, Kitagawa demonstrated that the frameworks, initially filled with water, could adsorb and release gas substances under low-temperature conditions, while Yaghi's overlapping research "went on to produce the iconic structure that essentially became a paragon and showcase of the entire field."

Further conceptualizing the design and construction process of the frameworks, Yaghi introduced the term *metal-organic framework* (MOF) and adopted the term *modular chemistry* for the construction process of "assembling judiciously designed rigid molecular building blocks into predetermined ordered structures (networks), which are held together by strong bonding."

The field of MOFs has expanded rapidly over the past two decades because of the seminal work of these three researchers and their colleagues. MOF structures have been applied for water adsorption from low-humidity air, to absorb PFAS from water, and have been evaluated for mining rare-earth metals from wastewater.

In 2014, Yaghi's team synthesized a zirconium/adipic acid MOF that was particularly effective at binding water vapor. In May 2017, he told your correspondent that his team had developed MOF-801 that was efficient even at a 20% relative humidity level.



Professor Yaghi's MOF-801 – The atom color scheme is: black = carbon, red = oxygen, blue polyhedra = zirconium. The lines are organic linkers. The yellow, orange and green balls are porous spaces in the framework.

Although *WDR* invited him to present his MOF water-collecting system at GWI's 2018 Tech Idol event in Paris, he suggested that MIT Professor Evelyn Wang had done more work with engineering a device, and suggested that she present her MOF work. Wang agreed, and introduced her team's device, which adsorbs water vapor during the cooler nights, and condenses water for collection under the ambient daytime temperatures (wdr2017-16).

Unlike conventional air-water generators (AWGs), which can use 30 to 90 times more energy than seawater RO, MIT's

2018 MOF system could operate at ambient conditions and could produce up to 15 L/d (4 gpd) with no electricity for a system with a footprint of 1m² (10 ft²).

Earlier this year, Yaghi said that the water productivity of an MOF water harvesting device using one ton of MOF, with an effective life of 6-7 years, can produce 3 m³/d (0.79 MGD), with zero energy input, at a cost of \$30/m³ (\$114/kgal).

While that price is not viable for large-scale municipal water supplies, it becomes much more palatable for point-of-use (POU)/point-of-entry (POE) systems, especially those located off-grid, and/or in arid locations, and where much of the supply is lost to leaks, otherwise wasted, used for non-potable applications, or where the majority of the water is used to convey wastewater to a treatment plant.

Technology

A TIME MAGAZINE 'INVENTION OF THE YEAR'

Texas-based VWater—spelled V-V-a-t-e-r—has proposed a "new class of advanced water treatment technology" that integrates electrochemical innovation, acoustic energy, and flotation processes in its proprietary Advanced Low Tension Electroporation Process (ALTEP). After reviewing information on the company's website, the 'electrochemical innovation' is actually a process known as *electroporation*.

Electroporation is a technique that uses pulsed, high-intensity electric fields to create holes in cell membranes into which drugs or genes can be introduced. It is most frequently used in medical applications, although *WDR* is aware of at least one company that has previously suggested it might control membrane biofouling. However, no results were provided, and no one has confirmed that it has ever been employed or tested in an RO system.

While it isn't difficult to envision how a process able to lyse cells could prevent biofouling, the practical aspects of how one would go about shock-treating a desal plant's feedwater to prevent biofouling are more difficult imagine. To try to get a clearer picture of this seemingly extraordinary process, your correspondent contacted the company and asked for more information. In response, VWater's CEO emailed a paper titled, "A Scientific Brief on Quantum-Classical Synergistic Water Treatment".

Unfortunately, the combined claims made in the paper and on the company's website left this reader bewildered, while making Elizabeth Holmes look modest and self-effacing. For example:

- "Our electroporation system can drive operating expenses as low as \$0.003 per gallon [\$0.79/m³], operating at a fractional 48 amps. This makes it

an incredibly cost-effective solution, capable of converting 100,000 gallons of discharge, wastewater, or sewage into clean, potable drinking water in just 8 minutes, compared to the 30 minutes required by RO.”

- “Energy efficiency for microbial inactivation and contaminant removal [is] superior to RO and comparable to UV disinfection.”
- “High recovery: no brine waste as in RO.”
- “Energy Efficiency: Electroporation vs. RO: While effective at removing bacteria, RO presents significant problems regarding energy consumption. Most modern RO systems operate at nearly 480 amps, using large amounts of energy to push the influent stream through the pores of the semi-permeable membrane filter. These systems are not only energy inefficient but also drive operating expenses through the roof, requiring over 1000 psi of consistent pressure to filter the influent stream.
- “RO systems can lose substantial amounts of water from evaporation or inherent inefficiencies in the filtration process. In contrast, VWater’s ALTEP system boasts zero discharge, making it the superior option.”

Because there were so many uncertainties about this technology, *WDR* asked Rice University’s Professor Meny Elimelech—someone who knows his way around an electrochemical process—for a second opinion. He said, “This technology is just for inactivating bacteria and viruses, and for this application, it can work. The comparisons to RO are strange, since RO is designed to remove salt, not microbes. It may be used for pretreatment before RO, but even then, there are much better pretreatment technologies. However, all their claims are vague, and they may violate the laws of physics.”

Editor’s Note 1: Somebody saw something that *WDR* didn’t. Last week, VWater’s innovation was named one of *Time* magazine’s Best Inventions of 2025. Of the technology, *Time* said, “Its electroporation system can be used anywhere from municipal facilities to disaster zones to residences.”

Editor’s Note 2: In 2015, Elizabeth Holmes was named one of *Time*’s Most Influential People of the Year.

IN BRIEF

Council members for the City of **Corpus Christi, Texas**, deferred a decision on paying a \$2.737 million, nonrefundable reservation option to secure access to 50 MGD (189,250 m³/d) of water from the Nueces River Authority’s proposed

100 MGD SWRO Harbor Island SWRO plant. Meanwhile, the city continues to consider its short-term options to ensure that it doesn’t run out of water in November 2026, as well as potential longer-term solutions.

Membrion, the Seattle, Washington-based manufacturer of electro-ceramic desal membranes, has announced completion of its \$20 million Series B1 round, anchored by Pangaea Ventures, PureTerra Ventures, Ecolab, and WL Gore & Associates. They are joined by The Lewis Family Office and existing investors, bringing Membrion’s total funding to \$43 million. Founder/CEO Greg Newbloom said, “Their commitment accelerates our momentum as we continue to deploy more full-scale industrial installations.” Membrion was a GWI Tech Idol award winner in 2023 and received the Distinction Award in GWI’s Global Water Awards category for Breakthrough Technology Company of the Year for 2024.

The **Sweetwater Authority**, which supplies water to South San Diego County, California, is reportedly considering a new 4 MGD (15,140 m³/d) South Bay Brackish Groundwater RO project. The project would reduce the Authority’s dependence on the San Diego County Water Authority, which is said to cost up to seven times more than Sweetwater’s own supplies. Sweetwater’s existing 10 MGD (37,850 m³/d) Richard Reynolds BWRO plant was completed in 2017.

DuPont Water Solutions has signed an agreement to acquire Sinochem (Ningbo) RO Memtech Company, with production in Zhejiang Province, China, to expand its RO manufacturing footprint into the Asia Pacific region. The acquisition is expected to close in Q4 2025 and supports DuPont’s strategy to localize production closer to its end customers. The new plant is the third plant to manufacture FilmTec RO elements, and joins existing plants in Edina, Minnesota, and Jubail, Saudi Arabia.

The European Investment Bank (EIB) and Spain’s **Acciona** have signed a €120 million (\$139.4 million) loan to finance the development of construction materials, renewable energy technologies, and solutions for water treatment and desalination. This is the first tranche of a total €150 million (\$174.3 million) loan approved by the EIB.

Toray Industries has announced the launch of a new low-pressure, ultra-low differential pressure RO membrane. The TLF-400ULD membrane is an 8-inch diameter BWRO element and has a maximum pressure drop of 15 psi (0.10 MPa) per element. Toray and Toray BlueStar Membrane will market the new offering worldwide.