

# WATER DESALINATION REPORT

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## Technology

### SOLAR POWER + RO MAY BE LOW COST OPTION

Water and power have always shared a unique relationship and desal plant economics and environmental impacts are often governed by that relationship. Energy costs can represent more than half of a desal facility's operating expenses and the plant's carbon footprint is directly related to its energy requirement. Because of this, there is constant search for less expensive, more sustainable energy options.

One of the 'hottest' and most environmental-friendly power generation technologies currently available is concentrating solar power (CSP).

CSP technologies are based on the concept of concentrating solar radiation to provide high-temperature heat for electricity generation in conventional power cycles. Most systems use parabolic troughs, glass mirrors or solar dishes that continuously track the sun's position to concentrate solar energy to boil water and generate steam that drives a turbine to produce up to 200 MW of electric capacity. To generate one Megawatt-hour of solar electricity per year, 4–12 m<sup>2</sup> (43–130 ft<sup>2</sup>) of land area is required. This means that 1 km<sup>2</sup> (247 acres) of arid land could continuously and indefinitely generate as much electricity as a conventional 50 MW fossil fuel power station.

Solar heat collected during the daytime can be stored in concrete, molten salt, ceramics or phase change media and extracted from the storage to run the power block at night.

Acciona Energy constructed the 64 MW Nevada Solar One CSP in Boulder City, Nevada last year and the \$266 million plant produces electricity at \$0.15–\$0.17/kWh. Although not yet as inexpensive as gas or coal-fired power, CSP has the advantage of not generating greenhouse gases.

The German Aerospace Center (DLR) recently conducted a study entitled *CSP for Seawater Desalination* that analyzed the technology's potential for use with seawater desal in the Middle East and North Africa (MENA) region. The result is a database on technology options, solar energy resources and the potential markets for solar desal in MENA countries. The report also includes a long-term scenario quantifying CSP's socio-economic and environmental impacts.

Reference system capital costs for a 21 MW CSP power plant and SWRO and MED desalination plants producing 24,000 m<sup>3</sup>/d (6.34 MGD) and 21 MW of solar power were

estimated at €76.4 million (\$117 million) and €84.9 million (\$130 million), respectively.

The report concludes that within 20 years, energy from solar plants will be the least cost option for electricity at less than \$0.04/kWh and a desalted seawater cost of less than €0.40/m<sup>3</sup> (\$0.61/m<sup>3</sup>; \$2.32/kgal).

Franz Trieb of the DLR's Institute of Technical Thermodynamics oversaw the study and told *WDR*, "Solar power's resource potential dwarfs global energy demand by several hundred times. Its cost is now equivalent to the price of oil at about \$50/barrel and the cost will reduce by 10 to 15 percent each time the world's installed capacity doubles. By 2025 it should be equivalent to \$15 to 20/barrel oil."

Like many technology options being considered, CSP is not a panacea, but this report goes a long way in enhancing its credibility as a credible option to consider. Dr Trieb summed things up by saying, "This study is a roadmap, not a wheelchair: it helps identify the medium and long-term goals and shows how we can achieve the goal, but it won't carry us there, we'll have to walk by ourselves."

## California

### 1<sup>ST</sup> PHASE SEAWATER NF/NF A SUCCESS

Long Beach Water Department has completed the first phase tests of its proprietary, dual-stage nanofiltration seawater desalination process. Known as *The Long Beach Method*, or *NF2*, the process was developed by Long Beach's Diem Vuong and employs a two-pass nanofiltration system with the first pass NF operating at 525 psi (36 bar) and the second at 250 psi (17 bar). The goal is to reduce energy consumption over conventional SWRO and provide a double barrier to increase water quality reliability.

A pilot test of the NF2 process has been in operation since October 2001, and for more than seven months, a 0.3 MGD (1,135 m<sup>3</sup>/d) demonstration project has been in operation to evaluate the side-by-side performance of the process to conventional SWRO.

Robert Cheng, Long Beach's assistant manager for operations, told *WDR* that the two systems recently underwent two, 48-hour performance tests to evaluate their performance. "Our goal during these phase one tests was to evaluate the relative energy consumption of the Long Beach

Process and SWRO while operating on seawater pretreated by microfiltration and producing permeate that met TDS requirements for potable water,” he said.

“We were able to demonstrate that the optimal, reproducible energy consumption for the NF2 process was 10.1 kWh/kgal (2.67 kWh/m<sup>3</sup>) versus 14.2 kWh/kgal (3.75 kWh/m<sup>3</sup>) for the SWRO with both systems operating on the same feedwater and an overall process recovery of 33 to 35 percent. Both systems are fitted with ERI’s PX energy recovery device and the energy consumption reported in the test includes the feedwater transfer pump and the high-pressure booster pumps,” said Dr Cheng.

After completing the first phase of testing, the SWRO will be dismantled and replaced with a second NF2 system. Further research will focus on membrane optimization, vessel configurations and new concepts for disinfection and microbial fouling control of the membranes utilizing ultraviolet light and chlorine dioxide.

Long Beach and the Bureau of Reclamation are also constructing an under ocean floor intake and discharge demonstration system to demonstrate an alternative currently in operation on a SWRO facility in Japan.

Additional information on the project is available at [www.lbwater.org/desalination/desalination.html](http://www.lbwater.org/desalination/desalination.html)

## TEXAS DESIGN-BUILD PROCUREMENT FOR BWRO

San Antonio Water System’s (SAWS) board of trustees has approved a resolution to use a design-build project delivery method for its proposed 20 MGD (75,700 m<sup>3</sup>/d) brackish groundwater desalination project. The \$200 million project will desalinate water from the Wilcox Aquifer to supplement the region’s water supply from the Edwards Aquifer.

Until last year, Texas was one of the few states with severe restrictions on alternative project delivery procurements. During its last legislative session, a bill was passed to allow the phase-in of design-build project delivery arrangements for certain infrastructure projects including water and desalination facilities.

Seventeen consultants responded to SAWS solicitation for information on alternative project development and financing strategies. After interviewing many of the respondents, SAWS selected the design-build approach. According to Janelle Okorie, SAWS’ vice president of strategic resource and business planning, “The design-build process will provide a huge benefit to our ratepayers. It will enable

certain design and construction activities to be completed in a faster time frame and, consequently, at reduced cost when compared to the traditional procurement options.”

Project procurement activities are expected to start later this year and the plant is expected to be on-line by 2011.

## Company News SHIP-BASED DESAL ABOUT TO SET SAIL

Water Standard Company (WSC) has announced that the company has received a commitment of up to \$250 million in equity funding to develop its ship-based desalination technology. Company CEO Amanda Brock told *WDR* that the funding commitment is set to be finalized later this week, and the company has plans to immediately move forward with the final design and construction of a large-scale vessel mounted SWRO.

“We’re in negotiations with several interested parties and look forward to closing one or more of the contracts very soon. Our financial partners are well connected globally and very experienced in infrastructure development. We’ve put together a team of veteran desalters and marine architects who have prepared a reference design that includes our patented seawater intake and concentrate outfall, and we plan to develop a fleet of vessels that can be deployed around the globe under both long term and short term contracts,” she said.

The vessels will include power generation capabilities and on-board seawater desalination systems with scalable production capacities of up to 200 ML/d. Potable water will be transported to shore by undersea pipeline or a flexible hose system.

WSC founder Andrew Gordon said the company has developed a strong intellectual property position for vessel-based, large-scale desalination and wastewater treatment. The company holds issued and pending patent applications in over 90 countries.

## Desal Research A DROP IN THE BUCKET

As the US’s largest water wholesaler, the Bureau of Reclamation brings water to more than 31 million people and produces irrigation water for farmland that produces 60 percent of the nation’s vegetables and 25 percent of its fruits and nuts. Reclamation’s mission is to “assist in meeting the increasing water demands of the West while protecting the environment and the public’s investment in these structures.”

Reclamation's fiscal 2009 net budget request of \$871 million includes \$12.4 million for R&D, of which a paltry \$3.9 million is to be focused on desalination. Some additional funding may be available through a new Water Security Initiative which also has a desalination component to help create and increase new supplies.

## California

### UF PLANT MEETS NEW QUALITY REGS

A newly commissioned 10 MGD (37,850 m<sup>3</sup>/d) UF membrane filtration plant will help the City of Ventura stay ahead of the stringent Long Term 2 Enhanced Surface Water Treatment Rule and the Stage 2 D/DBP Rule. The \$22 million Avenue Water Treatment Plant—which is expandable to 15 MGD—replaced a conventional filtration plant.

The facility employs Zenon 1000 UF membranes pre-purchased during the plant's design stage after having demonstrated success during pilot testing. The plant also includes a new wash water recovery system, sludge drying beds and comprehensive SCADA and security systems.

City water superintendent Jim Passini told *WDR* that the project won a local American Public Works Association award and was completed ahead of schedule and under budget. Kennedy/Jenks designed the plant, and it was constructed by James Cushman Inc with construction management provided by Mimiaga Engineering Group.

## Oman

### MEDRC R&D CENTER OPENS

A new purpose-built research facility was inaugurated over the past three days as the Middle East Desalination Research Center (MEDRC) held a membrane technology seminar in center's new training room. Forty desalting professionals from water ministries in 11 MENA-region countries attended the course that was funded by the government of Japan and organized by MEDRC's Dr Noreddine Ghaffour.

The new research facilities will include a 1,420 m<sup>2</sup> (15,300 ft<sup>2</sup>) building, located 100m (330 ft) from the beach. It will include numerous membrane and thermal pilot units, engineering and chemical laboratories, a seminar training room, desalination library and guest researcher accommodations.

MEDRC director Koussai Quteishat told *WDR*, "It's sponsorship of courses like this—by governments or

industry—that allows us to provide added value by inviting participants from various countries in the region to share experiences in addition to our usual objective of knowledge dissemination."

Quteishat said that the full MEDRC staff would move into the new facilities by the end of the week.

## Caribbean

### CWCO CHAIRMAN RESIGNS

Consolidated Water (CWCO) executive chairman Jeff Parker is stepping down from his role to a non-executive chairman position. Parker has been the director of the company since 1980 and chairman since 1982. He was named chief executive of the company in 1982 and took on strategic business development and investor relations activities in 2004.

Rick McTaggart, the company's president and CEO, will now be responsible for strategic business development and investor relations.

Parker told *WDR*, "There comes a time for the old guard to step back and let the young ones have their turn. I'm an expectant father and have a brand new fishing boat but will be looking around for something interesting to keep my business mind occupied between quarterly CWCO board meetings."

He can be contacted at [jeffp@candw.ky](mailto:jeffp@candw.ky)

## OpEd

### CANADA INVADES THE US

Canadian fear-monger Maude Barlow is traveling the US promoting her book *Blue Covenant: The Global Water Crisis and the Coming Battle for the Right to Water* as part of a national book tour sponsored by Food & Water Watch. *WDR* readers may recall Food & Water Watch as the organization that prepared the *Top Ten Reasons to Oppose Ocean Desalination*, a list that is so naïve and technically incorrect that it is laughable.

One wonders how someone such as Ms Barlow—who offers such a grossly over-simplistic and lopsided view of such an important subject—can continue to garner so much publicity? Here are some samples of the message she is spreading during several recent news stories and television shows in which she appeared—all are direct quotes:

- Desalination is not the answer. The plants are polluting behemoths, use an incredible amount of energy, add

to our climate crisis, and produce toxic brine that kills aquatic life for miles.

- Desalination plants will ring the world's oceans, many of them run by nuclear power. Corporate nanotechnology will clean up sewage water and sell it back to us at a huge profit. The rich will drink only bottled water ... while the poor die in increasing numbers.
- Desalination, the big technology, is dirty. It's polluting. It takes in a lot of aquatic life and then it puts it through this osmosis process with chemicals, spits out this chewed up aquatic life, chemicals, and salt brine back into the ocean and it kills everything for miles around. I mean you'd have to see a photo from the air of these desal plants. It looks like an octopus that's just let its ink out, right?
- And even in California, where they're planning 25 to 30 of them, they could find far more water from conservation than from these desal plants.
- I also think the US is looking at the Guarani aquifer in Latin America [located under Paraguay, Bolivia]. The United States has suddenly put up military bases around this aquifer, saying there are terrorists down there, but I don't think there are terrorists, I think there is water.
- This consortium advising the US government on water is being run by the world's largest weapons maker [Lockheed Martin], which starts to bring the whole notion of security and water together in an unhealthy and distressing way.
- If Coca-Cola can own the water it sells to you in a bottle, why wouldn't Suez or General Electric or Dow Chemical be able to say to you, "I own the water that I just cleaned. And I'm going to charge you whatever I like."

## IN BRIEF

India-based **BGR Energy Systems Ltd** has reportedly received prequalification approval for the 150 ML/d (40 MGD) Kutch SWRO desalination and 30 MW power facility in the western Indian state of Gujarat. The Rs 750 crore (\$185 million) plant would be undertaken on a BOOT basis by a consortium including BGR, Spain's Inima, Aqualia and Gestion Integral Del Agua.

**Siemens Water Technologies** announced the acquisition of the Chemitreat Group late last week. The Singapore-based company provides water treatment technologies including

desalination systems in the Asia-Pacific region and has annual sales of over €25 million (\$38.5 million). Siemens CEO Chuck Gordon said the acquisition "will provide us with a strong platform to accelerate our market entry into other countries, such as India and Vietnam."

The **Asia Pacific Desalination Association** (APDA) will hold its first Asian Conference on Desalination & Water Reuse in Qingdao, China on 27-30 May. More information on the conference can be obtained by contacting [masaru\\_kurihara@nts.toray.co.jp](mailto:masaru_kurihara@nts.toray.co.jp) or [cda-ida@163.com](mailto:cda-ida@163.com)

**KSB** has introduced a new high-pressure pump set for the small to medium-sized desalination market. The horizontal long-coupled multistage design is a variation of the Multitec product line made from duplex stainless steel with a discharge head of up to 800m (2,624 ft) and flow rates to 850 m<sup>3</sup>/hr (225,000 GPH).

## PEOPLE

**Martin Hoogland** has returned to CH2M Hill following a "sanity check" working as the manager of water equipment and systems for a start-up renewable energy company. He will be an Australian-based technologist and can be contacted at [martin.hoogland@ch2m.com.au](mailto:martin.hoogland@ch2m.com.au)

**Jong Myong Hong**, formerly with Doosan Heavy Industries, has joined Mott MacDonald where he will serve as a senior thermal desalination process engineer. He will be based in Abu Dhabi, UAE and can be contacted at [jong.hong@mottmac.co.ae](mailto:jong.hong@mottmac.co.ae)

## JOBS

**Veolia Water**—the worldwide leader in water & wastewater public-private contracts—is recruiting Plant Managers for our Caribbean locations. Candidates must have experience in the management, operation, and maintenance of seawater RO plants. Please contact [vwnasouthjobs@veoliawaterna.com](mailto:vwnasouthjobs@veoliawaterna.com) for details.

**Veolia Water North America** is searching for an Oklahoma-based Senior Project Manager, Capital Program Management to manage/coordinate large, complex municipal or industrial design/build projects. Visit [www.koffassociates.com/recruitments.html](http://www.koffassociates.com/recruitments.html) or contact Koff & Associates at 1-510-658-5633 or by e-mail at [mtargan@koffassociates.com](mailto:mtargan@koffassociates.com).