

# WATER DESALINATION REPORT

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## California

### BIDS OPENED FOR SWRO CONSULTANT

Three teams have responded to West Basin Municipal Water District's request for proposals for a consultant to assist in the planning and engineering of a comprehensive seawater desalination program master plan. The teams that submitted proposals late Friday afternoon were:

- Arcadis/Malcolm Pirnie with Veolia, SKM, Halcrow, Alkyon, Dudek, RosTek Associates and Nexant.
- RBF with Carollo Engineers, Trussell Technologies, SPI, GHD, Tenera Environmental, Briarly Associates, Robt Campbell, Katz & Associates, Geoscience, Rios-Clementi-Hale Studios, Scott Jenkins, Jeff Graham, Water Globe Consulting, Dietrich Consulting, MJF Consulting and Cynthia McClain-Hill.
- Tetra Tech with Coast Surveying, Water Globe Consulting, Mark Wilf, Tenera Environmental and DDB Engineering.

The project will determine the proposed SWRO plant's optimum capacity, which is expected to range from 20 to 100 MGD (75,700 to 387,500 m<sup>3</sup>/d). *WDR* understands that the firm selected to undertake the master plan will remain eligible to participate in the delivery of the eventual full-scale project.

All three bids are understood to be within the project's estimated \$750,000 to \$850,000 budget.

Interviews for shortlisted candidates are tentatively scheduled for 4 February, with a notice of award on 2 March; the Kickoff Meeting is planned for 14 March. The project recommendations, sequencing and program implementation requirements are due for delivery 300 calendar days from the Notice to Proceed.

## Company News

### EXECUTIVE STAFF TRIMMED

Besides seeing its stock drop from \$8.50 to its current \$3.60, Energy Recovery Inc (ERI) has weathered many changes since its July 2008 IPO. Its December 2009 acquisition of Pump Engineering (PEI) took a competitor off the table and added new product lines that answered critics' claims that it was a 'one trick pony'.

However, as the desal market slowed down over the past year, things have gotten a bit more difficult for the company. The best evidence of the difficulties has been the departure of several veteran desalters over the past year, including the

chief technology officer, product director and vice president of major project sales.

Last week, *WDR* learned that three more executives are leaving the firm. They are PEI sales and marketing vice president Larry Pelegrin, PEI's engineering vice president, Kevin Terrasi and Cleantech business director, Joe D'Souza.

GG Pique, the company's usually communicative CEO – this newspaper previously referred to him as “ebullient and talkative” – would only say through his marketing department, “As we look at desalination in 2011, we see a growing number of small and medium desalination plants associated with power, mining, and metals projects worldwide. As such, we are strategically aligning our organization to meet changing business demands. In turn, we are focusing on growing our engineering capabilities to help us develop new products into new markets – in fact we are actually beefing up our recruiting efforts in engineering. In addition, we work on continually improving our existing line of pumps, PX devices and TurboChargers to provide our customers with the quality, durability and high efficiency solutions that they are used to getting from ERI.”

We will now watch to see how the company will grow its engineering capabilities after losing a vice president of engineering with 15 years of product experience, how it will develop new markets after losing the business director hired to penetrate the Cleantech market, and how it will capitalize on the growing number of small and medium plants after losing a vice president of sales and marketing with 30 years of desal experience.

Pundits have said that the firm had the SG&A of a \$100 million company, but that issue now appears to have been addressed. There has long been speculation that the company would be a takeover target at a stock price below \$4.00. Now that the pace of mergers and acquisition seems to be picking up, we may soon find out.

## Public Health

### MAGNESIUM ADDITION TO DESAL WATER MULLED

By 2020, it is expected that 50 percent of Israel's potable water will be produced through seawater desalination. Most of the RO plants that produce this desalted water meet strict water quality specifications that call for a TDS concentration of less than 80 mg/L and a boron concentration of less than 0.4 mg/L, prior to post-treatment.

Along with more than 99.75 percent of the ions rejected by the RO membranes are some important nutritional minerals including calcium and magnesium. Since 2003, Israel's Department of Health has been considering an update to its water regulations. First, it wanted to investigate standards for substances that are not currently addressed, and second, to create regulations for desalinated water.

One of the primary considerations of the committees called to review the regulations was whether magnesium should be added to desalinated water in post-treatment. Among other factors, the committee considered expert reviews on calcium and magnesium in drinking water conducted by WHO panels. Dr Joe Cotruvo, who managed the panels, told *WDR* that the magnesium deficiency is associated with increased sudden cardiac death rates.

“Most of the world's population is deficient in magnesium and calcium, especially as they age and consume less dairy in their diets. Since desalinated water is manufactured, it would make sense to add beneficial ions like calcium and magnesium for the dual benefits of stabilizing the water to control corrosivity and improving mineral intake,” he said.

Although the committees initially recommended the addition of 10 mg/L, and later, 20-30 mg/L of magnesium, the Water Authority disagreed with the Ministry of Health.

When the matter was brought before the Israeli Parliament last week, the Water Authority again rejected the recommendation, claiming that the essentiality of magnesium in drinking water was not fully investigated, and noting that it would cost the Authority up to \$12.7 million annually.

One company that is watching the developments closely is Renewed Water Minerals, the Israeli-based supplier of an ion exchange remineralization system designed to add magnesium and calcium to a desalinated water supply.

Eial Windler, the company CEO, told *WDR* that they are currently conducting pilot tests of their system in Singapore and Israel, and noted, “Although it is not yet known whether remineralization will take place at the RO plant as part of post-treatment or at a later stage prior to distribution, we believe it is inevitable.”

## OpEd

### **DAMNED IF YOU DO, OR DON'T**

In 2005 and 2006, Southeast Queensland was in the grips of its worst drought on record with dam levels eventually dropping below 18 percent. In response, the state government's developed a \$9 billion Regional Drought Strategy Contingency Supply Plan to ensure a sustainable water supply.

The Hinze Dam was raised to increase its capacity, water conservation increased with Level 5 water restrictions implemented, more rainwater tanks were installed, a new regional water grid was constructed and several new wastewater reuse plants and a new seawater desalination plant were built.

After spending billions of dollars to secure its water supplies, record rains have inundated the region causing more than \$6 billion of damage and leaving a \$5 billion cleaning bill. The losses could detract around 0.35 percentage points from Australia's annual GDP.

The Tugun Desal Plant was called a ‘white elephant’ by critics even before the rains started. As dam levels increased, so did the calls to shut down the plant to save costs. The shutdown was temporary and the desal plant had to be restarted as turbid floodwaters overwhelmed other water plants. (See following story.)

As soon as the rains let up, critics began questioning the operation of the dams. They complained that the dams were being used to ‘hoard’ cheap drinking water rather than using the desal and reuse plants to produce drinking water, while reserving dam capacity for flood control.

Politicians are lining up on the side that allows them the best opportunity to criticize their opponents and minimize their own culpability.

A similar situation is being played out in Melbourne where it has also started to rain – and flood – as the \$5.7 billion Victoria Desal Plant is nearing completion. The politicians who decided to build the plant are being called incompetent for the crime of planning ahead, while they decry their opponents saying, “Their only policy was to pray for rain.”

Everyone seems to have forgotten that you can't predict the future with certainty.

## **Plant Mothballing**

### **TO BE OR NOT TO BE...**

Like most complex process systems, large-scale seawater desalination plants are designed for continuous operation and they usually perform most efficiently and economically after achieving steady-state operation. Frequent stopping and starting, or long-term mothballing, may not only affect the short-term performance of a plant, it may actually be detrimental to the system itself.

Since approximately 80 percent of a large-scale seawater desal plant's Total Water Cost is capital cost-related and only 20 percent reflects operating costs, it usually makes sense to operate the plant at design capacity as a baseload – rather than a peaking – facility. If a plant is frequently started and stopped, or subject to long-term shutdowns, it is likely

that the capital asset could be damaged, disproportionately impacting its value.

However, it is frequently necessary to shut down a plant, sometimes for extended periods. When a plant is shutdown or idled, adequate precautions must be taken to protect its value and ensure that it is available to perform as intended when it is finally restarted. Obviously, these precautions will vary based on the plant's location and the duration of the shutdown. Most shutdowns, even long-term shutdowns, require that at least one shift of operators remains on duty to maintain the plant.

**Yuma Desalting Plant, Arizona** — The Yuma Desalting Plant is the best-known example of a plant that has undergone a long-term shutdown. The 72 MGD (272,500 m<sup>3</sup>/d) BWRO was only operated for nine months after it was built in 1992 before it was restarted in 2007 for a 90-day test run and again, in 2010, for a one-year test.

Technically, the plant was considered to be in 'ready reserve', a condition that meant the plant could be up and running in one year. After initial operation, the facility was dewatered, and many parts were put in storage. The original cellulose acetate membranes were removed, cleaned and dried in a process developed at the plant to preserve them in ambient conditions in the dry desert air.

Before it was restarted, the plant conducted random samples to check the membrane integrity and salt passage. All the o-rings were replaced and the elements were re-installed in the original pressure vessels, where they are now operating and performing beyond expectations.

Plant manager Mike Norris told *WDR* that the issues associated with the long-term shutdown were not necessarily technical. "Our biggest challenge was to make sure that the plant remained within regulatory and environmental compliance throughout the shutdown. We had to ensure that all permits were up-to-date and make the necessary changes when environmental requirements changed. If we hadn't been diligent, and added a new dechlorination facility when our discharge permit requirements changed, our startup could have taken much longer," he said.

**Tampa Bay Desal Plant, Florida** — Last year's plentiful rain enabled Tampa Bay Water (TBW) to use its river water sources to meet its daily demand without having to utilize the more expensive desalinated water. When the desal plant was shut down, it also made it easier to perform some necessary repairs and preventative maintenance activities.

Early in the summer of 2010, TBW began maintaining the facility in a "hot standby" condition, circulating water through portions of the pretreatment system and periodically operating the RO trains to produce permeate for various preservation and production needs. The membrane

preservation solution in each rack was also changed every three to four weeks.

General manager Gerald Seeber told *WDR*, "We did not place the facility in a long-term standby mode. To do so would not have been in our Agency's best interests. Maintaining it in a hot standby condition allowed us to start producing water in a relatively short period of time when we need to do so, but it was not as economical to run it – especially at the low end of the production scale – when other water supplies were available. There is a net \$800,000 differential in annual production costs to produce 4 MGD versus 5 MGD, however, the cost of going from 19 to 20 MGD is substantially less."

Seeber said that the plant is now back up and is currently running at a production capacity averaging 15 MGD.

**Gold Coast Desal Plant, Australia** — Development of the 133,000 m<sup>3</sup>/d (35 MGD) SWRO project was undertaken while the region was suffering from an extended drought and area dams fell to record low levels. No sooner had the plant been commissioned, then it started to rain. As the dams filled, the desal plant was placed in a hot standby mode.

The rains turned into floods and an estimated 1,000 tonnes of silt poured into the rivers each day. Because the high sediment levels were impacting water quality from the other area water plants, the desal plant was brought back online and is now operating at 66 to 100 percent of capacity.

Although it is likely that the plant will revert to hot standby until a longer-term strategy is developed, the Minister of Natural Resources said, "The desal plant is doing exactly what it was designed to do and is proving to be an extremely valuable asset for maintaining water quality."

## Africa

### FORWARD OSMOSIS PACKS TESTED

Hydration Technology Innovations (HTI) is conducting a 10-day research project to test the effectiveness of its individual hydration pouch during a natural disaster. The test, which began last week in Kenya, will compare the effectiveness of the company's HydroPack as a bottled water alternative during the initial phase of a disaster relief scenario.

The HydroPack is intended for one-time use, and each pouch is pre-filled with a flavored osmotic agent that becomes a 12-fluid ounce (355 mL) electrolyte-enriched drink when fully hydrated. The pouch itself is made of a forward osmosis membrane that allows the pouch to draw in water and reject dissolved solids. When placed in almost any water source, a pouch will self-hydrate in 10 to 12 hours. The fluid can be consumed directly from the pouch using a straw.

One helicopter full of Hydropacks could deliver an equivalent amount of water as fifteen helicopters full of bottled water.

The test is being administered by the Kenyan Water for Health Organization and observed by the Red Cross and UNICEF in the flood-prone village of Mudimbia. A ten-day supply of HydroPacks has been delivered to 87 families, and the logistic benefits, training, compliance/acceptance issues and purity will be tested. An industrial design firm will also research the effectiveness of the packaging and instructions.

Eastern Chemical, producer of the cellulose acetate material used in the membrane, is also participating in the test.

## Australia

### \$3 MILLION IN R&F FUNDING AWARDED

Australia's National Centre of Excellence in Desalination (NCED) has announced the 12 projects that will participate in its second, \$3 million funding round. The projects focus on developing and commercializing new desal technologies, with an emphasis on process' energy efficiency.

The projects and project participants are:

*Development of Cleaning Guidelines for Desalination Membrane Users* – Victoria University with Integrated Elements, Nalco Australia

*Non-Brittle Ceramic Hollow Fibre Membranes* – Monash University with The University of Queensland

*Mitigation of Membrane Biofouling Using Natural Polysaccharide Surface Coating* – CSIRO

*Development of Universally Applicable Coatings and Additives for State-of-the-Art RO & Pretreatment Membranes* – Flinders Univ with Siemens, SA Water, Wind Prospects

*Real Time Detection and Management of Biofouling Conditioning Films in SWRO* – University of New South Wales with InPhaze, SA Water, Sydney Water, University of South Australia

*Fertilizers as Draw Solutes for Forward Osmosis Desalination: A Novel Approach for Fertigation in the Murray Darling Basin* – University of Technology-Sydney with CSIRO, Korea University, Yale, NSW State Water Corp

*Optimizing Low-Pressure Membrane Pretreatment for Desalination* – University of New South Wales with Curtin University, Siemens, Veolia, Water Corporation

*Silica Removal from Groundwater for RO Water Recovery Enhancement and Waste Brine Volume Reduction* – Victoria University with Hatch, Origin Energy, Minara Resources, University of Texas-El Paso

*Application of Capacitive Deionization in Inland Brackish Water Desal* – Univ of South Australia with LT Green Energy, Power and Water Corp, SA Water, Water Quality Research Australia, Environmental Biotechnology Cooperative

*Control of Organic Membrane Fouling Through Limitation and Control of Extracellular Microbial Products* – Murdoch University with Singapore Membrane Technology Centre, Nanyang Technological University Singapore, University of California-Irvine, WA Chemistry Centre

*Tjuntjunjarra Remote Inland Indigenous Community Solar/Waste Energy Groundwater Desal Project* – Murdoch Univ with French Institute of Filtration & Separation Techniques, memsys clearwater, Parsons Brinkerhoff, Singapore Membrane Technology Centre, Nanyang Univ Singapore, Univ of Technology-Sydney, WA Department of Housing

*Assessing and Mitigating Environmental Impacts of SWRO Outfalls on Key Benthic Marine Organisms* – Deakin University with University of Western Australia.

## IN BRIEF

**CaribDA** has announced that it will host a workshop entitled Successful Pretreatment of Caribbean SWRO Plants in Antigua on 7–8 April. The event will include a tour of the Antigua Public Utilities plant at Ffryes Beach. Information is available at [www.caribda.com](http://www.caribda.com).

**David H. Paul** has developed a new seminar that takes participants through the step-by-step process of RO system design, operations and troubleshooting. It provides a 'consultant-level' understanding of desalination and pretreatment, and reviews how different feedwater characteristics affect pretreatment, scaling and fouling. The seminar will be held in Albuquerque, New Mexico, on 1-3 March and more information is available at [www.dhpseminars.com/site/pdfs/ODO.pdf](http://www.dhpseminars.com/site/pdfs/ODO.pdf).

**Algeria's** First International Seminar on Water, Energy and the Environment will be held on 1-3 March in Algiers and will include a special, full-day desalination session organized by the IDA. More information is available at <http://iswee01.webnode.fr/idas-special-session/>.

## JOBS

**Process Engineer – Desal:** N.A. Water Systems LLC, of Veolia Water Solutions & Technologies (VWS), is currently seeking a Process Engineer – Desalination to work in our Moon Township, PA office. The successful candidate will possess a Bachelor's degree or equivalent in an engineering field, preferably in the field of water/wastewater engineering and ten years or more of desalination experience. For more information and to apply, visit our website: <http://www.veolia.com/en/careers> and search on Job Number 06114.