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Saudi water investments target multiple solutions

Significant investment by private and public sectors in Saudi Arabia will increase water supply through new desalination projects, conservation, leak reduction, and wastewater treatment and reuse. CEO and President of the US-Saudi Arabian Business Council Edward Burton reports on the latest developments in the Saudi Arabian water and wastewater sector.

Although Saudi Arabia has historically possessed scarce water resources, today the task of providing water for the Kingdom's growing population and expanding industry has become a matter of national urgency. Desalination plants that provide more than 50 percent of the country's potable water are aging and must compete with power generation plants, petrochemicals manufacturers, and energy exporters for the fuel allocations needed to feed the energy-intensive process of distilling salt water.

The Saudi Government has initiated a number of projects and reforms to respond to the growing demand for water in the Kingdom, but the private sector will also play a crucial role in serving the Kingdom's water resource needs. The National Water Company (NWC) has announced plans for capital investment worth US\$8.27 billion through 2016 in this sector. Additionally, the Saline Water Conversion Corporation (SWCC) is investing more than \$10.67 billion in desalination facilities, transmission systems, and power plants. Those capital investments provide opportunities for companies with the know-how, equipment,

and technologies that can help Saudi Arabia overcome its water challenges.

New desalination projects

According to the Saudi Arabian Water Environment Association, the desalination plants currently operating in the Kingdom require refurbishment and additional capacity if they are to keep pace with rising water demand, which is currently at seven million cubic meters per day (mm^3/d) and increasing at a rate of seven to eight percent annually. New facilities are under construction in Madinah, Yanbu, and Shuaiba, and existing facilities in Jubail have been refurbished. In fact, the \$5-billion Ras Al-Khair desalination plant, the world's largest, will add more than 1 mm^3/d to the national supply once it begins operations in 2014. The Saudi Ministry of Water and Electricity also announced that total government spending on water projects over the next 10 years will reach \$53.33 billion.

Conservation efforts

Even prior to the new projects, Saudi Arabia was the world's largest producer of desalinated

water responsible for 18 percent of global supply. However, desalination alone may not satisfy the country's future demands. Therefore, it has taken a number of measures to reduce consumption by increasing efficiency, eliminating waste, and ending unsustainable practices.

Adding to its demand-side challenges, with no source of fresh surface water and an average of only 2.8 to 3.9 inches of rainfall per year, the Kingdom also depends on desalinated water for agriculture. The use of ground water to irrigate crops beginning in the 1970s has nearly depleted Saudi Arabia's aquifers. So, in 2010 the Saudi Government announced it would discourage agricultural water use by ending subsidies for water-intensive crops by 2016.

As a result of outdated distribution systems, it is estimated that Saudi Arabia loses between 20 and 30 percent of its water (approximately one mm³/d) before it even reaches customers. The leakage rate is one of the highest in the world, as compared to 11 to 15 percent in the United States and five percent in Singapore. In 2007, the Kingdom launched a program to address the leakage and reduce the loss to five percent. In 2012, the NWC saved more than 97 mm³ in Riyadh, Jeddah, Makkah, and Taif by repairing leaks in pipelines. That enabled the NWC to register a surplus of \$160 million.

Although repairing leaks and ending unsustainable agriculture practices have tempered rising water use, the most pressing issue is the nation's high level of consumption. Saudi per capita water use is estimated at 66 gallons (250,000 m³) per day, a high rate attributable to discordance between the cost of production and the subsidized price domestic consumers enjoy. The average cost of desalinating and distributing a cubic meter of water is \$1.60, but municipal customers pay only \$0.08 for that amount. Rationalizing water tariffs would greatly increase conservation; however, such efforts are thought to elude popular acceptance.

The NWC has now begun to establish strategic water storage facilities in the Kingdom in order to ensure water security in its cities. The most recent project for water storage in Jeddah has begun its first phase at a cost of \$133 million and a capacity of 1.5 mm³/d of water. After completion, the facility will have a capacity of 6 mm³/d water and total project costs of \$586 million.

Alternative technologies

New ways of addressing water issues are being developed to complement increased desalination capacity and better conservation efforts. At the end of 2011, SWCC announced an agreement with Japanese company Hitachi Zosen Corporation to conduct research on using solar power for desalination purposes. In March 2012, SWCC also signed a memorandum of understanding (MOU) with The Dow Chemical Company (Dow) to jointly pursue research and development in desalination technologies. The MOU follows Dow's July 2011 plans to invest in a manufacturing facility for reverse osmosis elements in the Kingdom.

Wastewater as a solution

Since widespread flooding in Jeddah in 2009 revealed the lack of a sufficient sewage network in the city, the NWC has been working to improve Saudi Arabia's wastewater

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infrastructure. Foreign companies have been selected to manage water and wastewater networks in three of the Kingdom's largest cities. French companies Veolia Water, Suez Environment, and Saur are NWC's strategic partners in Riyadh, Jeddah, and Makkah and Taif, respectively. NWC had planned to award similar water management contracts for the cities of Madinah and Dammam, but has reviewed its policy and will now issue operations and maintenance contracts that will run for longer periods than the management contracts. NWC will be considering proposals for the operations and maintenance contracts over the coming months.

As a result of private sector involvement, the number of new wastewater connections made annually in Riyadh and Jeddah has grown from 20,700 in 2010 to more than 38,000. A number of new treatment plants are being commissioned that feature cogeneration of electricity. The NWC is building an estimated \$273-million plant at Jeddah's King Abdul Aziz International Airport. The plant will have a capacity of 0.5 mm³/d and will feature a biogas heat-to-power unit with a capacity of eight megawatts. In total, NWC has allocated about \$1.5 billion to future wastewater treatment plants and \$2 billion for wastewater pipe mains nationwide.

Increased capacity for sewage treatment has also provided a new solution to the Kingdom's water shortage. Saudi Arabia currently reuses less than 20 percent of its treated sewage effluent (TSE), which is a strong alternative to desalinated water in non-potable applications.

In comparison, Bahrain and Qatar have demonstrated 100-percent reuse of TSE for agriculture and industrial purposes. Although Saudi Arabia has a much larger and more broadly distributed amount of TSE, the country is operating strategically in using this water. TSE sales in the Kingdom have risen from a negligible amount in 2008 to approximately 0.5 mm³/d presently. Looking ahead, Saudi Arabia aims to become the Gulf Cooperation Council's largest TSE market, with a target of increasing reuse to 1.9 mm³/d by 2020. The Kingdom plans on doing so through its Treated Sewage Effluent Initiative, which will address the challenges of water shortages across Saudi Arabia, protect natural groundwater resources, reduce wastewater discharge, and develop new infrastructure through investment opportunities with the private sector.

One idea for reusing TSE that has received recent attention is district cooling. In the Gulf climate, nearly 70 percent of power generation is consumed by air conditioning. TSE can be chilled and circulated through urban areas to replace conventional air conditioning methods, resulting in a 40-percent decrease in power demand and numerous environmental benefits.

In the mining sector, the Saudi Arabian Mining Company (Ma'aden) has commissioned a 381-kilometers (237-mile) pipeline to pump TSE from Taif to its inland mines. The \$123.7-million engineering, procurement, and construction contract, which also includes two pumping stations, was awarded to Saudi Metal Services Company for Trading and Contracting in January 2012. The success of that transmission project will influence the future use of TSE in industrial applications farther from the coast, where water availability has historically been a major limiting factor for production.

Additionally, the NWC and the Saudi Electricity Company (SEC) signed five contracts in December 2012 worth \$111 million to provide electricity plants with treated water. In 2016, the NWC will provide 55 mm³/d meters of treated water to five electricity-generating stations in Hail, Al-Qassim, Rafha, Qurrayyat, and Wadi Al-Duwasir.

Privatization

The NWC is moving ahead with plans to partially privatize its water and wastewater assets and is seeking technical, legal, and financial consultants on its TSE program. Under those plans, the NWC seeks to sell its assets to the private sector through the establishment of two special purpose entities. Although the NWC will remain a significant shareholder in the treatment plants, a private sector firm will assume operation and maintenance activities. That decision mirrors similar plans being undertaken by SWCC to privatize its desalination business in order to invite private sector efficiency and experience to the Kingdom's water sector.

Opportunities

Rising demand and large government projects have made Saudi Arabia's water and wastewater sector an attractive market for companies offering engineering services for the desalination and wastewater industries. Another need is equity financing for new water works projects. Although the Saudi Government is leading the investment drive in the sector, local private sector companies are looking for foreign technology

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partners and lenders to help bid on new contracts and build additional plants. The private sector contributes two mm³/d to SWCC's production via the Water and Electricity Company, the purchasing agent of SWCC and the SEC, and investment incentives exist for companies that want to help contribute to further growth in the industry.

Author's Note

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