TEXAS PUBLIC POLICY FOUNDATION
PolicyBrief

March 2015
Armstrong Center for Energy & Environment

Baby Got Brack: Desalinating Brackish Groundwater in Texas

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Key Points

- Texas aquifers contain enough brackish groundwater to cover the entire state to a depth of 15 feet. If desalinated, it could support current consumption levels for 150 years.
- New innovations in reverse osmosis and new desalination technologies have the potential to drive the costs down and make brackish water desalination cost effective on a large scale.
- Any legislation regarding brackish groundwater should recognize the distinguishing characteristics that separate fresh and brackish groundwater and allow for its use and development.

Introduction

Texas aquifers contain enough brackish groundwater to cover the entire state to a depth of 15 feet.[1] This is the equivalent of 2.7 billion acre-feet, or 880 trillion gallons. If desalinated and purified it is enough water to sustain the current level of water consumption for 150 years.[2]

Current Production

Five of sixteen Regional Water Planning Groups (RPG) recommended groundwater desalination as one of their water management strategies to meet 2060's projected need as part of the 2012 State Water Plan (SWP).[3] The RPGs project that desalting brackish water can create slightly over 180,000 acre-feet of new water per year by 2060.[4] Currently, there are 46 municipal desalination plants in Texas, 34 of which use brackish groundwater as their raw source.[5]

Plants using brackish groundwater are responsible for a design capacity of 73 million gallons per day, with the El Paso's Water Utilities' Desalination facility making up more than 36 percent of that total.[6] El Paso's facility came online in 2007 and is responsible for increasing freshwater production by approximately 25 percent. In 2016 the San Antonio Water System (SAWS) is slated to open a brackish groundwater desalination plant that will produce about 10 million gallons of water a day. Using 13 production wells, the plant will pump the brackish water from the Wilcox Aquifer in southern Bexar County. According to SAWS the plant will expand in 2021 and 2026 to provide an additional 15 gallons of water a day.[7]

What's the Holdup?

The most common form of desalination is reverse osmosis, which is an energy intensive process, and while not cost-prohibitive, it is still relatively expensive.[8] In reverse osmosis, brackish water is pushed through a semi-permeable membrane at high pressure causing freshwater to diffuse through the membrane and the salty brine to remain behind.[9] For example, reverse osmosis driven desalination in El Paso's facility costs 2.1 times what it does to produce fresh groundwater and 70 percent more than surface water.[10]

Increasingly efficient membranes have made reverse osmosis around 10 percent more efficient, but up until this point innovation has been slow. Currently, energy requirements make up roughly half the costs in desalination. Desalinating brackish groundwater through reverse osmosis requires 219 to 815 kilowatt-hours per acre-foot.[11] Powering a 50-inch LCD television for 11 hours a day, every day for a year, only uses 766 kilowatt-hours of power. A 2012 study published by the Texas Water Development Board (TWDB) estimated the total cost of production of brackish groundwater at $357 to $782 per

acre-foot. The study included capital costs and operational costs, which, vary widely due to the source of water, location and quality of the source of water, concentrate disposal methods, permitting fees, and regional operations costs.[12]

Promising Futures

Better membrane technologies in reverse osmosis and new desalination technologies like forward osmosis and capactive desalination have the potential to drive the costs down and make brackish water desalination cost effective on a large scale. Forward osmosis is a particularly attractive alternative due to its application of heat from an energy source that is currently going to waste—such as a power plant's cooling water discharge.[13]

Recommendations and Conclusion

Current Texas law recognizes no distinction between brackish and fresh groundwater. As such, groundwater conservation districts (GCD) regulate and permit all groundwater in the same way. GCDs have a large impact on developing new desalination plants due to rules on pumping limits and exporting water outside of the district. This stymies the market and slows development of brackish groundwater.

Any legislation regarding brackish groundwater should recognize the distinguishing characteristics that separate fresh and brackish groundwater and allow for its use and development while balancing the need to protect our natural resources and defend private property rights. ✯

Notes

1 Susan Combs, *Texas Water Report: Going Deeper for the Solution*, Texas Comptroller of Public Accounts, Pub. 96-1746, 18. (Jan. 2014).

2 Ibid.

3 Kathy Wythe, "Everybody is Talking About it: Is Brackish Groundwater the Most Promising 'New' Water?" Texas Water Resources Institute.

4 Texas Water Development Board, "Desalination: Brackish Groundwater," *Water for Texas* (Feb. 2013).

5 Wythe, Texas Water Resources Institute.; Combs, *Texas Water Report: Going Deeper for the Solution*, *p.*18.

6 Texas Water Development Board, "Desalination: Brackish Groundwater."

7 Wythe, Texas Water Resources Institute.

8 Combs, *Texas Water Report: Going Deeper for the Solution*, p.19.

9 Wythe, Texas Water Resources Institute.

10 Ibid.

11 Combs, *Texas Water Report: Going Deeper for the Solution*, p.19.

12 Jorge Arroyo and Saqib Shirazi, "Cost of Brackish Groundwater Desalination in Texas," Innovative Water Technologies for Texas Water Development Board. (Sept. 2012).

13 Wythe, Texas Water Resources Institute.