

Desalination and Long-Haul Water Transfer as a Water Supply for Dallas, Texas: A Case Study of the Energy-Water Nexus in Texas

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Abstract






As existing water supplies become increasingly strained in some locations, water planners turn to alternative options to quench cities' thirst. Among these options for inland cities is desalination of seawater or brackish groundwater with long-haul water transfer. Desalination using reverse osmosis membranes is the most common technology in use, yet high pressures required for operation make desalination an energy-intensive water supply option. The subsequent conveyance of desalinated water through long-haul pipelines also requires large amounts of energy. To analyze desalination and long-haul transfer as a drinking water supply, Dallas, Texas, was chosen as a test-bed with two scenarios: seawater desalination near Houston and brackish groundwater desalination near Abilene, both with long-haul transfer of desalinated water to Dallas. Combining the energy requirements for long-distance pumping with the energy demands for desalination, we estimate that desalination and long-haul transfer is nine to 23 times more energy-intensive per unit of water than conventional treatment of local surface water sources, an increase of 230 to 630 MWh/d for 20 million gal (75,700 m³). These results suggest that desalination and long-haul transfer as a water supply for Dallas is less sustainable, based on energy consumption, than use of local surface water sources or water conservation.

Keywords

desalination, long-haul transfer, energy, water

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