Under What Conditions are Salinity-gradient Solar Ponds Cost-effective as a Source of Heat and/or Electricity for Desalination of Brackish Groundwater?

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PURPOSE OF STUDY

The single factor that keeps desalination from becoming economically viable in the Southwest is the brine disposal problem. Government restrictions and permitting processes unavoidably affect the method of disposal chosen for specific sites. Reject brine is industrial waste, as opposed to household waste, and requires special permits for disposal. Additionally, saline groundwater has more elements and compounds in greater variety than seawater. Because some groundwater may contain toxic compounds such as arsenic, the concentrated brines from these sources may be classified as hazardous waste. A hazardous waste classification further increases the state and federal disposal regulations and, proportionately, the cost of disposal. The overwhelming consensus among researchers is that, in inland regions, restrictions on brine disposal options reduce the economic feasibility of desalination.

The primary benefit of solar pond powered desalination is that it bypasses the need to dispose of waste brine. Thus, solar ponds may provide a viable means to pursue desalination technology in the arid Southwest. The goal of this research was to determine if salinity-gradient ponds coupled with desalination units are economically viable compared to existing water sources.

RESULTS

- The results of this study indicate that the cost impact of all three disposal methods will continue to decline. However, increases in the capital and operations and maintenance cost of desalination equipment as well as the cost of power may have a significant impact on the disposal method chosen for a desalination facility. As equipment costs rise, the most inexpensive disposal strategy must be chosen.
- Salinity gradient solar ponds, although not dramatically cheaper than other disposal methods, may still be a viable option especially in circumstances where the unit cost of power is very high or where access to a power grid is limited. Moreover, the actual cost of utilizing SGSPs may be lower than reported when other factors are taken into account, such as savings incurred by bypassing the waste disposal permitting process, the environmental savings associated with using a renewable fuel, or tax breaks that may be developed for facilities that use renewable fuels.

BENEFITS

- This research will assist those involved with inland desalination efforts and the problem of brine disposal.
- The student presented this work as her University Honors Program thesis in partial fulfillment of the requirements for graduation with University Honors.

Desalination of brackish water is a promising technology that may provide additional water to the arid Southwest in the near future.