

# Solar Desalination of Brackish Water Using Membrane Distillation Process

Shuguang Deng, NMSU

*This project aims at reducing energy cost for brackish water desalination and removal of trace contaminants from brackish water by using solar energy assisted membrane distillation processes.*

## PROBLEM AND RESEARCH OBJECTIVES

Shortage of fresh water supply in New Mexico and southwestern parts of the U.S. is becoming an increasingly important and challenging problem. The objectives of this research are: evaluating technical and economic feasibility of solar desalination technology based on membrane distillation for New Mexico brackish water; assessing the feasibility of removing trace contaminants including arsenic, fluoride and nitrate from brackish water in the membrane distillation desalination process; developing a cost-effective solar desalination process for New Mexico brackish water using membrane distillation technology; Obtaining process data for process scale up and design for commercial solar desalination plant and recommending membrane distillation solar desalination technology for the State of New Mexico.

## METHODOLOGY

Solar energy for heating brackish water and membrane distillation process data were collected separately. Three different solar collectors were evaluated and one of them was tested for almost 10-month period that covers the best and worst solar energy season in New Mexico. Two membrane distillation modules: flat sheet and hollow fiber, were evaluated in a lab unit for brackish water desalination and removal of other ions including arsenic, fluoride and nitrate. A mathematic model was developed to analyze the solar-assisted membrane distillation processes for their process performance and cost estimation.



## PRINCIPAL FINDINGS

It was found that the solar water heater could increase the brackish water temperature to above 170 F during the summer time. This feed water can be directly fed into a membrane distillation desalination unit without a booster heater. However, a booster heater is needed during the winter months because the solar collector can only heat the feed water to about 140 F, which is too low for the membrane distillation process. It was also found that the hollow fiber membrane module is much more efficient than the flat sheet membrane module. More than 99% of the major contaminants in the brackish water including arsenic, fluoride and nitrate can be removed in the membrane distillation process designed for brackish water desalination. A detailed report summarizing all the findings will be issued after this project is completed.