**Membrane Systems for Integrated Desalination and Potable Reuse**

Amy E. Childress

Astani Department of Civil and Environmental Engineering

University of Southern California

Los Angeles, California USA

This talk analyzes three concepts of synergistic integration of desalination and potable reuse systems. In the first concept, a modeling framework is developed to evaluate combining seawater reverse osmosis (RO) and treated wastewater streams. It was found that potable reuse scenarios, where treated wastewater is combined with intake seawater, lowered energy consumption, seawater intake volume requirements, and discharge volumes compared to scenarios with seawater only as the influent. In the second concept, the energy impact of combining brackish water RO brine streams and regional brine interceptor/collector streams with treated wastewater upstream of the RO process at a potable reuse facility is evaluated. Two scenarios were considered: one that includes seawater inflow and infiltration that is common in coastal regions and one that does not. Multiple energy-saving strategies were evaluated, including energy recovery devices, closed-circuit reverse osmosis, and desalination of the higher-salinity streams separately from the treated wastewater. It was found that the percent energy increase in treating high-salinity streams decreases as background wastewater salinity increases; thus, marginal energy consumption is expected to have a decreasing trend in future years. Inorganic scaling potential, product water requirements, and discharge permits that may limit recoveries were also considered. In the third concept, the developed framework is being used to consider a future scenario of augmenting a potable reuse facility with seawater to meet potable water demand. Alterations that would be required at the potable reuse facility are being considered including chemical additions and selection of suitable RO membranes. The benefits of additional water supply are weighed against additional energy and costs.