The Energy-Water Nexus

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Abstract
This panel is organized around twin themes of “water for energy” and “energy for water,” with an emphasis on discussion of technological strategies for addressing key challenges.

Water is used for energy extraction, conversion and delivery: fracking of shale formations, cooling of power plants, conveying heat in district energy systems, and other purposes. At the same time, energy is required to make water available and useful for human purposes, e.g., pumping to move water to where it is needed, heating to turn water into industrial process steam, and expending thermal and/or electrical energy to treat wastewater or desalinate brines. Energy-water relationships are facing increasing stresses as the climate warms, as populations grow in already-water stressed regions, and as expectations of higher living standards rise with rising incomes. What roles can technology play in addressing water-energy challenges?

Cooling of power plants accounts for nearly half of all water withdrawals in the U.S. In recent years, water shortages or intake-water temperatures too high to be used for cooling have forced some power plants to reduce or entirely stop generating electricity. Addison Stark will discuss advanced power plant cooling technologies that ARPA-E is supporting aimed at greatly reducing the water-dependence of power plants in water-stressed regions. Jeffrey Stokes will provide perspectives on water use strategies of the Public Service Enterprise Group (PSEG), including using the treated effluent from municipal wastewater treatment for cooling in lieu of fresh water at a large power plant in New Jersey.

Water-stressed regions are found on almost every continent, and water scarcity affects more than 40 percent of people on earth today, according to the United Nations. Energy is an important consideration in addressing scarcity. Bernard Haykel will offer some thoughts on social and political dimensions of the energy-water nexus in the energy-rich, water-stressed Gulf countries of Saudi Arabia, UAE, and Qatar. John Webley will offer perspectives as the leader of a company commercializing advanced sea water desalination technology designed to use much less energy than conventional systems.