Sandia National Laboratories

Energy, Climate & Infrastructure Security

The Climate Security program area works to understand and prepare the nation for the national security implications of climate change.

Vision

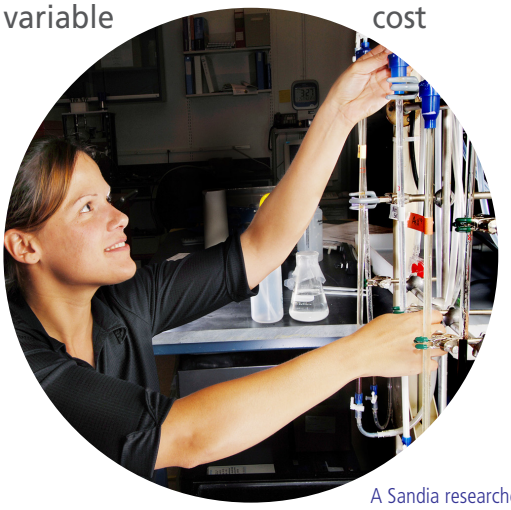
To enhance the nation's security and prosperity through sustainable, transformative approaches to our most challenging energy, climate, and infrastructure problems.

Goal: Deploy technology solutions that make government and private sector success in water safety, security, and sustainability, both domestically and globally

The safety, security, and sustainability of our fresh/potable water supply are national security issues. Nationally, water is a critical part of our economy through the connection to energy production and to our economic prosperity and security. Globally, the world is challenged by water issues that add stress to populations in many regions of the world—that stress could lead to socio-political instability.

Because the global climate/environment is a vast, complex, and interconnected system, the socio-economic-political issues (of which water availability is but one) are also diverse and complex with social, economic, technological, and governance dimensions. Our goal in the ECIS water activity is to deploy technology solutions that make possible government and private-sector success in water safety, security, and sustainability, both domestically and globally, as measured by direct funding of our water program. In short, we seek to remove water availability as a constraint to human endeavors.

In pursuit of this goal, it is necessary to focus on water safety, security, and sustainability issues that address both water-quantity and -quality. Solutions to these problems are further complicated by the many different governmental and private-sector parties that control funding for water research and the complicated nature of water issues—ranging from an assumed guaranteed right to a variable cost



A Sandia researcher investigates a more efficient method of desalinating water.

U.S. DEPARTMENT OF ENERGY

resource stream. We work with the departments of Energy, Interior, State, and Homeland Security; with private-sector companies; and foreign governments and institutions to address these challenges.

To address these national security issues, Sandia's program focuses on water-treatment technology development to improve water quality and quantity and systems analysis and modeling to improve understanding and comprehension of diverse sets of information and aid water decision makers.

Sandia applies these technological solutions to water security issues and energy and water problems to advance the state of the art and impact issues that face the nation today concerning future water supplies and adaptation to climate change.

We are working to improve green-house water efficiency with low-water growing methods.

Water also plays a large role in current methods of generating electricity. When water is boiled to make the steam that spins the turbine to generate the electricity, it must be cooled down to the liquid phase again (the Carnot cycle). Water from outside the steam loop is used to perform this cooling—a very large amount of water.

Sandia is investigating the potential of the deep saline aquifers at three locations near the San Juan Power Station (which generates electricity that flows across the southwest). Our geoscientists and modelers are applying their experience from the Waste Isolation Pilot Plant nuclear repository to the geology near the plant to determine the potential volumes of water that might be available and the geochemistry of those aquifers.

Another project is determining how to most efficiently prepare the water for use by the plant. Even though this cooling water need not be "potable," it will require treatment to make it usable. Sandia is developing nanofiltration membranes to desalinate the pumped water to reduce total dissolved solids levels to those appropriate for cooling-tower use and to the remove scale-forming contaminants. As always, Sandia is trying to find the solution that minimizes energy consumption in the filtration process to reduce the parasitic losses at the power station.

Sandia researchers pioneered a filtration method for removing arsenic from water supplies.

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Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2011-1812P