

Exceptional service in the national interest



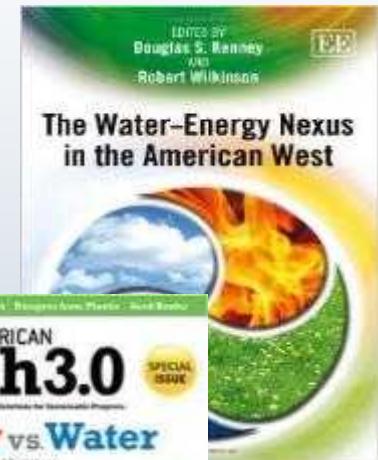
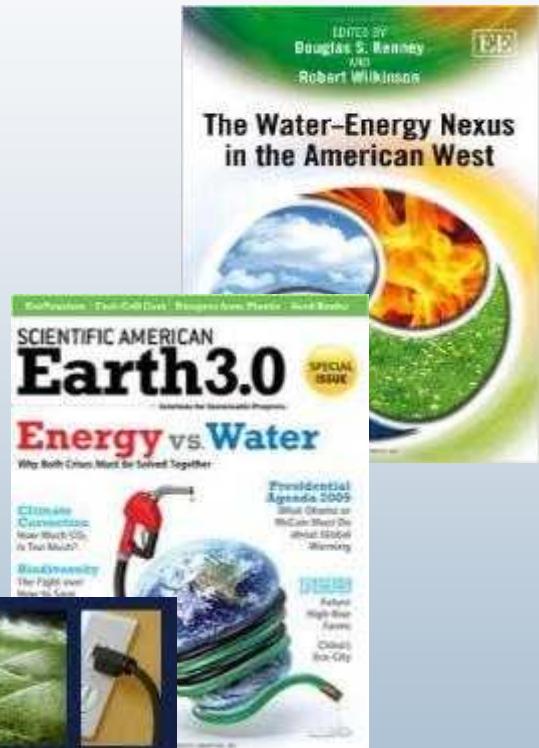
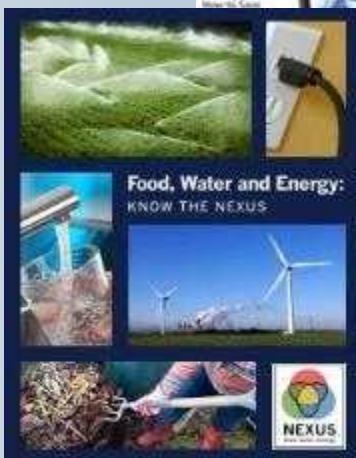
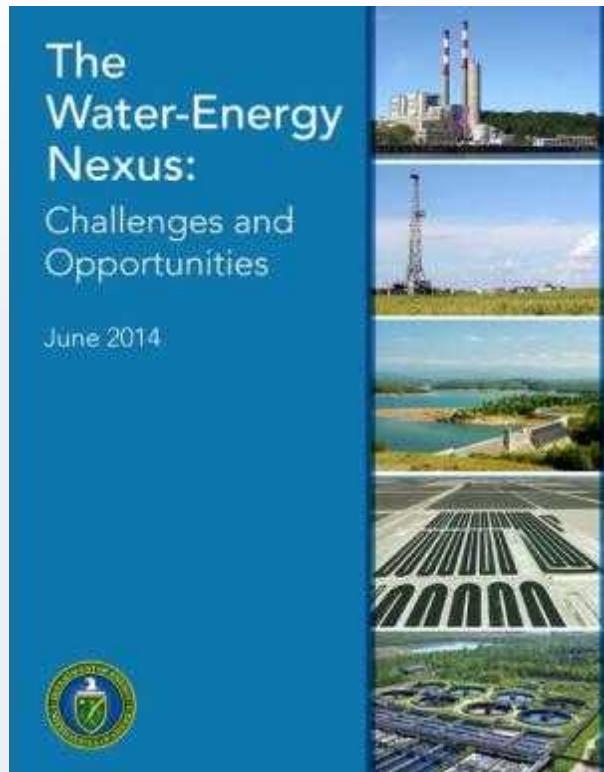
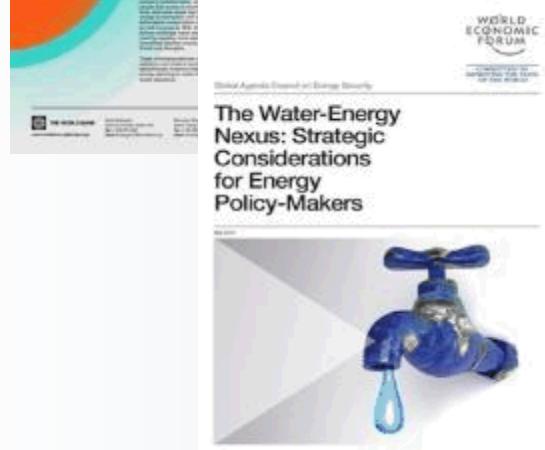
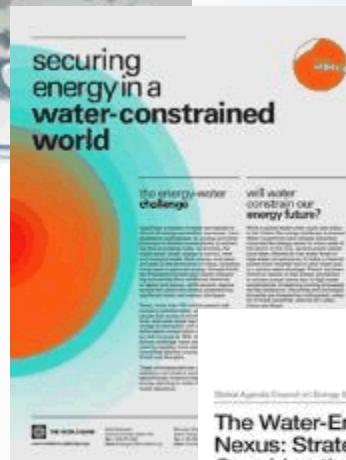
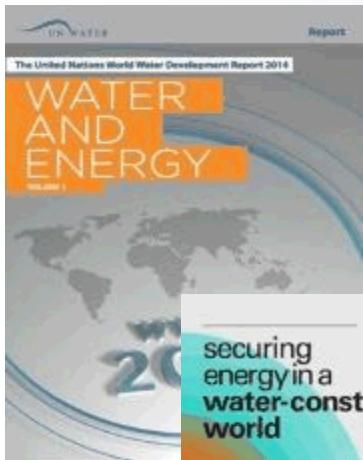
Resilient and Sustainable Coupled Energy-Water Systems

Peter Davies and Stephanie Kuzio



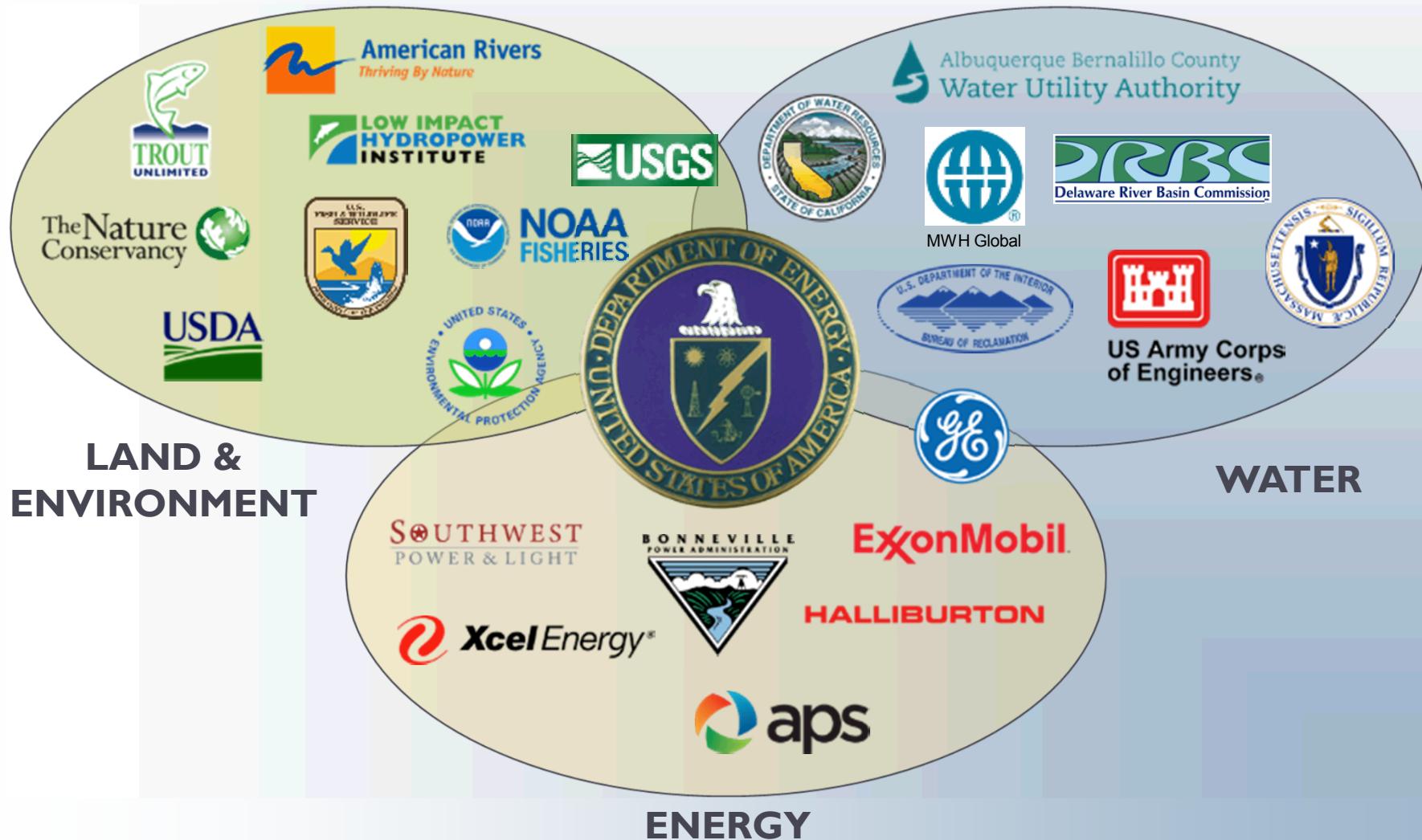
Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

The Problem



The Landscape

DOE brings unique capabilities and is uniquely positioned to coordinate, leverage, and build on existing efforts at the energy-water nexus



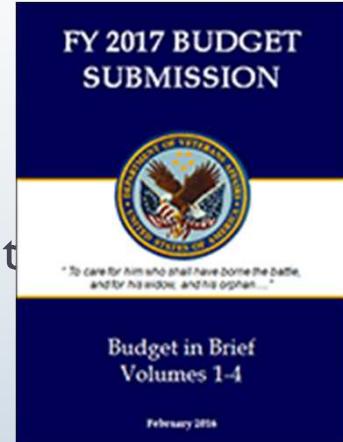
Energy-Water Nexus

Big Idea Summit II



The DOE Energy-Water Nexus (EWN)

- ▶ **GOAL:** “Assist the nation in moving towards resilient and sustainable coupled energy-water systems:”
 - ▶ Optimize the freshwater efficiency of energy production, electricity generation, and end use systems.
 - ▶ Optimize the energy efficiency of water management, treatment distribution, and end use systems.
 - ▶ Enhance the reliability and resilience of energy and water systems.
 - ▶ Increase safe and productive use of nontraditional water sources.
 - ▶ Promote responsible energy operations with respect to water quality, ecosystem, and seismic impacts.
 - ▶ Exploit productive synergies among water and energy systems.



**Presidents
Budget
Request
For E-W:
\$ 96.1M**

DOE Energy Water FY15 Activities

- Big Idea Summit II Energy Water
- Series of six Secretarial roundtables soliciting broad input on different aspects of the energy-water nexus, including fuels, water infrastructure, electricity, and systems integration. These roundtables have informed Departmental prioritization of current and future work.
- China EW Clean Energy Research Center (CERC) awarded to U.C, Berkley
- 2015 DOE Quadrennial Technology Review highlights technology advances could positively impact the challenges faced in the energy-water nexus, including desalination.
- Advances in modeling capability to balance water supplies within the GCAM integrated assessment modeling framework. This capability allows analysis of how constraints on supplies will interact with evolving energy and agricultural demands

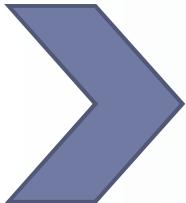


DOE Energy-Water Regional Partnerships Concept

SNL Energy Water Program Goals and the DOE platforms

Vision: SNL leads DOE's engagement with energy water through leading the EWN laboratory team and the Southwest and Southern Rocky Mountain Energy Water partnership

Goals



Develop integrated adaptation and vulnerability assessment models for energy-water systems stressed by climate change, extreme events and data

Develop next generation desalination technologies for brackish and produced waters to extend water use

Develop implementable technologies to dramatically reduce fresh-water resources needed for energy production

Data, Modeling, and Analysis

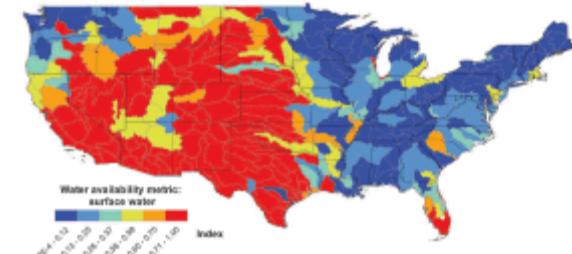
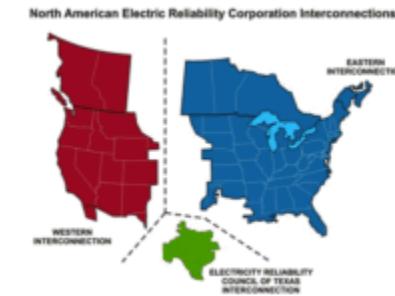
Advanced Technology

Engagement, Policy Analysis, and Decision Support

FY 14-15 SNL Energy Water Projects



- DOE OE- ARRA project integrated transmission planning in collaboration with WECC, ERCOT, WSWC and WGA
- DOE FE/NETL- Water Atlas: water availability in 31 eastern states
- DOE EERE-Hydropower optimize on environmental factors and power production.
- DOE EERE- Geothermal Desal project
- EPRI CRADA- Graphene Oxide membranes
- Bureau of Land Management: Federal water use in energy extraction in the New Mexico Portion of the Permian Basin
- New LDRD investments



Data, Modeling, and Analysis

Advanced Technology

Engagement, Policy Analysis, and Decision Support