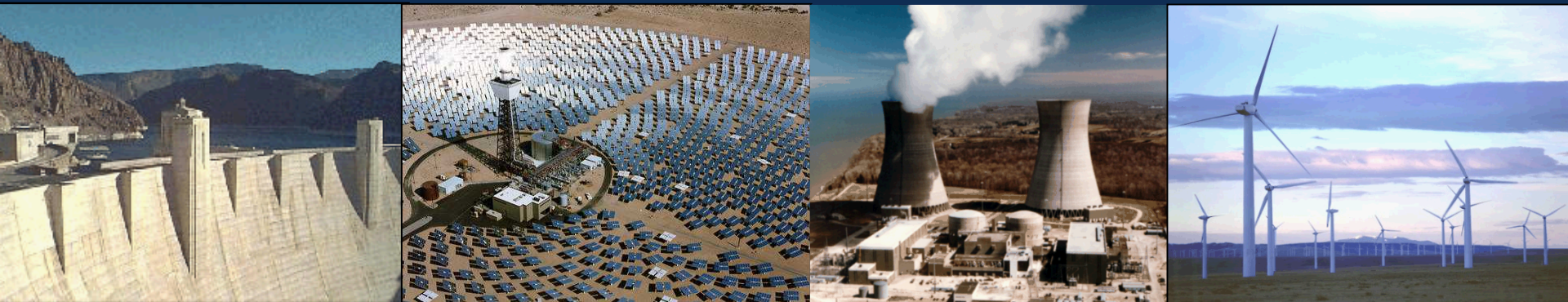


Exceptional service in the national interest



Panel 1: Utility Overview

The Water-Energy Nexus: Capturing the Benefits of Integrated Resource Management for Water and Electricity Utilities and their Partners
University of California and the U.S. Department of Energy
Irvine, CA May 28-29, 2015



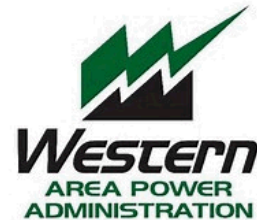
Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Panel Questions

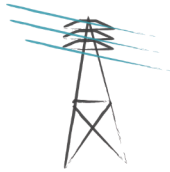
- What interfaces or interactions do you see between your utility and the other (water or energy) domain? How is this changing?
- What are the ideal circumstances—technical, regulatory, economic, organizational, cultural—that facilitate water and energy utilities working together?
- What obstacles or impediments do water and/or energy utilities run up against that make collaboration difficult?
- What are the key policy and legal barriers to developing an integrated approach?
- What types of water sector innovations or arrangements would be most helpful to energy utilities and vice versa?
- What changes do you envision in the next decade in your utility or industry that would impact achieving an integrated approach?

Panelist

- Vince Tidwell; Sandia National Labs
- Eric Schmitt, California ISO
- Ron Nichols, Southern California Edison
- Karen Zelmar; Pacific Gas & Electric Co.
- Warren Teitz, Metropolitan Water District of Southern California
- Mark Gabriel, Western Area Power Administration



Integrated Planning



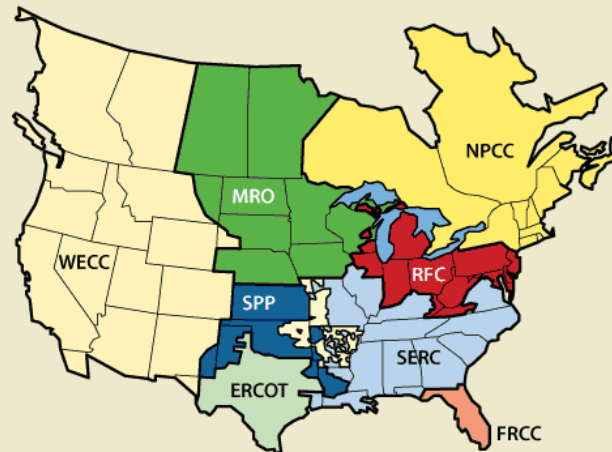
WECC



**WESTERN
GOVERNORS'
ASSOCIATION**

Serving the Governors of 19 States and 3 US-Flag Pacific Islands

The North American Electric Reliability Corporation Regions



Source: North American Energy Reliability Corporation.



WSWC
Western States Water Council

Climate Impacts on New Development

Characterizing Limitations on Available Water for New Development

○ Potable Water

- Unappropriated surface water
- Unappropriated groundwater
- Appropriated water (rights transfers)

○ Non-Potable Water

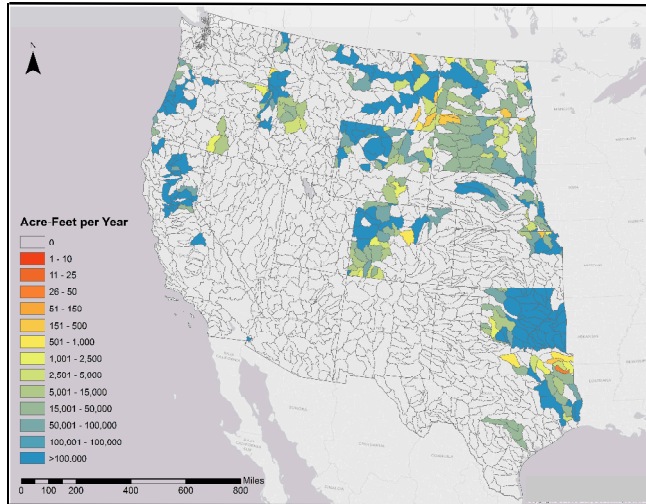
- Municipal/Industrial wastewater
- Shallow brackish water



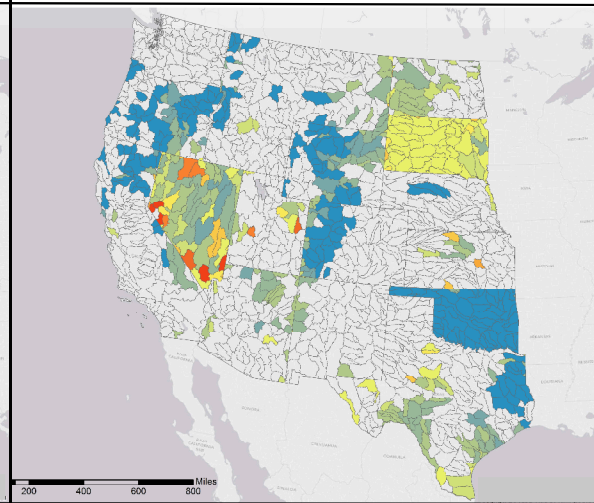
Relative
Availability
and Cost

Water Availability

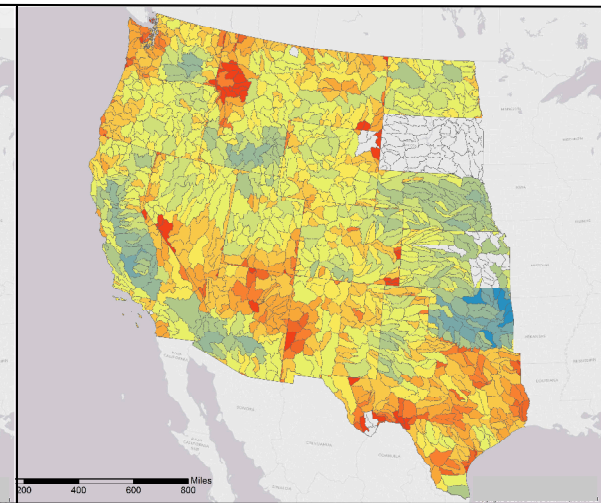
Unappropriated Surface Water



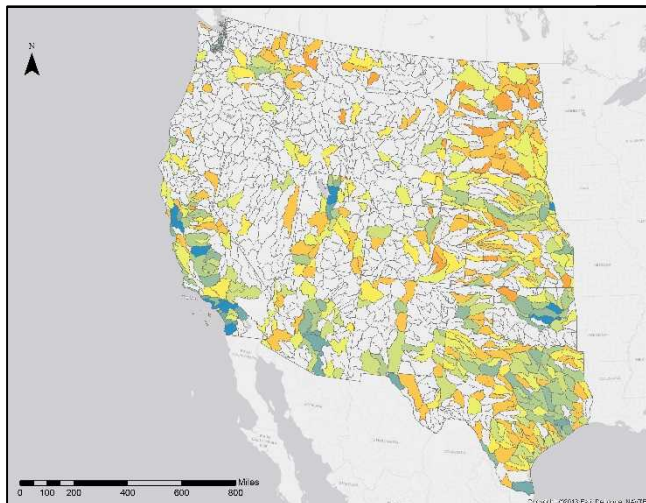
Unappropriated Groundwater



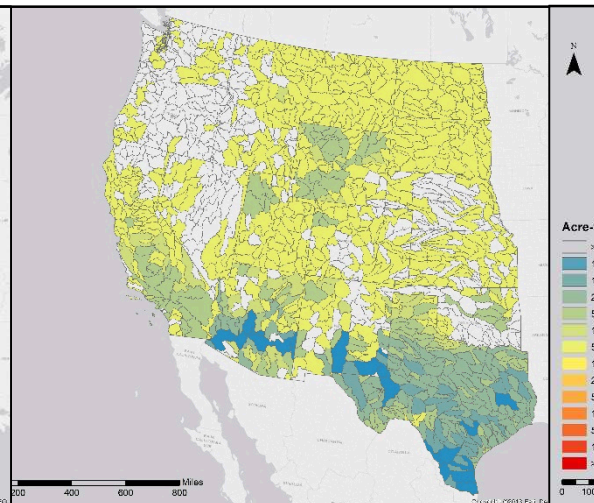
Appropriated Water



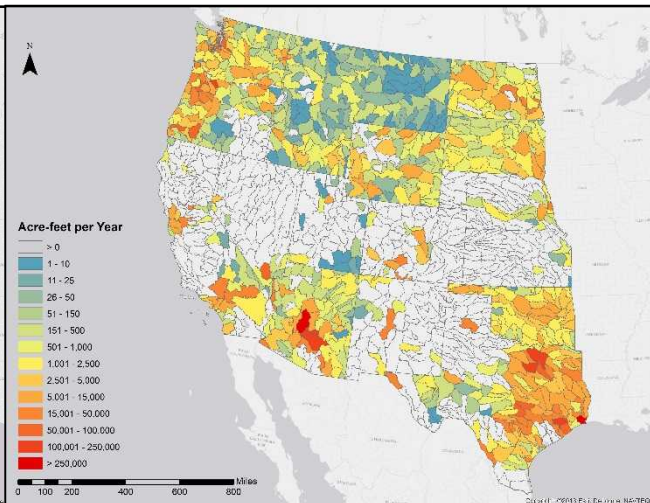
Municipal Wastewater



Brackish Groundwater

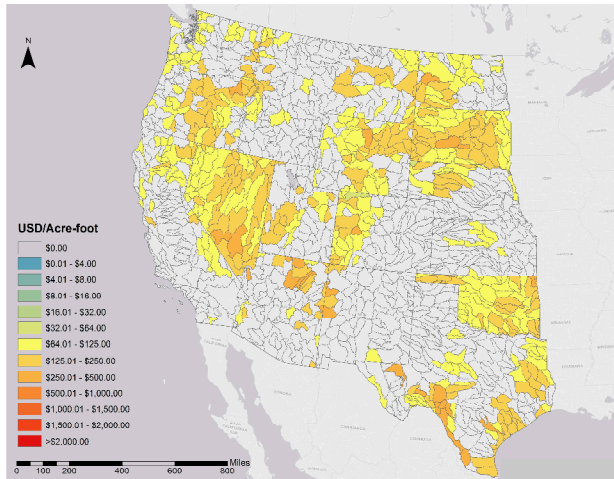


Consumptive Demand 2010-2030

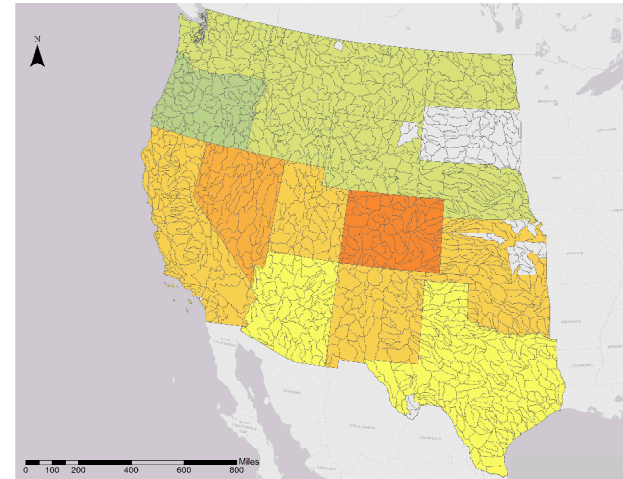


Relative Cost of Water

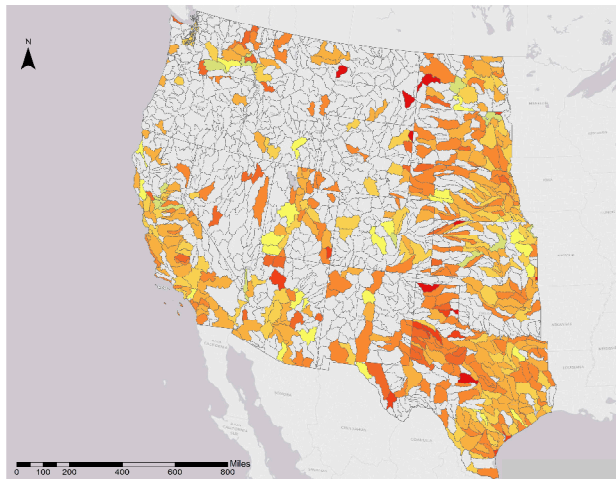
Unappropriated Groundwater



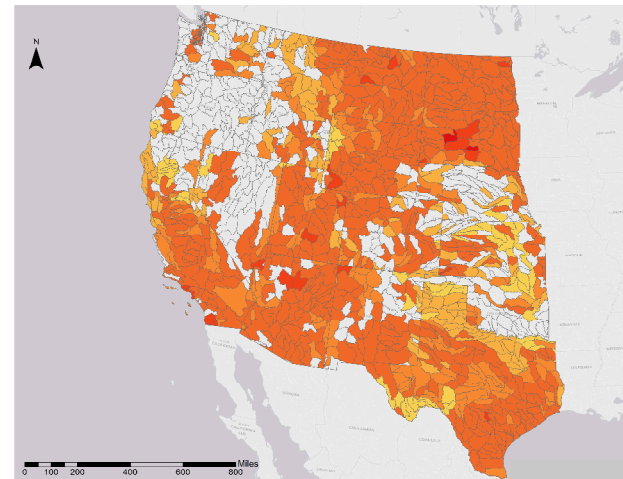
Appropriated Water



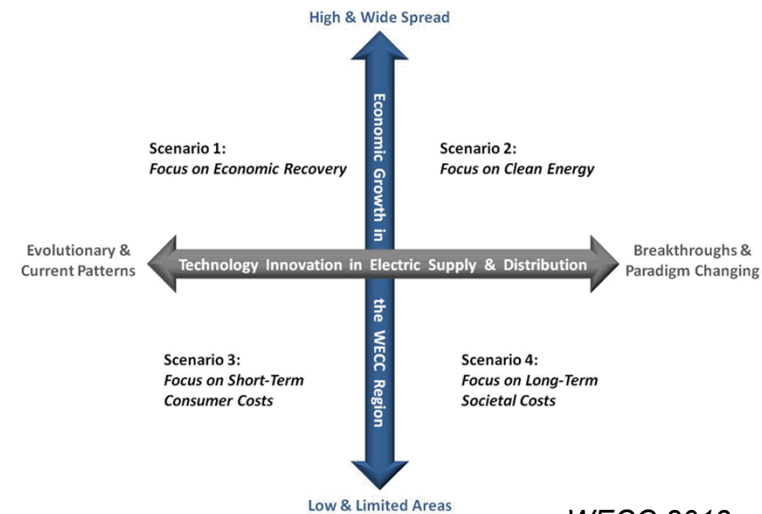
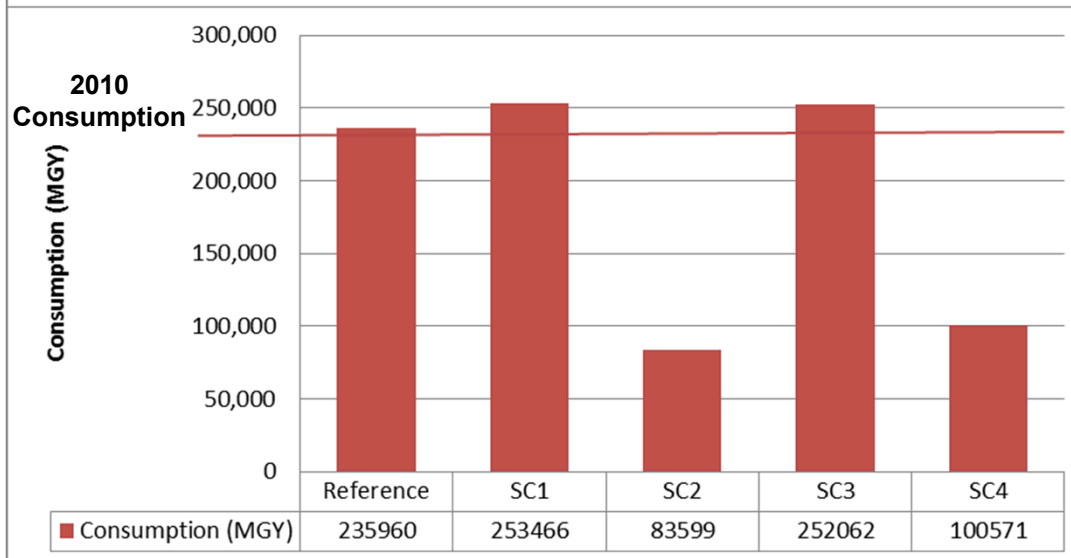
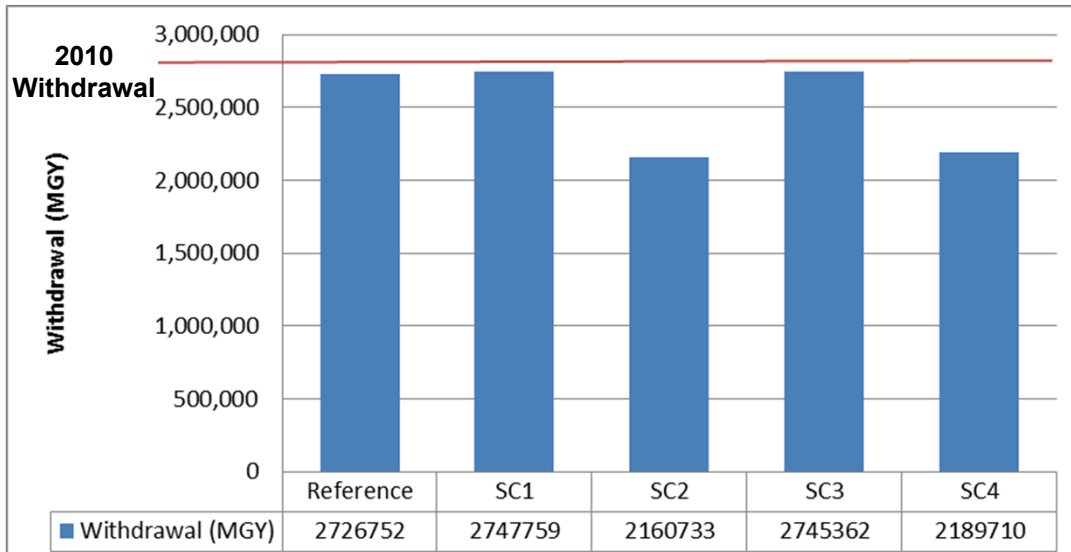
Municipal Wastewater



Brackish Groundwater



2013 Interconnection-Wide Transmission Planning



2013 Interconnection-Wide Transmission Planning

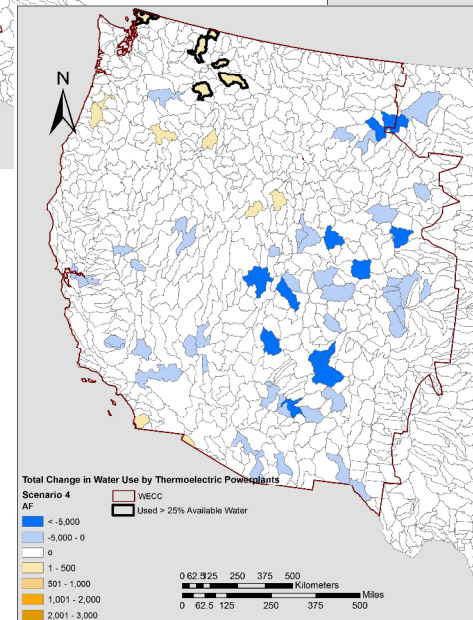
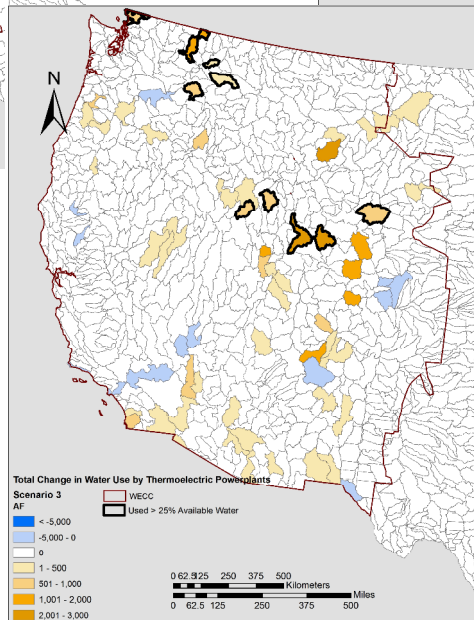
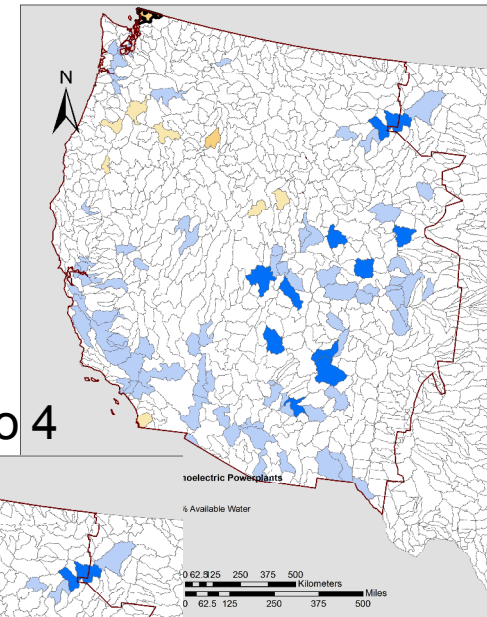
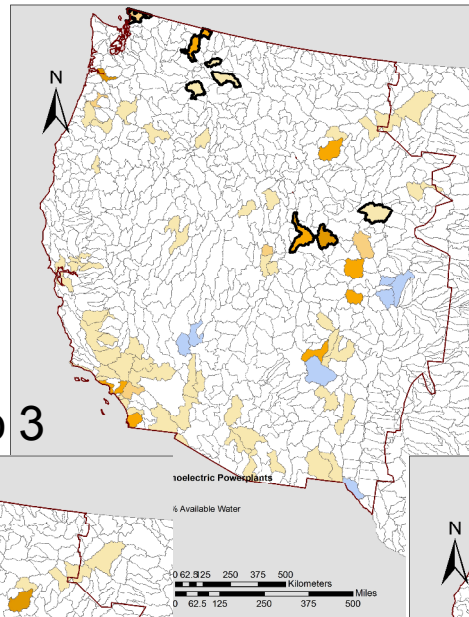
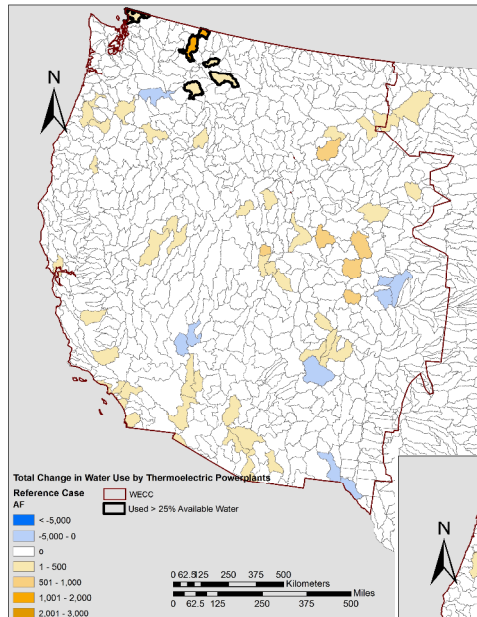
Reference Case

Scenario 1

Scenario 2

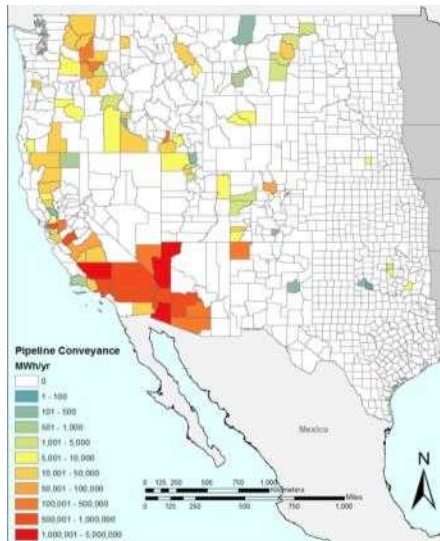
Scenario 3

Scenario 4

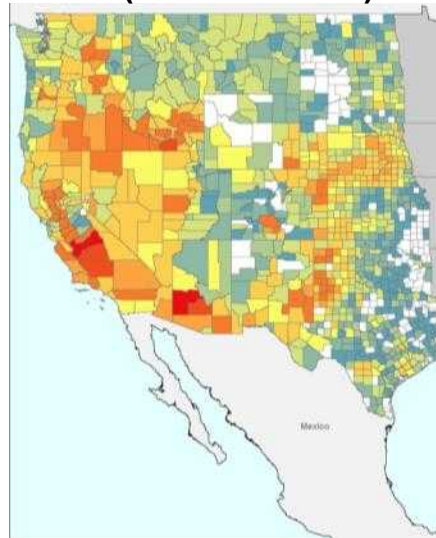


Energy for Water

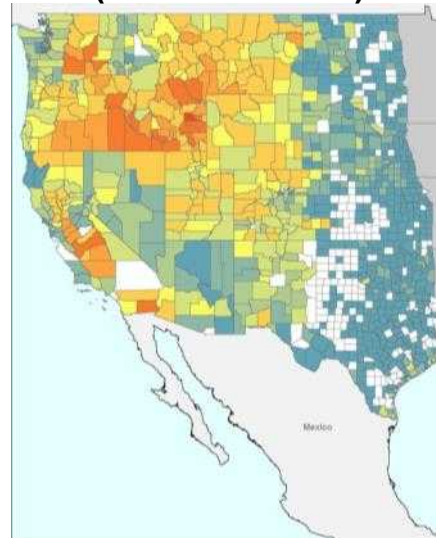
Large-Scale Conveyance



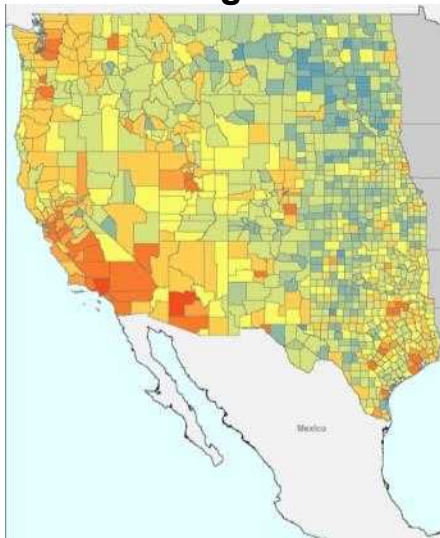
**Agricultural Pumping
(Groundwater)**



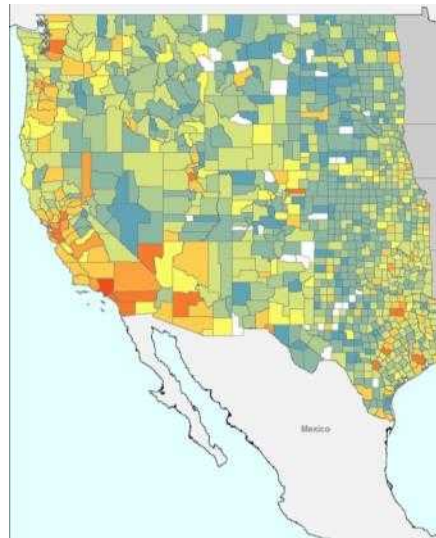
**Agricultural Pumping
(Surface Water)**



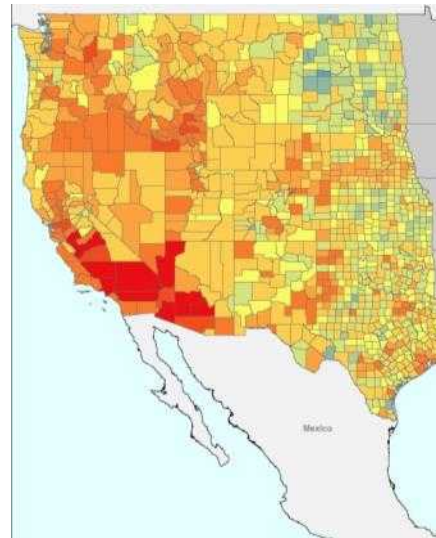
Drinking Water



Municipal Wastewater

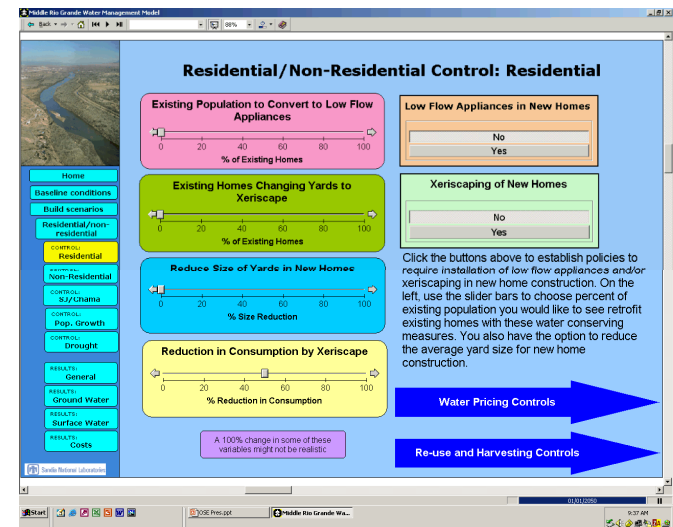
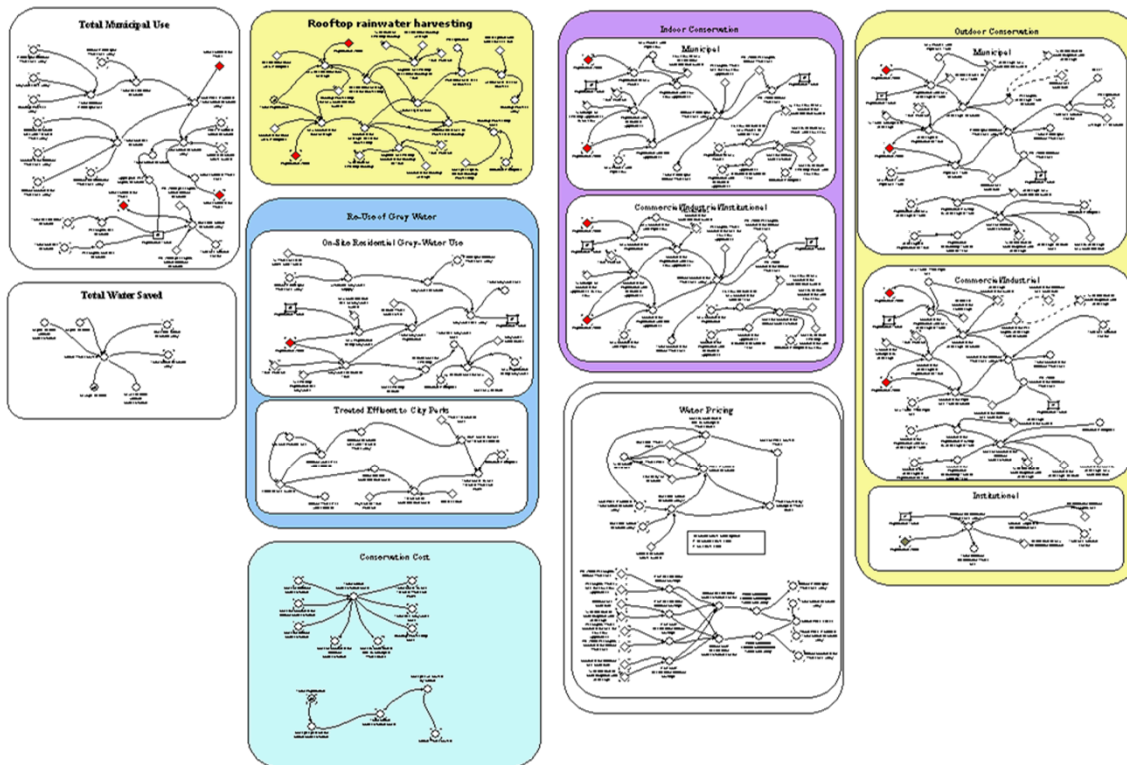


All Water Services



~6% of
electricity use
goes to
providing
water services.

Source: Tidwell et al. 2014



Vincent Tidwell

vctidwe@sandia.gov

(505)844-6025

http://energy.sandia.gov/?page_id=1741