



ELECTRIC POWER
RESEARCH INSTITUTE

Electric Power/Water Sustainability

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Energy-Water Nexus, Western
Regional Workshop

Salt Lake City, Utah

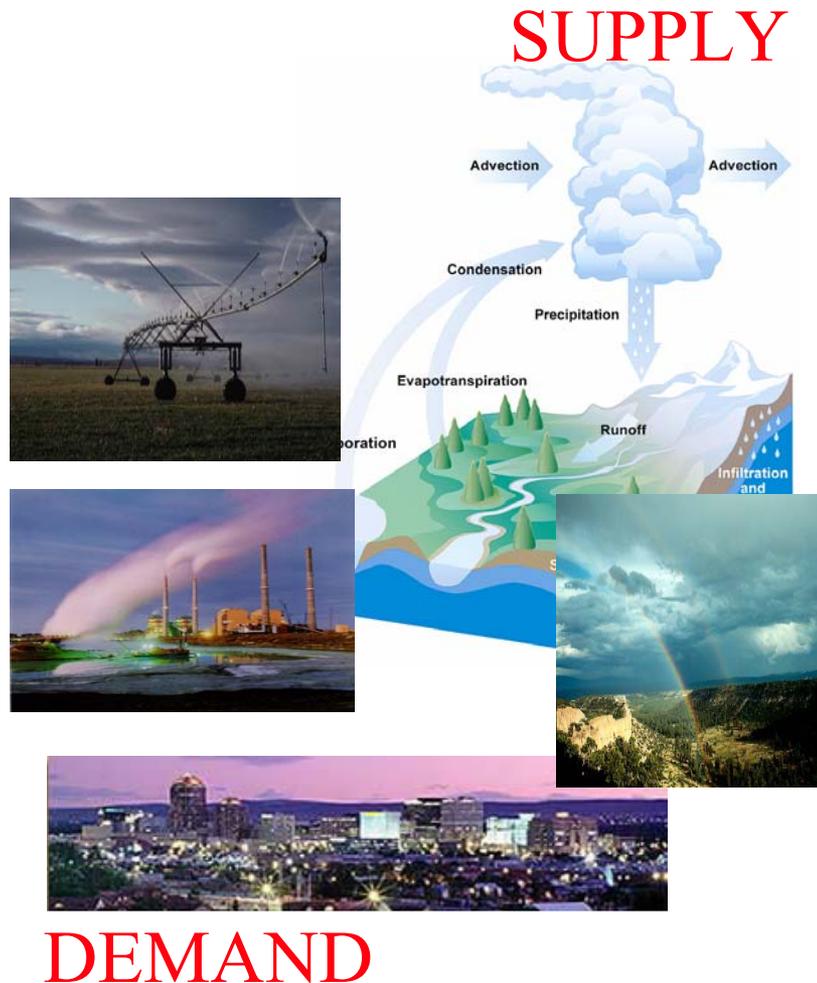
January 10, 2006

Water Is a Critical Resource

- Fast growing demand for clean, fresh water
- Increased demand for environmental protection and enhancement
- All regions of US especially vulnerable to water shortages
- Water availability impacts
 - Electricity supply and demand
 - Electricity grid topology
 - Societal and economic infrastructure sustainability

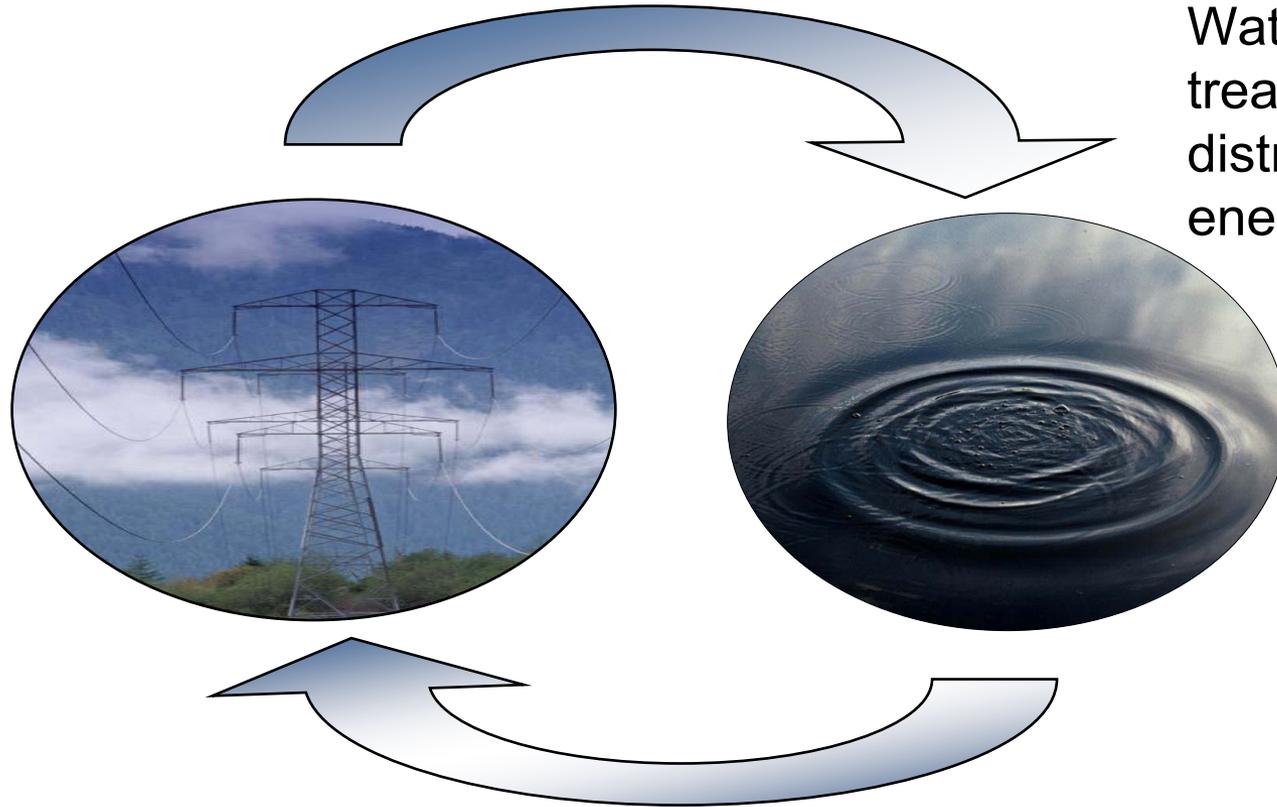


Consequences of Growing Electric Power and Water Demands



- More intensive management of water resources
- Greater integration between water and energy planning
- More watershed/regional planning
- New science and technology to support planning and management needs

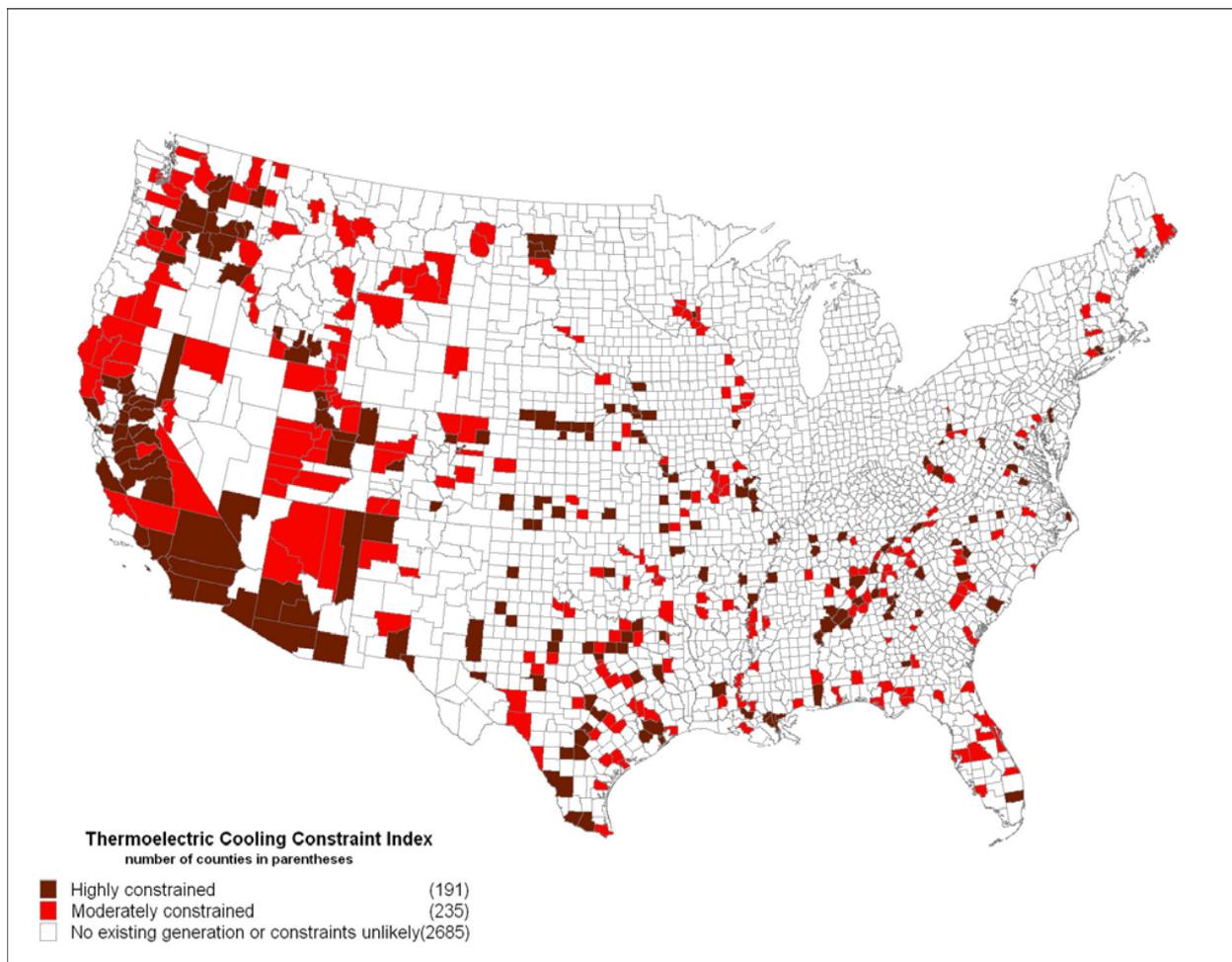
Energy and Water are Inextricably Linked



Water pumping, treatment, and distribution require energy

Energy production and generation require water

Thermoelectric Cooling Constraint Index (2025)



EPRI Energy/Water Sustainability Research Program



**Pilot Spray Enhancement Testing
Crockett Cogeneration Station**

- Objective – Enable power companies to operate in an environment where there will be increasing limitations on water resource utilization and increasing demand for electric power
- Strategic elements
 - Regional public-private research partnerships
 - Power companies
 - Government and public agencies
 - National energy laboratories
 - Universities
 - Stakeholder groups
 - Integration of micro and macro approaches
 - Annual energy/water sustainability forum

Program Research Topics

- Watershed management decision support models
- Advanced cooling technologies
- Use of degraded water
- Watershed hydrology and biogeochemical cycling science
- Market-based environmental management approaches
- Local and regional infrastructure design and integration



**Wet Surface Air Cooler
Test Unit for San Juan Plant**

Ecological Assets in Business 2006: A Multi-Industry Workshop

- March 13–14, 2006
- Palo Alto, California
- Topical Presentations on Key Issues
 - Water Users Investing in Ecosystem Services
 - Water Quality Trading: Strategies and Opportunities from U.S. EPA
 - Natural Land Management Strategies for Value Generation
 - Setting Up a Wetland Bank in the U.S.: Strategies for Coordinating with EPA
 - The International Picture of Eco-Assets
 - Status Report: Carbon Credit Trading in the U.S. and Abroad



EPRI Research Reports

1. Water & Sustainability (Volume 1): Research Plan (EPRI 1006784, 2002)
2. Water & Sustainability (Volume 2): An Assessment of Water Demand, Supply and Quality in the U.S. – The Next Half Century (EPRI 1006785, 2002)
3. Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production – The Next Half Century (EPRI 1006786, 2002)
4. Water & Sustainability (Volume 4): U.S. Electricity Consumption for Water Supply and Treatment (EPRI 1006787, 2002)
5. Use of Degraded Water Sources as Cooling Water in Power Plants (EPRI 1005359, 2003) – Cosponsor CEC PIER Program
6. Spray-Cooling Enhancement of Air-Cooled Condensers (EPRI 1005360, 2003) – Cosponsor CEC PIER Program
7. A Survey of Water Use and Sustainability in the U.S. with a Focus on Power Generation (EPRI 1005474, 2003)
8. Comparison of Alternate Cooling Technologies for U.S. Power Plants: Economic, Environmental and other Tradeoffs (EPRI 1005358, 2004)
9. The Formation and Fate of Trihalomethanes in Power Plant Cooling Water Systems (EPRI 1009486, 2004) - Cosponsor CEC PIER Program
10. Framework to Evaluate Water Demands and Availability for Electric Power Production Within Watersheds Across the US : Development and Applications (EPRI 1010116, 2005)
11. Air-Cooled Condenser Design, Specification, and Operation Guidelines (EPRI 1007668, 2005)

Partnering with Government Agencies

- CEC Public Interest Energy Research (PIER) Program
- NETL Fossil Energy/Water Research Program
- ZeroNet Research Project
- Federal Advisory Committee on Water Information (ACWI)
- Sustainable Water Resource Roundtable
- National Laboratory Energy/Water Nexus
- Energy/Water Sustainability Report to Congress
- Federal Water Sustainability Roadmap
- California/Western Energy/Water Center



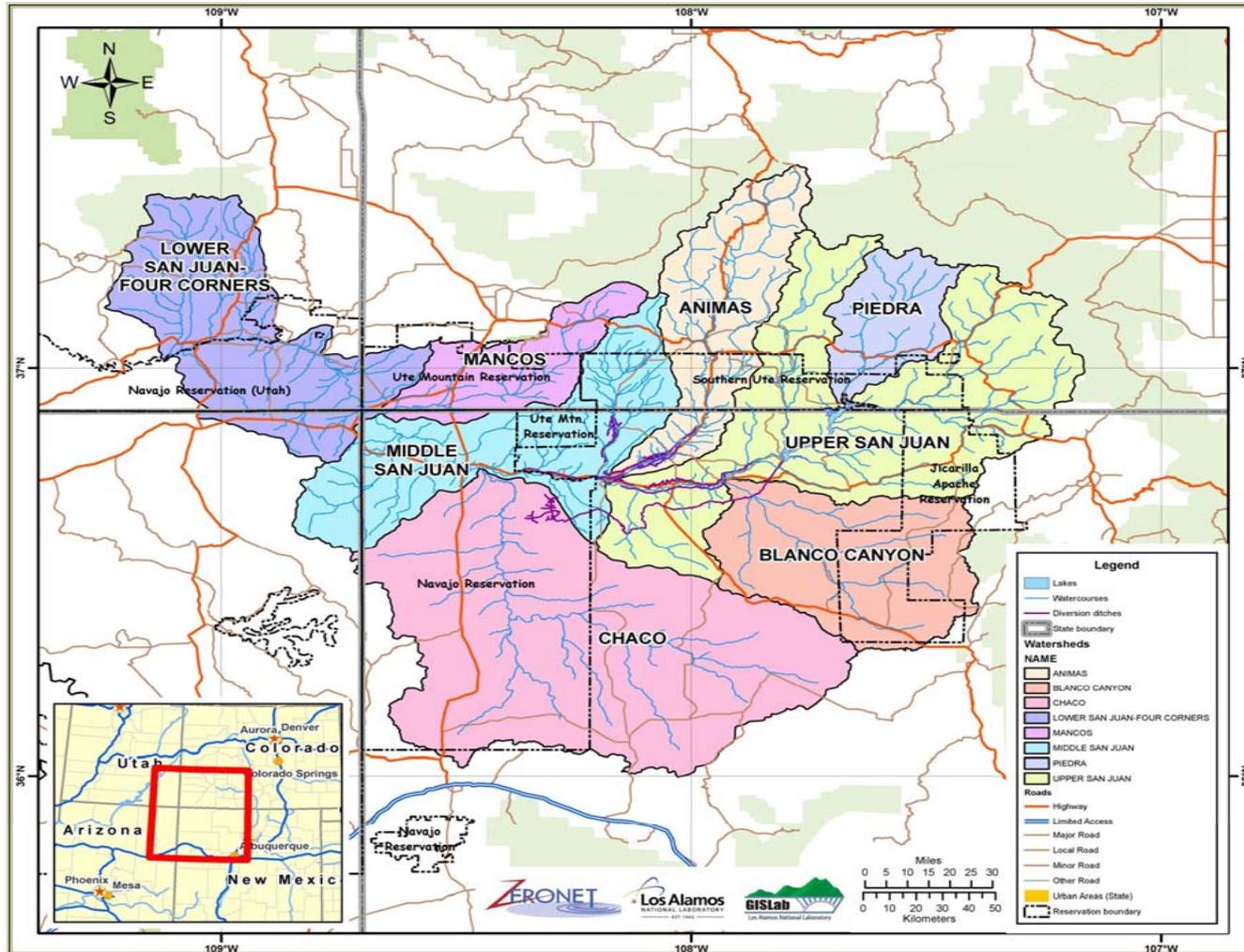
ZeroNet Water-Energy Initiative



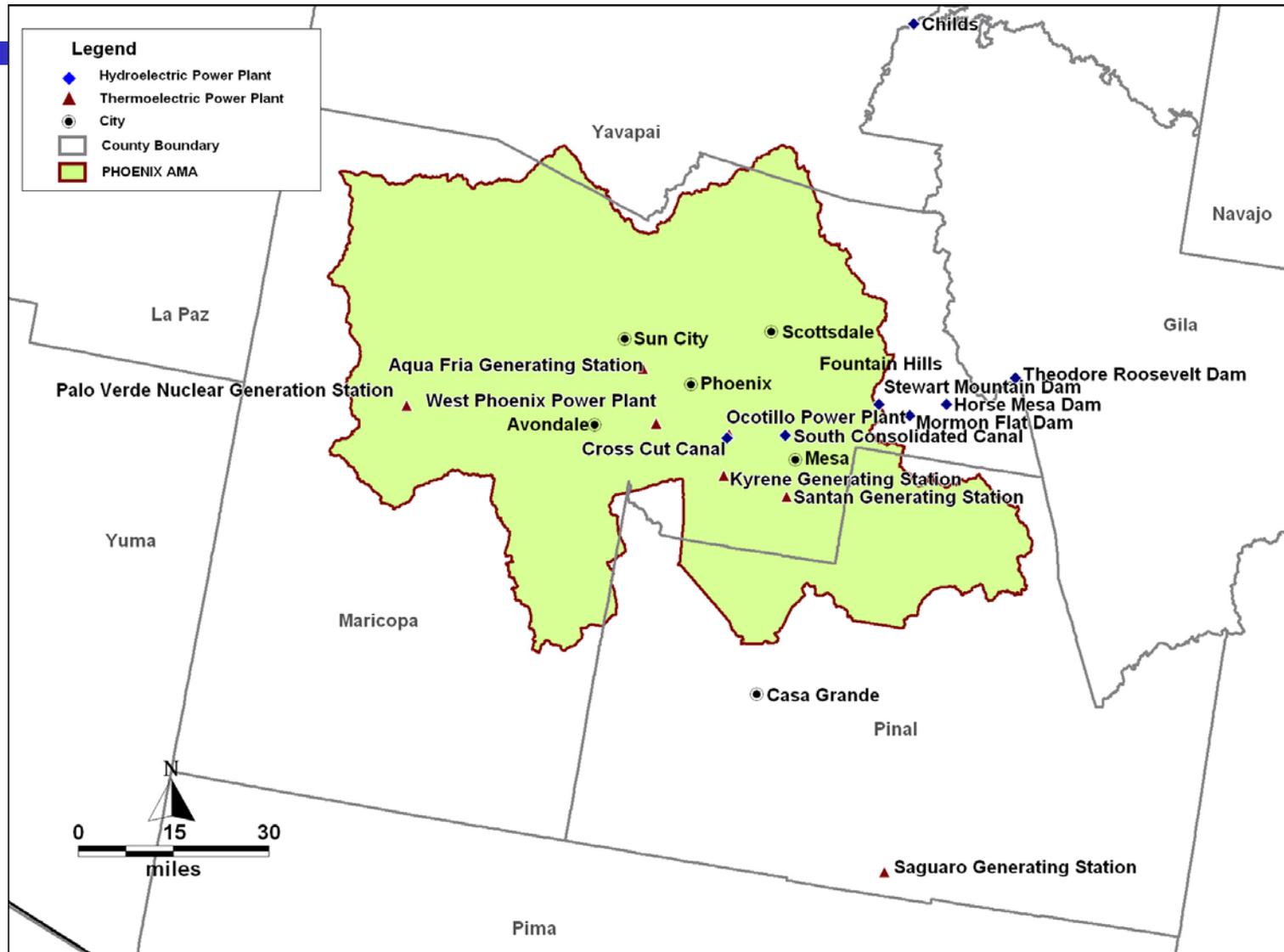
ZERONET



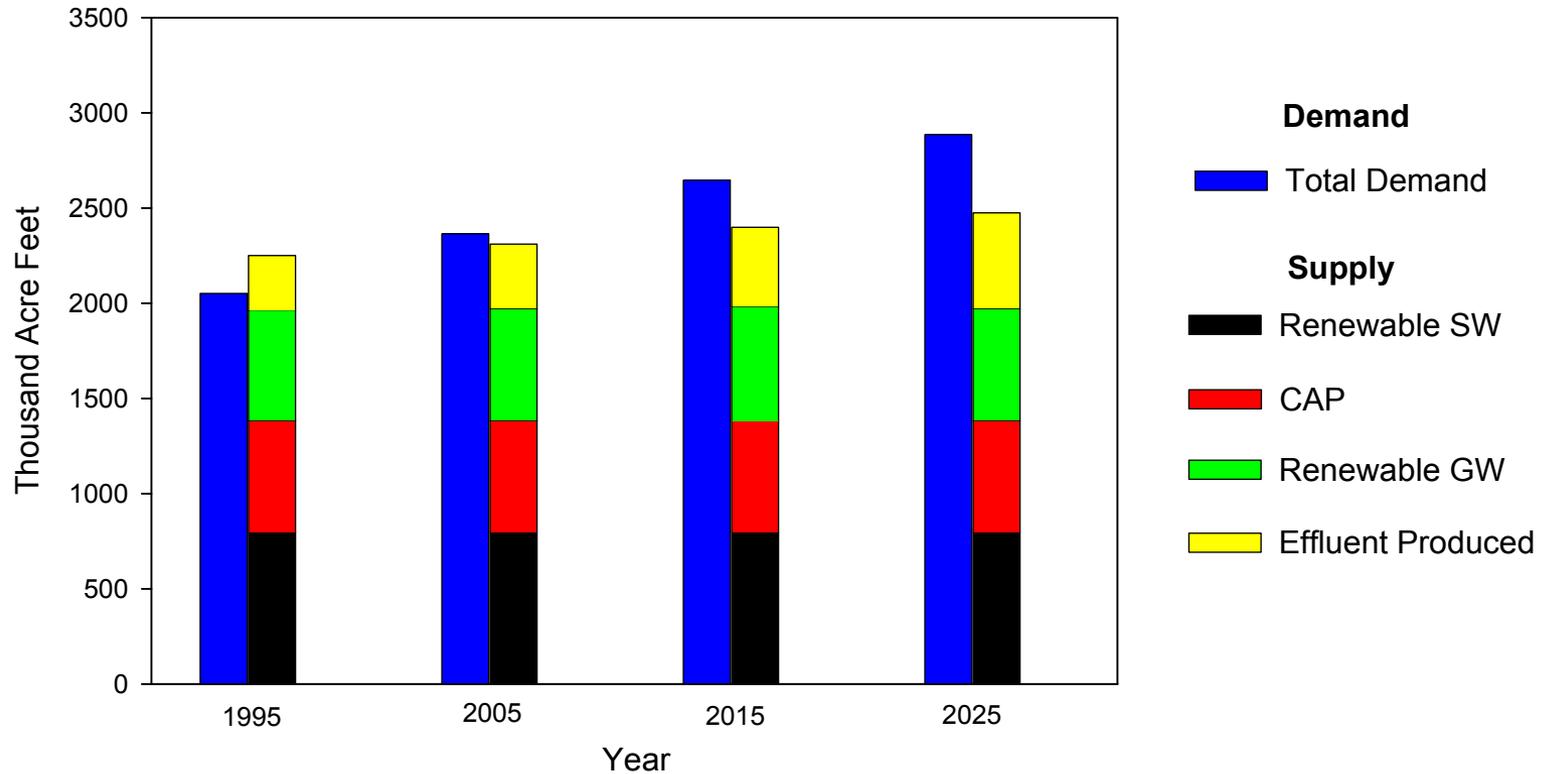
San Juan Basin



Phoenix Active Management Area

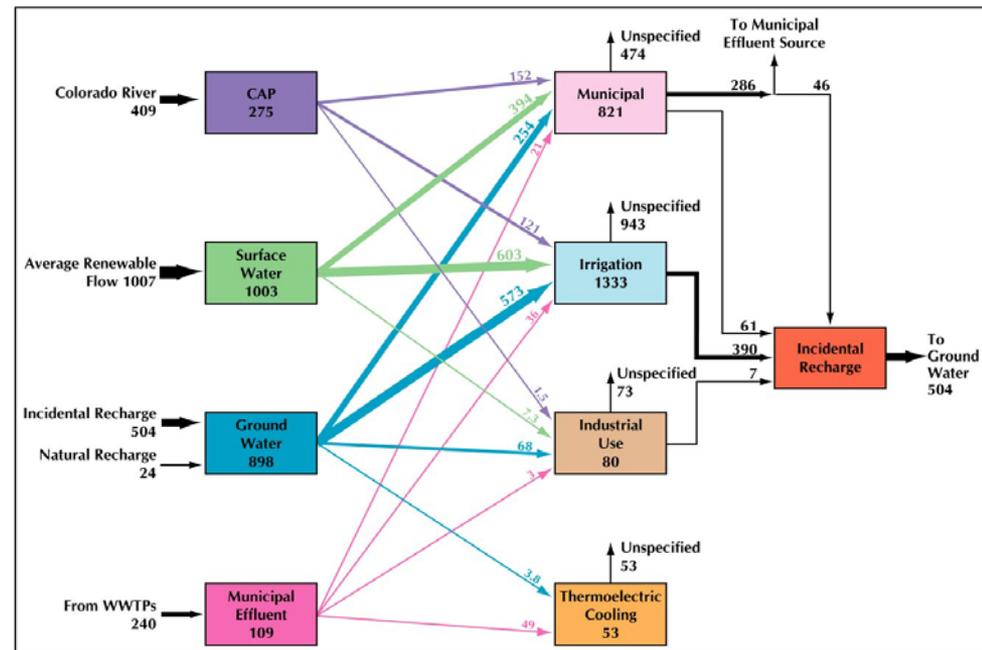


Phoenix AMA Demand and Supply



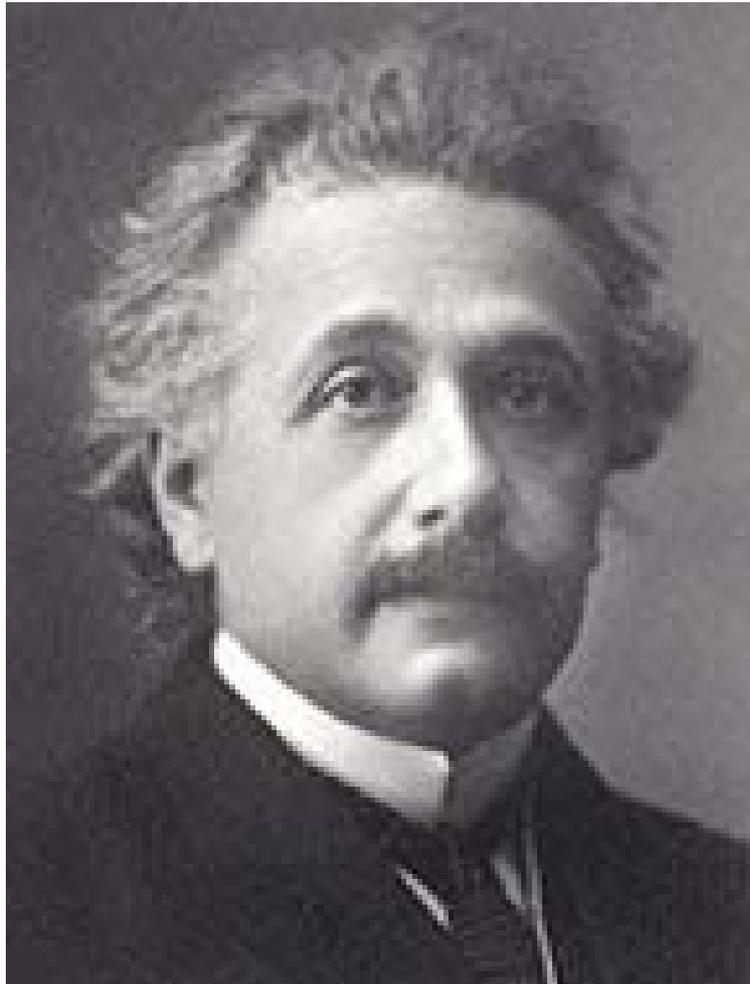
General Conclusions on Water in the Phoenix Area

- Phoenix AMA expected to have one of the greatest increases in generating capacity anywhere in the US
- Rapid increase in population and municipal demand is also expected with minimal improvements in per capita water use
- Municipal effluent likely to be an important source of water
- Groundwater overdrafts continue into the foreseeable future (inferential based on water budget calculations)

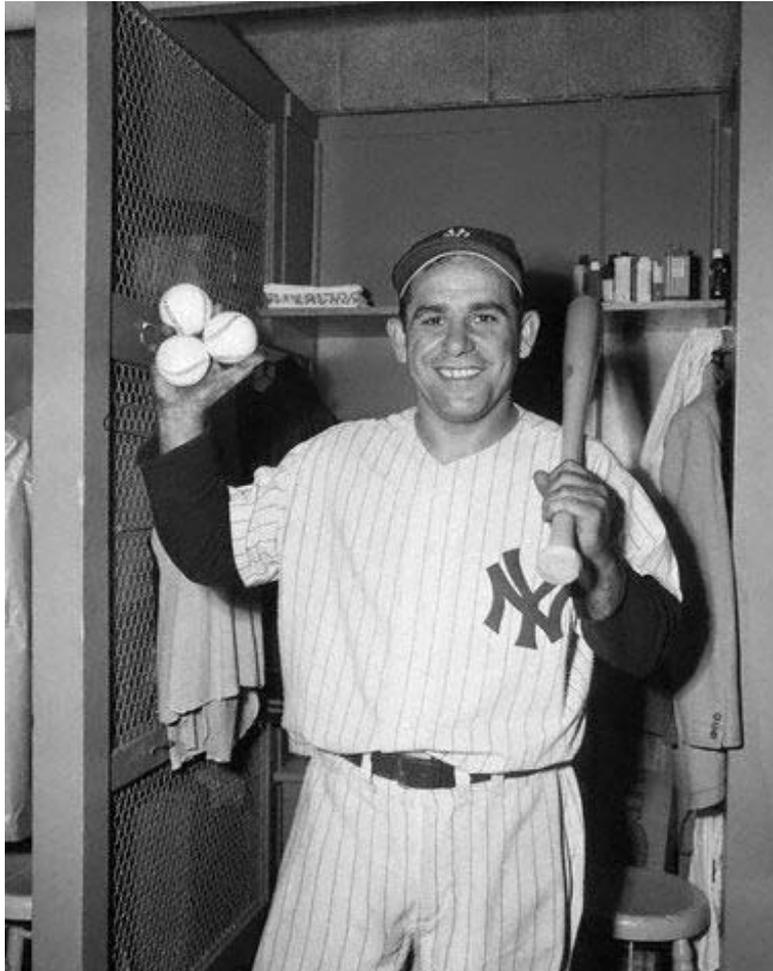


Water Sources and Uses in 1995
(thousand acre-feet)

Expert Roadmap Panel – Einstein & Berra

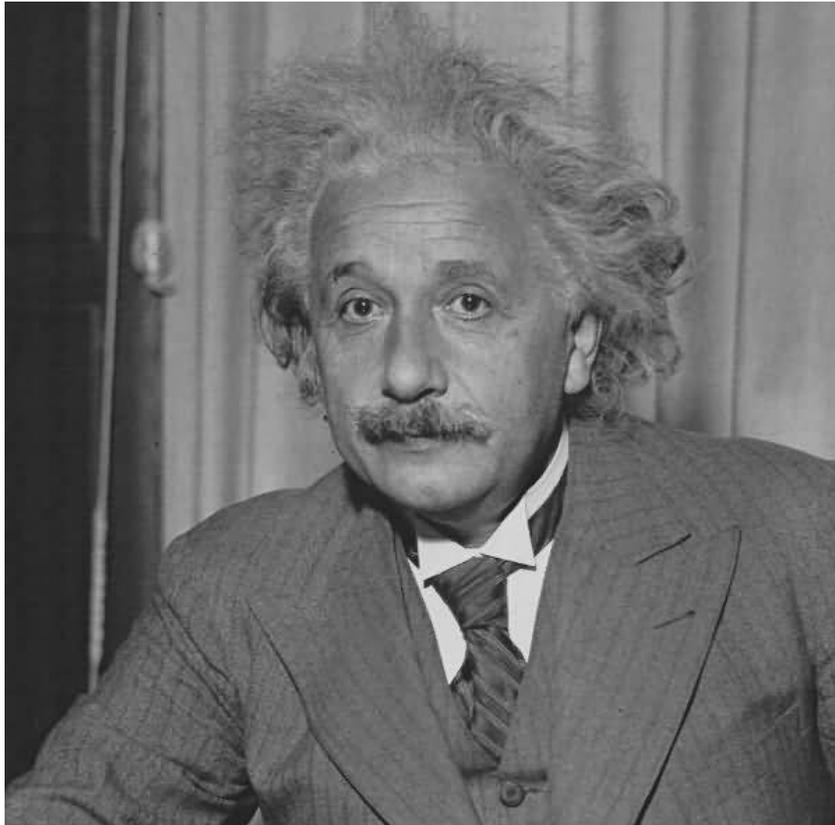


Why Do We Need a Roadmap?



- You got to be careful if you don't know where you're going, because you might not get there.
- The future ain't what it used to be.

What are your thoughts on a Roadmap?



- If we knew what it was we were doing, it would not be called research, would it?
- I never think of the future. It comes soon enough.