



Crosscutting Technology Research Program Water Management R&D Summary

Water Management R&D encompasses the need to reduce the amount of freshwater used by power plants and to minimize any potential impacts of plant operations on water quality. Water is a vital resource that is inextricably linked to the quality of our lives and the increasing demand for water by all sectors of our economy continues to stress the availability of water for power generation. The largest withdrawals of water from the United States are for cooling water for thermo-electric power generation and national efforts are underway to develop technologies to reduce the need for water for power generation. Research conducted under this program area will develop technologies to achieve the flexibility, efficiency, reliability, and environmental quality essential for

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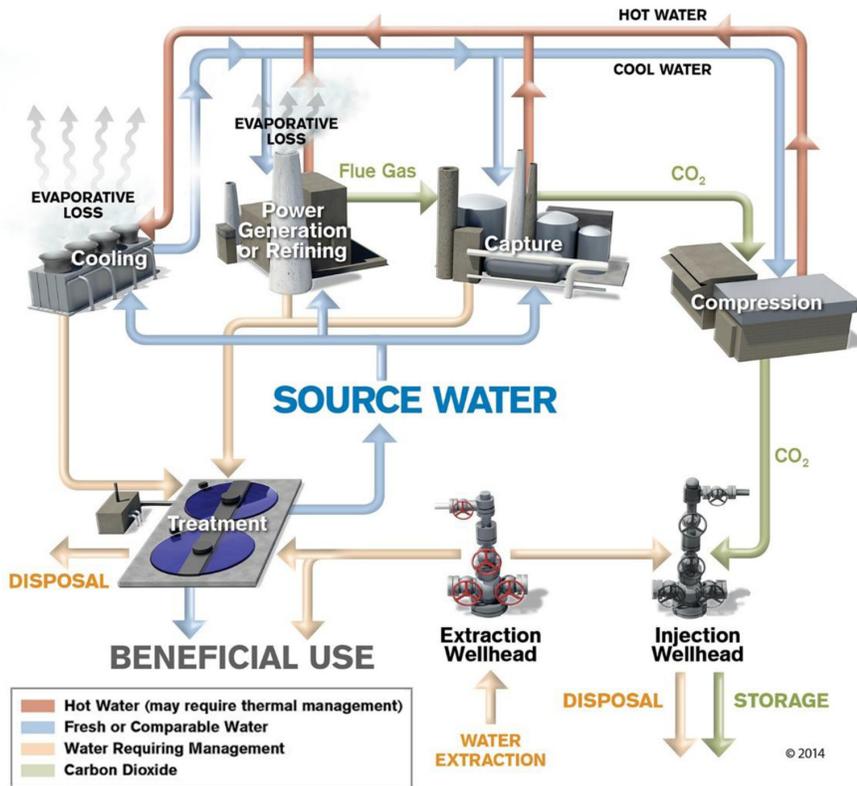
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The Nexus of Carbon Capture and Storage and Water Usage



This figure was developed by the U.S. Department of Energy's Regional Carbon Sequestration Partnership's Water Working Group. It depicts the various relationships between water and the dominant processes generally necessary to carry out carbon capture and storage. More information can be found <http://www.netl.doe.gov/research/coal/carbon-storage/wwg>.

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continued operation of fossil energy power systems. NETL is working with stakeholders to focus on these research tasks:

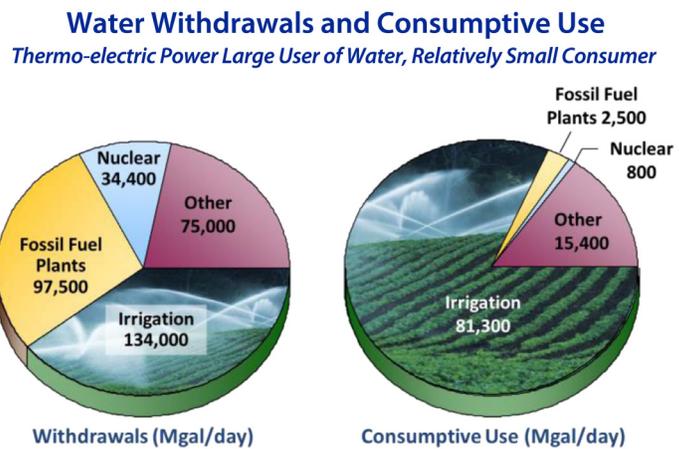
- **Process Efficiency** improvements focus on reducing water consumption. These efforts include improving heat transfer technology and better thermal integration of power plant systems—particularly new plants with carbon capture technologies, which will need greater efficiency to reduce their water needs. Research is being conducted on projects featuring waste heat utilization, advanced cooling, and improved process integration with lower or no water footprint.
- Conduct **Water Treatment** research to develop advanced technologies for greater reuse of power plant cooling water. This includes research to investigate methods of recovering water from power plant flue gas to reduce the plant's water requirements, and research on recovering clean water from high-dissolved-solids waste streams to allow higher cooling-water-recirculation rates.
- **Data Collection, Modeling, and Analysis** to improve the availability, quality, and amount of data collected for pertinent water resources. Develop models of complex systems that yield insight for water-energy analyses to help inform decision makers and support policy development.

Impacts and Benefits

The following impacts are possible through this proposed research:

- Develop a range of technologies to optimize and/or reduce freshwater use for energy processes through improved waste heat recovery, alternate heat transfer fluids, and new sources of water (i.e., utilizing treated wastewater).

- Enable cost-effective implementation of water management technologies throughout the power generation sector.
- Support the national effort directed at removing barriers to sustainable, efficient water and energy use, by developing technology solutions, and enhancing understanding of the intimate relationship between energy and water resources.
- Develop tools to support stakeholder assessments based on qualitative and quantitative scenarios, probabilistic approaches, insights into system (weather) shocks and extremes, and improved characterization of uncertainties (e.g., coping with drought).



Source: "Estimated Use of Water in the United States in 1995," USGS Circular 1200, 1998

Typical Fossil Plant Steam Cycle/Water Balance Research Opportunities

