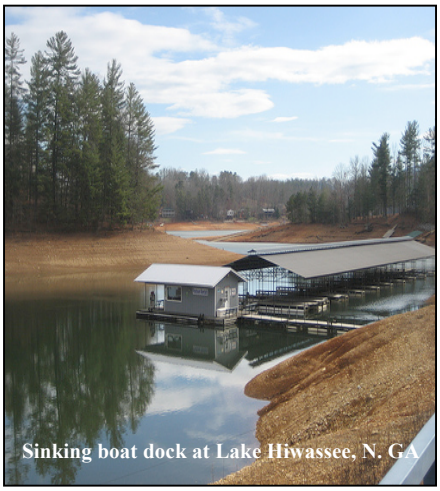
The Water – Energy Connection: Georgia Facts & Figures


Sinking boat dock at Lake Hiwassee, N. GA

During the 2007 summer, Georgia and the Southeast experienced one of its worst droughts in over a century, aggravating both inter- and intra-state water wars along with implementation of crisis measures to conserve limited supplies. The drought continues today. A vulnerable electricity system was also revealed. Existing power plants in the region, such as TVA's Browns Ferry reactor in Alabama along the Tennessee River, reduced production due to high water temperatures and reduced river flows. Scientists predict that unless remedies are pursued, global warming can lead to more severe and long-lasting drought conditions. Poor energy choices made today can affect Georgia's ability to cope in the future.

Saving Water by Saving Energy

In December 2007, Georgia's Drought Response Unified Command (DRUC) highlighted the water-energy connection, issuing a statewide press release that stated:

> *DRUC encourages Georgians to help save water by conserving electricity. Large amounts of water are required to generate electricity. In Georgia, each kilowatt hour (kWh) of electricity production consumes 1.65 gallons of water according to the National Renewable Energy Laboratory.[1] To put it in context, the average Georgia household's electricity use is 1,148 kilowatt hours per month, requiring 1,894 gallons of water to generate.[2]*

For many, this was the first time they heard that turning on the lights or watching TV had anything to do with a power plant using water to generate electricity.

Water Use & Consumption by Power Plants

Georgia's power sector is the largest water user in the state, followed closely by agriculture.[3] Georgia's power plants already degrade water quality (e.g. increasing thermal pollution, emitting chemicals and heavy metals) and reduce water availability. Power plants compete for water with other important uses vital to our state's economy and quality of life: drinking water supply, agriculture, industry, fishing, and recreational opportunities. Less water used for power generation translates into more water for other life-dependent or life-enhancing uses.

Thermal power plants must have significant water resources continuously and readily available to create and condense steam to power their turbines. ***Water use*** refers to the amount of water that is withdrawn from the water body by the power plant. ***Water consumption*** refers to the amount of water that the power plant withdraws that is not returned to the water supply source, water that is "lost" or "consumed," primarily due to evaporation.

Water withdrawals and consumption figures depend heavily on what types of cooling technologies are used. Power plants that use once-through systems (i.e., do not have cooling towers), withdraw and heat very large volumes of water but little is consumed because direct evaporation is low. In contrast, "closed cycle system" power plants that use cooling towers do

not need to withdraw nearly as much water, but their cooling tower evaporation means a much higher rate of water consumption. Cooling towers offer environmental and engineering advantages over once-through systems, but they consume a lot of water. In Georgia, some power plants use cooling towers some or all of the time, while others do not.

Cooling towers at Plant Vogtle along Savannah River

For instance, coal-fired Plant Branch withdraws over a billion gallons of water per day from Lake Sinclair, but consumes a few million gallons of water because of its primary reliance on once-through condenser cooling water and only seasonal use of its cooling tower. Georgia's nuclear plants Hatch and Vogtle use cooling towers for condensing steam, resulting in less water withdrawn (around 60 million gallons per day) but with a much greater volume of water consumed or lost (between 34 and 43 million gallons per day). This ultimately results in these plants returning less than half of the water withdrawn to the Altamaha and Savannah rivers respectively. With the proposed expansion of Plant Vogtle, more water will be lost as steam from the two existing and two proposed reactors than is currently used by all residents of Atlanta, Augusta, and Savannah *combined*.[4]

Less Water-Intensive Energy Solutions Exist

When comparing types of energy generation, regardless of whether cooling towers are used, nuclear power has higher rates of both water withdrawal and consumption than coal and natural gas and far more than renewables such as wind, solar, and biomass.[5] For example, good wind resources exist in Georgia on land and particularly offshore along the coast. According to the Department of Energy's National Renewable Energy Laboratory, developing 1000 MW of wind in Georgia would save 1628 million gallons of water per year.[6] Less water-intensive cooling (but more costly) technologies, such as dry cooling, are available but no existing or proposed power plants in Georgia are pursuing them. According to a study by the State of Georgia, reducing electricity use through energy efficiency measures has the immediate impact of reducing water required by power plants.[7] Individual actions can also achieve water savings. EnergyStar appliances use less energy and water. Energy Star washing machines, for example, require approximately 50% less energy per load and use 30-50% less water than a typical model. This saves water two ways and saves consumers money on both their water and energy bills.

What Can Be Done

Legislators can require implementation of water-saving energy measures such as energy efficiency and conservation and advance less water-intensive electricity supplies, such as biomass, wind and solar. Legislators can also put the brakes on proposed utility plans to build more coal and nuclear plants that would commit even more of Georgia's scarce water supplies, to say nothing of the huge sums of investment capital.

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[1] National Renewable Energy Laboratory, *Consumptive Water Use for U.S. Power Production*, Paul A. Torcellini, Nicholas Long, & Ronald D. Judkoff, Dec. 2003.
[2] DRUC Press Release, 12/11/07, at https://www.piersystem.com/go/doc/1619/185714/.
[3] Fanning, J.L. 2003. *Water Use in Georgia by county for 2000 and water-use trends for 1980-2000*. Georgia Geologic Survey Information Circular 106, 176.
[4] Using 2005 Census figures and with the average per capita daily water use in GA at 75 gallons from surface and ground water sources, http://water.usgs.gov/watuse/tables/dotab.st.html. Water use figures for new reactors from Southern Nuclear Operating Company, Vogtle Early Site Permit Application, Environmental Report, August 2006.
[5] Hoffmann, J., S. Forbes, T. Feeley. U.S. DOE, *Estimating Freshwater Needs to Meet 2025 Electrical Generating Capacity Forecasts*, June 2004 and DOE, *Energy Demands on Water Resources, Report to Congress on the Interdependency on Energy and Water*, December 2006.
[6] National Renewable Energy Lab, *Economic Benefits, Carbon Dioxide (CO2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Georgia*, June 2008. 300 MW land based and 700 MW offshore.
[7] Georgia Environmental Facilities Authority, *Georgia Energy Review*, March 2006.