WATER CONSERVATION OPPORTUNITIES THROUGH ENERGY EFFICIENCY IN GEORGIA

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REFERENCE: Proceedings of the 2005 Georgia Water Resources Conference, held April 25-27, 2005, at the University of Georgia. Kathryn J. Hatcher, editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

Abstract. Initiatives to advance water conservation through energy efficiency measures are an essential part of any sound water management plan. Energy efficiency and conservation practices provide significant and well-documented net water savings. Incorporating sound energy planning policies, with an emphasis on "incentivizing" energy efficiency and energy conservation, into state water policy guidelines in Georgia would provide valuable water quality benefits for Georgians and at the same time save money for commercial and residential electricity consumers.

INTRODUCTION

This report highlights the role of energy efficiency in building sustainable, water-conserving communities and ways in which cost-effective, tangible advancements in energy efficiency and energy conservation initiatives can aid in achieving state water conservation goals. This report does not focus on the water quality impacts associated with electricity production.

ELECTRICITY PRODUCTION IN GEORGIA

Most of the electricity produced in Georgia comes from coal-fired and nuclear power plants. Figure 1 lists the state's total electric power industry generation by energy source in 2002 according to the Energy Information Administration (EIA, 2004). Despite resource availability, very little electricity has been generated in Georgia from less water intensive non-hydroelectric, renewable energy sources (such as biomass, solar and wind). "Other renewables" include: wood, black liquor, other wood waste, municipal solid waste, landfill gas, sludge waste, tires, agriculture byproducts, other biomass, geothermal, solar thermal, photovoltaic energy, and wind. The 5.1% in Figure 1 is mostly from industrial combined-heat-and-power (CHP) plants (EIA, 2005).

Water use for electricity generation

Given that Georgia's thermoelectric power sector has the largest water withdrawals in the state, these power plants are essentially competing for water for other important needs that are vital to our state's economy and quality of life, including agriculture, industrial needs, fishing, and recreational opportunities. Less water used for the purpose of power generation translates into greater water availability for other life-dependent or life enhancing uses throughout our state.

According to the United States Geological Survey (USGS) 2003 report "Estimated Use of Water in the United States in 2000," nationally the largest water withdrawals were for thermoelectric power (195,000 million gallons per day, of which 30% was from saline sources) and irrigation (137,000 mgd all from fresh water sources).

In Georgia, total water withdrawals in 2000 were reported at 6500 million gallons of water per day (mgd). The leading water-use categories reported for Georgia were: 1) thermoelectric power 3312 mgd (saline and fresh); 2) public supply 1250 mgd (fresh); 3) irrigation 1140 mgd (fresh); 4) industrial 652 mgd (saline & fresh); and 5) domestic use 110 mgd (USGS, 2003). [Public supply refers to water withdrawn by public and private water suppliers that furnish water to at least 25 people or have a minimum of 15 connections.]

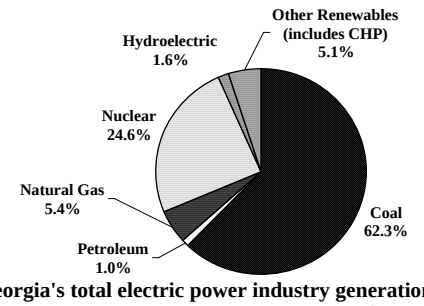

Figure 1. Georgia's total electric power industry generation of electricity by energy source, 2002 (Energy Information Adminstration).

Producing electricity from Georgia's fossil fuel and nuclear power plants requires large quantities of water. Power plants must be located next to large bodies of water or have significant water resources continuously and readily available to create steam to power the turbines. A portion of that water is consumed (transformed to steam) and therefore lost to the supply sources from which it was withdrawn. Table 1 provides a sampling of water withdrawal and estimated water consumption figures for both coal and nuclear plants in Georgia based on figures from the Georgia Environmental Protection Division.

Water withdrawals and consumption figures depend heavily on what types of cooling technologies are used. Power plants that use once-through cooling (i.e. do not have cooling towers), withdraw very large volumes of water while little water is consumed or lost because there is a negligible amount of evaporation. In contrast, power plants that use cooling towers do not need to withdraw as much water, but have a higher rate of water consumption due to the evaporation from the cooling towers. When comparing types of energy generation in relation to their water withdrawal and consumption, regardless of whether cooling towers are used, nuclear power has shown to have higher rates of withdrawal and consumption than coal or natural gas. Less water-intensive cooling technologies, such as dry cooling, that can be used at fossil fuel power plants are not available for nuclear plants.

In Table 1, Plant Branch's extremely large withdrawal of over a billion gallons of water per day and low consumption of only a few million gallons of water per day relates back to its use of a combination of once-through condenser cooling water and a part-time once-through cooling tower. Georgia's nuclear plants, on the other hand, use mechanical draft cooling towers, 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 returning less than half of the water withdrawn to the original supply source, in these cases to the Savannah and Altamaha rivers. In addition, all nuclear reactors must have large, continuous water supplies available to cool the nuclear fuel rods in the reactor core to prevent a catastrophic meltdown accident.

Impacts of energy efficiency on water use

Significant water savings can be achieved in Georgia through more attentive selection of fuel supplies and choice of technology for power generation. The "end-use" sector that relates to the consumer or demand side of the energy equation also offers significant water saving potential for Georgia. Demand-side energy efficiency is not just a way to save energy; it is also a way to save water. Energy efficiency measures have the ability to reduce the need for new power plant generation and expanded capacity and thereby decrease the amount of water withdrawn and consumed for electricity generation from Georgia's highly valued water resources.

The following examples of energy efficiency applications illustrate important water conserving opportunities. For example, certified EnergyStar® appliances often reduce energy and water consumption at

Table 1. Sampling of Georgia's Power Plants Surface Water Permits, Use, and Consumption* 2001

Plant/ Type	Size—Net Capability (megawatts)	Surface Water Source	Permitted Monthly Average (gallons per day)	2001 Reported Monthly Average (gpd)	2001 Estimated Consumption* (gpd)	Consumption (gpd) per megawatt
Branch/ coal	1607	Oconee (Lake Sinclair)	1,245,000,000	1,050,000,000	4,000,000	2489
Scherer/ coal	3430	Ocmulgee (Lake Juliette)	115,000,000	59,000,000	34,000,000	9913
Hatch/ nuclear	1726	Altamaha	85,000,000	60,000,000	34,000,000	19,699
Vogtle/ nuclear	2297	Savannah	85,000,000	64,000,000	43,000,000	18,720

*Consumption is based on annual average engineering data. Because discharges are not measured, consumption cannot be derived from withdrawals minus discharges.

the same time. EnergyStar® clothes washers use 30-50% less water and 50% less energy per load. These and other energy efficiency measures offer direct impacts of reduced water consumption which, when adopted by a large consumer population, offer significant, aggregate impacts.

Simple water conservation measures, such as replacing showerheads with low-flow, high-performance designs, can reduce household water use by 25-75% while also reducing energy use. Since less water is required for the shower, less energy is used to heat the water. According to the Rocky Mountain Institute, in 10 years an efficient showerhead could return 10–40 times its cost in saved energy alone, not counting the value of the saved water.

Also, the adoption of energy efficient practices and technologies reduces system-wide energy needs, thereby reducing the water requirements of the electric system as a whole. For example, where peak energy savings are gained from the installation of energy efficient measures, this creates a reduced need for new peak (or seasonal) power plants to be built.

Georgia has room for improvement when it comes to using energy more efficiently. In 2001, EIA data ranked Georgia 10th in the nation for total energy consumption (this included all sectors: residential, commercial, industrial, and transportation). Georgia ranked 8th in the nation for per capita energy consumption for electricity. Additionally, Georgia ranks 40th in the country in per capita spending on energy efficiency programs (York, 2002).

ENERGY EFFICIENCY POLICY RECOMMENDATIONS

There are a number of federal, regional, state, and local policies and initiatives that can be implemented or enhanced in Georgia to increase the use of energy efficiency. The most effective are utility-funded energy efficiency programs, minimum energy efficiency standards for appliance and equipment products, tax incentives and regional initiatives to commercialize energy efficient technologies.

Utility funded energy efficiency programs

Electric utilities in Georgia can play a key role in increasing the use of energy efficiency through energy efficiency programs. An example of an energy efficiency program is a utility offering a rebate to its customers who purchase energy efficient appliances. A utility can meet its customers' increasing energy needs either through supply-side resources such as power plants and electric transmission lines or by reducing demand for electricity through energy efficiency programs. Utilities that want to provide an electricity product that has the lowest total cost to ratepayers and is environmentally friendly typically use a well-balanced mix of both supply and demand side resources. By offering rebates or other incentives for customers to install energy efficient measures, utilities would be assisting in reducing the demand for electricity, thus reducing the demand on Georgia's water resources.

Energy efficiency standards for appliance and equipment products

Appliance and equipment products used in homes and businesses consume a substantial amount of energy. An effective policy in reducing the energy consumption of these products is establishing energy efficiency standards for them. A standard is a minimum energy efficiency requirement for a product category set by the federal or state government on any new products sold in the category covered by the standard. Federal and state product standards that have been adopted include products such as air conditioners, refrigerators and electric motors. Unlike some other states, Georgia has not adopted any appliance and equipment standards above federal standards.

Energy efficiency tax incentives

The State of Georgia could encourage the purchase of energy efficient products through the use of sales tax exemptions. If Georgia adopted such a policy, then customers who buy qualifying energy efficient products, such as an energy efficient refrigerator, would not have to pay sales tax on the product. A good set of standards to use for determining whether a product qualifies is that developed by Energy Star®. Energy Star® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy (DOE) that includes the establishment of voluntary high efficiency standards for products. If a product meets an Energy Star® standard, then the manufacturer can put the Energy Star® logo on the product. Maryland and Minnesota have enacted sales tax exemptions for energy efficient products. According to the DOE, water heating uses 17% of the energy in U.S. homes and is the second largest energy expense in U.S. households. Older water heaters were shown to be less than 50% efficient. Providing incentives to customers to purchase a new, more efficient water heater would immediately reduce energy demand, and consequently, the demand on Georgia's water resources.

Obstacles to energy efficiency

Georgia law requires the state's regulated utilities (Georgia Power Company and Savannah Electric & Power Company) to submit a long-range plan, known as an Integrated Resource Plan, every three years for

approval by the Georgia Public Service Commission (PSC). These plans show how a utility intends to meet the energy needs of its customers over the next 20 years and to address both supply-side resources, such as power plants and transmission lines, and demand-side resources, such as energy efficiency programs. However, since 1995, the PSC has called for the use of a highly restrictive screening test that precludes practically any significant energy efficiency program from being included in the utilities' long-range plans. Fortunately, the PSC decided to revisit this policy in 2004 to explore ways in which tangible utility energy efficiency programs could become available to consumers on a voluntary basis.

Economic benefits

Adopting energy efficiency and water conservation practices offers more than water conserving benefits and can result in significant dollar savings for consumers. Businesses in Georgia have realized monetary savings by reviewing their energy consumption activities and implementing more efficient measures. For example, the Georgia Institute of Technology's Economic Development Institute (EDI) helped Butler Sand reduce their energy costs by 5% annually by doing such things as replacing standard motors with premium motors instead of rebuilding them. EDI also helped the Rogers State Prison cannery operation in Reidsville reduce water use by 24 million gallons and lower their energy bill, saving over $100,000 annually by implementing various practices.

SUMMARY

Policies to advance water conservation through statewide energy efficiency initiatives should be incorporated into Georgia's statewide water management plan. In order to realize significant net water savings from energy efficiency and conservation practices, close coordination among water utilities, power companies, and state regulatory agencies that oversee water and energy resource management will become increasingly important. Little coordination of this type currently exists. Incorporating sound energy planning policies, with an emphasis on "incentivizing" energy efficiency and energy conservation, into state water policy guidelines will provide much needed, system-wide benefits to both the energy and water resources in our state.

LITERATURE CITED

Barczak, S. and R. Kilpatrick, 2003. Energy Impacts on Georgia's Water Resources. *Proceedings of the 2003 Georgia Water Resources Conference*, at the University of Georgia, Athens, GA.

Baum, E., February 2004. Clean Air Task Force. Wounded Waters: The hidden side of power plant pollution. pp. 2-6, 14-15.

Energy Information Administration (EIA), January 2004. State Electricity Profiles 2002. DOE/EIA-0629(2002). Tables 2 & 5, pp. 46-48.

EIA, 2001. State Energy Data 2001: Consumption. pp. 13-14.

EIA, January 2005. Electric Power Monthly. Table 1.14.A Net generation from other renewables by State by Sector, October 2004 and 2003.

Georgia Environmental Protection Division (GAEPD), June 2002. Georgia Power Water Use.

GAEPD, 2002. Georgia Power Letter to GAEPD Re: Reporting for Consumptive Surface Water Use, September 27 and November 13, 2002.

Georgia Institute of Technology Economic Development Institute (GATechEDI), October 8, 2001. Georgia Tech energy specialists help middle Georgia sand company realize energy savings. www.edi.gatech.edu/news.cfm

GATechEDI, June 16, 2003. Georgia Tech helps Reidsville Prison. www.edi.gatech.edu/news.cfm

Rocky Mountain Institute, 1995. Water Efficiency for Your Home: Products and advice which save water, energy and money, 3rd Edition. www.rmi.org

United States Department of Energy, Energy Efficiency and Renewable Energy Office, June 2004. Conventional Water Heating Efficiency. http://www.eere.energy.gov/consumerinfo/heatcool/hc_conventional_water_heating.html

United States Geological Survey (USGS), March 2003. Estimated Use of Water in the United States in 2000. USGS Circular 1268. Table 2, pp. 2-7, 13.

York, D. and M. Kushler, Dec. 2002. State Scorecard on Utility and Public Benefits Energy Efficiency Programs: An Update. Rpt. No. U023. P. 19.