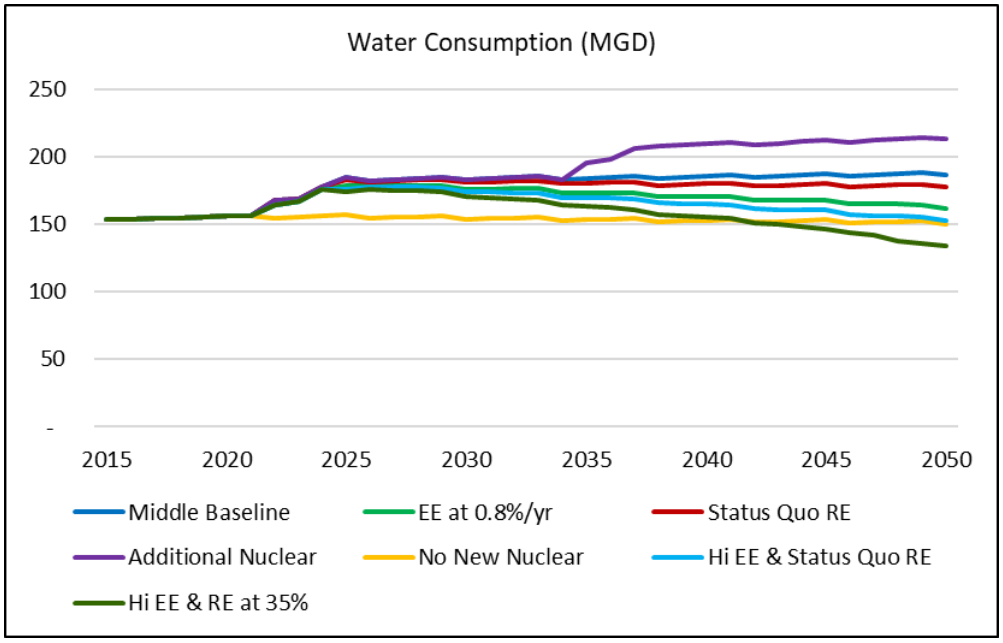
The Water-Energy Nexus in Georgia:
A Detailed Examination of Consumptive Water Use in the Power Sector

Cadmus and CNA developed a report for Southface and the Southern Environmental Law Center that examines the connection between electricity production in Georgia and the water consumed or lost in the process. This connection is referred to as the water-energy nexus. Electricity generation requires large amounts of water to cool thermoelectric power plants – water that is largely consumed in the cooling process and then unavailable for other, downstream uses. The volume of water needed by the electric power sector is not merely a function of the total amount of electricity required to meet demand. The way in which electricity is generated makes an enormous difference and different electricity production pathways can have very different implications for water use. Prudent resource planning requires an understanding and consideration of those implications.

The report provides the results of analysis completed using an electric power sector model that calculates projected water use and other environmental impacts. The study considered various potential future pathways for Georgia's power sector and, using the model, estimated the water requirements, costs, and emissions of carbon dioxide and several air pollutants for each. Three different load growth projections and six alternate future scenarios were examined that make different assumptions regarding energy efficiency, nuclear power, and renewable energy. The projected water consumption for the business as usual scenario ("Middle Baseline" in the report) and these alternate future scenarios is shown in the figure below.



The full analytical results are provided in the report (The Water-Energy Nexus in Georgia April 2018). **In summary, here is what we learned:**

- A wide range of outcomes for water withdrawals and consumption are possible for Georgia depending on electricity demand and how it is met. While higher demand certainly means a greater need for power generation, meeting that demand with nuclear, coal, natural gas, or solar energy will result in much different water use profiles for the state.

- By avoiding the need for new generation, energy efficiency reduces water use, carbon dioxide emissions, air emissions, and total system cost. Reductions in demand through various efficiency and conservation programs have the benefit of permanently reducing demand, thereby avoiding the need for new generation investments and their associated water use, CO_2, and other air emissions.

- Cost-effective generation options are available to meet demand while reducing water use, CO_2, and air emissions. The costs of solar energy, wind energy, and batteries are declining rapidly. These technologies, though currently used in relatively small amounts in Georgia, have lower capital and operating costs than nuclear energy and are not far from natural gas or coal generation costs. Solar photovoltaics (PV) and wind are financially viable now, and the cost of storage is coming down.

- While Georgia appears headed toward greater water consumption because of the coming completion of two new nuclear generating units, this impact can be mitigated. Greater deployment of energy efficiency and renewable energy could help to counterbalance those increases in water use.

- Despite its increased water use, nuclear power provides multiple benefits in the form of reduced emissions of CO_2, SO_2, NO_x, particulates, and mercury when compared to coal generation, and CO_2 and NO_x when compared to natural gas generation. However, it also requires greater water consumption than other, more cost-effective currently available technologies for electricity conservation and generation.

Based upon the analysis, Southface and SELC recommend the following actions to support the state's efforts to monitor and manage Georgia's water-energy nexus:

1. *The State should invest more in energy efficiency.* Georgia utilities and agencies have implemented modest energy efficiency programs but could do much more. In recent years, energy efficiency programs across the state have saved about 0.3 percent of prior year annual retail sales. Several southern states, such as Kentucky and North Carolina, easily best Georgia's energy efficiency performance. A number of states in the nation regularly achieve

five to six times Georgia's level of energy efficiency program savings. We found that an energy efficiency rate of 0.8 percent per year by 2050 in Georgia could avoid the need for 5.5 nuclear power generating units or 42 natural gas generating units. Energy efficiency has advantages over traditional energy supply in that it is a cheaper energy resource for the utility, lowers average customer bills, uses no water, and has no emissions. The low rate of energy efficiency deployment in Georgia suggests that the potential for improvement is significant.

2. *Georgia should increase its rate of renewable energy adoption.* According to the U.S. Energy Information Administration (EIA), in 2015 Georgia had about 220 gigawatt hours (GWh) of electricity produced by solar PV, about 0.18 percent of the total. In contrast, Georgia's neighbor, North Carolina, with its more favorable renewable energy policies, had more than six times that amount, and is growing quickly. Though there are plans for significant increases in solar PV in Georgia over the next five years, these additions will still represent a small share of overall generation. However, if the planned additions in Georgia continue at the same rate over the next few decades, they would eventually make a significant contribution to generation and could significantly limit the increases in water consumption that would otherwise occur. If coupled with an energy efficiency program, water consumption in the power sector could decline significantly from the 2015 amounts, a boon for other water use sectors facing increased demand from population and economic growth.

3. *Georgia should develop consistent water withdrawal and water consumption data.* As the old adage says, you can't manage what you don't measure. Accordingly, Georgia should invest more to obtain consistent and reliable data for water use (withdrawals and consumption) in the state. We found that water consumption numbers for regions and sectors across the state were inconsistent and the methods used to develop them were unclear. We believe that addressing this information gap would sharpen the state's already strong water planning efforts.

4. *Georgia should strengthen the State's water-energy planning practices.* In the regional water planning process, Regional Councils must address water quality or water supply constraints through the identification and selection of water management practices. Few, if any, of these water management practices address thermoelectric water withdrawals and consumption, despite the decisive scale of the water use in this sector. We hope that Water Planning Regions can, with the state's assistance, devise strategies to pro-actively address this water planning need. Additionally, we encourage the state to consider ways to better

integrate water quality and supply considerations into the energy regulatory process. This could yield important long-term results for the state. If Georgia did integrate these planning processes to identify and promote optimal ways to meet both water and energy needs, it could find opportunities to meet energy demand in ways that save water for other key areas of economic growth, while at the same time protecting and restoring natural stream functions.

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