WATER AND WATTS

JESS CHANDLER, DENNIS CREECH, ELIOT METZGER, SAMANTHA PUTT DEL PINO, ALEX TAPIA, BEN TAUBE

SUMMARY CONCLUSIONS

The Southeast faces immense challenges in meeting the water and energy needs of a growing population. Efforts to ensure an adequate supply of one resource must recognize impacts on the other.

- **Water for energy** – nearly two out of every three gallons of freshwater withdrawals in the Southeast are sent to electric power plants to meet cooling water demands. About a gallon of water is consumed for each kilowatt hour (kWh) of electricity produced.
- **Energy for water** – the annual amount of energy needed to heat water for an average home is more than the annual energy used to light that same house. Water and wastewater treatment account for 4 percent of total national electricity use.

To meet both regional energy and water demands, especially in light of recent droughts and changing climate conditions, public officials should recognize and carefully manage the relationships between energy and water. Electric power production in the Southeast draws about 40 billion gallons of water daily (65 percent of total freshwater withdrawals). Meanwhile, the energy needed to treat water and wastewater can account for a more than 30 percent of municipal energy costs and an average home is spending about $250 per year on energy needed for hot water.

Conservation efforts can reduce demands on both energy and water resources, while saving consumers money and building markets for high-performance products and services. State and federal policy action to understand these connections and implement conservation and efficiency measures can capture energy, water, and economic benefits.

Policy Priorities

- Evaluate water resource requirements and impacts of electric power supplies. Create standard regulatory review and approval processes that prioritize energy investments in technologies with minimal or no impacts on water availability.
- Demonstrate leadership with energy and water efficient public buildings that reduce utility costs and save taxpayers money:
  - Adopt energy and water conservation criteria for new buildings and upgrade existing buildings with high efficiency systems.
  - Implement procurement plans for energy efficient and water efficient products, such as those that earn ENERGY STAR® and WaterSense® labels.
  - Develop water recycling strategies for public facilities, such as rainwater harvesting and water reuse applications for plumbing and landscaping. Create programs that expand such practices to residential, commercial, and industrial facilities.
- Develop educational programs with utilities, businesses, and local environmental and consumer organizations to build awareness of connections between water and energy use.
- Offer financial incentives, such as rebates or tax credits, to build markets for high-efficiency buildings, equipment, and products (such as those that qualify for ENERGY STAR or WaterSense labels).
- Provide financial incentives to homeowners and businesses for installation of solar water heating systems to save energy at homes and commercial and industrial facilities.
- Support programs to audit and upgrade water and wastewater treatment facilities to capture energy savings opportunities.

BOX 1 **Key Terms**

Demand-side—refers to the end uses of water or energy.

Supply-side—refers to the production, processing, or distribution of water or energy (e.g., electric power plants, water treatment facilities).

Thermoelectric power plant—a facility that generates electricity by processes that produce heat and steam to turn a turbine (such as coal, oil, gas, biomass, or nuclear power plants); often requires significant amounts of "cooling water" as part of the process.

Water consumption—any water that is swallowed, used, incorporated, or evaporated.

Water withdrawals—water taken from any number of sources, such as aquifers, rivers, lakes, and streams.

OVERVIEW: *Energy and Water Resource Challenges in the Southeast*

Communities and industries depend on an adequate, reliable, affordable supply of water and energy. Careful management of these resources helps ensure a high quality of life and a productive economy. Frequent droughts and population growth can compromise a state's ability to ensure adequate water resources for communities, industry, agriculture, tourism, recreation, and ecosystems. Similar resource and population pressures can also compromise a state's ability to meet its energy needs.

The Southeast is presently facing both energy and water resource challenges (see Box 2). Looking ahead, managing demand for regional energy and water resources will be critical. This brief offers an overview of where energy and water demands intersect and policy actions that can address this dual challenge.

Relationships between energy use and water are often overlooked. In the Southeast, and elsewhere, these connections can lead to opportunities to address both energy and water challenges at the same time.[1] A crucial first step is recognizing where energy use requires water, and where water use requires energy. The next step is implementing the appropriate policies and incentives to manage the links between regional energy and water resources.

In terms of water for energy, the Southeast relies on tremendous quantities of water to produce power. Existing nuclear and coal-fired power plants, for example, consume several hundred gallons of water for each megawatt hour (MWh) of electricity they produce. These facilities may draw several thousand gallons more to cycle "cooling water" through the plant as part of the power production process. Nearly two-thirds of total freshwater withdrawals in the Southeast go to meet water demands at thermoelectric power plants.

In terms of energy for water, buildings and homes use substantial amounts of energy to meet hot water demands. In homes with electric water heaters, for example, about 25 percent of households' electricity is used to heat water.[2] Regional efforts to conserve water and educate consumers about water links to their energy bills can offer important additional energy savings.

There are many other connections between energy and water use. A significant amount of water is involved in the extraction and processing of energy resources. Hydroelectric power production results in water consumption through evaporation. Water purification (such as desalination) can involve energy-intensive processes. Urban or suburban growth can lead to additional energy use for water treatment and delivery. Resource and land use planning should recognize and address all such relationships to ensure a stable, adequate future supply of both energy and water.

For the purposes of this brief, without minimizing the importance of other energy-water relationships, we focus on these primary links in the Southeast:

- Water demands for electric power production
- Energy demands for heating and treating water and wastewater

WATER FOR ENERGY: *How Much Water Does That Light Bulb Use?*

Nearly 40 billion gallons are withdrawn each day from Southeast freshwater supplies for thermoelectric power plants (about 65 percent of all withdrawals, see Figure 1). To put this in perspective, this is nearly equal to the total daily freshwater withdrawals for public supply across the entire United States.[3]

This water is needed for cooling purposes at power plants that use coal, oil, gas, nuclear, or biomass fuels to generate heat and produce electricity. Depending on the cooling methods, a portion of this water is consumed (lost to the atmosphere through evaporation). Over the course of a year, thermoelectric power plants in the Southeast consume nearly 140 billion gallons as a result of evaporation losses—equal to the annual water use of more than 1 million homes.[4]

Some water that is withdrawn is later returned and can be reused, assuming water quality is not compromised. However, water consumed at power plants is lost to the atmosphere

BOX 2 A Dual Challenge: Securing Energy and Water Resources in the Southeast

The Southeast is the fastest growing and most populous region in the United States. According to census data, the region's population increased nearly 20 percent in the past decade. States in the region issued more than 420,000 new housing permits in 2007—about 30 percent of the national total for that year. More people and more buildings mean more demand for water and energy.

After several decades of relatively abundant, cheap energy, the Southeast is facing a situation where demand is increasing and costs for conventional power generation are becoming more volatile. Fossil fuel supplies are finite and new power plants costly, yet the region is currently on a path that relies heavily on these conventional energy resources to meet increasing demands through 2030.

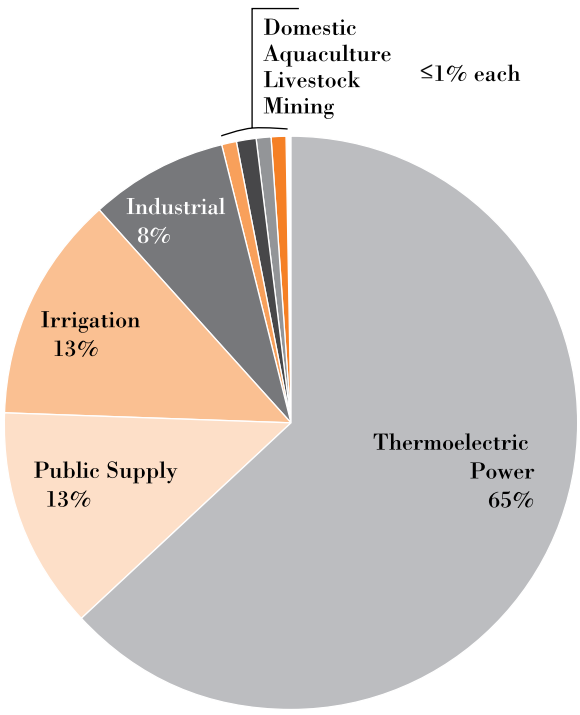
A similar challenge is emerging for water resources. For many years the Southeast has enjoyed a renewable freshwater supply in excess of its consumptive needs. However, recent drought conditions have affected supplies for municipalities, industries, hydroelectric dams, and thermoelectric (nuclear and coal-fired) power plants. Freshwater bodies across the Southeast have lost capacity or even disappeared, causing problems for states, industries, and residents. The situation has led to conflicts among Georgia, Alabama, and Florida over control of the Apalachicola/Chattahoochee/Flint River Basin and similar conflicts between North and South Carolina over the Catawba River.

Did You Know?

Southeast power plants withdraw an average of two full bathtubs of water to generate the electricity needed to power a refrigerator for a day, losing about four gallons to evaporation in the process.

Hot water running from a faucet for five minutes uses energy equivalent to that needed to power a 60-watt light bulb for 14 hours. (U.S. Environmental Protection Agency's WaterSense program.)

FIGURE 1 Southeast Freshwater Withdrawals, by Use Category, 2000



Source: U.S. Geological Survey's "Estimated Use of Water in the United States in 2000" (water.usgs.gov/watuse/).

through evaporation. Limiting consumptive water use in electric power production is important to ensure sufficient overall water availability in the regional "supply chain," thus protecting the interests of downstream water users, including homes, industries, recreation, and ecosystems. Managing water withdrawals, meanwhile, is critical to ensure demand does not exceed water availability at any one time, especially when local resources are stressed. Regional drought conditions in 2008, for example, threatened to shut down several large thermoelectric power plants in the Southeast over concerns that there would not be enough supply to meet all concurrent demand for dwindling freshwater resources.

Some thermoelectric power plants employ "once-through" systems that draw water for cooling purposes and then treat and discharge the water.[5] These require more withdrawals, but result in less total consumption. The opposite is often true for power plants that utilize ponds or cooling towers to reuse water through "closed-loop" systems. These require relatively less water in terms of withdrawals, but can ultimately consume more water through evaporation in the cooling process. Some newer plants (mostly natural gas-fired) use hybrid or dry-cooling systems that consume little to no water. These systems, however, typically require additional energy to operate.

Nuclear power plants withdraw and consume the largest amounts of water, followed by power plants that use fossil fuels (coal or oil), biomass, or waste. Natural gas-fired power plants tend to use the least amount of water (see Figure 2).[6]

Electric power policy options to help secure water resources in the Southeast

As decision makers evaluate options for meeting regional electricity needs, they should consider water resource implications and develop solutions that secure energy and water supplies. Specifically, state regulators should prioritize water and energy efficient options in electric power planning. State policymakers have opportunities to capture water benefits with actions that target either the supply of or demand for electricity.

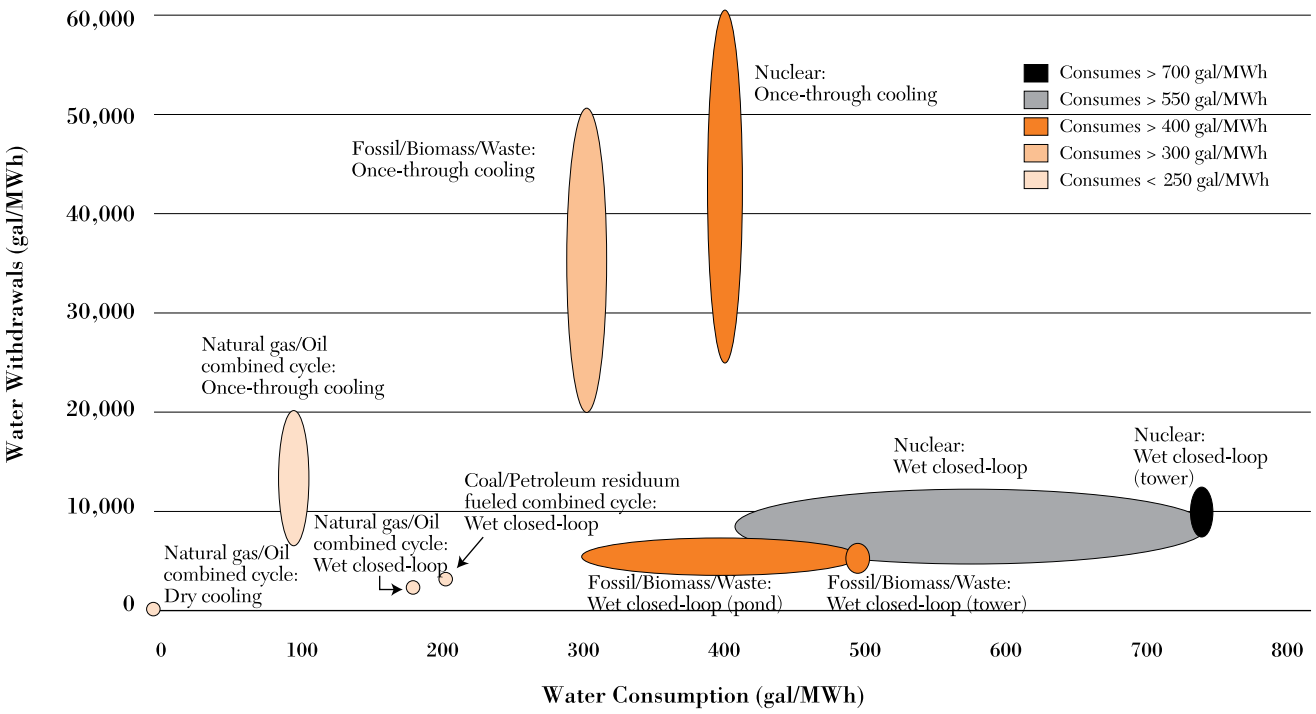
Supply-side policy priorities:

- **Evaluate how new electric power production will impact water resources**
  Currently, the Southeast is on a path to meet most of its increasing electricity needs through 2030 with water-intensive thermoelectric generation.[7] To ensure that such growth does not jeopardize water supplies, state regulators (including environmental or natural resource departments and public utility commissions) should work together to assess the water impacts of new power production and identify resources that have minimal water requirements. States can use policy and planning tools—such as water permitting authority and electricity resource planning—to encourage water efficient technologies at new and existing power plants.
- **Prioritize investments in energy resources and technologies that use little or no freshwater**
  State regulators should also seek to advance energy resources that require little or no water. States can develop a framework to assess energy resource impacts to water availability and prioritize options with dual water and energy benefits. Investments in water efficient renewable energy resources can lead to greater energy and water security (see companion issue brief on renewable energy opportunities in the Southeast: www.wri.org/publication/southeast-energy-policy). States can also work with the Department of Energy to demonstrate and deploy emerging technologies that minimize freshwater demands and consumption.[8]

Demand-side policy priorities:

- **Educate consumers about the links between energy and water use**
  A broad effort to explain connections between energy and water resources in the Southeast will help educate consumers. Partnerships between federal and state agencies, utilities, businesses, and nongovernmental organizations (NGOs) can help communicate the opportunity to save water by saving energy. Consumer outreach—through public service announcements, brochures, community workshops, or even simple graphics on energy bills—can help more people recognize the opportunity to save energy and water at the same time.

FIGURE 2 Typical Range of Water Withdrawals and Consumption for Thermoelectric Power Plants



Source: Electric Power Research Institute's "Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production-The Next Half Century."

- **Encourage investment in energy efficiency**
  Steps taken to minimize energy demands will help relieve pressure to construct new power plants, thus avoiding the need to divert additional freshwater resources. In addition, efficiency gains at commercial, industrial, or even residential facilities can reduce the water used for boilers, heating and cooling systems, or other processes.

  Southeast states have abundant opportunities to improve energy efficiency (see companion issue brief on energy efficiency opportunities in the Southeast: www.wri.org/publication/southeast-energy-policy). Broader awareness among consumers about the benefits of energy efficiency can expand demand for high-performance products and services, creating new markets and jobs in the Southeast.[9] Advanced building design can make homes and commercial buildings more efficient and more comfortable—saving money and resources at the same time. Realizing all the available opportunities will require coordinated long-term planning, but states can begin by implementing programs that educate consumers and build markets for energy efficient products.

- **Demonstrate leadership with energy efficient public buildings**
  Policies that encourage cost-effective investments in energy efficient public buildings will ultimately reduce energy bills and save taxpayers money. According to the U.S. Environmental Protection Agency, four of the eight Southeast states (Alabama, Florida, North Carolina, and Virginia) have policies that encourage energy efficiency in public buildings.[10] South Carolina also requires new or substantially renovated state buildings to meet Leadership in Energy and Environmental Design (LEED) Silver certification or equivalent standards. Dozens of local governments across the region require energy and green building certification for public buildings.[11] These states can build on initial policy steps. Other states in the region should follow these examples, or even raise the bar.

  States can require new public buildings to meet energy efficiency standards for comfort and performance. Additional efforts to upgrade existing buildings with energy efficient systems and equipment can help reduce energy demand, thereby helping to relieve pressure on water resources. States have tremendous purchasing power; directives to purchase energy efficient products, such as those with the ENERGY STAR label (see Box 3), can save money, energy, and water while advancing new markets for efficiency.

BOX 3 Opportunities in the Southeast

ENERGY STAR (www.energystar.gov), the joint program of the U.S. Department of Energy and the U.S. Environmental Protection Agency, helped consumers across the country save $16 billion on utility bills in 2007. The program offers homeowners, businesses, industry, and government a variety of tools and resources to manage energy use more efficiently. ENERGY STAR also has a labeling program that helps consumers identify high-efficiency products and buildings. Wider adoption of high-efficiency products and buildings in the Southeast represents a major opportunity to reduce electric power demands and thus relieve pressure on freshwater resources used for cooling water. Appliances, homes, and commercial or industrial facilities that bear the ENERGY STAR label are 20 to 90 percent more efficient than standard models.

- **Offer financial incentives to spur markets for energy efficient homes, equipment, and products**
  State policymakers can provide financial incentives to encourage consumers to purchase energy efficient products and build or purchase energy efficient homes and facilities. Georgia and Virginia, for example, recently offered sales tax holidays on ENERGY STAR and WaterSense labeled products that can save energy, water, and money. In South Carolina, as of July 1, 2009, the state no longer imposes a sales tax on ENERGY STAR-certified manufactured housing and offers a $750 tax credit as a further incentive. Some states are allowing local governments to provide loans to property owners that are seeking to invest in energy upgrades for their homes or buildings (see companion issue brief on energy efficiency opportunities: www.wri.org/publication/southeast-energy-policy). These and other financial enticements, like product rebates, can help drive new markets for high-efficiency goods and services while lowering demand for water-intensive electric power resources.

ENERGY FOR WATER: *Saving Energy by Turning Off the Faucet*

Turning off a light in an empty room will save energy and avoid a higher bill at the end of the month. However, fixing a leaky faucet may actually save more energy and more money. Many consumers do not realize that energy is needed to heat, treat, and pump each one of those water drops. Recognizing that water use and energy demand overlap offers opportunities to capture dual benefits with policies that advance water efficiency.

Any action to reduce water use, especially hot water use, with more efficient products or processes can have dramatic impacts on energy use in homes or buildings. About 40 percent of water used in single family homes is heated.[12] Studies show that heating this water is by far the most energy-intensive step in the life-cycle for water used in residential and commercial buildings.[13] Heating 1,000 gallons (somewhat less than the water needed to shower for 15 minutes everyday for a month) can use about 200 kilowatt hours (kWh) of energy—enough to power a 42-inch flat screen television for three months.[14] Regional efforts to conserve water, along with steps to heat it using more efficient equipment—or even the sun (see Box 4)—represent opportunities to save both energy and water.

There are also additional "upstream" and "downstream" energy benefits with water conservation. Potable water requires energy for pumping and treatment. Similarly, wastewater from a building requires energy for processing at a treatment plant. Water and wastewater treatment are energy-intensive processes and can account for more than a third of total municipal energy usage.[15] Nationally, four percent of total electricity consumption is related to moving or treating water and wastewater.[16] Programs to reduce water consumption can thus have important indirect energy benefits as they reduce the amount of energy needed to pump, transport, heat, and treat water.

Several studies in the Southeast suggest policy action and investments in water efficiency can lead to substantial benefits. The Southern Environmental Law Center highlighted the importance of proactive state planning to reduce water resource demands during periods of population growth and land development.[17] Research by American Rivers attempts to quantify the savings associated with state and local action to advance water efficiency. They estimate that Columbia, South Carolina could save $45–$100 million if it pursued water efficiency programs as opposed to building new dams. Charlotte and Raleigh, North Carolina could save a combined $105–$220 million. Metropolitan Atlanta, Georgia could save $300–$700 million and conserve enough water to equal the amount it draws from Lake Lanier.[18]

Water policy options to help secure energy resources in the Southeast

In terms of water management opportunities that will capture energy savings, recognizing the link is the first priority. Otherwise overlooked energy saving opportunities abound and are easily captured with efforts to enhance water efficiency in

BOX 4

Southface Spotlight: Heating Water with Solar Power

Anyone who has touched a car hood or stood on a rooftop in the middle of the summer knows the heating power of the sun. Buildings throughout the Southeast have abundant opportunities to harness this solar-thermal energy for domestic hot water use (laundry, cleaning, bathing) and other water heating. Tapping the sun's heat with solar hot water systems is a relatively low-tech and sensible means of limiting energy needs. Sunlight is used to preheat input water, with additional heating supplied by conventional water heaters.[1]

In general, solar hot water systems can provide 40 to 80 percent of the domestic water heating for a home or commercial building.[2] A homeowner can save $150 or more in energy costs each year. Southeast states have a significant opportunity to reduce electric power demands with this free energy supply. Florida, for example, can save more than 8,000 GWh of electricity with solar hot water systems on residential and commercial buildings.[3] Solar hot water systems can also reduce energy demands from natural gas water heaters or pool heating.

Cities and states from Georgia to Virginia can take advantage of these opportunities. The federal government offers homeowners and businesses a tax credit that covers 30 percent of the installed cost of a solar water heating system.[4] Typical costs range from $2,500 to $10,000. This credit, combined with additional state and local incentives, can encourage more homes and businesses to replace outdated water heaters with solar hot water systems. These projects can save energy and money, while potentially spurring new jobs and markets.

Notes

1. Southface. "Fact Sheet: Using the Sun to Heat Water." Available online: www.southface.org/web/resources&services/publications/fact-sheets/residential_solar_water111804.pdf
2. U.S. Department of Energy. 2000. "Solar Hot Water Technology." Solar Buildings Program. Available online: www.osti.gov/accomplishments/documents/fullText/ACC0197.pdf.
3. Denholm, P. 2007. "The Technical Potential of Solar Water Heating to Reduce Fossil Fuel Use and Greenhouse Gas Emissions in the United States." National Renewable Energy Laboratory. Technical Report: NREL/TP-640-41157. Available online: www.nrel.gov/docs/fy07osti/41157.pdf.
4. For additional information about tax credits for solar hot water and other renewable or energy efficiency incentives, see North Carolina State University's Database of State Incentives for Renewable Energy & Efficiency at www.dsireusa.org.

Written by Paul Bostrom

BOX 5

Southface Spotlight: Energy and Water Savings by Design: Southface's Eco Office

The Southface Energy Institute's 8,000-square-foot office and training center in Atlanta, Georgia, is designed to reduce energy use by 60 percent and water use by 75 percent compared to a conventionally designed small office building. The Eco Office is a showcase facility, inspiring a new approach to building design that can address both energy and water challenges in the Southeast.

High-performance heating, cooling, and lighting systems account for the most significant savings. Only five small, air-to-air heat pumps are needed to condition the building due to a super-insulated, air-tight building shell and energy efficient windows. Employees can control their own heating and cooling vents connected to an under-floor air distribution system. Window and building orientation maximize natural daylight, which is supplemented with an energy efficient lighting system that uses occupancy sensors and task lighting to reduce demand. The building also taps into available solar energy with a grid-connected 7.1 kW photovoltaic (PV) array.

The building's water conservation features include motion-activated timed flow faucets and high efficiency toilets and urinals. Southface has also installed a rainwater collection system. A 14,500-gallon buried cistern collects rainwater from the site and provides water for irrigation, while a 1,750-gallon rooftop cistern harvests water from the PV array to be utilized for flushing toilets and cooling mechanical systems.

The water efficiency technologies at the Eco Office save energy by reducing the need for potable water and wastewater treatment. The energy efficiency technologies save water by reducing the evaporative loss of water at electric power plants. The energy efficient windows, lighting and mechanical systems for this small building save over 100,000 gallons of water annually.

Written by Paul Bostrom

homes and buildings. Southeast policymakers can take steps to promote water (and energy) savings, starting with these near-term actions that focus on demand-side efficiency.

- **Demonstrate leadership with water efficient public buildings**
  As mentioned earlier, states in the Southeast can save energy and water with more efficient public buildings. State policymakers can do the same with water efficiency upgrades to realize water and energy (and taxpayer) savings in public buildings.

  As states implement policies that adopt advanced energy performance criteria for new and existing public buildings, they can incorporate water conservation criteria as well. States can also demonstrate the feasibility of new water recycling technologies. Public buildings can install rainwater capture systems to reduce demand on municipal supplies and take advantage of opportunities to reuse water for landscape irrigation or other applications. Southface has implemented these and other water and energy saving features into its "Eco Office" in Atlanta, Georgia (see Box 5). More demonstration and deployment of these technologies, starting with public buildings, can help encourage broader adoption across residential, commercial, and industrial sectors.

  Finally, state procurement policies can help save water and energy, and spur new markets for water efficient goods and services. State governments can require that agencies purchase water efficient products, such as those that earn the U.S. Environmental Protection Agency's WaterSense label (see Box 6).

- **Provide financial incentives to spur markets for water efficient homes, equipment, and products**
  States can complement financial incentives for energy efficiency with similar incentives for water efficient products. For example, water utilities or governments can offer rebates for purchase of high-efficiency toilets (HETs) that are certified to use less water and perform as well as—or better than—standard toilets. Cobb County, Georgia began offering such incentives in October 2007, and now the entire Metropolitan North Georgia Water District offers rebates of $50 for 1.6 gallon per flush toilets and $100 for WaterSense-labeled 1.28 gallon per flush toilets.[19]

- **Develop and launch information campaigns to educate consumers on water-energy links and water efficiency opportunities**
  States, utilities, local governments, and environmental and community groups can help communicate the benefits of water efficiency, both as it relates to consumer behavior and technology adoption. Many consumers are not aware of the water and energy wasted when they leave a faucet running or clean dishes with a half-empty dishwasher. Likewise, many consumers are not aware of recent technology advances that dramatically improve the performance of water efficient clothes washers, dishwashers, faucets, showerheads, and toilets.

  The U.S. Environmental Protection Agency's WaterSense program can be a useful resource for consumers and utilities seeking to capture these opportunities. WaterSense has partnered with more than 1,000 utilities, government agencies, nonprofit organizations, manufacturers, retailers, distributors, certifying organizations, and irrigation

BOX 6

Saving Water and Energy

WaterSense (www.epa.gov/watersense) has become the national symbol for water efficiency. Launched by the U.S. Environmental Protection Agency (EPA) in 2006, the WaterSense label now appears on hundreds of high-efficiency products such as toilets and bathroom sink faucets, with plans to expand to more residential and commercial products in the future. EPA is also working to develop a WaterSense label for new homes that use 20 percent less water inside and out. The first pilot home built to the WaterSense draft specification for water-efficient new homes is in Cary, North Carolina.

WaterSense labeled products are independently tested and certified to use less water, and perform as well as—or better than—standard models. High-efficiency, high-performance products can lead to significant water and energy savings in the Southeast. If one out of every ten homes in the region replaced older, inefficient toilets with WaterSense labeled toilets, it could save nearly 25 billion gallons of water annually (enough to meet Charlotte, North Carolina's entire public water supply needs for nearly eight months). Additionally, it could save residents about $150 million in water bills, and reduce electric power use (needed to treat, pump, and deliver the water) by more than 80 million kWh, which is about equal to the annual electricity use for 7,500 homes.

Other simple steps can have dramatic impacts. For example, a $2 aerator (an adapter that can be screwed on to the opening of a bathroom faucet) can lead to significant water and energy savings by reducing the flow rate without compromising performance. If just half of the households in the Southeast retrofitted their faucets with WaterSense labeled faucets or faucet aerators, it could save residents more than 6 billion gallons of water and $40 million in water bills annually. Because of the links between hot water and energy use, it would also save residents another $80 million in energy bills each year.

professionals across the country to promote the benefits of water efficient products and services. In South Carolina, for example, Spartanburg Water Utility is adapting WaterSense information, materials, and approaches to inform consumers about the importance of water efficiency. The utility has customized WaterSense fact sheets, bill stuffers, brochures, stickers with tips, and other materials to promote water efficiency to its consumers.

- **Encourage wider adoption of solar hot water systems with additional tax credits or low-interest loans** Solar water heating can meet most of the energy needed to heat water in homes and businesses (see Box 4). A general awareness campaign can help spread this message and financial incentives can help launch the market. State tax credits or rebates can complement the federal tax credit to help consumers and businesses meet up-front costs of installation. States or utilities can provide low-interest loans that will make such systems more affordable and help reduce the energy needed to heat water in the Southeast.
- **Evaluate energy use at water and wastewater treatment facilities and provide funding for efficiency upgrades to capture energy savings opportunities.** As noted earlier, there are significant "upstream" and "downstream" energy demands for water use. Water efficiency can help reduce those demands, but there are also opportunities to capture direct energy savings at water and wastewater treatment facilities. Water and wastewater utility energy consumption can be 30 to 60 percent of a city's bill, but research suggests such facilities can reduce energy use by 5 to 25 percent or more.[20] State and local governments can use guidance documents from the U.S. Environmental Protection Agency and tools from the ENERGY STAR program to create programs to identify and capture this energy efficiency potential.

  For resources, see:
  www.epa.gov/waterinfrastructure/bettermanagement_energy.html
  www.energystar.gov/index.cfm?c=water.wastewater_drinking_water

ACKNOWLEDGMENTS

The authors are grateful for the comments and insights from several external reviewers, including Margo Farnsworth, George M. Hornberger, Trish Jerman, Virginia Lee, Brandin McDonough, Rod Sobin, and Valerie Thomas. The authors also thank the following colleagues for sharing their thoughts on early drafts: Evan Branosky, Tom Damassa, Polly Ghazi, Stephanie Hanson, Charlie Iceland, Piet Klop, Franz Litz, and Janet Ranganathan. In addition, the authors are especially grateful for the research and production support from Hyacinth Billings, Paul Bostrom, Jarryd Commerford, Jennie Hommel, Robyn Liska, Bob Livernash, and Maggie Powell, who helped complete this publication.

ABOUT THE AUTHORS

Jess Chandler is a PhD candidate at the Georgia Institute of Technology.

Dennis Creech is the Executive Director of Southface.

Eliot Metzger is an Associate in WRI's Climate and Energy Program.

Samantha Putt del Pino is a Senior Associate in WRI's Climate and Energy Program.

Alex Tapia is a Program Manager at SEEA.

Ben Taube is the Executive Director at SEEA.

SOUTHEAST ENERGY ISSUE BRIEF SERIES

The World Resources Institute (WRI)—together with the Southeast Energy Efficiency Alliance (SEEA), Southern Alliance for Clean Energy (SACE), and Southface—compiled high-level overviews of regional opportunities to enhance energy efficiency, develop renewable electric power resources, and manage water-energy relationships. These briefs and supplemental state-level data are available at: www.wri.org/publication/southeast-energy-policy.

We would like to thank the following organizations who have provided financial support for our work in the Southeast:

Emily Hall Tremaine Foundation
Energy Foundation
Oak Foundation
Robertson Foundation
Sea Change Foundation
Southern Energy Efficiency Center
Turner Foundation
U.K. Global Opportunities Fund
U.S. Department of Energy
WestWind Foundation

Notes

1. Webber, M. 2008. "Energy versus Water: Solving Both Crises Together." *Scientific American*. Available online: www.sciam.com/article.cfm?id=the-future-of-fuel.
2. U.S. Environmental Protection Agency. 2008. "WaterSense: Saving Water Saves Energy: Make the Drops-to-Watts Connection." www.epa.gov/watersense/pubs/waterenergy.htm.
3. Hutson, S., N. Barber, J. Kenny, K. Linsey, D. Lumia, and M. Maupin. 2005. "Estimated Use of Water in the United States in 2000." U.S. Geological Survey. USGS Circular 1268. Available online: water.usgs.gov/watuse/.
   U.S. Geological Survey. 2000. Public Supply Water Use." Available online: ga.water.usgs.gov/edu/wups.html.
4. Torcellini, P., N. Long, and R. Judkoff. 2003. "Consumptive Water Use for U.S. Power Production." National Renewable Energy Laboratory. Available online: www.nrel.gov/docs/fy04osti/33905.pdf.
5. Upon returning the water to lakes and rivers, water quality is often a concern. The temperature of the returned water can be much higher than the ambient temperature of the water bodies and causing damage to the aquatic ecosystem. States can set discharge rules and permit requirements to ensure water quality is protected.
6. Myhre, R. 2002. "Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production—The Next Half Century." Prepared for the Electric Power Research Institute. Available online: mydocs.epri.com/docs/public/000000000001006786.pdf.
7. Based on projections for the South Atlantic and East South Central subregions in the Energy Information Adminstration's Annual Energy Outlook: www.eia.doe.gov/oiaf/aeo/.
8. U.S. Department of Energy. 2006. "National Energy Technology Laboratory's Power Plant-Water R&D Program." National Energy Technology Laboratory. Available online: www.netl.doe.gov/technologies/coalpower/ewr/pubs/Power%20Gen%202006_Water%20R&D.pdf.
   Shuster, E. 2007. "NETL Fossil Energy Issues Note No. 2 Energy/water issues." National Energy Technology Laboratory. Available online: www.netl.doe.gov/energy-analyses/pubs/Energy-Water%20Issue%20Note.pdf.
9. For example, see American Council for an Energy-Efficient Economy, Summit Blue Consulting, ICF International, and Synapse Energy Economics. 2008. "Energizing Virginia: Efficiency First." Available online: www.aceee.org/pubs/e085.htm.
   Laitner, S., and M. Kushler. 2007. "The Economic Benefits of an Efficiency-Led Clean Energy Strategy to Meet Growing Electricity Needs in Michigan." American Council for an Energy-Efficient Economy. Report Number E07X. Available online: www.aceee.org/pubs/e07x.htm.

10. U.S. Environmental Protection Agency. 2008. "State Planning and Incentive Structures." Available online: www.epa.gov/cleanenergy/energy-programs/state-and-local/state_planning.html#eea.
11. U.S. Green Building Council. 2009. "LEED Initiatives in Government and Schools." Available online: www.usgbc.org/DisplayPage.aspx?CMSPageID=1852#local.
12. DeOreo, W.B. and P.W. Mayer. 2000. "The End Uses of Hot Water in Single Family Homes from Flow Trace Analysis." Aquacraft Inc. Water Engineering and Management. Available online: www.aquacraft.com/Download_Reports/DISAGGREGATED-HOT_WATER_USE.pdf.

    Mayer, P.W., W.B. DeOreo, E. Opitz, J. Kiefer, B. Dziegielewski, W. Davis, and J.O. Nelson. 1999. "Residential End Uses of Water." American Water Works Association Research Foundation. Denver, CO.
13. Arpke, A. and N. Hutzler. 2006. "Domestic Water Use in the United States: A Life-Cycle Approach." *Journal of Industrial Ecology* 10 (1-2).
14. U.S. Environmental Protection Agency. "WaterSense: Saving Water Saves Energy: Make the Drops-to-Watts Connection." www.epa.gov/watersense/pubs/waterenergy.htm.
15. U.S. Environmental Protection Agency. 2001. "Conservation Savings Increment Loans." Environmental Financial Advisory Board. Available online: www.epa.gov/efinpage/efab/csiloans.pdf.
16. U.S. Environmental Protection Agency. "WaterSense: Saving Water Saves Energy: Make the Drops-to-Watts Connection." www.epa.gov/watersense/pubs/waterenergy.htm.
17. Southern Environmental Law Center. 2008. "Drought in the South: Planning for a Water-Wise Future." Available online: www.southernenvironment.org/uploads/publications/drought_paper_09-08-08.pdf.
18. Hoffner, J. 2008. "Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast." American Rivers. Available online: www.americanrivers.org/waterefficiencyreport.
19. U.S. Environmental Protection Agency. "WaterSense: Cobb County Water System." Available online: www.epa.gov/watersense/water/profiles/cobb.htm.
20. U.S. Environmental Protection Agency. 2008. "Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities." Available online: www.epa.gov/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf.

ABOUT SEEA

The Southeast Energy Efficiency Alliance (SEEA) promotes energy efficiency for a cleaner environment, a more prosperous economy, and a higher quality of life in the Southeastern region of the United States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia). SEEA was incorporated in the state of Georgia as a 501(c)(3) in January, 2007. www.seealliance.org

ABOUT SOUTHFACE

Since 1978, Southface has encouraged responsible solutions for environmental living. Driven by the Southeast's growing need to save energy and water and preserve our natural resources, Southface has successfully fostered unique partnerships with government, business and nonprofit organizations. Southface programs and publications reach design and construction professionals, homeowners, government officials and others to promote sustainable homes, workplaces and communities through education, research, advocacy and technical assistance. www.southface.org

ABOUT WRI

The World Resources Institute is an environmental think tank that goes beyond research to create practical ways to protect the Earth and improve people's lives. Our mission is to move human society to live in ways that protect Earth's environment for current and future generations.

Our programs meet global challenges by using knowledge to catalyze public and private action:

- *To reverse damage to ecosystems.* We protect the capacity of ecosystems to sustain life and prosperity.
- *To expand participation in environmental decisions*. We collaborate with partners worldwide to increase people's access to information and influence over decisions about natural resources.
- *To avert dangerous climate change*. We promote public and private action to ensure a safe climate and sound world economy.
- *To increase prosperity while improving the environment*. We challenge the private sector to grow by improving environmental and community well-being.

In all of our policy research and work with institutions, WRI tries to build bridges between ideas and actions, meshing the insights of scientific research, economic and institutional analyses, and practical experiences with the need for open and participatory decision-making. www.wri.org

ISBN 978-1-56973-720-0