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GEORGIA ENERGY REPORT 2019

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Table of Contents

Introduction	02
Initiatives and Programs	03
Energy Consumption	14
Energy by Sector	16

Introduction

The Georgia Environmental Finance Authority (GEFA) publishes the Georgia Energy Report to highlight energy use, energy conservation, new energy resources, and energy-related trends in Georgia and the U.S.

Georgia's economy and population continue to grow as the state becomes more energy efficient, produces renewable energy, and implements new energy programs. Since the 2016 Georgia Energy Report, GEFA funded multiple solar energy installations and an innovative solar installation education program at Savannah Technical College. State agencies implemented more than \$80 million in performance contracts and solar energy installations exceeded 1,500 megawatts (MW).¹

Many people and organizations are moving Georgia to a cleaner and more efficient energy future. The 2019 Georgia Energy Report highlights the growth of energy efficiency and renewable energy, the future of nuclear energy, and the changes in American energy production and policy. The report also summarizes GEFA programs that improve and conserve energy resources. Finally, the report contains an overview of Georgia's energy data, including energy production and consumption statistics.

The Georgia Energy Report is a valuable resource for Georgia's citizens, policymakers, and others interested in Georgia's energy story.

¹ http://www.powermag.com/largest-solar-plant-in-southeast-will-be-built-in-georgia/

Solar Shines in Georgia

Solar energy in Georgia continues to accelerate. Georgia has taken advantage of reduced solar costs and a relatively high solar radiation to become one of the top states for installed solar capacity. Georgia achieved this without the use of legislative action or a renewable portfolio standard. According to the Solar Energy Industries Association (SEIA), Georgia has more than 1,500 MW of installed solar capacity.

As of 2018, Georgia Power had nearly 1 gigawatt (GW) of solar capacity on the grid.² By 2024, Georgia Power expects to grow its renewable energy portfolio to nearly 5.4 GW, much of which will be solar.³ Solar is not limited to one utility, however. Other utilities, including Electric Membership Corporations (EMC) represented by Green Power EMC and municipal electric companies, have installed solar. By 2021, Green Power EMC expects to have over 600 MW of solar installed across the state.⁴ Beyond utilities, local governments are following the lead of their residents to green city operations. In early 2018, the city of Atlanta announced an agreement to install solar on 24 city-owned buildings. This report will also highlight GEFA's solar efforts and other innovative ways solar is being brought to market.

- ² https://www.georgiapower.com/company/news-center/2018-articles/renewable-energy-growth.html
- ³ https://psc.ga.gov/site/assets/files/4279/media_advisory_for_7-16-19_gpc_irp_for_web.pdf
- ⁴ https://www.prnewswire.com/news-releases/green-power-emc-to-significantly-expand-its-solar-energy-portfoliowith-construction-across-four-georgia-locations-300668713.html



Performance Contracting

In 2010, Georgia voters approved guaranteed energy savings performance contracting for use by state agencies. Since then, GEFA has actively developed the program. Eight projects are now under contract, which represents about \$88 million in financed projects.

In an energy performance contract, the energy services company (ESCO) guarantees the state will save an agreed-upon amount of money with the installation of energy- and water-efficient equipment and systems. Rather than appropriating the funds to pay for the work, the state uses a loan from a third-party financial institution. The guaranteed savings allow the agency to pay off the loan in a budget-neutral manner.

Agencies can enter into contracts of up to 20 years. Each year the ESCO performs measurement and verification (M&V) to ensure the project is achieving the guaranteed savings. Energy performance contracts are a proven, budget-neutral way for agencies to fund efficiency and operational improvements. As a result, the contracts are common in the public and private sectors.

During the first eight years of the program, the six state agencies listed below entered into eight energy performance contracts:

- The Georgia Institute of Technology
- The University of Georgia
- Georgia World Congress Center Authority
- Georgia Department of Corrections (GDC)
- Georgia Department of Natural Resources North Georgia Mountains Authority
- Georgia Department of Transportation

Seven performance contracts have finished construction and are generating savings. Phillips State Prison, the first of two GDC performance contracts, exceeded its guarantee by \$362,047 over the first three years. GEFA will continue to work with state agencies to implement energy performance contracts as an important method for saving energy and money while improving facilities.

Energy Assurance

Georgia and the Southeast are susceptible to a range of natural disasters, including winter ice storms, tornadoes, flooding, extreme temperatures, and hurricanes. Beyond natural disasters, human-made cyber and physical attacks are becoming more common across the country. To prepare for and respond to energy shortages caused by these events, GEFA leads Emergency Support Function #12 (ESF-12) and works closely with other state agencies and private-sector partners. GEFA utilizes U.S. Department of Energy (DOE) funding to maintain a statewide Energy Assurance Plan and to lead ESF-12 in meetings, workshops, and exercises. A key component of ESF-12 is the engagement of private-sector partners who own and operate nearly all of Georgia's energy supply and infrastructure.

GEFA led ESF-12 during numerous emergency events in recent years. Since the 2016 Georgia Energy Report, numerous severe weather systems directly impacted Georgia, including Hurricane Michael. These events reduced the fuel availability and knocked out electricity to millions of customers across the state. Disasters often cut electricity to critical facilities and infrastructure, including hospitals, nursing homes, 911 centers, water and wastewater treatment plants, and cellular communications towers. GEFA and the Georgia Emergency Management Agency (GEMA) work with the state's electrical providers to respond to resource requests and to gather and provide situational awareness to local, state, and federal leadership. At times, GEFA staffs the State Operations Center around-the-clock until the emergency is over. GEFA will continue to lead ESF-12 and work with other state agencies and the private sector to enhance the state's response capabilities.



Conservation

Drinking water and wastewater treatment are two of the most expensive and energy intensive services local governments provide their citizens. With this in mind, GEFA provides a 1 percent interest rate reduction on loans for energy efficiency and renewable energy projects at water, wastewater, and solid waste facilities. Many local governments have taken advantage of these loans to save money and energy.

Eligible projects can include landfill methane gas collection, renewable energy production, combined heat and power, energy management planning, inflow/infiltration detection projects, lighting upgrades, and installation of energy efficient treatment equipment and processes. Eligible energy production or energy conservation projects may be funded as a portion of a larger infrastructure project or as a stand-alone project. GEFA will work with the borrower to identify which portion(s) of the project are eligible for the energy conservation designation.





Fuel Storage Tank Program

The Fuel Storage Tank Program (FSTP) is the centralized management and monitoring office for fuel storage tanks owned by state agencies and institutions. The FSTP was established in 1995 in response to federal construction and maintenance standards for Underground Storage Tanks (USTs). The program was expanded in 2004 to include oversight and maintenance of state-owned Aboveground Storage Tanks (ASTs). There are currently more than 650 active USTs and ASTs at more than 300 state-owned sites.

Malfunctioning fuel storage tanks pose a threat to the state's land and water resources. The FSTP helps state agencies ensure the tanks are working properly and staff and fuel delivery companies are taking precautions to prevent spills and leaks. For USTs, the Georgia Environmental Protection Division (EPD) enforces state and federal rules and regulations. If violations are found during EPD inspections, fines and closing of the facility are possible sanctions. EPD inspects USTs at state facilities at least once every three years. Local fire marshals regulate ASTs.

The FSTP contracts with petroleum equipment and service companies to perform annual inspections and to provide site maintenance when requested. The FSTP approves the work and reviews the invoices.

When FSTP staff visit a facility, they review information such as fuel levels and temperatures provided by the tank monitoring system. The fuel tanks and equipment are also inspected for needed repairs or possible tampering. FSTP staff perform small repairs without having to use the contractors, which saves hundreds of dollars per repair. Small repairs include removing water from tank sumps, clearing alarms, and adjusting sensors. Before leaving a site, FSTP staff identify any compliance deficiencies to be corrected and establish best management practices to ensure the site stays in compliance between inspections.



Weatherization

The Weatherization Assistance Program (WAP) provides free home energy efficiency testing and solutions to help low-income households reduce energy costs. WAP treats the house as a single energy-consuming system rather than a loose collection of unrelated pieces of equipment. It requires advanced diagnostic skills and cost-effective measure selection and installation. Efficiency measures result in significant energy and cost savings in excess of 20 percent. Single-family homes, multifamily buildings, and mobile homes are eligible.

In FY2018, WAP weatherized 458 units, which amounts to annual energy savings of 13,969 million British Thermal Units (MMBtu). GEFA secured an additional \$1.3 million for the WAP program in 2018 from the Georgia Department of Human Services by meeting spending and production goals. This increase in funding enabled the WAP to service 160 additional households.



Building Operation

Building Operator Certification® (BOC) is the industry-recognized credential in energy efficient building operation developed by the Northwest Energy Efficiency Council. BOC trains facility personnel in making heating, ventilation, air conditioning, electric, and lighting systems more energy efficient.

Through a partnership with Gwinnett Technical College, GEFA's BOC scholarship program provides training for state building operators, maintenance staff, and facilities personnel to efficiently operate and maintain their facilities.

GEFA covers most of the tuition (\$1,500) for participants to complete eight BOC courses, hands-on project assignments, and exams. Scholarship recipients provide baseline utility data from one facility—12 months of utility data preceding the training and 12 months of utility data post training—to allow GEFA to track energy savings and report on the program.

Additionally, GEFA requires the development of an Energy Action Plan by each participant. Participants present to their facility supervisors and management team on the last day of class.

Results from the 2016 BOC Scholarship Class:

In the fall of 2017, GEFA tracked energy data results from the 2016 BOC class, which was provided to state agency and university/college facility managers. Compared to baseline, several class participants saved a significant amount of energy. Overall, seven buildings showed a decrease in energy usage totaling 2,012 MMBtu. On average, each facility was able to show energy savings of approximately \$3,312 per year.

Student Testimonials

"Building Operator Certification provided a great base of understanding of facilities and how building systems work. That with best practices shared in class allowed me to start saving energy and money for our institution immediately."

- Chris Warnock, Coordinator, IT and Facilities at Gwinnett Technical College

Georgia Solar

Georgia has seen significant growth in large, utility scale solar installations in the last several years. In 2016, GEFA designed and implemented the Georgia Solar program—a financial incentive program for cities, counties, and public schools to install small scale solar photovoltaic (PV) systems. It also required the recipients to educate the community on the benefits of solar energy production. Georgia Solar supported the cost (up to 50 percent with a maximum of \$50,000) to install up to 60 kilowatt (kW) of ground mount or rooftop solar. The following installations were completed in 2017-2018.

- Athens-Clarke County: 36 kW
- City of Atlanta in partnership with the Atlanta BeltLine: 8.9 kW
- Atlanta Neighborhood Charter School: 41 kW
- Augusta-Richmond County Public Library: 60 kW

In November 2018, GEFA announced a second round of Georgia Solar funding for the following organizations:

- Dade County Schools: 60 kW rooftop project at Dade County High School
- Savannah-Chatham County Schools: 30 kW ground mount at Gadsden Elementary School
- City Schools of Decatur: 20 kW rooftop project at Renfroe Middle School
- City of Ringgold: 23 kW rooftop project at the city public works facility



Solar for Schools

In 2016, GEFA awarded a Solar for Schools contract to Savannah Technical College, which offers a Photovoltaic Systems Installations Technical Certificate. There are more than 250,000 Americans working in solar as of 2017 according to The Solar Foundation's latest National Solar Jobs Census. Georgia now has more than 4,000 solar workers and tremendous potential for growth with solar jobs up 10 percent in 2017.

Solar for Schools provided students the opportunity to enter the workforce specializing in electrical applications for installing, inspecting, and repairing solar panels. Students learned about solar energy while gaining hands-on experience, which ensures employability in Georgia's growing solar industry.

Funding for Savannah Technical College supported scholarships for students and highly-visible solar arrays on campus. Students installed two rooftop solar projects—a small scale 18 kW, fixed-roof mount system in the center of the Savannah campus and a 42 kW, fixed-roof mount system on the automotive building. Students also installed two three-seat, PV covered ConnecTables. One ConnecTable is in the center of the Savannah campus and the other is at a bus stop on the Liberty Campus. The off-grid tables include four GFCI traditional outlets and eight USB ports. The tables can charge 75–150 mobile devices per day.

Savannah Technical College continues to partner with GEFA to develop marketing initiatives, including a presentation, video case study, and community outreach, to gain interest in renewable energy from local schools, colleges, and business leaders.

In August 2018, GEFA announced a second round of Solar for Schools funding in partnership with the Technical College System of Georgia. Contracts were awarded to the following technical colleges:

- Southern Crescent Technical College (Griffin Campus): 33 kW rooftop project
- · Ogeechee Technical College (Sylvania Campus): 20 kW ground mount project, including scholarships

Plant Vogtle

In 2009, the Georgia Public Service Commission (PSC) approved Georgia Power's request to build two new nuclear units at Plant Vogtle. Units 3 and 4 are the first and only new nuclear units under construction in the U.S. since the 1970s. The units are Westinghouse AP1000 reactors designed to produce approximately 1,000 MW of power. Initially planned to be online by 2017, the current target dates for units 3 and 4 are 2021 and 2022, respectively. The Westinghouse bankruptcy contributed to the delay.

Construction management of the project shifted from Westinghouse to Southern Nuclear following the bankruptcy. In December 2017, the PSC reaffirmed their commitment by voting to allow continued construction of the project despite the delays and budget impacts. The estimated cost of the new units is now approximately \$27 billion.

Georgia Power owns about 45 percent of the project. The other owners are Oglethorpe Power, the Municipal Electric Authority of Georgia, and Dalton Utilities. According to an August 2018 Georgia Power press release, there were more than 7,000 people working on the project site. Once complete, the new units will provide enough baseload electricity to power 500,000 homes and businesses.



Energy Jobs

Georgia is home to more than 118,000 workers in electric power generation, transmission and distribution, fuels, and energy efficiency.⁵ The clean energy sector accounts for more than 19,000 full-time equivalent jobs according to a 2015 "Georgia Clean Energy Census".⁶ The same study finds more than 800 clean energy firms, which generate approximately \$3.3 billion in gross revenue. Clean energy jobs in Georgia are available in a wide range of business sectors, including energy efficiency, renewable energy, energy storage, smart grid, and alternative fuel vehicles. The energy efficiency sector, which includes builders, architects, and HVAC installers, accounts for the largest percentage of clean energy jobs.

Solar energy is one of the fastest growing employment sectors in the state. According to the Solar Foundation, there were 4,310 solar jobs in Georgia⁷ in 2017. This is an increase of 10 percent over the previous year. The Solar Energy Industries Association states that there are more than 200 solar companies in Georgia, including installers and manufacturers.

- ⁵ Data from the "U.S. Energy and Employment Report," published by the National Association of State Energy Officials and the Energy Futures Initiative, 2018.
- ⁶ "Georgia Clean Energy Industry, 2015 Census," published by Southface, January 2016.
- ⁷ "2017 National Solar Jobs Census,"published by the Solar Foundation



Energy Consumption

Georgia's energy consumption per capita started dropping in 1997 after years of increases. Despite increased population and economic growth, this signified Georgia was becoming more energy efficient. BTUs consumed per person in Georgia dropped more than 25 percent between 1996 and 2016. The reduction in energy consumption per capita can be attributed to many things, such as technology improvements in transportation, stronger energy codes for residential and commercial buildings, and increased awareness of environmental issues. Another marker of the state's increased efficiency is BTUs consumed per dollar of gross domestic product (GDP). Georgia's economy in 2016 used 31 percent less energy per dollar of GDP than in 1997.⁸

⁸ The energy statistics cited in this section are from the U.S. Energy Information Administration. The most recent data available ranges from 2016 to 2018.



Energy Consumption per Capita



Economic Energy Intensity, BTU per Dollar of GDP



BTUs

15 | gefa.georgia.gov

Energy by Sector

Not counting the electric power sector⁹, the transportation sector is the largest consumer of energy in the state. The transportation sector passed the industrial sector as the largest consumer in 2004. This change can be explained by a few things, including the decline of manufacturing in the U.S., changing commuting patterns, and Georgia's growth as a logistics hub. Industrial, residential, and commercial, in that order, are the next largest consumers of energy after transportation.



Energy Use by Sector

* The electric power sector in Georgia is the number one consumer of energy. However, the energy consumed by the electric power sector in Georgia is not included in the above graph. This is because energy consumed by the electric power sector includes energy used for the generation and delivery of electricity to the point of use plus the energy consumed by the electric power sector itself.

Petroleum

Georgia, especially metro Atlanta, is a major consumer of petroleum. The state is dependent on oil and petroleum products drilled and refined in other states and countries. Most of the petroleum for metro Atlanta and north Georgia enters the state via two pipelines from the Gulf Coast. Petroleum is also imported through the ports of Savannah, Georgia, and Brunswick, Georgia. Due to its reliability on pipelines, Georgia is extremely vulnerable to supply interruptions from weather and human interference. In 2016, Georgia consumed approximately 7.1 billion gallons of petroleum, of which approximately 4.8 billion gallons were motor gasoline. Since its peak in 2005, motor gasoline consumption is down 6.6 percent.

Crude oil production in the U.S. has surged since the first the Georgia Energy Report. At a low point in 2008, American crude oil production has grown 87 percent through 2017. The increase in oil production is largely due to improved techniques that allow for economic recovery of shale oil in states like North Dakota and Texas. During this same time period, the average annual price of a barrel of West Texas Intermediate (WTI) crude dropped from nearly \$100 to just above \$50. In late 2015, the U.S. started allowing global crude oil exports for the first time in 40 years, helping to alleviate the surplus of crude oil in the U.S.



U.S. Field Production of Crude Oil

Coal

The amount of coal consumed in Georgia decreased in recent years. However, it is still a major source of energy for electric power generation. In 2016, Georgia consumed 19,704,000 short tons of coal. This represents a 53 percent reduction from 2007—the year with Georgia's highest coal consumption. Most of the coal was consumed in the electric generation sector.

Like petroleum, Georgia imports all its coal. Georgia's coal supply primarily comes from Kentucky and Wyoming and arrives via railroad. Demand for subbituminous Wyoming coal increased because the delivered cost is typically lower than bituminous coal from Kentucky. Wyoming coal is also lower in ash and sulfur, which helps it meet some U.S. Environmental Protection Agency (EPA) requirements. However, Wyoming coal is less energy dense than Kentucky coal, which requires burning more to produce the same amount of energy. This means future environmental regulations could change the mix required by Georgia utilities.



Natural Gas

The natural gas market has changed dramatically in recent years. Technological improvements, including hydraulic fracturing, have allowed substantial gas recovery from shale formations. Shale gas enables the U.S. to produce significantly more natural gas and to lower prices, which peaked in 2008. In 2017, the U.S. produced an average of 73.6 billion cubic feet per day (Bcf/d) and consumed an average of 74.2 Bcf/d, therefore producing nearly all the natural gas consumed in the country. Because natural gas is not as easily or affordably imported or exported as petroleum products, the U.S. readily benefits from the increasing supply.

In 2016, Georgia used 707,000 million cubic feet (MMcf) of natural gas. Almost half of the natural gas consumed in Georgia is for electric power generation, which represents dramatic growth. In 1997, only 4.6 percent of the natural gas consumed in Georgia was utilized for electric power generation.

Like petroleum, Georgia is dependent on interstate pipelines for natural gas. Georgia also has access to liquefied natural gas (LNG) imports through the Elba Island Terminal near Savannah, Georgia. However, due to the current supply of natural gas in the U.S., there are plans to turn several LNG import facilities, including Elba Island, into LNG exporting facilities. Elba Island is expecting to start exporting LNG in 2019.



Henry Hub Natural Gas Spot Price

Pipelines and Georgia

Georgia relies on imported refined petroleum products to meet its demand through two interstate pipelines — Colonial Pipeline and Plantation Pipeline.

The Colonial Pipeline system spans 3,500 miles with more than 5,500 miles of pipe (some right-of-way contains more than one line) from Texas to New Jersey. Colonial Pipeline ships more than 100 million gallons per day of refined petroleum products to Alabama, Delaware, Georgia, Louisiana, Maryland, Mississippi, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia.

The Plantation Pipeline system receives petroleum products from nine refineries in Mississippi and Louisiana and delivers to 130 shipper terminals in eight states through a 3,100 mile network of pipeline. States served by the Plantation Pipeline include Alabama, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. Plantation Pipeline delivers about 30 million gallons per day of refined product.

Providing transportation fuels and other refined petroleum products involves the supply of crude oil through the global oil market and the capacity to refine crude oil. While refineries are spread throughout the U.S., the greatest concentration of refining capacity is located along the Gulf Coast in Louisiana, Mississippi, and Texas. Georgia relies almost entirely on the refining capacity in the Gulf Coast.

Georgia's petroleum industry includes major companies that import fuel and wholesale and retail distributors, including service stations and fuel oil and propane distributors. While most of the petroleum products come to the state via the Colonial and Plantation pipelines, the Dixie Pipeline supplies propane. Some products are also imported through the ports in Brunswick and Savannah. Petroleum products delivered to Georgia are received at terminals and trucked to local distribution points.

Natural gas imported to Georgia arrives via three interstate pipelines—Transco Pipeline owned by Williams Companies Inc., East Tennessee Natural Gas pipeline system owned by Spectra Energy, and the Southern Natural Gas pipeline system owned by Kinder Morgan. The Transco Pipeline is the second largest natural gas pipeline system in the nation. It consists of 10,200 miles of pipeline extending from Texas to New York City. The East Tennessee Natural Gas pipeline system is 1,525 miles long. It begins in Tennessee and extends to just south of Roanoke, Virginia. The Southern Natural Gas pipeline system is made up of approximately 7,600 miles of pipeline. It extends from Gulf Coast locations in Texas and Louisiana to seven southeastern states. Southern Natural Gas is the major supplier of natural gas to Atlanta Gas Light (AGL) Company.

Even though Georgia lacks underground storage for natural gas, AGL operates three LNG peak-shaving facilities. The largest facility is the Riverdale LNG plant, which has a storage capacity of 2.56 Bcf. It is supplied by two interstate pipelines. AGL's Cherokee LNG plant in Ball Ground, Georgia, has approximately 2 Bcf of storage capacity. It is supplied by three pipelines. Like the Riverdale plant, the Cherokee plant also serves the Atlanta market. AGL's LNG plant in Macon, Georgia, has a storage capacity of almost 1.5 Bcf.



21 | gefa.georgia.gov

Electricity

A significant development in Georgia's electricity market is the growing significance of natural gas to the state's electric generation mix. In 2018, 41 percent of Georgia's electricity was generated by natural gas. In 2001, natural gas accounted for 3 percent. Dramatically increasing supplies in the U.S. lowered the price significantly and pollution regulations pressured utilities into switching from coal to natural gas. While less electricity is generated from coal than in the past, it remains an important source of electricity. In 2018, coal generated 25 percent of the state's electricity and nuclear generated approximately 26 percent. The remaining generation consisted of hydroelectric, biomass, and other renewables.

The fuel type used to generate electricity depends on many factors, including demand, the time of day, the season, and the weather. Electric providers must meet the demands of their customers at any time of the day despite storage challenges. Electricity generation is divided into three load categories: baseload (around-the-clock), intermediate load (mid-morning until the evening), and peak load (afternoon and early evening when demand is highest).

Each fuel type has specific operating and cost characteristics. This determines which fuel the load category will use to generate electricity. Baseload is usually satisfied by nuclear and coal generators (due to low variable costs and limited operational flexibility, i.e., it takes time for the generators to warm up), biomass, and some hydroelectric generation (due to low variable costs). Intermediate load is often satisfied by gas and oil steam turbines, combined cycle gas turbines, and hydroelectric power. These types are used because operational flexibility allows them to be ramped up and down as loads rise and fall during the day and the variable costs are lower than other options. Peak load is usually satisfied by single-cycle gas turbines, hydroelectric power, pumped hydroelectric power, and wind- and solar-generating units.



Georgia Environmental Finance Authority

233 Peachtree St NE Ste 900 Atlanta, GA 30303 MAIN 404-584-1000 FAX 404-584-1069 gefa.georgia.gov