

Alvin W. Vogtle

Nuclear Plant

 Southern Nuclear





About Plant Vogtle

The Alvin W. Vogtle Electric Generating Plant near Waynesboro, Ga., is one of the state's two nuclear power plants. Like its predecessor, the Edwin I. Hatch Nuclear Plant near Baxley, Ga., Plant Vogtle is jointly owned by Georgia Power, Oglethorpe Power, the Municipal Electric Authority of Georgia and Dalton Utilities. The plant is named for Alvin W. Vogtle Jr., the chief executive officer of Southern Company, Georgia Power's parent firm, from 1969 through 1983.

Georgia Power began planning Plant Vogtle in 1971. Unit 1 began commercial operation in 1987, and Unit 2 began commercial operation in 1989. The plant's 3,100-acre site along the Savannah River became the largest construction project ever undertaken in Georgia. At the peak of construction, more than 14,000 people worked to build the two electric generating units at Plant Vogtle.

Approximately 900 people – including engineers, mechanics, control room operators, lab technicians, instrument and control technicians, electricians, security officers and others – oversee the plant's operation 24 hours a day, seven days a week. Full-time on-site inspectors from the U.S. Nuclear Regulatory Commission (NRC) monitor the plant to ensure it is maintained and operated safely, efficiently and in accordance with established nuclear operating procedures.

Plant Vogtle's massive containment buildings – with their four-foot-thick concrete walls – house, below ground level, two 355-ton reactor vessels on huge concrete slabs. The twin cooling towers, large structures that stand 548 feet above the surrounding landscape, release non-radioactive steam as part of the power plant's cooling process.

Like other electric generating plants, Plant Vogtle has large turbines and generators, a computerized control room, a chemistry lab and a high-voltage switchyard. Plant Vogtle sends millions of kilowatts of electricity to destinations all across the region, providing enough energy to power approximately 600,000 homes - and we expect this number to increase following the completion of Vogtle's units 3 and 4.

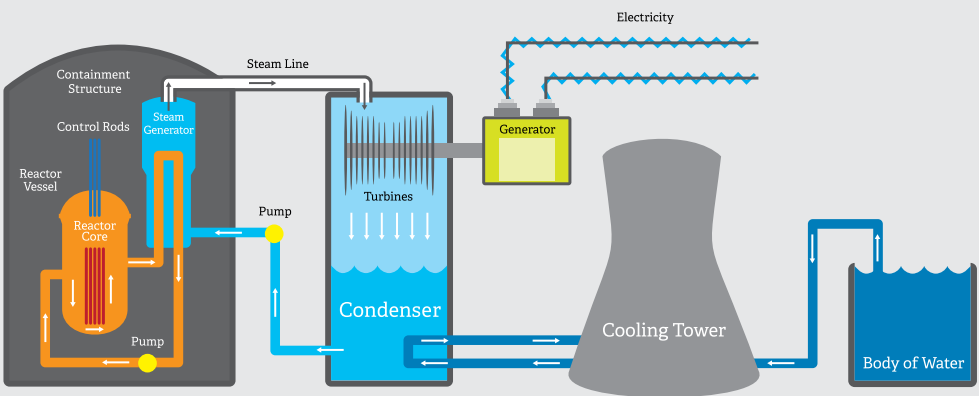
How Nuclear Power Plants Operate

While fossil power plants generate steam by burning oil, gas or coal, nuclear power plants generate steam with the use of ceramic pellets made from uranium or other fissionable elements. This steam fans the propeller-like blades of a turbine connected to the generator shaft. The electrical current from the generator is then fed to a network of wires (the electric grid) and delivered to consumers.

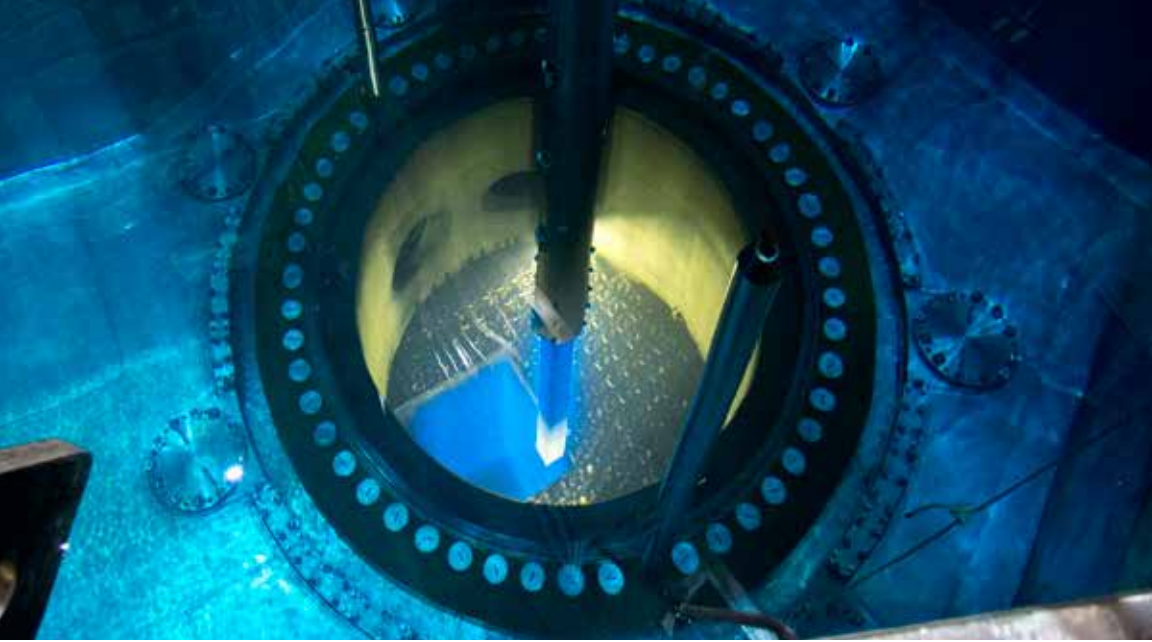
The cylindrical pellets, each about the size of a pencil eraser, are arranged in long vertical rods within the reactor. Many rods are then bundled together to form a fuel assembly. Inserted throughout bundles of the fuel tubes are many "control rods." These rods regulate a process called fission, resulting in atoms splitting, which generates heat.

Operation of the reactor is controlled by varying the number of rods, the degree to which these rods are inserted or withdrawn from the core and by controlling other plant parameters.

Pressurized Water Reactor (PWR)



This simplified diagram shows how the steam generating process works.



The Water Cycles

Pressurized water reactors, such as the two at Plant Vogtle, use three separate water systems. To begin, water is pumped under high pressure through the reactor core where the nuclear chain reaction heats the water to a temperature of about 630 degrees Fahrenheit. Because the water in the reactor is kept under high pressure, it does not boil into steam. This hot water travels from the reactor to the four steam generators – located inside the protective containment structure – before it is pumped back into the reactor.

In the steam generator, cooler water in a separate system surrounds the tubes filled with hot water from the reactor core, which heats the cooler water until it boils into steam. This water does not mix with the reactor water. The hot steam passes to the turbine where it strikes the turbine blades, making the turbine spin much like a windmill when wind hits its blades. The turbine then spins an electric generator, producing electricity. After the steam is used, it is condensed into water to continue the cycle.

The condensers cool by circulating water from natural draft cooling towers using water from the Savannah River. This third, separate water system never comes in contact with the steam within the power plant or water in the reactor cycle.

Public Safety

Safety is the top priority of the U.S. nuclear energy industry. We take very seriously our obligation to protect the health and safety of our employees, the public and the environment.

Securing Our Facilities

Prior to Sept. 11, 2001, nuclear power plants were already the most secure facilities of any industrial sites in the nation. Since Sept. 11, the nuclear power industry has taken a number of significant steps to reinforce and enhance our security measures, including increased personnel, training, technology and barriers – spending an additional \$1.2 billion on security throughout all commercial nuclear power facilities in the United States.

Nuclear power plants are an important component of the nation's critical infrastructure and have been designed with multiple layers of protection, including structural strength, highly trained operators and proven emergency plans.

The NRC holds nuclear power plants to the highest security standards of any American industry. And, of the 17 infrastructure categories currently under evaluation by the U.S. Department of Homeland Security, the nuclear power sector is by far the best protected. Furthermore, the nuclear power sector is referenced by Homeland Security as its security standard.

Emergency Planning

Comprehensive plans have been developed in accordance with federal requirements by the NRC and other oversight agencies to respond to an emergency at any of the Southern Nuclear-operated facilities.

Southern Nuclear has overall responsibility for the emergency plan, which involves Southern Nuclear, Georgia Power and county, state and federal agencies.

The emergency plan specifies the procedures, personnel and equipment used to classify an emergency, and defines and assigns responsibilities and outlines an effective course of action for safeguarding personnel, property and the general public.

These plans are updated regularly and maintained at all times. Drills and exercises are conducted frequently to test these plans and to train and evaluate personnel on procedure adherence.

In the unlikely event of an emergency, Southern Nuclear would notify off-site authorities such as the Georgia Emergency Management Agency, the NRC and local county officials. Communication would be maintained with these agencies to keep them fully aware of the emergency status, including on-site and off-site radiological information.

FLEX Strategy

Following the earthquake and tsunami that impacted the Fukushima Daiichi Nuclear Plant in March 2011 in Japan, industry leaders in the U.S. worked together to develop a flexible, diverse coping strategy that would protect U.S. plants against extreme events. The FLEX strategy includes built-in safety systems at the plant, as well as portable emergency equipment such as generators, battery packs, pumps, air compressors and battery chargers to the plant site. With this backup equipment that is stored on site, the plant has greater capability for ensuring power and water are available to maintain key safety functions. In the absence of AC power from built-in safety systems, this equipment can be deployed quickly by plant employees. It would be used to maintain reactor core cooling, used fuel pool cooling and containment integrity. This equipment provides the greatest safety benefit to the plant in the shortest amount of time.

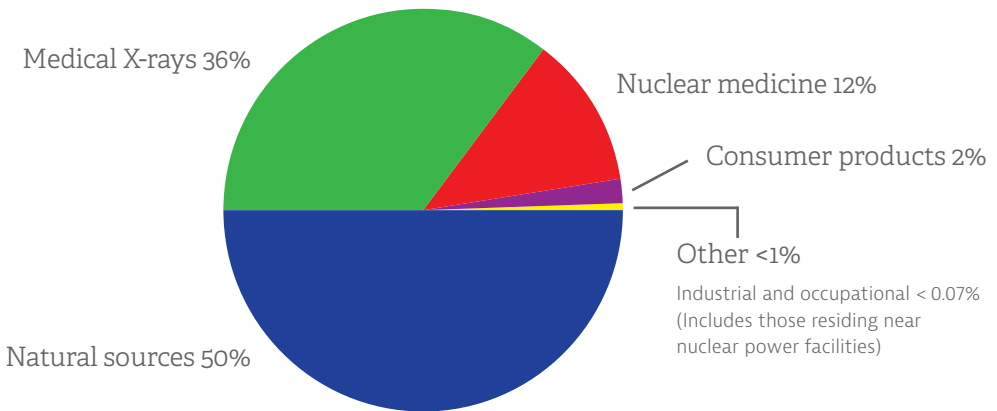
The FLEX strategy also has a third component – two emergency response centers, one in Memphis, Tenn. and one in Phoenix. Each of these secure, 80,000-square-foot facilities has five sets of equipment that can be transported by truck or air to a plant site anywhere in the United States in 24 hours. The equipment at the centers is the same as the equipment that's stored in our dome. It would only be sent if something happened to our on-site equipment during an extreme and unexpected event. This backup equipment – both at the emergency response centers and here at the dome – ensures that plant operators can maintain key safety functions even if off-site power sources are curtailed.

Radiation

The combined effect of the structural, mechanical and human safety systems built into our nuclear plants means that a person living within a few miles of a plant receives less radiation from its presence than from watching television.

Radiation absorbed by the human body is measured in millirem. The average "background" radiation from our natural environment (sunlight, food, rocks, soil) adds up to around 250 to 300 millirem a year, depending on where we live. Other man-made sources of low-level radiation add greatly to this total.

Exposure to Radiation



A typical chest X-ray is about 10 millirem of radiation; a jet airplane flight from New York to California and back again adds 5 millirem. Those living within a 5-mile radius of a nuclear power plant will receive less than one millirem of radiation per year.

Federal regulatory agencies carefully set and enforce dose limits to protect the public, the environment and plant employees.

Defense in Depth

Nuclear power plants are designed with many redundant safety systems, sometimes called “defense in depth.” Fuel pellets, which are between three and five percent fissionable U-235, are sealed in zircaloy tubes. The fuel assemblies are then contained in a reactor vessel, which has 8-inch-thick steel walls and weighs about 500 tons including the weight of the reactor head. All this is housed in a containment building. There are several redundant cooling systems to minimize the possibility of overheating the reactor core. A nuclear reactor operating at full power can be shut down in a few seconds by rapidly inserting the control rods to stop the fission process.

New Nuclear Plant Development

To meet the rising demand for electricity as the state of Georgia adds more than 4 million new residents by 2030, Georgia Power and Southern Nuclear are building two additional nuclear energy facilities at Plant Vogtle, the first new nuclear generation to be built in the United States in more than 30 years.

Once complete, the new Westinghouse AP1000 reactors will produce enough energy to power 500,000 Georgia homes and businesses. Final regulatory approval for the project was received in February 2012 when the Nuclear Regulatory Commission issued the Construction and Operating Licenses for units 3 and 4.



The new units are incorporating safety and technology enhancements that improve the already stellar record of the company's operating facilities. At the facility site, significant work has been done on the turbine islands, cooling towers and nuclear islands. Major components began arriving at the site in late 2012 and early 2013, the first of which was the reactor vessel for Unit 3.

The construction of Vogtle 3 and 4 is currently the largest job-producing project in Georgia, employing approximately 6,000 people during peak construction. It will create 800 permanent jobs when the facilities begin operating.

The co-owners of Vogtle Units 1 and 2 will maintain their current ownership shares of Vogtle 3 and 4: Georgia Power, 45.7 percent; Oglethorpe Power, 30 percent; Municipal Electric Authority of Georgia (MEAG), 22.7 percent; and Dalton Utilities, 1.6 percent.

The Nuclear Advantage

Nuclear energy is a safe, reliable, cost-effective form of energy. Since 1974, Southern Company has operated nuclear plants safely and reliably. The average 3-year capacity factor of our nuclear power plants is more than 90 percent. Capacity factor is the percent of time the unit is available to provide power to the electrical grid. Nuclear power has a low production cost compared with other fuel sources. Uranium is used as nuclear fuel, and it has less price volatility than other fuel sources such as coal and natural gas.

Nuclear power adds diversity to our energy portfolio. Twenty percent of the nation's electricity is supplied by nuclear power. Behind coal and natural gas, it is the third leading source of electricity. The use of nuclear power increases our independence by decreasing our dependence on foreign oil.

Nuclear power produces no greenhouse gases, making it a sound, environmentally responsible fuel source. Nuclear power accounts for three-quarters of all emission-free electric generating capacity in the U.S.

Protecting Our Environment

Plant Vogtle's Commitment to the Environment

In addition to the clean air features of nuclear power, Plant Vogtle has been a certified Wildlife Habitat Council site since 1993. More than 600 acres have been replanted with loblolly and native longleaf pines. Plant Vogtle also participates in bluebird nest monitoring and local environmental education programs.



Bluebird nest

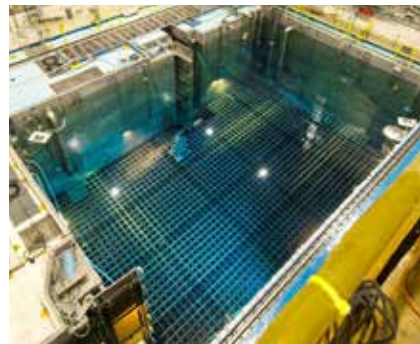
Plant Vogtle has management programs that enhance the habitat for species such as bluebirds, wood ducks, wild turkey and the endangered red-cockaded woodpecker. Land management efforts at Plant Vogtle contributed to Southern Company's certification as a member of the National Wild Turkey Federation Energy for Wildlife.

Storage of Used Fuel

A solid material, used nuclear fuel is safely stored at nuclear power plant sites, either in steel-lined, concrete pools filled with water or in steel or steel-reinforced concrete containers with steel inner canisters. The first on-site storage method is referred to as the spent fuel pool. The second is called dry cask storage.

Spent Fuel Pool

When most of the uranium has been used in the fission process, the fuel assemblies are removed from the reactor vessel and replaced with new fuel assemblies. At most plants, used fuel is stored in large, steel-lined, concrete pools filled with water. These pools are known as spent fuel pools. Both water and concrete are excellent radiation shields. In these spent fuel pools, the water acts as an absorber and prevents radiation from escaping the pool. The water also keeps the fuel cool while the fuel decays or becomes less radioactive over time. The water itself is completely contained inside the plant's concrete auxiliary building.



Spent fuel pool

Dry Cask Storage

Under the Nuclear Waste Policy Act of 1982, the U.S. Department of Energy is the federal agency responsible for the disposal of high-level waste such as used nuclear fuel. After decades of exhaustive scientific and engineering research, a permanent repository for the used fuel still has not been established.

The government's delay in providing a permanent repository means that nuclear plants must store more used fuel than expected and store it for longer than originally intended. Since 1986, dozens of U.S. nuclear plants have supplemented their storage capacity by building above-ground dry storage facilities. Other countries also have safely and successfully stored used fuel above ground since the mid-1970s.

All of Southern Nuclear's plants use dry cask storage. Dry storage casks are cylindrical containers constructed of steel or steel-reinforced concrete and lead, which serve as proven, effective radiation shields. These containers effectively shield the radiation as used fuel continues its cooling process. Once loaded with used fuel assemblies, the containers are stored either horizontally in a concrete vault or stored upright on a thick concrete pad.

Each dry storage container design must be approved by the NRC. The agency requires that dry storage containers be constantly monitored and relicensed

Dry cask storage



every 20 years. The containers are designed and tested to prevent the release of radiation under the most extreme conditions – earthquakes, tornadoes, hurricanes, floods and sabotage – and they are naturally cooled and ventilated.

Spent fuel pools at nuclear plants were designed to store at least a decade's worth of used fuel. With dry storage, used fuel can be safely stored for much longer. The NRC has determined that used fuel can be safely stored at plant sites for at least 30 years beyond the licensed operating life of the plant. While used nuclear fuel can be safely stored on-site, Southern Company and the industry maintain that a permanent underground repository is the best, long-term solution.

These storage areas are well protected by a combination of sturdy plant construction, state-of-the-art surveillance and detection equipment, and armed, well-trained paramilitary security forces.

Owners and Operators

Southern Nuclear, headquartered in Birmingham, Ala., operates Southern Company's six nuclear units at three locations: the Alvin W. Vogtle Electric Generating Plant near Waynesboro, Ga., the Edwin I. Hatch Nuclear Plant near Baxley, Ga., and the Joseph M. Farley Nuclear Plant near Dothan, Ala. Plants Vogtle and Hatch were built by and are co-owned by Georgia Power, Oglethorpe Power Corporation, the Municipal Authority of Georgia and Dalton Utilities. Together, these two nuclear power plants generate approximately 20 percent of Georgia Power's electricity. Plant Farley was built and is owned by Alabama Power, and the plant generates approximately 20 percent of Alabama Power's electricity.

With more than 9 million customers and approximately 44,000 megawatts of generating capacity, Atlanta-based Southern Company (NYSE: SO) is the premier energy company serving the Southeast through its subsidiaries.

Southern Company and its subsidiaries are leading the nation's nuclear renaissance through the construction of the first new nuclear units to be built in a generation of Americans.

Southern Company has been named by the U.S. Department of Defense and G.I. Jobs magazine as a top military employer, recognized among the Top 50 Companies for Diversity and the No. 1 Company for Progress by DiversityInc and designated as one of America's Best Employers by Forbes magazine.

The overall performance of Plant Vogtle has been outstanding over its 30 years of operation and continues to improve. In fact, Plant Vogtle generated more electricity in 2016 than any other year in its history. Investing for another 30 years of safe operations, personnel in 2017 installed a new digital turbine control system that will ensure even more reliable production of electricity for the future.

Plant Vogtle was named the Augusta area's Outstanding Corporation at the 2016 National Philanthropy Day ceremony – an annual event held by the Greater Augusta Chapter of the Association of Fundraising Professionals. Vogtle was nominated for the award by United Way of the CSRA in recognition for countless hours of community service and nearly \$3 million in employee and corporate donations over the years.

Plant Vogtle Energy Education Center

Visit the Plant Vogtle Energy Education Center and experience Georgia's largest nuclear energy generating plant. Call in advance to book your tour at 706.724.5197.



Alvin W. Vogtle Electric Generating Plant

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