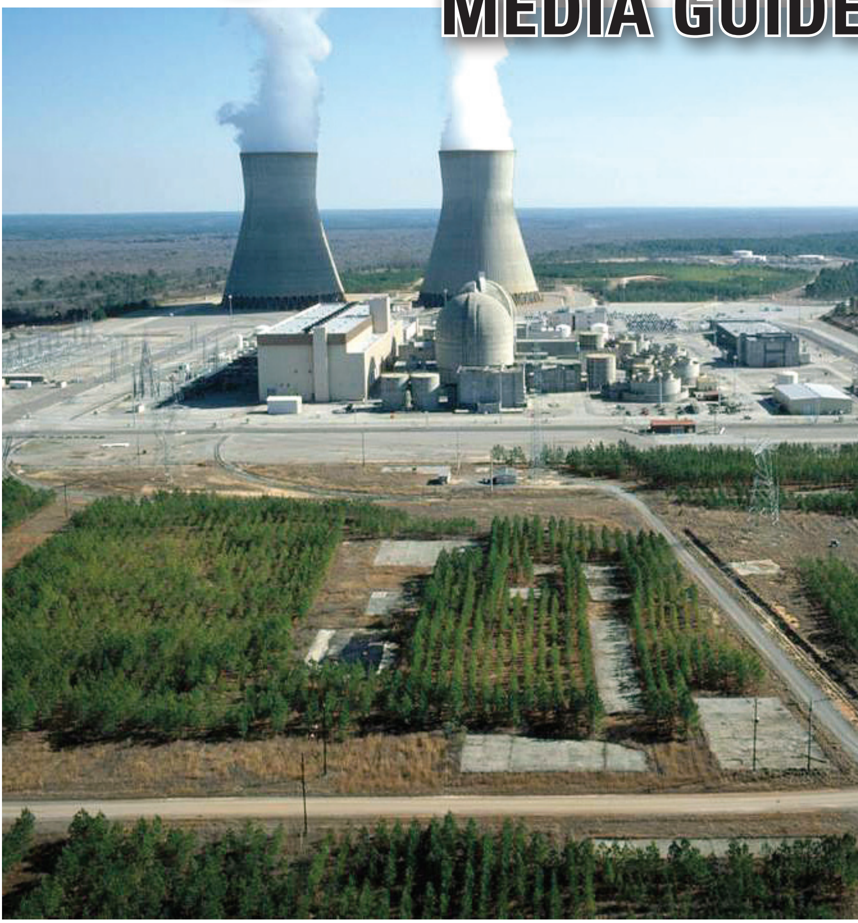
PLANT Vogtle

Alvin W. Vogtle Electric Generating Plant

MEDIA GUIDE



GEORGIA POWER
A SOUTHERN COMPANY

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A Guide for Journalists

Covering the news related to nuclear power can be challenging for reporters. The nuclear power industry is one of the most highly regulated industries in America. And it's very complex. Southern Nuclear Operating Company's Public Affairs department developed this Media Guide for the Alvin W. Vogtle Electric Generating Plant to help journalists cover the many aspects related to the plant and to nuclear power in general.

We strive to give honest, straightforward answers to questions from the media about our company and Southern Company's nuclear power plants. And we pride ourselves on being available to the media when you need us. In fact, our Media Line is available 24 hours a day: 205-992-5395. After hours and on the weekends, a media relations representative always is on call and will call you back promptly.

This Media Guide is designed to provide quick, specific information about Plant Vogtle's two nuclear units, as well as helpful information on the benefits of nuclear power, safety and security, emergency planning, nuclear physics, nuclear fuel and other topics related to nuclear power generation. The illustrations and explanations will help you understand how certain components and systems work in a nuclear power plant. Many terms commonly used in the nuclear power industry are defined.

We hope this information will help you when you cover stories about Plant Vogtle or the nuclear power industry. Our company needs you, because you are a very important source of information to our customers and neighbors living near the plant. In the unlikely event of an emergency, your role in informing the public with timely, accurate information would be vital.

Please contact us whenever you need information about Plant Vogtle or about the nuclear power industry. And we would be happy to host you at the plant for a more in-depth look at what we do. We look forward to working with you.

Public Affairs
Southern Nuclear Operating Company

Owners and operators

Southern Nuclear Operating Company, 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. Plant Vogtle and Plant Hatch were built by and are co-owned by Georgia Power Company, Oglethorpe Power Corporation, the Municipal Electric 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 19 percent of Alabama Power's electricity.

Southern Nuclear, Georgia Power and Alabama Power each are wholly -owned subsidiaries of Southern Company. With 4.2 million customers and more than 42,000 megawatts of generating capacity, Atlanta-based Southern Company (NYSE: SO) is the premier energy company serving the Southeast, one of America's fastest-growing regions. A leading U.S. producer of electricity, Southern Company owns electric utilities in four states and a growing competitive generation company, as well as fiber optics and wireless communications. Southern Company brands are known for excellent customer service, high reliability and retail electric prices that are significantly below the national average. Southern Company is consistently listed among the top U.S. electric service providers in customer satisfaction by the American Customer Satisfaction Index (ACSI). Visit our website at www.southerncompany.com.

Georgia Power is the largest subsidiary of Southern Company, one of the nation's largest generators of electricity. The company is an investor-owned, tax-paying utility, serving its 2.25 million customers in all but four of Georgia's 159 counties. Georgia Power's rates are below the national average. Visit Georgia Power's website at www.georgiapower.com.

Oglethorpe Power Corporation is a $4.8 billion power supply cooperative serving 38 Electric Membership Corporations (EMCs) in Georgia. These EMCs provide retail electric service to more than 3.7 million Georgians throughout the state. Oglethorpe Power is the nation's largest electric cooperative in terms of assets, annual kilowatt-hour sales and ultimate consumers served. Visit Oglethorpe Power's website at www.opc.com.

The Municipal Electric Authority of Georgia (MEAG) is a public corporation providing power to 49 Georgia communities that in turn bring energy to approximately 600,000 citizens. As the third largest power supplier in the state, MEAG had energy sales that exceeded $703 million in 2005. MEAG has assets of more than $4.8 billion, co-owns four generating plants with a generating capacity of 1,566 megawatts, and co-owns Georgia's Integrated Transmission System (ITS). Visit MEAG's website at www.meagpower.org.

Dalton Utilities has operated as a public utility since 1889. Dalton Utilities provides potable water, electrical, natural gas and wastewater treatment services to the City of Dalton and portions of Whitfield, Murray, Gordon, Catoosa and Floyd counties. Dalton Utilities serves approximately 65,000 customers. Visit Dalton Utilities' website at www.dutil.com.

Safety and emergency planning

Safety is the first priority in operating our nuclear plants. Safety was emphasized during plant design and construction, and safety continues to be emphasized daily in oversight of operations, training of employees, validation of monitoring instruments and controls, testing of safety systems, and communication between operators, utilities, system suppliers and regulators. In the unlikely event of an emergency at any of our nuclear plants, special guidelines would be implemented to protect the safety of the general public surrounding the plant.

Precautions have been taken to ensure that an accident does not occur at Plant Vogtle. However, emergency plans have been developed to ensure quick and effective response should an emergency occur. The Plant Vogtle Emergency Plan specifies procedures for Southern Nuclear, Georgia Power, and county, state and federal governments in responding to an emergency and to the needs of the public. Southern Nuclear has overall responsibility for the plant's Emergency Plan, which also involves the public and the news media.

The role of the news media during an emergency

The news media plays an important role in informing the public about nuclear power. That role becomes even more critical in the unlikely event of an emergency.

If an emergency occurred at Plant Vogtle, a joint information center would be established in Waynesboro, Ga., for the use of the news media. Southern Nuclear, Georgia Power, and county, state and federal officials responding to the emergency would disseminate information and hold joint news briefings there. This joint information center is called the Emergency News Center, and it is located in the Burke County Office Park on Highway 56 in Waynesboro, Ga. Phone numbers for key contacts and directions to the facility are listed in the section called "News Media Contacts and Directions."

If you are assigned to cover events at Plant Vogtle, now or during the unlikely event of an emergency, it's important for you to develop basic understanding of nuclear safety systems, radiation, and the emergency plans in place to protect the public. Please take time to read this Media Guide and call us with any questions you have. A media representative is on call at all times. Tours of Plant Vogtle are available, and you are encouraged to set up an appointment to visit us.

EMERGENCY NEWS CENTER
Burke County Office Park (next to Pineland Bakery), Highway 56, Waynesboro, Ga.

Nuclear power plant control room

The Benefits of Nuclear Power

The benefits of nuclear power are many. First and foremost, nuclear power is a safe, reliable and cost-effective source of electricity. Nuclear power provides 15 percent of Southern Company's generation, and we have been operating nuclear plants safely and reliably for more than 25 years. Southern Company's three nuclear plants have operated at high levels of reliability, with an average three-year fleet capacity factor of 91.1 percent, exceeding the U.S. average of 89.13 percent for the years 2006-2008. Capacity factor means 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.

Nuclear energy helps diversify our fuel mix, both for Georgia Power's customers and for our country. Nuclear power provides 20 percent of the nation's electricity and is a key element in a balanced fuel mix. Nuclear power increases America's energy independence by decreasing our dependence on foreign oil. Nuclear power also helps to relieve energy cost uncertainty caused by volatile natural gas and coal prices. Today there are 104 nuclear power reactors operating in 31 states. Nuclear power is the second leading source of electricity, after coal.

Nuclear energy is a sound, environmentally responsible fuel source. Nuclear energy produces no greenhouse gases. Nuclear power accounts for three-quarters of all emission-free electric generating capacity in this country.

Nuclear energy will continue to play an important role in meeting the growing energy needs of Southern Company customers, as the Southeastern U.S. continues to expand rapidly. Southern Company is a leader in the nuclear power industry, and is exploring nuclear development opportunities to meet our customers' needs in the future.

Nuclear technology is used every day in many diverse ways to benefit the world and our standard of living. Nuclear technology is used in the medical field, for exit signs in schools and office buildings, and for the production of electricity. Nuclear technology for the production of electricity is very safe, and that safe operation is demonstrated every day.

On-call media relations representatives

Southern Nuclear Operating Company
205-992-5395

Georgia Power
404-506-7676 or 800-282-1696

Plant Vogtle Visitors Information Center
706-826-3630 or 706-826-3632

Web sites
www.southerncompany.com
www.georgiapower.com

During an emergency

Plant Vogtle Emergency News Center
(Activated only in the event of an emergency at the plant)
706-554-1859

Georgia Power Corporate Media Center
(Activated only in the event of an emergency at the plant)
404-506-7676 or 800-282-1696

Plant Vogtle recorded information line containing most current information:
(Activated only in the event of an emergency at the plant)
888-847-1186

Contacts for federal, state and local agencies

Federal agencies

Nuclear Regulatory Commission (NRC)
Public Affairs, Region II, Atlanta
opa2@nrc.gov or 404-562-4416 or 4417 (during business hours)
After hours, call the NRC Headquarters Operations Officer in Rockville, Md.: 301-816-5100

Federal Emergency Management Agency (FEMA)
770-220-5200 (24 hours)

Savannah River Site/Department of Energy/Savannah River Nuclear Solutions
803-725-3333

State agencies

Georgia Emergency Management Agency (GEMA)
Public Information Officer, Atlanta
404-635-7200 (24 hours) or 404-635-7000 (during business hours)

South Carolina Emergency Management Division
803-737-8500

Local emergency management agencies

Burke County Emergency Management Agency
706-554-6651

Aiken County Emergency Management Agency
803-642-1623

Allendale County Emergency Management Agency
803-584-4081

Barnwell County Emergency Management Agency
803-259-7013

Alvin W. Vogtle
Emergency News Center
(WHERE MEDIA SHOULD GO IN AN EMERGENCY)

Highway 56, Waynesboro, Ga.
(in the Burke County Office Park)

Once this facility is activated, media calls should be directed to 706-554-1859. Spokespersons from Southern Nuclear, Georgia Power, Georgia Emergency Management Agency, and the affected county, state and federal agencies responding to the event will be at the Emergency News Center to discuss their activities.

Directions to Plant Vogtle Emergency News Center

FROM ATLANTA

Take I-20 east out of Atlanta to I-520 in Augusta.
Take I-520 east to U.S. Highway 25.
Proceed on U.S. Highway 25 to Waynesboro.
Turn right onto Georgia Highway 80/56 in Waynesboro.
The Burke County Office Park is on Georgia Highway 80/56, on the right, about .8 of a mile beyond the intersection of Georgia Highway 80/56 and U.S. Highway 25.

FROM AUGUSTA

Take U.S. Highway 25 south out of Augusta to Waynesboro.
Turn right onto Georgia Highway 80/56 in Waynesboro.
The Burke County Office Park is on Georgia Highway 80/56, on the right, about .8 of a mile beyond the intersection of Georgia Highway 80/56 and U.S. Highway 25.

FROM PLANT VOGTLE

Exit Plant Vogtle and turn right onto River Road.
At the intersection of River Road and Georgia Highway 80, turn left onto Georgia Highway 80 and proceed southwest to the convergence of Georgia Highway 80 and 56.
Turn left on Highway 56 and proceed southwest into Waynesboro.
The Burke County Office Park is on Georgia Highway 80/56, on the right, about .8 of a mile beyond the intersection of Georgia Highway 80/56 and U.S. Highway 25.

FROM WAYNESBORO AIRPORT

Turn left at the end of the Airport Access Road onto Highway 25.
Proceed north to the traffic sign.
Turn left and proceed to the second traffic sign.
Turn left and proceed approximately .8 of a mile. The Burke County Office Park is on the right. (Case International Tractor Dealership is on the left.)

Note: Media personnel should use the **front entrance.**

About Plant Vogtle

Plant Vogtle sits on a 3,200-acre site along the Savannah River, in Burke County near Waynesboro, Ga., and approximately 34 miles southeast of Augusta, Ga. Similar to other electric generating plants, Plant Vogtle has large turbines and generators, a computerized control room, and a chemistry lab, and is connected to the electric grid through high-voltage switchyards. However, massive containment buildings – with thick walls of concrete and steel – house two 355-ton reactor vessels on huge concrete slabs. These concrete structures shield the environment from radiation. The 548-foot-high twin cooling towers can be seen for miles.

Approximately 900 people – engineers, mechanics, control room operators, lab technicians, instrument and control technicians, electricians, security officers and others – oversee the plant's operations 24 hours a day, every day of the year. 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.

Who was Alvin W. Vogtle?

The plant is named for the late Alvin W. Vogtle, Jr., former chairman of the board of Southern Company, parent company of Southern Nuclear and Georgia Power. Vogtle first joined the Southern system as president of Southern Electric Generating in 1960 after serving as the company's legal counsel at a Birmingham law firm. In 1962, he was named executive vice president of Alabama Power, and in 1965, he was named vice president of Southern Company and Southern Company Services. He became executive vice president of Southern Company in 1966, and in 1969, he was named as the fourth president of Southern Company, serving as the company's chief executive until his retirement in 1983.

The former chairman led the utility during a time of unprecedented growth and economic challenges, including the energy crisis of the 1970s and a decade of inflation with historically high energy prices. He was recognized throughout the industry for his judgment and leadership abilities, serving on numerous business and civic boards. Vogtle was named Executive of the Year in 1981 by the National Management Association and Chief Executive of the Year for the electric utility industry in 1978 by *Financial World Magazine*.

Born in Birmingham, Ala., in 1918, Vogtle earned a Bachelor of Science degree from Auburn University. At the age of 23, he received a law degree from the University of Alabama. He achieved a distinguished military record during World War II. After flying more than 30 combat missions as a U.S. Army Air Corps pilot, Vogtle crashed in North Africa and became a German prisoner of war. During two years of captivity, he made five unsuccessful escape attempts. On his sixth try, he scaled a 15-foot-high barbed-wire fence and reached freedom in Switzerland. He was awarded the Purple Heart, and his service formed the basis for the 1963 movie, "The Great Escape." Alvin W. Vogtle died in 1994.

Plant facts and statistics

Owners

Georgia Power Company	45.7%
Oglethorpe Power Corporation	30.0%
Municipal Electric Authority of Georgia	22.7%
Dalton Utilities	1.6%

Operator
Southern Nuclear Operating Company

Location
In Burke County on the Savannah River near Waynesboro, Ga., and approximately 34 miles southeast of Augusta, Ga.

Nearest City
Waynesboro, Ga.

Reactors
Type – Pressurized Water Reactor (PWR)
Rated capacity (size) – 1,225 megawatts per unit

Nuclear Steam Supply System (Reactor Manufacturer)
Westinghouse Electric Company

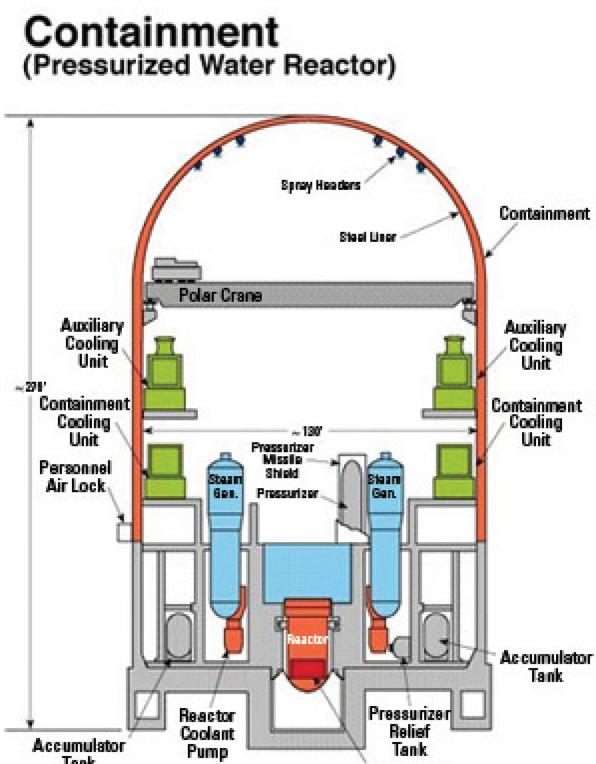
Turbine Generator Manufacturer
General Electric Company

Engineer/Construction Firm:
Bechtel Corporation
Southern Company Services

Containment
Vertical cylindrical, post-tensioned concrete structure with a dome and a flat base. It houses the reactor, reactor coolant system and other Nuclear Steam Supply System (NSSS) components. The interior is lined with a carbon steel plate. Concrete shields the reactor and other NSSS components. The containment building is 140 feet in diameter and 226 feet high. There are two containment buildings, one for each reactor.

Construction Start Date
1974

Commercial Operation
Unit 1 – June 1987
Unit 2 – May 1989



Typical containment structure

Cost
$8.87 billion, including financing

Size of Site
3,150 acres

Employment
Approximately 900

Fuel (17x17 array)
Fuel assemblies: 193
Overall length of fuel assembly: approximately 12 feet
Fuel rods per assembly: 264

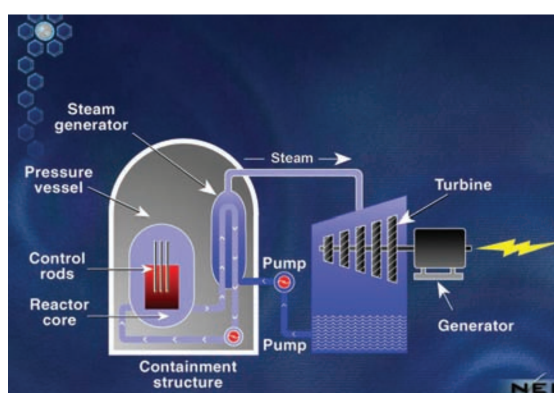
Control Rods
(Rod Cluster Control Assemblies – RCCAs)
Number of RCCAs: 53
Control rods per RCCA: 24
Absorber material composition: silver-indium-cadmium
Cladding: stainless steel

Emergency Power (Safety Related)
Diesel generators: 2 per unit
Rated capacity: Seven megawatt each
Four 125-volt DC buses per unit

Reactor Coolant System (RCS)
Four loops, each loop with a reactor coolant pump and steam generator. Operates at a nominal pressure of 2,235 psig (pounds per square inch gauge).

Reactor Coolant Pumps
Four pumps, each 7,000 horsepower with 100,600 gallons per minute capacity. Operating Voltage: 13,800 volts

Steam Generators
Four generators, each with 5,626 tubes made of stainless steel



Typical Pressurized Water Reactor (PWR) design

Circulating Water Systems (CWS)
The condenser is cooled by the circulating water system, which transfers heat to the cooling towers. Water comes from water wells or from the Savannah River.

Plant Vogtle Achievements

In addition to major achievements such as setting safety and reliability records, Plant Vogtle employees set the standard for improving the quality of life in the local community.

Environmental commitment

Plant Vogtle has been a certified Wildlife Habitat Council site since 1993. More than 600 acres have been replanted with loblolly and native longleaf pine. Plant Vogtle also participates in bluebird nest monitoring and local environmental education programs.

Loblolly Pine

The plant is located in a rural area that supports diverse wildlife. Plant Vogtle has management programs that enhance habitat for species such as bluebirds, wood ducks and wild turkey. Land management efforts at Plant Vogtle contributed to Southern Company's certification as a member of the National Wild Turkey Federation Energy for Wildlife.

Plant Vogtle has also recently entered into a Safe Harbor Agreement with the Georgia Department of Natural Resources for the red-cockaded woodpecker, a federal endangered species. This Safe Harbor Agreement ensures that adequate habitat will be provided and managed properly for the red-cockaded woodpecker.

Red-cockaded woodpecker

Community service

Plant Vogtle employees strive to be good corporate citizens by giving back to the local community. Many employees volunteer hours of personal time and contribute financially to charities, schools and organizations that help those in need.

For example in 2009, Southern Nuclear and Georgia Power employees at Plant Vogtle:

- Pledged more than $100,000 to the United Way of the Central Savannah River Area.
- Participated in:
  - The American Cancer Society's "Relay for Life"
  - Reading programs at the plant's partner school, SGA Elementary
  - Environmental Teacher Corps
  - Educational outreach programs
  - The Martin Luther King, Jr. Day Project at Phinizy Swamp Nature Park
  - Blood drives for Shepard Community Blood Center
  - Central Savannah River Area College Night
  - Burke County Energy Academy
  - Teacher workshops
- And served as members of:
  - The Citizens of Georgia Power, Vogtle Chapter
  - The Citizens of Georgia Power, Waynesboro Chapter
  - The United States military, both at home and abroad

Emergency Planning

Comprehensive plans have been developed and approved by the Nuclear Regulatory Commission and other oversight agencies to respond to an emergency at Plant Vogtle, in accordance with federal requirements. Southern Nuclear has overall responsibility for the Plant Vogtle Emergency Plan, which involves Southern Nuclear, Georgia Power and various county, state and federal agencies.

The Emergency Plan specifies the procedures, personnel and equipment which would be used to classify an emergency, to define and assign responsibilities, and to outline 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 annually to test these plans and to train and test personnel on following procedures correctly.

Managing a nuclear plant emergency

At Plant Vogtle, technical staff is on duty 24 hours a day, 365 days a year. These men and women are trained to recognize and correct plant problems before they become emergencies. If an emergency does occur, plant personnel are prepared to serve as the initial on-site emergency response organization. Depending on emergency severity, the on-site personnel would be supplemented and supported by additional Southern Nuclear and Georgia Power personnel within one hour.

In addition, emergency support is available from a variety of other organizations, including the U.S. Nuclear Regulatory Commission, the state of Georgia, the state of South Carolina, the U.S. Department of Energy, other electric utility companies, the Institute of Nuclear Power Operations, and the Nuclear Energy Institute.

Should an emergency occur, one of the first steps taken would be to notify off-site authorities such as the Georgia Emergency Management Agency (GEMA), the South Carolina Emergency Management Division, the U.S. Nuclear Regulatory Commission, 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.

At the same time, employees would begin taking steps immediately to restore the plant to a safe condition, monitor and control radiation, and manage and coordinate all emergency activities. These activities take place in specially equipped facilities.

Information dissemination in the event of an emergency

In the event of an emergency at Plant Vogtle, an Emergency News Center would be established to disseminate information to the news media. The Emergency News Center is located at a separate site near the plant, in the Burke County Office Park on Highway 56 in Waynesboro, Ga. All emergency information would be disseminated from the Emergency News Center, which would serve as a joint information center for Southern Nuclear, Georgia Power and the local county, state and federal agencies involved in responding to the emergency.

A Corporate Media Center would be established at Georgia Power's Corporate Headquarters at 241 Ralph McGill Boulevard in Atlanta. The Corporate Media Center would serve as an initial information center until the Emergency News Center nearer the plant site is activated.

The degree of activity at these and other off-site emergency facilities would depend on the severity of the emergency.

Kinds of emergencies

There are four classifications used to describe severity levels of nuclear power plant emergencies. From least severe to most severe, the emergency classifications are listed below.

1. **Unusual Event.** A minor problem has occurred. No release of radioactive matter has taken place or is expected. There is no danger to the public. Residents do not have to take any action.

2. **Alert.** Small amounts of radioactive material could be released inside the plant. An alert gets emergency workers ready if the event becomes more serious. There is no danger to the public. It is unlikely that residents will need to do anything.

3. **Site Area Emergency.** There has been a serious problem. Small amounts of radioactive material could be released into the area close to the plant. Government officials may order evacuation or sheltering of the public as a precaution. Emergency workers would be ready to take actions if needed. Residents will be advised to tune in to their Emergency Alert stations (radio or television) for more information.

4. **General Emergency.** This is the most serious type of emergency at a nuclear power plant. Radioactive material could be released outside the plant site. State and county agencies may direct residents to take protective actions. If so, residents will be notified by tone alert radio or through the media. County officials will assist and direct residents.

Emergency notification systems

There are a variety of emergency notification systems that would alert residents near Plant Vogtle if an emergency should occur.

Vogtle Tone Alert Radios
Vogtle tone alert radios have been distributed to homes and businesses within 10 miles of the plant. A loud tone will sound and a short message will be broadcast directing residents what to do and advising them to listen to a local radio or television station for more details. Radios are tested each Wednesday.

Siren Systems
Sirens have been installed within the 10-mile Emergency Planning Zone (EPZ) around Plant Vogtle. These sirens alert residents to listen to a local radio or television station. The sirens have a sound different from fire trucks. They are tested frequently. They will sound briefly during Plant Vogtle's annual emergency drill and during maintenance.

Public protective actions

If an emergency occurred at Plant Vogtle, state and county officials would be notified immediately. They, in turn, would determine the need for any protective measures for the public. The public in the vicinity of the plant would be told about an emergency immediately by a variety of emergency notification systems – by tone alert radios (in homes, businesses and institutions), or by outdoor sirens, loudspeakers, or emergency workers. In addition, emergency information would be broadcast over local radio and TV stations designated as alert stations in the Emergency Alert System.

Depending on the severity of the emergency, state and county authorities would advise the public what action, if any, to take for protection against radiation. The two actions health officials might recommend are called **take shelter** and **evacuate.**

Take shelter means to protect oneself by going inside a building and keeping out as much outside air as possible. Taking shelter would generally be advised if there were small amounts of radiation in the air. The Emergency Alert System would be the major source of information and instruction to the public.

Evacuation may be ordered by government authorities during an emergency at the plant if they decide that the protection provided by taking shelter is insufficient. Citizens would be told to move to pre-designated reception centers outside the emergency area. Evacuation plans are part of the overall Plant Vogtle Emergency Plan. These evacuation plans have been thoroughly researched and include provisions for transporting, routing and housing the public; protecting property; and handling virtually every conceivable difficulty during an evacuation. Public officials have been specifically trained to carry out these plans.

Within 24 hours of an incident that requires emergency assistance for area residents – for example, when an evacuation has been ordered – an insurance pool supported by American Nuclear Insurers will establish a local claims office. Insurance personnel can provide emergency funds for out-of-pocket living expenses such as transportation, food, lodging, emergency medical treatment and lost wages.

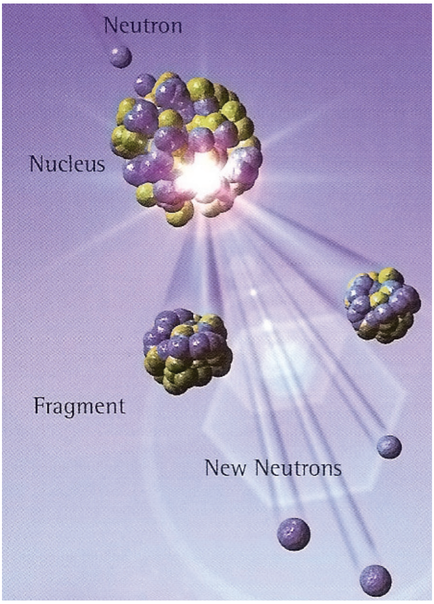
In any emergency event at Plant Vogtle that requires protective action guidelines to be issued, the utility and state and county officials would work closely with the media to ensure media organizations have accurate information to disseminate to the local population around the plant. **During an emergency, the media would have a key role in getting accurate information to the public in a timely manner.**

See back pocket of this Media Guide for a map of the Emergency Planning Zone.

The Fission Process

The fuel source for nuclear power plants is uranium. Unlike coal, gas and oil, uranium does not burn chemically. The heat needed to create steam in a nuclear power plant comes from the splitting of atoms, a process called fission.

Here's how it works
Like most U.S. nuclear power plants, Plant Vogtle uses uranium enriched in Uranium-235 (U-235) as fuel. In the reactor, uranium atoms are bombarded by neutrons, which are smaller parts of an atom (sub-atomic particles). Fission may occur when a uranium or plutonium atom absorbs a neutron and the atom splits. In the process, the atom produces additional neutrons (an average of 2.5 each fission), which go on to split more U-235 and Plutonium-239 (Pu-239) atoms, which create more neutrons, and so on. The result is a chain reaction.



Nuclear Fission ***Source: NEI***

An important by-product of nuclear fission is heat. When a uranium atom is split, it releases a large amount of energy in the form of heat, which is transferred to the coolant water. The fission process also produces two or more isotopes called fission fragments. These radioisotopes also contribute energy to the coolant, but most of the energy generated comes directly from the fission process.

This process occurs in the reactor core where the fuel transfers its heat to water that is then circulated to the steam generator.

Think of it another way…
If you used a magnifying glass to magnify rays from the sun, the rays could get very hot. If you could do this in a pool of water, you'd eventually have a hot tub. And if you could keep this up indefinitely, pretty soon you'd have a sauna.

Heat release is the key objective in power production, regardless of the fuel. Interestingly, while fission heat production may be a 20th-century phenomenon, the principle of using thermal energy (heat) to boil water to make steam to turn a turbine to produce power has been around for centuries.

Controlling fission in a nuclear reactor

The purpose of a nuclear reactor design is to create a controlled, self-sustaining chain reaction. In other words, the reaction can be turned on and maintained at a specific level.

When a nuclear power plant and its fuel are new, a neutron source (Californium) is used to get the fission process started. Interestingly, everything about the reactor – the vessel itself, its assemblies and fuel – is designed in advance to produce the desired number of fissions necessary, but no more than the optimum.

Once the reactor has started, enough neutrons remain in the fuel to restart the fission process as needed – for example, after a refueling shutdown.

Control and moderation of the chain reaction are the functions of water and control rods. The water contains boron, a chemical similar in appearance to rock salt. Borated water helps control the fission process by absorbing excess neutrons. The control rods are used to absorb neutrons as needed to control the nuclear chain reaction.

More about nuclear physics and fission

Nuclear power plants cannot explode like a nuclear weapon. Nuclear weapons are made of highly-enriched (or concentrated) uranium or virtually pure plutonium. The type of fuel used in a nuclear reactor is incapable of producing the intense chain reaction of a nuclear weapon. It is physically impossible to detonate nuclear fuel that is used to produce electricity.

Natural uranium, as it is mined, is 99.3 percent U-238 and 0.7 percent U-235. Only U-235 is readily fissionable. However, since the concentration of U-235 is so low that it will not efficiently sustain a fission chain reaction, it must be enriched. Enrichment is a complicated physical concentration process performed at special plants. Fuel used in nuclear power generating plants is enriched to about 3 to 5 percent U-235. In contrast, weapons-grade uranium is enriched to approximately 95 percent or more. So even though they come from the same base – uranium – the two are completely different.

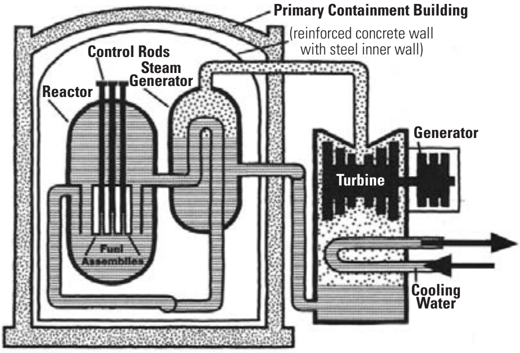
U-238 also plays an important role in power production. Neutrons are absorbed in U-238 and Pu-239 is created. In older fuel, a significant fraction of the core power is generated from plutonium fissions. Fission of U-238 also can occur, but it is not a significant contributor to the core power.

A small amount of uranium packs a lot of energy. In fact, a nuclear fuel pellet the size of a sewing thimble can produce approximately the same amount of energy as a ton of coal.

Nuclear Power Generation

Nuclear power plants generate electricity using the same engineering technology as conventional steam plants that burn fossil fuels (coal, oil, natural gas or other combustibles). The difference is the heat source used to make steam. At fossil plants, a "boiler" is used to make steam, while at nuclear plants, reactors generate heat to create steam.

In all steam generating plants, the cycle is the same: the heat source generates steam, which turns turbines, which power the electric generator. The rotation of the generator produces electrical current, which is fed into a grid, which delivers the electricity to consumers.



How Plant Vogtle works

At a nuclear plant like Plant Vogtle, fuel rods in the reactor core contain uranium oxide pellets. The uranium atoms in the pellets undergo what is called a "chain reaction," where they split, or fission, creating heat. When water is pumped from the bottom of the reactor up around the hot fuel rods, it absorbs the heat without boiling because it is kept under high pressure, like a pressure cooker. This "superheated" water is sent through tubes in a steam generator where cooler water surrounds it and boils to steam. The two water sources remain separated from each other; only the heat is transferred. The steam turns blades on a turbine generator causing it to spin a magnet inside a coil of wire. The motion causes electrons to move along the wire in a constant flow called an electric current. Cooling water from the cooling tower condenses the remaining steam and flows back to the cooling tower where excess heat is given off as a mist above the tower.

Reactor controls and operation

The reactor as a heat source is a very simple machine. It has only one set of moving parts, and when in a steady state of operation, no moving parts at all. The moving parts are the control rods, which are slowly moved in and out of the reactor core (uranium fuel) to increase or decrease nuclear power. The heat that the reactor core produces is the by-product of a sustained fission reaction. Fission occurs when free-traveling neutrons strike the nuclei of other atoms, causing them to split, while also freeing more neutrons.

Control rods regulate the reactor power because they are made from neutron-absorbing material. If they are inserted inside the core, they absorb most free-traveling neutrons, thus prohibiting the neutrons from striking and splitting other nuclei. If all the control rods are fully inserted into the reactor core, the reactor shuts down altogether. When the control rods are withdrawn, more neutrons are free and more collisions occur, producing even more neutrons and the power level increases.

The element boron is also a neutron absorber, and varying its concentration in the cooling water adjusts the number of neutrons available to produce fissions, thus controlling the power level. Boron is used to fine tune reactor power or for shutting down the reactor during emergency shutdowns, prolonged unit outages or refueling.

By-products of operation

A reactor operating at any power level can be instantly shut down by rapidly inserting control rods into the core or by injecting boron.

However, even with reactor power at zero, the reactor core continues to emit heat. This decay heat must be removed or the temperature inside the reactor core could reach very high levels – high enough to melt the nuclear fuel rods and the nuclear fuel inside them. Because of the nuclear reactions, the reactor core becomes extremely radioactive, with additional isotopes created that give off heat by undergoing radioactive decay.

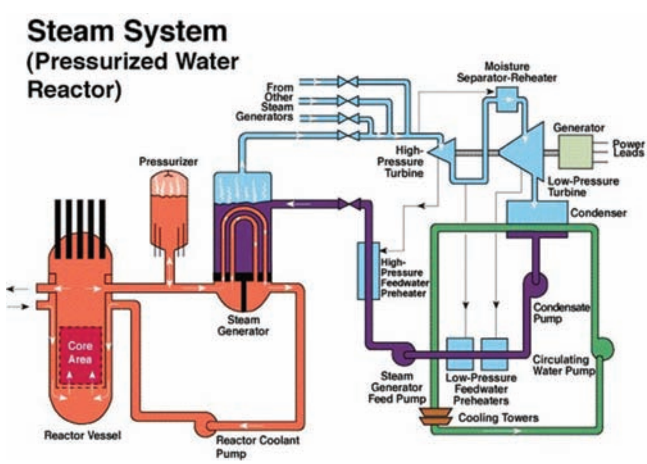
For this reason, it is extremely important that the reactor core be continuously cooled during plant operation or after shutdown. The following sections summarize Plant Vogtle emergency systems that ensure the reactor core is cooled and radioactive products are contained under all types of conditions.

Types of Light Water Reactors

The term Light Water Reactor came into being more than 50 years ago when reactors began using normal purified water for cooling, rather than heavy water, which is used in Canada's Candu reactors.

There are two types of Light Water Reactors, distinguished by the type of reactor cooling system they use. These are the Pressurized Water Reactor (PWR) and the Boiling Water Reactor (BWR). A PWR can use a two-loop, three-loop or four-loop system. Plant Vogtle is a PWR with a four-loop system. The figure on page 17 shows a typical PWR generating cycle.

In a PWR such as Plant Vogtle, control rods enter the reactor from the top. Operators may insert the rods in a controlled, systematic manner. If there is a need to shut down the reactor quickly, all the rods may be manually or automatically inserted into the reactor core.



There are two water cooling systems: the primary and the secondary. The primary water coolant circulates across the fuel in the reactor core, where it reaches a temperature of about 620 degrees Fahrenheit. To keep this coolant from boiling, the primary system is kept at a pressure of about 2,235 pounds per square inch gauge (psig). This high-pressure/high-temperature primary coolant is pumped through tubes in four steam generators where the coolant transfers some of its heat to the secondary cooling system. The primary coolant, now at a lower temperature, is pumped back into the reactor and the cycle continues.

Since the primary and secondary cooling systems are isolated from each other, the radioactive water in the primary cooling system does not contaminate the non-radioactive water in the secondary cooling system.

Water in the secondary cooling system is under less pressure than in the primary cooling system, which allows it to boil, thereby creating steam. This steam passes into the high-pressure turbine where it turns the turbine blades, much like a windmill when wind hits its blades.

The steam leaves the high-pressure turbine and enters the moisture separator/reheater where it is "recharged." It then flows into the low-pressure turbines where it provides more power for rotation. Both the high-pressure and low-pressure turbines are on the same shaft, which is also attached to the generator whose rotation produces the electricity.

The recycled steam subsequently enters the condenser where it is cooled and converted back into liquid to continue the cycle. The condenser cools by circulating water from a natural draft cooling tower; water for the cooling tower is taken from the Savannah River. This circulating water never comes in actual contact with the steam. After its pass through the condenser, the water is about 23 degrees Fahrenheit warmer than ambient temperature. This excess heat is given up to the atmosphere through the cooling tower with a minimum of environmental impact.

Now called "condensate," the secondary coolant water leaves the condenser and is pumped through the feedwater heaters back into the steam generators where the whole process continues. Before entering the feedwater heaters, however, the condensate passes through a full-flow demineralizer (or "condensate polishing system") to remove any impurities that may have entered the system.

Accident prevention

One essential point about a Light Water Reactor is that it cannot explode like a nuclear weapon. Nuclear weapons are made of highly enriched uranium or virtually pure plutonium. No nuclear explosion is possible with the low-enriched fuel used to produce electricity.

The core of a Light Water Reactor contains a large amount of highly radioactive material at high temperature and pressure. The chief danger is a loss of cooling water, causing a build-up of heat that would damage or melt the fuel rods.

To prevent this, commercial nuclear power plants are designed with a strategy of defense-in-depth.

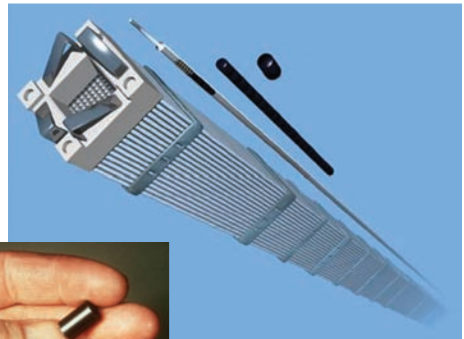
The first layer of designed features is essentially self-regulating. In general, the fission process slows as the coolant temperature rises.

Other passive systems include physical barriers that restrict the spread of contamination outside the primary systems. Barriers such as the fuel's zirconium alloy cladding, the thick reactor vessel and the thick concrete containment provide protection in case of an accident.

Following is a description of these physical barriers at Plant Vogtle that keep radioactive fission products from reaching the environment.

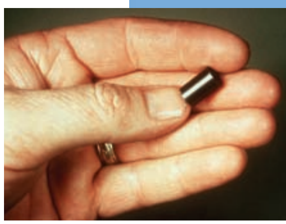
Active systems are designed to ensure continuous core cooling and safe shutdown of the plant.

Fuel cladding – Uranium fuel used at Plant Vogtle is in the form of a ceramic "pellet" which normally houses 99.99 percent of the radioactive fission products. These fuel pellets are stacked inside tubes. The tubes are arranged in fuel assemblies and are placed within the reactor vessel, comprising the core.



Fuel assembly, fuel rod, cladding, fuel pellet

Reactor vessel – The reactor vessel is a barrel-like structure about 16 feet in diameter with carbon steel walls lined with stainless steel. It is located inside the lower part of the containment building. The reactor vessel with its attached pipes, reactor coolant pumps and the pressurizers comprise the primary coolant system boundary. This keeps any fission products, which may escape the cladding in the event of broken fuel tubes, from reaching the rest of the plant.



Fuel Pellet

Containment – The containment building is constructed to prevent the inadvertent release of radioactivity to the environment under both normal operating conditions and the most severe of accident conditions. Therefore, all systems that potentially could release large amounts of radioactivity are located in the containment structure. At Plant Vogtle, the containment structure houses the reactor vessel and the reactor cooling system with its steam generators, reactor coolant pumps and pressurizer.

The containment building is made of concrete with thick walls. The concrete is post-tensioned and reinforced with a network of steel rods (rebar), each about the thickness of a human forearm. The structure is lined with thick steel and is designed to withstand extreme temperatures and pressures which might result from a serious accident. The containment is sealed and must be entered and exited through special air-lock chambers. Most penetrations such as pipes or conduits entering the containment walls have automatic valves that close at the first sign of trouble, isolating and sealing off the containment to prevent leakage. As a Category 1 Seismic structure, the containment building can withstand powerful earthquakes and high winds. It can survive tornado winds of 360 miles per hour, as well as the impact of tornado missiles such as utility poles or even something as massive as an automobile. In addition, since 9-11, studies have been conducted to analyze a commercial aircraft crash into the reactor containment building and the impact on the containment building's structural strength. A comprehensive study conducted by the Electric Power Research Institute concluded that the containment structures that house nuclear fuel are robust and would protect the fuel from impacts of large commercial aircraft.

Engineered safety systems

The function of the Engineered Safety Systems is to contain, control, mitigate, and terminate accidents and to maintain safe radiation exposure levels below applicable federal limits and guidelines. Some of the safety-related systems defined as Engineered Safety Systems for Plant Vogtle are:

Reactor protection system – The reactor protection system is designed to shut down the reactor safely. The system continuously monitors important plant parameters. If a problem occurs and causes the reactor power, pressures, temperatures, coolant flow rates or other plant parameters to exceed prescribed limits, the reactor shuts down automatically by the immediate insertion of all control rods into the core. The reactor also can be shut down manually if the reactor operator determines that a potentially unsafe condition exists.

Emergency Core Cooling Systems (ECCS) – The most immediate action to be taken after a loss of coolant accident is to replenish cooling water back into the reactor and to assure that the core remains under water. The function of the ECCS is to provide the reactor with emergency cooling water after normal cooling water has been lost.

There are two emergency core cooling systems, each designed to be completely redundant. Their operation is initiated either manually by an operator or automatically when the control systems in the plant detect an accident condition.

Both high pressure injection and low pressure injection systems can inject water for long periods, pumping water supplied either from the refueling water storage tank or through recirculation from the containment sump.

Auxiliary feedwater system – The auxiliary feedwater system (AFW) serves a dual purpose. During normal plant startup or hot standby, it provides the secondary side of the steam generators with condensate. As mentioned before, the condensate picks up the heat from the primary coolant, boils and becomes the main steam for the turbine. This lowers the heat of the primary coolant, while providing steam for plant-related operations. During accident conditions, the AFW receives heat from the primary coolant. For example, if the plant were to lose all electric power, the AFW – using pumps driven by steam turbines (not requiring electricity) – could cool down the primary side and maintain the plant in a safe shutdown condition until power is restored.

Emergency power – During normal operations and when the plant is shut down, components that could be used in emergency situations are powered with electricity from the off-site power grid.

Plant Vogtle Units 1 and 2 have two emergency diesel generators each. Either of these generators is designed to supply the power needed for safe operation of the plant's emergency systems if off-site power is not available.

Additionally, most of the safety-related instrumentation needed for safe shutdown of the plant can be operated by DC batteries that are constantly kept charged and ready for service if all other power sources should fail.

Finally, even without any electrical power available, the plant can be shut down safely and cooled by using the natural circulation of the primary system while manually venting steam from the secondary side of the steam generator. Water for the steam generator is provided using the steam-driven auxiliary feed pump.

Containment isolation system – The purpose of this system is to isolate and close all openings to the containment if a high radiation situation exists in the containment building. Automatic signals are sent to appropriate valves and dampers to close, thus isolating all containment penetrations – except for those needed for the operation of the Emergency Core Cooling Systems.

Habitability systems – The control room heating, ventilation and air conditioning (HVAC) system protects control room personnel from accident conditions. The atmosphere inside the control room can be isolated from the rest of the plant and the outside environment to keep out radiation, smoke, toxic substances and other harmful airborne contaminants.

Combustible gas control system – The combustible gas control system monitors the atmosphere inside containment.

In summary, Plant Vogtle has a number of redundant safety systems to prevent an emergency at the plant and to restore the plant to safe conditions.

Used Nuclear Fuel

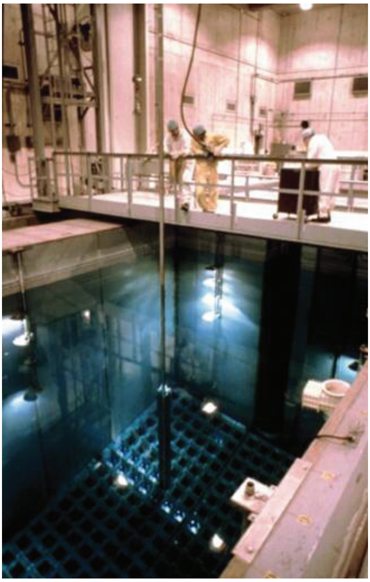
Used nuclear fuel is a solid material that is safely stored at nuclear power plant sites, either in steel-lined, concrete pools filled with water or in steel or steel-reinforced concrete containers with steel inner canisters. The first storage method is referred to as the spent fuel pool. The second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

On-site storage of used fuel is well protected by a combination of sturdy plant construction, state-of-the-art surveillance and detection equipment, and armed, well-trained paramilitary security forces.

Nuclear plants were designed to store at least a decade's worth of used fuel. And with dry storage, used fuel can be safely stored much longer. The U.S. Nuclear Regulatory Commission (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. Let's examine these options.

Spent fuel pool

After enough U-235 has been used up in the fission process, the fuel assemblies need to be removed and replaced with new fuel assemblies. However, the used fuel is highly radioactive. 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, which prevents radiation from escaping from the pool. The water also keeps the fuel cool while the fuel decays, or becomes less radioactive over time. The water itself never leaves the inside of the plant's concrete auxiliary building.



Spent fuel pool

Spent fuel pools are very effective for storing used fuel safely. Uranium, in the form of small pellets, is the fuel used to generate the power to operate nuclear power plants. These fuel pellets are about the size of the tip of your finger. Fuel pellets are placed in long metal fuel rods while being used in the reactor. Once this fuel is used or partially used, it must be moved to an area called the spent fuel pool to cool.

To prevent spent fuel pools from becoming too crowded, used fuel assemblies eventually must be removed from the pool. Commercial nuclear power plants in the United States are required by law to contract with the federal government for the permanent disposal of used nuclear fuel. Southern Company nuclear plants have paid almost a billion dollars into the Nuclear Waste Fund, but the government has failed to live up to its contractual obligation to dispose of used fuel. Read the section on Yucca Mountain to learn more.

Dry storage

The government's delay in providing a permanent repository for used nuclear fuel 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.

Southern Nuclear uses dry storage at Plant Farley and Plant Hatch. We estimate that dry storage will be needed at Plant Vogtle by 2014.

Currently there is no used fuel being stored in dry storage at Plant Vogtle.

Dry storage containers 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 the used fuel continues its cooling process. Once loaded with used fuel assemblies, the containers are stored horizontally in a concrete vault, or they stand 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 every 20 years. The containers are designed and tested to prevent the release of radioactivity under the most extreme conditions – earthquakes, tornadoes, hurricanes, floods and sabotage – and they are naturally cooled and ventilated. Dry storage is very safe for the public and the environment.

Dry storage containers range from $500,000 to more than $1 million each. And remember, utility customers have already contributed billions of dollars into the federally mandated Nuclear Waste Fund for a national permanent repository.

Southern Company and Yucca Mountain

The nuclear industry is unique among energy producers in its contractual commitment to cover the full costs for managing its waste materials. A fee on nuclear power generation is paid into a dedicated fund -- the Nuclear Waste Fund (NWF) -- to support the design, construction and operation of a national repository at Yucca Mountain.

Current balance in the NWF exceeds $15 billion. Consumers contribute $759 million a year to the NWF. Customers of Alabama and Georgia pay over $60 million a year into the NWF.

Since 1983, consumers of electricity from nuclear power plants have paid over $23 billion into the Nuclear Waste Fund (NWF) and consumers in Alabama and Georgia have committed more than $1.4 billion.

DOE has determined that the annual fee collected from ratepayers is adequate to fund the development, construction, and operation of Yucca Mountain.

On January 31, 1998, the federal government defaulted on its contractual obligation to begin moving used fuel from the nation's nuclear power plants resulting in consumers incurring additional costs for designing, licensing, and building dry storage facilities on plant sites. Southern Nuclear Operating Company, Georgia Power Company, and Alabama Power Company filed suit against the United States seeking damages based upon the government's breach of the standard contracts.

In July 2007, the U.S. Court of Federal Claims awarded Georgia Power and Alabama Power damages representing all of the direct costs of the expansion of used nuclear fuel storage facilities from 1998 through 2004 related to the government's breach of contracts related to the disposal of used nuclear fuel. In January 2008, the government filed a notice of appeal. In February 2008, the government filed a motion to stay the appeal pending the court's decisions in three other cases already on appeal. In April 2008, the court granted the government's motion to stay the appeal. In April 2008, a second claim against the government was filed for damages incurred after Dec. 31, 2004 (the court mandated cut-off in the original claim), due to the government's alleged continuing breach of contract. Damages will continue to accumulate until the issue is resolved or the storage is provided.

The U.S. government has an obligation to remove spent fuel from nuclear plants and Yucca Mountain is the way to solve the issue of a permanent repository.

Currently, Southern Company continues to support the Yucca Mountain project and understands that the government must resolve the waste issue for the future of nuclear energy.

In June 2008, DOE submitted a license application to the U.S. Nuclear Regulatory Commission to construct the repository.

In 2009, the Obama administration announced plans to empanel a blue-ribbon commission of experts to study alternatives to Yucca Mountain. However, the NRC's Yucca Mountain repository license application review process continues.

Need for repository

Under the Nuclear Waste Policy Act of 1982, the U.S. Department of Energy (DOE) is the federal agency responsible for the disposal of high-level waste such as used fuel. After more than 20 years of exhaustive scientific and engineering research, the President and Congress in 2002 approved Yucca Mountain, Nevada, as the site of a national repository for used nuclear fuel. Opponents of the Yucca Mountain project have attempted to delay or halt its development through a series of legal actions.

Although there is still a lot of debate over this issue, DOE developed and submitted a license application to the Nuclear Regulatory Commission (NRC) in June 2008. The NRC will independently evaluate DOE's repository design and safety analysis to determine if the planned facility meets regulatory requirements.

Disposing of used fuel at this remote desert site supports sound national energy, environmental and security policies. The world's leading scientists, the President, Congress and now the courts have agreed on this fundamental principle.

Based upon the decision of the Obama Administration to study alternatives to Yucca Mountain, on July 8, 2009 the industry requested that the DOE update the fee adequacy analysis and suspend the annual fee payments paid into the Nuclear Waste Fund. On July 27, 2009 in response to Senate Energy and Water Appropriations language in H.R. 3183 related to suspension of collection of the fee, the Administration issued a Statement of Administration Policy stating that all of the fees collected in the Nuclear Waste Fund are essential to meet the obligations of the Federal Government for managing and ultimately disposing of spent nuclear fuel and high-level radioactive waste.

The development and commercialization of recycling technologies is decades away. The pursuit of these technologies does not relieve the federal government of its statutory responsibility to provide a disposal facility. Even when fully operational, recycling technologies will produce byproducts that require a permanent repository.

Seven miles of tunnel built at Yucca Mountain

Key points on Yucca Mountain

- **Yucca Mountain is a remote desert location.** Yucca Mountain is part of an isolated, unpopulated desert region in Nevada. It is on the western border of the Nevada test site, where more than 900 nuclear weapons were detonated, most underground, from the dawn of the atomic age until about ten years ago. This area of Nevada is still actively used by the U.S. military.
- **Yucca Mountain is the subject of one of the most comprehensive scientific investigations ever conducted.** The intensive scientific study of Yucca Mountain's suitability as a national used nuclear fuel repository – called "site characterization" has been completed to assess the capability of the natural features at Yucca Mountain to safely contain radioactive waste. Yucca Mountain site characterization is one of the most thorough scientific studies ever performed – lasting years, costing more than $9 billion, and involving thousands of scientists, engineers and technicians.
- **Additional scientific testing confirms the site's suitability.** The DOE has constructed a series of tunnels inside Yucca Mountain to conduct seismological, geological and hydrological studies. Scientists have expanded tests in these tunnels and its numerous niches to study the reaction of rock and the movement of water through the rocks to the heat released by used nuclear fuel in a repository. The enhanced knowledge of the repository gained over the past eight years has led to a significant refinement of DOE's performance assessment of Yucca Mountain. This latest information has strengthened scientific confidence in the repository's ability to protect public health and safety.
- **The Yucca Mountain recommendation is decision-making based on sound science.** Based on this scientific study, in 2002 the U.S. Secretary of Energy recommended and the President and Congress approved Yucca Mountain as the site for a national permanent used nuclear fuel repository.

DOE's published scientific reports have all been subject to intense public scrutiny and critical review by peer scientific organizations such as the International Atomic Energy Agency and the Nuclear Waste Technical Review Board. The merits of these studies and independent views on them were debated by Congress in its consideration of the joint resolution that would eventually become the site approval. The overwhelming conclusion, reached by both Republicans and Democrats, was that a decision to go forward with the site was supported by sound science.

Radiation and Health

Radiation is a natural part of our environment. It's in the air we breathe, in the food we eat, in our homes and even in our bodies. The levels of background radiation vary greatly from one location to another. For example, the background level in Denver, Co., is almost twice that in the Plant Vogtle area.

Man-made radiation

People also are exposed to sources of man-made radiation, such as X-ray machines, radioactive materials used in nuclear medicine and radioactive materials released in nuclear power production. Radiation from these sources is no different from natural background radiation we receive daily.

Measurement

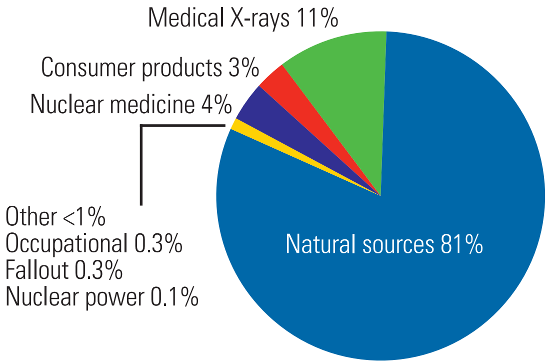
Radiation is measured in units of millirem. In the United States, the average person receives from 250 to 300 millirem a year from natural background radiation. That same person also receives about 90 millirem a year from medical care. The average person receives less than 1 millirem a year from living next to a nuclear plant. Sources of radiation are listed below.

Radiation effects

How radiation affects us depends upon the kinds of particles or rays, the amount and duration of exposure, how much of the body is exposed, how much radioactive material stays in the body, and how old we are.

Small increases in radiation exposure will not harm you. That is why people don't worry about the change in background radiation exposure when they move from one city to another. Even so, nuclear power plants operate to keep radiation exposure to the public as low as possible.

Large amounts of radiation — more than a hundred thousand millirem — could possibly harm you. The chances are very small that an accident at Plant Vogtle would release a significant amount of radiation. But if such an accident should happen, emergency plans are designed to help residents in the local community avoid receiving dangerous amounts of radiation.



This chart shows that the nuclear power industry is only a small contributor to your average radiation exposure.

Changes Since 911

Prior to the Sept. 11, 2001 attacks on America, nuclear power plants were the most secure facilities of any industrial sites in the nation. Since 911, the nuclear power industry has taken a number of significant steps to reinforce, enhance and increase our security measures, including personnel, training, technology and barriers – spending an additional $1.2 billion on security.

The U.S. Nuclear Regulatory Commission (NRC) holds nuclear power plants to the highest security standards of any American industry. Since September 2001, the NRC has strengthened security requirements for nuclear plant sites, and all U.S. plants have met these stringent requirements.

Of the 17 infrastructure categories currently under evaluation by the U.S. Department of Homeland Security – such as the chemical industry, transportation, telecommunications, and so on – Homeland Security has said the nuclear reactor sector is by far the best protected. Furthermore, the nuclear reactor sector is being used by Homeland Security as the security standard for the other 16 sectors of our national infrastructure.

To be more specific, stringent security measures include surveillance equipment, vehicle barriers, multiple wire entanglements, secure blast-proof doors and specially trained paramilitary forces with the weapons and technology to repel a terrorist attack.

The defense-in-depth philosophy used in the construction and operation of nuclear power plants provides high levels of protection for public health and safety. Redundant safety systems and reactor shutdown systems have been designed to withstand the impact of earthquakes, hurricanes, tornadoes and floods. Areas of the plant that house the reactor and used nuclear fuel also would withstand the impact of a widebody commercial aircraft, according to peer-reviewed analyses by the Electric Power Research Institute. This study was conducted after 911 and it confirmed that the structures that house nuclear fuel are robust and protect the fuel from impacts of large commercial aircraft.

Access to nuclear power plants is controlled by multiple barriers, high-tech detection systems, and security officers who search all entering vehicles and people. All workers entering plant operating areas also must pass through sensitive metal and explosives detection equipment.

Nuclear power plants are an important component of the nation's critical infrastructure, and they are designed and built to withstand natural disasters as well as attack. Nuclear plants have multiple layers of protection, including structural strength, highly trained operators, and proven emergency plans. And nuclear power plants are one of the few power sources that would be relatively unaffected by destruction of surrounding infrastructure and interruptions in fuel supply.

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

Nuclear Development

Southern Company's actions to again explore the nuclear energy option are part of our long-range generation planning process that seeks to identify the most cost-effective, reliable and environmentally responsible fuel sources to meet growing electricity demand in our service territory. Nuclear power is a proven technology that is re-emerging as an attractive generating source. As energy needs grow in the Southeast, Southern Company is on the forefront of exploring nuclear energy as an option to meet rising electricity demand. We are exploring the development of new nuclear facilities for several important reasons.

Increased demand for energy is driving the need for new baseload capacity. The population of the southeastern United States continues to expand rapidly, and forecasters predict that 40 percent of the U.S. population will live in the Southeast by 2030. The state of Georgia is expected to grow by 4 million people by 2030. Over the last 10 years, average residential consumption rose approximately 11 percent.

So, demand for electricity is growing at a phenomenal rate and is expected to increase even more dramatically in the next 20 to 25 years. Nuclear power is a safe, reliable and cost-effective power source that has a low impact on the environment. It is a prudent business decision to preserve nuclear power as an option to meet our customers' needs.

New units at Plant Vogtle

On behalf of the plant owners, Southern Nuclear filed applications with the U.S. Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) and a Combined Construction and Operating License (COL) for new units at the Vogtle site.

In August 2009, Southern Nuclear received the ESP for Plant Vogtle Units 3 and 4. The Vogtle ESP is the first one in the industry to reference a specific technology, Westinghouse AP1000. Additionally, Southern Nuclear's ESP comes with a Limited Work Authorization (LWA). The LWA allows limited safety-related activities to begin at the site prior to the COL being issued.

An ESP allows the NRC to review and pre-approve the site for construction of new units and allows the company to conduct design, construction and other site-specific evaluations before a decision to build is made.

The COL provides Southern Nuclear with one license to build and operate a nuclear plant based on an NRC pre-

Construction site of new units at Plant Vogtle

approved design at a specific site. We have selected Westinghouse Advanced Passive (AP1000) technology for new units at Plant Vogtle. The NRC continues its review of the COL application for Plant Vogtle. Based on the NRC's schedule, Southern Nuclear expects to receive the COL in the 2011 timeframe.

Additionally, the new Vogtle units have received certification from the Georgia Public Service Commission. Georgia Power, a subsidiary of Southern Company, and co-owner of the proposed units, filed an Application for Certification of Vogtle Units 3 and 4 on August 1, 2008. The filing was approved by the Georgia Public Service Commission on March 17, 2009.

Pending appropriate approvals, Vogtle Unit 3 will be operational in 2016 and Unit 4 in 2017.

NuStart consortium

Southern Company is a founding partner of NuStart Energy Development, LLC, a consortium of utilities that has been awarded funds from the U.S. Department of Energy for the development of a COL for a new nuclear power plant. NuStart was formed in 2004 and now has 10 member companies, including Southern Company.

The consortium's objectives are to demonstrate the U.S. Nuclear Regulatory Commission's untested licensing process of obtaining a COL for an advanced nuclear power plant and to complete the design engineering for the Westinghouse AP1000 and the General Electric (GE) Economic Simplified Boiling Water Reactor (ESBWR).

Because obtaining a COL is a critical step in the renaissance of the nuclear power industry, NuStart seeks to demonstrate that the COL can be obtained on schedule and within budget and that advanced plant designs can be approved by the NRC. In September 2005, NuStart selected the Grand Gulf Nuclear Station and the Bellefonte Nuclear Plant as the sites for two COL applications. Grand Gulf, owned by an Entergy subsidiary, was designated for the GE ESBWR reactor design and Bellefonte, owned by the Tennessee Valley Authority (TVA), was chosen for the Westinghouse AP1000 reactor design.

In May 2009 NuStart announced that Plant Vogtle Units 3 and 4 would become the reference plant for AP1000 technology, replacing TVA's Bellefonte site. This means that all other COL applications submitted in the U.S. for AP1000 technology will reference standard material included in the Plant Vogtle Units 3 and 4 application.

Decisions to construct a new nuclear plant will be made by the individual members of the consortium at a later date. By member agreement, the consortium is precluded from constructing a unit. After a decision by the NRC, any combination of the consortium's members could use the COL.

Southern Company's participation in NuStart will benefit the company by helping further the development of the next generation of advanced passive reactor technologies and by testing the NRC licensing process.

Words to Know

Chain Reaction — a sequence of reactions that cause themselves to repeat.

Cold Shutdown — when the cooling-water temperature in the reactor is below the boiling point and the pressure is reduced to atmospheric pressure.

Coolant — a fluid, usually water, used to cool a nuclear reactor and transfer heat energy.

Containment — the steel and concrete structure along with the various components that surround and isolate the reactor.

Contamination — the presence of radioactive material in a place where it is not desired.

Control Rods — movable rods used to slow down or stop a nuclear chain reaction by absorbing neutrons.

Core — the central part of a nuclear reactor that contains the fuel assemblies.

Curie — the basic unit used to describe the strength of radioactivity in a sample of material.

Dosimeter — a device that can be worn and used to measure the radiation a person receives over a period of time.

Emergency Core Cooling System — an emergency system designed to keep the reactor core cool if normal cooling fails.

Emergency Planning Zone (EPZ) — the 10-mile diameter around the plant. This area is required to have special emergency plans.

Fission — the splitting or breaking apart of atoms into two or more new atoms. The process releases energy and produces heat.

Fuel Assemblies — a group of fuel rods assembled into a bundle.

Fuel Pellets — thimble-sized uranium oxide pellets. A reactor core may contain up to 10 million pellets.

Fuel Rods — long, hollow tubes of zirconium metal that contain stacks of fuel pellets.

Half-life — the length of time it takes for a radioactive substance to lose one-half of its radioactivity.

Millirem — a unit used to measure radiation dose.

Nuclear Regulatory Commission (NRC) — the U.S. government agency that regulates the nuclear power industry.

Radiation — energy released in the form of tiny particles or electromagnetic waves.

Reactor Core — the central portion of a nuclear reactor containing nuclear fuel, water and the control mechanism as well as the supporting structure.

Reactor Trip (SCRAM) — refers to the insertion of control rods in the fuel core of the reactor, stopping the fission process.

Reactor Vessel — the thick steel vessel that contains the fuel, control rods, and coolant.

REM — roentgen equivalent man. Common unit used for measuring human radiation doses, usually in millirem (1,000 millirem = 1 rem)

Shielding — any material, such as lead or concrete, used around a nuclear reactor to protect workers and equipment.

Spent Fuel — used nuclear fuel awaiting disposal.

Uranium — a radioactive element found in natural ores. Uranium is the basic fuel of a nuclear reactor.

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