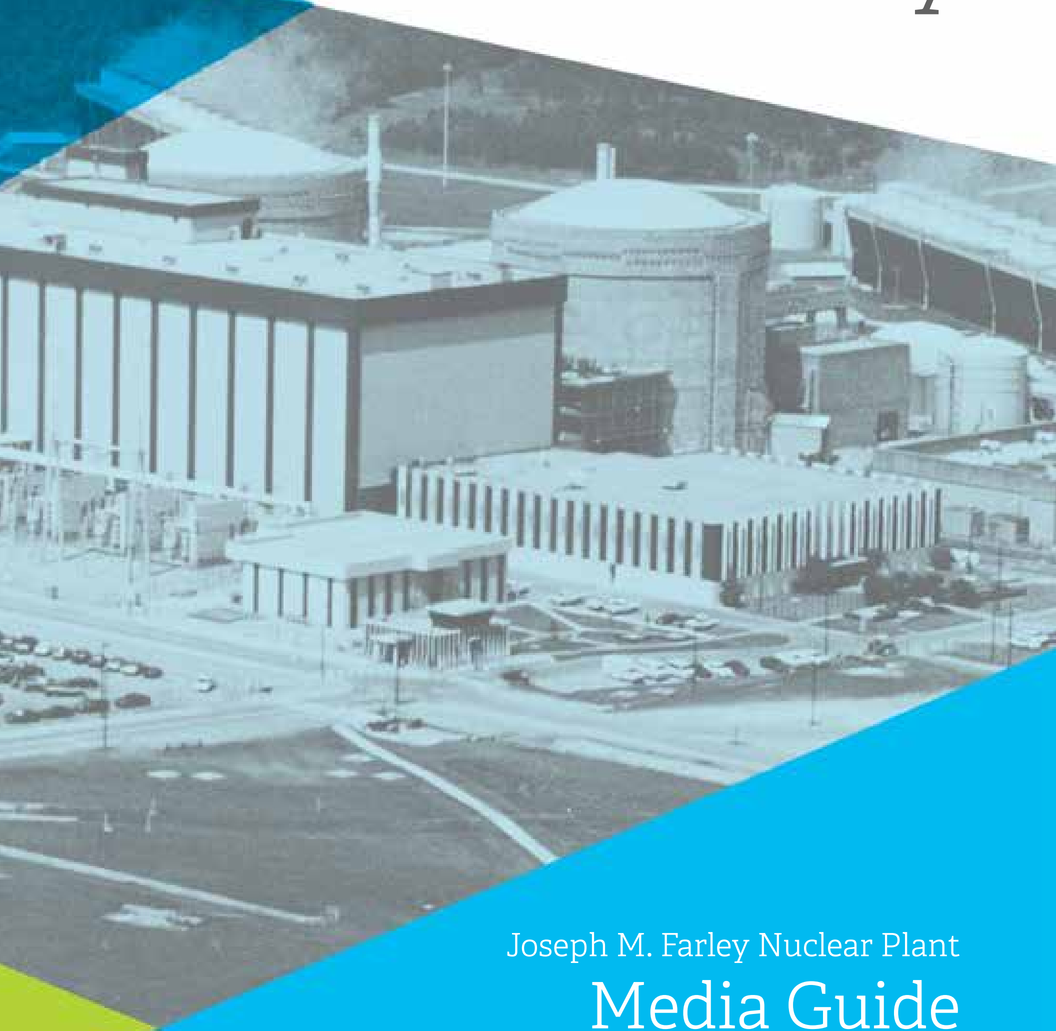
Alabama Power

Plant Farley



Joseph M. Farley Nuclear Plant

Media Guide

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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 Communications department developed this media guide for the Joseph M. Farley Nuclear 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 Farley'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 Farley 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 take time to read this media guide and call us at 1-800-344-8295 with any questions you have. Tours of Plant Farley are available, and you are encouraged to set up an appointment to visit us.

Communications

Southern Nuclear

Owners and operators

Southern Nuclear, headquartered in Birmingham, Ala., operates Southern Company's six nuclear units at three locations: the Joseph M. Farley Nuclear Plant near Dothan, Ala., the Alvin W. Vogtle Electric Generating Plant near Waynesboro, Ga.; and the Edwin I. Hatch Nuclear Plant near Baxley, Ga. Plant Farley was built and is owned by Alabama Power, and the plant generates approximately 19 percent of Alabama Power's electricity. Plant Vogtle and Plant Hatch were built by and are co-owned by Georgia Power, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and Dalton Utilities. Together, these two nuclear power plants generate approximately 20 percent of Georgia Power's electricity.

Southern Nuclear, Georgia Power and Alabama Power each are wholly owned subsidiaries of Atlanta-based Southern Company (NYSE: SO). Southern Company is America's premier energy company, with 44,000 MW of generating capacity and 1,500 billion cubic feet of combined natural gas consumption and throughput volume serving 9 million electric and gas utility customers through its subsidiaries. The company provides clean, safe, reliable and affordable energy through electric utilities in four states, natural gas distribution utilities in seven states, a competitive generation company serving wholesale customers across America and a nationally recognized provider of customized energy solutions, as well as fiber optics and wireless communications. Southern Company brands are known for excellent customer service, high reliability and affordable prices that are below the national average. Through an industry-leading commitment to innovation, Southern Company and its subsidiaries are inventing America's energy future by developing the full portfolio of energy resources, including carbon-free nuclear, 21st century coal, natural gas, renewables and energy efficiency, and creating new products and services for the benefit of customers. 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 by DiversityInc, listed by Black Enterprise magazine as one of the 40 Best Companies for Diversity and designated a Top Employer for Hispanics by Hispanic Network. The company has earned a National Award of Nuclear Science and History from the National Atomic Museum Foundation for its leadership and commitment to nuclear development and is continually ranked among the top utilities in Fortune's annual World's Most Admired Electric and Gas Utility rankings. Visit our website at www.southerncompany.com.

Alabama Power provides reliable, affordable electricity to more than 1.4 million customers across the state.

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, emergency plans would be implemented to protect the safety of the general public surrounding the plant.

The Plant Farley emergency plan specifies procedures for Southern Nuclear, Alabama 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 Farley, the Joint Information Center (JIC) would be established in Dothan, Ala., for the use of the news media. Southern Nuclear, Alabama Power and county, state and federal officials responding to the emergency would disseminate information and hold joint news briefings there. The Joint Information Center is located in the Juvenile Court Services Building at 179 North Foster Street in Dothan, Ala. 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 Farley, 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.

JOINT INFORMATION CENTER (JIC)

Houston County Juvenile Court Services building, 179 North Foster Street in Dothan, Ala.

A licensed senior reactor operator explains control room operations to a reporter in the simulator during annual site media day.

The benefits of nuclear power

The benefits of clean nuclear power are many. First and foremost, nuclear power is a clean, safe, affordable and reliable source of electricity. Nuclear power provides 16 percent of Southern Company's generation, and we have been operating nuclear plants safely and reliably for more than 40 years. Our nuclear energy facilities produce 76 percent of Alabama's emission-free electricity and 91 percent in Georgia. We operate our facilities at high levels of reliability with an average three-year fleet capacity factor of 93.2 percent, exceeding the U.S. average of 91.2 percent for the years 2013-2015. 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.

We support local and state economies.

Did you know that the average nuclear plant spends approximately $40 million annually in wages? In Alabama alone, more than $158 million of materials, services and fuel are purchased annually from more than 190 local companies. Also, nuclear plants pay approximately $16 million in state and local taxes.

We protect the environment.

Nuclear energy produces more clean-air energy than any other energy source. It provides 76 percent of Alabama's emission-free electricity and 62 percent of all U.S. emission-free electricity. More than 33 million metric tons of carbon dioxide are prevented by Alabama's nuclear facilities. This is equal to what would be released by more than 6.4 million passenger cars. That's more than all the cars registered in the state of Alabama!

We care about your safety.

Nuclear facilities are held to the highest of standards by the federal government and its inspectors. There are comprehensive plans in place – in partnership with local, state and federal agencies – that prepare for the unexpected and provide layer upon layer of redundant safety features.

We are the most reliable.

Nearly 100 nuclear facilities in the U.S. provide about 20 percent of all electricity in the country. These facilities generate electricity 24 hours a day, seven days a week.

Efficiency is the core!

One uranium fuel pellet is about the size of a fingertip and creates as much energy as one ton of coal or 17,000 cubic feet of natural gas. A typical large nuclear energy facility produces enough electricity for nearly 723,000 homes while using only 20 metric tons of uranium fuel each year.

On-call media relations representatives

Southern Nuclear
205-992-5395

Alabama Power
205-257-4155

Plant Farley Energy Education Center
334-899-5108

Web sites

www.southernnuclear.com

www.alabamapower.com

facebook.com/southernnuclear

@southernnuclear

During an emergency

Plant Farley Joint Information Center (JIC)
(Activated only in the event of an emergency at the plant)
800-344-8295

Alabama Power Corporate Media Center
(Activated only in the event of an emergency at the plant)
Media only: 205-257-1281
Public: 800-367-4020

Plant Farley recorded information line with most current update
(Activated only in the event of an emergency at the plant)
205-257-2655

Contacts for federal, state and local agencies

Federal agencies

Nuclear Regulatory Commission

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

www.nrc.gov

Federal Emergency Management Agency
770-220-5200 (24 hours)
www.fema.gov

State agencies

Alabama Emergency Management Agency
205-280-2200 (24 hours)
ema.alabama.gov

Georgia Emergency Management & Homeland Security Agency
Public Information Officer, Atlanta
404-635-7200 (24 hours) or 404-635-7000 (during business hours)
www.gema.ga.gov

Local emergency management agencies

Houston County Emergency Management Agency (Alabama)
334-794-9720
www.dothanhoustoncountyema.org

Henry County Emergency Management Agency (Alabama)
334-585-6702
ema.henrycountyalabama.org

Early County Emergency Management Agency (Georgia)
229-723-3029
www.blakelyearlyema.org

Plant Farley

Joint Information Center (JIC)

(WHERE MEDIA SHOULD GO IN AN EMERGENCY)

The Farley Joint Information Center (JIC) is located at **179 N. Foster Street, Dothan, Ala.** It is housed in the back of the Houston County Juvenile Court Services building and is located in the same city block as the Houston County Courthouse. It is one block northeast of the intersection of Highways 231 and 84 in the center of downtown Dothan.

Once the facility is activated, media calls should be directed to 334-702-2507. Spokespersons from Alabama Power, Southern Nuclear, the Alabama Emergency Management Agency, the Georgia Emergency Management Agency, and the affected counties and federal agencies responding to the event will be at the information center to discuss their activities.

From Dothan Airport

- Take Paramore Road to Napier Field Road.
- Turn right at caution light onto Napier Field Road.
- Take Napier Field Road to Highway 231.
- Turn left on Highway 231 S.
- Take Highway 231 S. to Highway 84 E. (Main Street).
- Turn left onto Highway 84 E. (Main Street).
- Go one block and turn left onto Foster Street.
- The Farley Joint Information Center is located at the rear of the Houston County Juvenile Courts Building at 179 N. Foster Street. This is the next to the last building on the left in the first block of Foster Street off of Main Street.

From Montgomery

- Take Highway 231 S. to Highway 84 E. (Main Street).
- Turn left onto Highway 84 E. (Main Street).
- Go one block and turn left onto Foster Street.
- The Farley Joint Information Center is located at the rear of the Houston County Juvenile Courts Building at 179 N. Foster Street. This is the next to the last building on the left in the first block of Foster Street off of Main Street.

From Columbus, Ga.

- Take Highway 431 S. into Dothan.
- Continue across the Dothan bypass (Ross Clark Circle) where Highway 431 S. becomes Oates Street.
- Turn left onto Highway 231 S.
- Turn left onto Highway 84 E. (Main Street).
- Go one block and turn left onto Foster Street.
- The Farley Joint Information Center is located at the rear of the Houston County Juvenile Courts Building at 179 N. Foster Street. This is the next to the last building on the left n the first block of Foster Street off of Main Street.

From the Florida Panhandle

- Take Highway 231 N. into Dothan.
- Continue across the Dothan bypass (Ross Clark Circle) where Highway 231 becomes Oates Street.
- Turn right onto Highway 84 E. (Main Street).
- Go one block and turn left onto Foster Street.
- The Farley Joint Information Center is located at the rear of the Houston County Juvenile Courts Building at 179 N. Foster Street. This is the next to the last building on the left in the first block of Foster Street off of Main Street.

From Blakely, Ga.

- Take Highway 62 out of Blakely into Dothan. Georgia Highway 62 becomes Alabama Highway 52.
- At the Dothan bypass (Ross Clark Circle), turn left.
- Turn right onto Highway 84 W. (Main Street).
- Turn right onto Foster Street.
- The Farley Joint Information Center is located at the rear of the Houston CountyJuvenile Courts Building at 179 N. Foster Street. This is the next to the last building on the left in the first block of Foster Street off of Main Street.

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

About Plant Farley

The Joseph M. Farley Nuclear Plant is located on 1,850 acres along the Chattahoochee River near Dothan in southeast Alabama. It is owned by Alabama Power and operated by Southern Nuclear. It is one of three nuclear facilities in the Southern electric system.

Construction of the plant began in 1970. Unit 1 achieved commercial operation in December 1977. Unit 2 began commercial operation in July 1981. The total cost of the plant was about $1.57 billion.

Each unit is capable of generating 900 megawatts (mw) for a total capacity of 1,800 mw. The plant is powered by Westinghouse Pressurized Water Reactors.

The containment building, which houses the reactor, the reactor coolant system and other nuclear related components, is constructed of reinforced concrete and carbon steel.

Since commercial operation began in 1977, Plant Farley has generated more than 350 billion kilowatts of electricity. That's enough generation to supply every Alabama residential customer with electricity for 25 years.

Approximately 900 people – 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, 7 days a week. Full-time on-site inspectors from the U.S. Nuclear Regulatory Commission (NRC) monitor the plant to ensure it's maintained and operated safely, efficiently and in accordance with established nuclear operating procedures.

Who was Joseph M. Farley?

The plant is named for Joseph M. Farley, former president, CEO and director of Southern Nuclear. A native of Birmingham, Ala., Farley attended Birmingham-Southern College and then received an engineering degree from Princeton University in 1948. After earning his law degree from Harvard University in 1952, he began his career with Southern Company.

In 1965, he was elected executive vice president of Alabama Power. He became president of Alabama Power in 1969, and the following year he assumed the responsibilities of chief executive officer. During his 20 years of leadership, Farley steered Alabama Power through an era of unprecedented change and turmoil, while at the same time overseeing an aggressive construction program – providing the electric energy needed to sustain economic growth in Alabama into the next century.

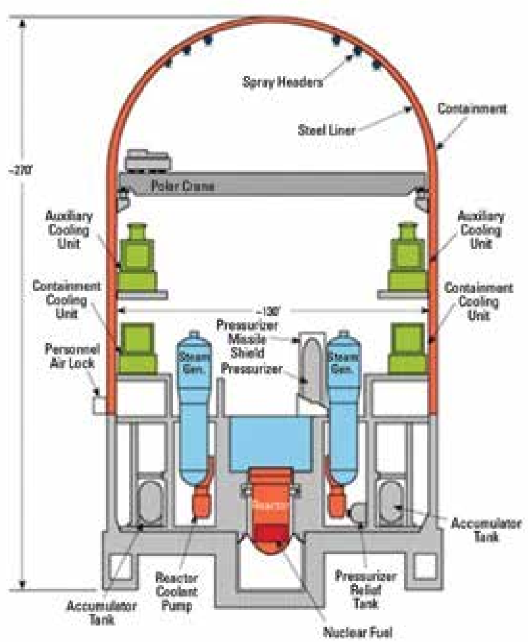
After leaving Alabama Power in 1989, Farley became executive vice president-Nuclear of Southern Company. In that position, he guided the formation of the nuclear subsidiary, Southern Nuclear, which was formed for the purpose of operating Southern Company's six nuclear units. He subsequently was named president, CEO and director of Southern Nuclear. During this time, he continued his service to the nuclear power industry, serving as chairman of the American Nuclear Energy Council from 1989 until 1992, and as a member of the Board of Directors of the U.S. Council for Energy Awareness. At the 1989 inaugural meeting in Moscow of the World Association of Nuclear Operators, Farley was one of 49 representatives from the United States.

When he retired from Southern Nuclear in 1992, Farley served as counsel at Balch & Bingham LLP. He also served on a variety of boards, such as Torchmark and Children's HealthSystem, and was involved in a host of civic and charitable community endeavors.

Joseph M. Farley died in 2010 at the age of 82.

Plant facts and statistics

CONTAINMENT
(Pressurized Water Reactor)



Typical Containment Structure

Owner:
Alabama Power

Operator:
Southern Nuclear

Location:
Houston County in Southeast Alabama, 16 miles east of Dothan.

Acreage:
1,850 acres. 400 used for the plant.

Reactors:
Type: 3-loop Pressurized Water Reactor (PWR)
Rated Capacity (size) – 950 megawatts per unit

Nuclear Steam Supply System (Reactor manufacturer):
Westinghouse Electric Company

Turbine Generator Manufacturer:
Westinghouse Electric Company

Containment:
Vertical, cylindrical, reinforced concrete structure with a dome and a flat base. It houses reactor, reactor coolant system and other Nuclear Steam Supply System components. It is 130 feet in diameter and 183 feet high. There are two containment buildings, one for each reactor.

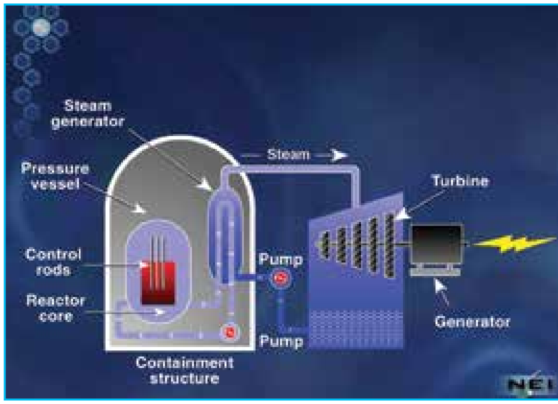
Construction Start Date:
1972

Commercial Operation
Unit 1: December 1977
Unit 2: July 1981

Cost:
$1.57 Billion

License Extensions:
Granted May, 2005
Unit 1: June 25, 2037 (originally licensed until 2017)
Unit 2: March 31, 2041 (originally licensed until 2021)

Employment:
Approximately 900



Typical Pressurized Water Reactor (PWR) Design

Engineer/Construction Firms
Bechtel Corporation
Daniel Construction Company
Southern Company Services

Fuel (17x17 array)
Fuel assemblies: 157
Overall length of fuel assembly: approximately 12 feet
Fuel rods per assembly: 264

Control Rods
(Rod Cluster Control Assemblies – RCCAs)
Number of RCCAs: 48
Control rods per RCCA: 24
Absorber material composition: silver-indium-cadmium
Cladding: stainless steel

Emergency Power (Safety Related)
Diesel generators: 1 dedicated per unit; 3 others as backups
Rated capacity: 4 MW each
Four 120-volt vital AC distribution panels

Reactor Coolant System (RCS)
Three 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) and 577 degrees Fahrenheit.

Reactor Coolant Pumps (RCP)
Three pumps, each 7,000 horsepower with 90,000 gallons per minute capacity.
Operating voltage: 4,160

Steam Generators
Three generators, each with 3,592 tubes made of stainless steel.

Circulating Water Systems (CWS)
The condenser is cooled by the circulating water system, which transfers heat to the cooling towers. Water comes from the Chattahoochee River via the Service Water Pond.

Plant Farley achievements

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

Environmental commitment

Since 1992, Plant Farley has been recognized as a certified wildlife habitat by the Wildlife Habitat Council. The council is a non-profit international organization dedicated to protecting and enhancing wildlife habitat.

Plant Farley's bluebird nesting program is very successful.

Almost half of Farley's 1,850 acres are wooded, with the remainder consisting of meadows, wetlands, ponds and a 95-acre lake.

Shortly after Plant Farley was built, a detailed land management plan was developed. The plan outlines strategies for enhancing the habitat for waterfowl, songbirds, deer and plant life. Mowing, tree planting and nest box placement are carefully monitored.

Plant Farley's bluebird nesting program is considered a very successful wildlife program. More than 75 bluebird boxes have been installed at the site. The nesting program has expanded into the local community. The plant has partnered with local school children who help monitor the boxes on their own school campuses and record results.

Baby bluebirds thrive in nesting boxes.

Plant Farley has been recognized as a certified wildlife habitat.

Community service

Plant Farley 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, Southern Nuclear and Alabama Power employees at Plant Farley regularly:

- Give more than $180,000 to the Wiregrass United Way.

Participate in:

- March of Dimes Walk America
- Habitat for Humanity
- Make-A-Wish Volunteer and Wish Granting
- Renew Our Rivers Campaign
- Wheelin' Sportsmen Catfish Roundup
- House of Ruth Gift Wrapping
- Girl Scout Cookie Rally

And serve as members of:

- The Alabama Power Service Organization
- The United States military, both at home and abroad
- Houston County Make-A-Wish Advisory
- Dothan Leadership Council
- United Way Loaned Executive Program

Emergency planning

Comprehensive plans have been developed by Southern Nuclear and approved by the Nuclear Regulatory Commission and other oversight agencies for responding in the event of an emergency at Plant Hatch, in accordance with federal requirements. Southern Nuclear has overall responsibility for the Plant Hatch 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 Farley, 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 Alabama Power personnel.

In addition, emergency support is available from a variety of other organizations, including the U.S. Nuclear Regulatory Commission, the state of Alabama, the state of Georgia, 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 Alabama Emergency Management Agency, the Georgia Emergency Management Agency, 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 Farley, a Joint Information Center (JIC) would be established to disseminate information to the news media. The Joint Information Center is located at a separate site near the plant, in the Houston County Juvenile Court Services building at 179 N. Foster Street in Dothan, Ala. All emergency information would be disseminated from the Joint Information Center, which would serve as a combined communication hub for Southern Nuclear, Alabama Power and the local county, state and federal agencies involved in responding to an emergency.

Initially, a Corporate Media Center would be established at Alabama Power's Corporate Headquarters at 600 North 18th Street in Birmingham, Ala. The Corporate Media Center would serve as an information center until the Joint Information Center (JIC) 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 accident severity of nuclear power plant emergencies. From least severe to most severe, the emergency classifications are listed below.

1. **Notification of Unusual Event.** The least serious of the four NRC classifications. It means there is a minor problem at the plant. Because of strict federal regulations, many situations occur that qualify as unusual events. Unusual events pose no danger to the public. You will not need to take any actions unless directed to by state and local officials.
2. **Alert.** An event has occurred that could reduce the plant's level of safety. There should be no danger to the public. County and state officials will be involved and prepared for any necessary response. You will not need to take any actions unless directed to by state and local officials.
3. **Site Area Emergency.** An event has occurred that could involve major problems with plant systems. Local radio and television stations in the area will provide information and instructions. If you're in an affected area, you will be notified by state and local officials about any actions you need to take.
4. **General Emergency.** The most serious of the four NRC classifications. Radioactive material could be released outside the plant site. State and local authorities will take action to protect the public. Sirens may be sounded and local radio and television stations will provide information and instructions. If you're in an affected area, you will be notified by state and local officials about any actions you need to take.

Emergency notification systems

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

Siren Systems

Sirens have been installed in Ashford, Columbia and Gordon. 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 Farley's annual emergency drill and during maintenance.

Eighty-nine pole-mounted sirens are installed throughout the Farley 10-mile EPZ.

CodeRED Emergency Notification System

The CodeRED Emergency Notification System may be utilized to contact residents by phone in the event of an emergency. It is also available as an app on your smart phone. For additional information, contact your local emergency management agency.

Public protective actions

If an emergency occurred at Plant Farley, 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 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 three actions health officials might recommend are called **take shelter, go inside/stay inside** 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.

Go inside/stay inside means protecting yourself by going inside any type of building, home or business. This action will keep you safe if there is a security event occurring at the plant. Radiation levels above EPA limits are not detected under this emergency action.

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 Farley 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 Farley 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.**

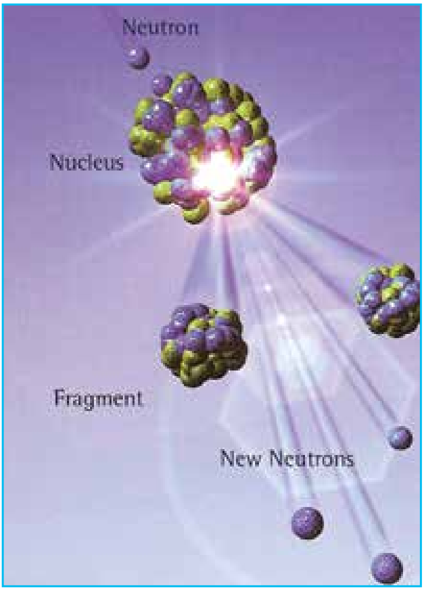
For more information on emergency procedures, view the Emergency Information Calendar found at www.southerncompany.com/nuclearenergy/farley.aspx, or download directly by scanning the QR code below.

Nuclear physics

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 Farley 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 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. 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 21st-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 neutron 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.

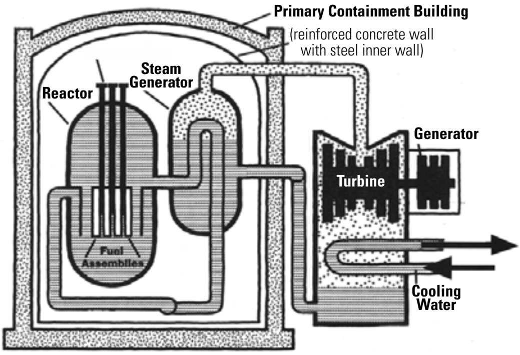
A small amount of uranium packs a lot of energy. In fact, a nuclear fuel pellet the size of a sewing thimble can produce approximately the same amount of energy as a ton of coal.

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 FARLEY WORKS

At a nuclear plant like Plant Farley, 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 Farley emergency systems that ensure the reactor core is cooled and radioactive products are contained under all types of conditions.

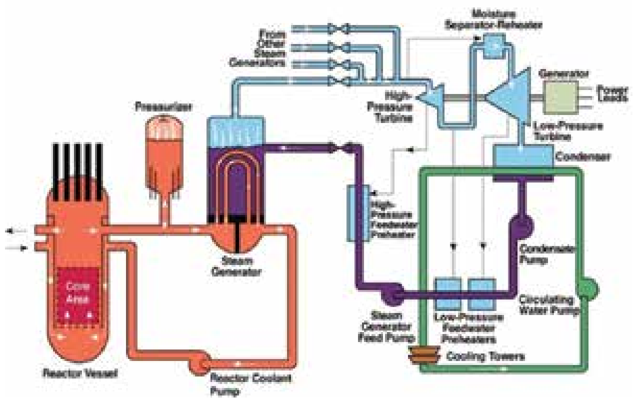
Types of light water reactors

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 Farley is a PWR with a three-loop system. The figure on page 17 shows a typical PWR generating cycle such as that of Plant Farley units 1 and 2.

In a PWR such as Plant Farley, 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.

STEAM SYSTEM
(Pressurized Water Reactor)



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 577 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 three 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 forced or mechanical draft cooling tower; water for the cooling tower is taken from the Chattahoochee 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 Farley 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 Farley 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 13 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 Farley, 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 extremes of 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, a comprehensive study conducted by the Electric Power Research Institute concluded that the containment structures that house nuclear fuel are robust and 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 Farley 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 ECCSs, 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 the 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 Farley units 1 and 2 have two emergency diesel generators each. As an added feature, a fifth diesel generator is available to supply power to either unit should the two primary diesel generators be unavailable. These generators are 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 ECCS.

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 Farley 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 cask 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 cask 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.

Dry cask 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 cask storage at each of our plant sites.

Currently, used fuel is being stored in dry cask storage as well as in the spent fuel pool at Plant Farley. This photo shows an industry dry cask storage site.

Dry storage containers are cylindrical containers constructed of steel or steel-reinforced concrete and lead, which serve as proven, effective radiation shields. These casks 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 cask 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.

While dry cask storage is very safe for the public and the environment, it is expensive. 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.

Background radiation

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, Colorado, is almost twice that in the Plant Farley 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

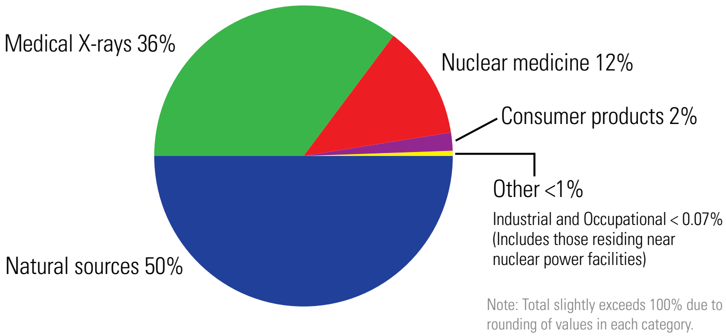
Radiation is measured in units of millirem. In the United States, the average person receives from 250 to 300 millirem a year from natural background radiation. That same person also receives about 90 millirem a year from medical care. The average person receives less than 1 millirem a year from living 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 Farley would put out 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.

Withstanding seismic activity

U.S. nuclear power plants are among the most robust, secure facilities ever built. They have significantly higher design and performance requirements than other industrial stations, and they are built to withstand much larger earthquakes than any other facility.

Our company was already working with the NRC and the rest of the nuclear industry to evaluate seismic risks and hazards using new modern methods well before the 2011 event at the Japanese Fukushima Daiichi nuclear plant.

Although our plants are located in regions with low seismic activity, Southern Nuclear has regularly assessed our plants against the current state of seismic knowledge. These regular assessments have resulted in enhanced margins of safety and increased reliability.

As the state of knowledge of seismic events progresses, so do the seismic models and the tools available to assess the impact on nuclear power plant performance. We continue to reaffirm that our nuclear energy facilities are built robustly enough to safely shutdown and withstand seismic events.

Protecting critical systems

Southern Nuclear considers cyber security to be a serious issue and has allocated significant resources to develop and implement a comprehensive program to protect its critical systems from cyber attacks.

The SNC cyber security plan provides a means to achieve high assurance that digital computer and communication systems and networks associated with critical functions, including safety, security and emergency preparedness, are effectively protected against cyber attacks.

The CSP has established a defensive in depth model that places our most protected equipment behind boundary isolation devices. Our plant safety and control systems are not connected to business networks or the Internet. Comprehensive controls over the use portable media and equipment are in place.

Southern Nuclear participates with the industry and government agencies to be aware of and assess its readiness for emerging cyber threats.

Plant Vogtle units 3&4

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 near Waynesboro, Ga., the first new nuclear generation to be built in the United States in more than 30 years.

Units 3&4 are scheduled to begin commercial operation in 2019 and 2020, respectively. 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&4.

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

The construction of Vogtle 3&4 is currently the largest job-producing project in Georgia, employing approximately 5,000 people during peak construction. It will create 800 permanent jobs when the facilities begin operating.

The co-owners of Vogtle units 1&2 will maintain their current ownership shares in Vogtle 3&4: Oglethorpe Power, 30 percent; Municipal Electric Authority of Georgia (MEAG), 22.7 percent; and Dalton Utilities, 1.6 percent. Georgia Power's proportionate share of the estimated in-service cost of the two units, based on its current ownership interest of 45.7 percent, is certified at $6.1 billion.

The Vogtle 3&4 project provides at least $4 billion more value to customers than the next best available technology, according to Georgia Public Service Commission staff. In addition, the facility will generate clean, safe and reliable energy that customers deserve and expect.

Georgia Power's uncompromising focus is on safety and quality, and we will incorporate all safety and technology advancements that improve the facility and make it the best value for the citizens of Georgia.

New units at Plant Vogtle

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.

Plume — something such as smoke, steam or water that rises into the air in a tall, thin shape.

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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