Alvin W. Vogtle Nuclear Power Plant - Units 1&2
Pressurized Water Reactors (PWRs)
Plant Vogtle Fact Sheet
March 2011

- Plant Vogtle is designed to withstand an earthquake equal to the plant's maximum projected seismic event.

- Plant Vogtle Units 1 & 2 are pressurized water reactors (PWRs)

- Plant Vogtle was designed in accordance with Nuclear Regulatory Commission (NRC) requirements related to natural events such as earthquakes, tornadoes, flooding (including tsunamis) and hurricanes. These requirements ensure that the plants can be safely shutdown and maintained in shutdown status after these events. The NRC requirements provide a design margin above historical event levels.

- Plant Vogtle, as well as federal, state, and local officials, has a detailed comprehensive emergency plan to respond to events within the plant's design and beyond the plant's design. Our trained skilled staff is on-site 24 hours per day and is trained to recognize and respond to problems. If an emergency occurs, the plant has the necessary equipment and plant personnel have detailed procedures and training to respond appropriately.

- Environmental hazards differ depending on location. For example, tsunamis or giant tidal waves are not credible events at Plant Vogtle because it is an inland site - located approximately 130 miles from the coast at an elevation of approximately 220 feet above sea level. Also, the Plant Vogtle site is located in an area of low seismic activity.

- Plant Vogtle is designed to withstand 0.20g horizontal peak ground acceleration which is well above any predicted earthquake ground motion in the area. This ground motion approximately represents an earthquake magnitude of 6.

- An independent seismic margins review, that was peer reviewed by seismic experts and submitted to the NRC, has confirmed Plant Vogtle is capable of sustaining an earthquake ground motion that is 50 percent higher than its design level and approximately represents an earthquake magnitude of 7.0.

- There are no active faults in the Plant Vogtle area and the site is in a low seismic zone. The site has had seismic instrumentation installed for over 20 years and has never recorded any earthquake ground motion. In the past 300 years, there has been no earthquake greater than a magnitude 3.7 in the surrounding area.

- Plant Vogtle is equipped with seismic monitoring systems that are set at extremely low triggering levels. If a seismic event triggers the seismic monitoring system, it would provide seismic ground motion data to the control room so the operators can determine the severity of the event and per procedures make appropriate decisions concerning plant safety.

- The building and structures that are necessary to maintain the plant in a safe condition are designed to withstand flooding and high winds. This includes flying debris produced by tornadoes with wind speeds up to 360 mph. The river water intake structure is designed to operate at very high river levels. Given the drainage capabilities of the Savannah River basin, it is highly unlikely a water source of this quantity would ever threaten the intake structure.

- All of Plant Vogtle's safety-related structures and equipment are located at or above 220 feet mean sea level (MSL). A safety analysis evaluating the site's vulnerability to floods, tsunamis, dam breaks and other events on

the Savannah River - including the failure of all upstream dams - determined that the maximum flood elevation that could result from such events is 168 MSL and would not impact Vogtle's safety-related structures or equipment.

- Plant Vogtle has a wide array of plant systems that ensure redundancy and the capability to ensure the plant reaches cold shut down and maintains it.

Information from Plant Vogtle Media Guide

Complete Plant Vogtle Media Guide available online at:
http://www.southerncompany.com/nuclearenergy/SNCmedia/0700747-Vogtle%20Media%20Guide%20Insides.pdf

Plant Vogtle – Background Information

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.

Plant Vogtle – Accident prevention details

One essential point about Plant Vogtle's reactors is that they 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 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.

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.

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.

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 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 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.

Plant Vogtle – Facts & Statistics

Owners
Georgia Power Company 45.7%
Oglethorpe Power Company 30.0%
Municipal Electric Authority Of Georgia 22.7%
City of Dalton 1.6%

Operator
Southern Nuclear Operating Company

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

Nearest City
Waynesboro, Ga., 21 miles west

Reactors
Type - pressurized water reactors (PWRs). Two units
Turbine Generator: 1,225 megawatts per unit
Total Capacity – 2,450 megawatts

Nuclear Steam Supply System (Reactor Manufacturer)
Westinghouse Electric Company

Turbine Generator Manufacturer

General Electric Company

Containment
Vertical cylindrical, post-tensioned concrete structure with a dome and a flat base. It houses reactor, reactor coolant system and other Nuclear Steam Supply System (NSSS) components. The interior is lined with carbon steel plate. Concrete shields the reactor and other NSSS components. It is 140 feet in diameter and 226 feet high. Minimum vertical wall thickness is 3 feet 9 inches. Minimum dome thickness is 3 feet and 6 inches with a foundation thickness of 10 feet.

ARCHITECT/ENGINEER:
Bechtel Power Corporation and Southern Company Services, Inc.

COST:
$8.87 billion (including financing)

APPROXIMATE EMPLOYMENT:
900

CONSTRUCTION START DATE:
1974

OPERATING LICENSE
Unit 1 – March 16, 1987
Unit 2 – March 31, 1989

COMMERCIAL OPERATION:
Unit 1 – June 1987
Unit 2 – June 1989

LICENSE RENEWALS:
Granted June 3, 2009
Unit 1: January 16, 2047 (Originally licensed until 2027)
Unit 2: February 9, 2049 (Originally licensed until 2029)

SIZE OF SITE:
3,150 acres

Fuel (17x17 array)
Fuel assemblies: 193
Overall length of fuel assembly: approximately 14 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: 7 MW 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.

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.