Edwin I. Hatch Nuclear Power Plant - Units 1&2
Boiling Water Reactors (BWRs)
Plant Hatch Fact Sheet
March 2011

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

- Plant Hatch Unit 1 & 2 are boiling water reactors (BWRs).

- Plant Hatch 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 Hatch, 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 are 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 Hatch because it is an inland site - located approximately 75 miles from the coast at an elevation of approximately 130 feet above sea level. Also, the Plant Hatch site is located in an area of low seismic activity.

- Plant Hatch is designed to withstand 0.15g 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 5.5.

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

- There are no active faults in the Plant Hatch area and the site is in a low seismic zone. The site has had seismic instrumentation installed for over 30 years and has never recorded any earthquake ground motion. In the past 300 years, there has been no earthquake greater than a magnitude 3.9 in the surrounding area.

- Plant Hatch 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 Altamaha river basin, it is highly unlikely a water source of this quantity would ever threaten the intake structure.

- Plant Hatch uses a multi-barrier GE Mark I containment system. A primary containment structure surrounds the reactor pressure vessel. The primary containment is a robust structure of steel designed to contain energy and radioactivity released during a loss of coolant accident. The reactor building, or secondary containment structure, surrounds primary containment and is also designed to prevent the release of reactivity to the environment under both normal and accident conditions.

- Plant Hatch 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 Hatch Media Guide

Complete Plant Hatch Media Guide available online at:
http://www.southerncompany.com/nuclearenergy/SNCmedia/Plant%20Hatch%20Media%20Guide.pdf

Plant Hatch – Background information

Plant Hatch sits on a 2,224 acre site along the Altamaha, Georgia's largest river. Since it began operation in 1974, Plant Hatch has supplied, on average, more than nine percent of Georgia's total electricity needs. The site includes two reactor units, eight cooling towers, a turbine room the size of two football fields, a state-of-the-art control room, an environmental lab and a high-voltage switching yard or substation. About 850 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 monitor the plant to ensure it is maintained and operated safely, efficiently and in accordance with established nuclear operating procedures.

Plant Hatch – Accident prevention details

- One essential point about Plant Hatch's Boiling 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 Boiling 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 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 this section is a description of these physical barriers at Plant Hatch that keep radioactive fission products from reaching the environment. Active systems are designed to ensure continuous core cooling and safe shutdown of the plant.

- **Containment** – Plant Hatch uses multi-barrier pressure suppression type containments consisting of a primary and a secondary containment. It is called the General Electric Mark 1 Containment.

  The primary containment consists of two structures, the drywell and the suppression chamber, also known as a "torus". The reactor vessel is contained within the drywell. The drywell is connected with vent pipes to the suppression chamber. Together, the drywell and suppression chamber make up the primary containment. Their function is to contain energy and radioactivity released during a Loss of Coolant Accident (LOCA).

  The drywell is a steel pressure vessel with a spherical lower portion and a cylindrical upper portion resembling an inverted light bulb. The drywell is enclosed in five feet of concrete. This provides extra shielding and structural strength.

  The pressure suppression chamber is a steel pressure vessel in the shape of a torus or doughnut, below and encircling the drywell. Large pipes connect the drywell and torus. Water in the torus is used to relieve pressures and quench steam in the drywell in the event of a LOCA.

  The reactor building, or secondary containment, surrounds the drywell and suppression pool. The containment building is constructed to prevent the 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 Hatch, the containment structure houses the reactor vessel and the reactor cooling system with reactor coolant pumps and pressurizer.

  The containment building is made of thick concrete 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. All 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 airborne debris such as utility poles or 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 protect the fuel from impacts of large commercial aircraft.

- **Fuel cladding** – Uranium fuel used at Hatch 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 18 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.

- **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 Hatch are:

- **Reactor protection system** – The reactor protection system is designed to shut down the reactor safely. The system continuously monitors important plant parameters as well as the operation of the reactor. If a problem occurs and causes the reactor power, pressures, temperatures, or coolant flow rates 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.

- **Suppression pool cooling** – The large volume of stored water in the suppression pool, or torus, is used as emergency water storage, as well as a heat sink for energy freed in the event of an accident. The torus water can also be cooled by heat exchangers and other external water supplies.

- **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.

  Hatch Units 1 and 2 have two emergency diesel generators each and share a fifth diesel generator that can supply power for either unit. 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.

- **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 all 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 consists of two hydrogen recombiner subsystems and two hydrogen monitoring subsystems. Hydrogen, which can be present after a Loss of Cooling Accident, is removed to avoid the possibility of fires and explosions.

  In summary, Plant Hatch has a number of redundant safety systems to prevent an emergency at the plant or to restore the plant to a safe condition should an emergency occur.

Plant Hatch – Facts & Statistics

Owners
Georgia Power Company 50.1%
Oglethorpe Power Company 30.0%
Municipal Electric Authority Of Georgia 17.7%
City of Dalton 2.2%

Operator
Southern Nuclear Operating Company

Location
11 miles north of Baxley, Georgia, in Appling County on the southern bank of the Altamaha River.

Nearest City
Baxley, Georgia, 11 miles south

Reactors
Type - Boiling Water Reactor (BWR)
Size - Unit 1 – 924 megawatts
Unit 2 – 924 megawatts
Total Capacity – 1,848 megawatts

Nuclear Steam Supply System (Reactor Manufacturer)
General Electric Company

Turbine Generator Manufacturer
General Electric Company

Containment
General Electric Mark 1- Pressure Suppression. The Primary Containment at Plant Hatch consists of a "drywell" and a pressure suppression chamber (torus). Both are steel pressure vessels. The drywell is encased in reinforced concrete to provide shielding and additional resistance to deformation. A removable drywell head encloses the top of the drywell. The primary containment system consists of a multiple-barrier, pressure suppression type containment. The primary containment houses the reactor vessel, the reactor coolant loops, and other branch connections of the reactor primary system. Secondary containment surrounds the primary containment and is designed to provide an additional barrier. The primary containment structure is housed in the reactor building which is the secondary containment structure. Each reactor unit at Plant Hatch has a reactor building/ primary containment structure.

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

COST:
Unit 1 - $414 million
Unit 2 - $520 million

APPROXIMATE EMPLOYMENT:
850

CONSTRUCTION START DATE:

1968

OPERATING LICENSE:
Unit 1 - August 6, 1974
Unit 2 - June 13, 1978

COMMERCIAL OPERATION:
Unit 1 - December 31, 1975
Unit 2 - September 5, 1979

LICENSE RENEWALS:
Granted January 15, 2002
Unit 1: August 6, 2034 (originally licensed until 2014)
Unit 2: June 13, 2038 (Originally licensed until 2018)

SIZE OF SITE:
2,224 acres

FUEL (array)
Fuel assemblies: 560
Overall length of fuel assembly: approximately 14 feet
Fuel rods per assembly: approximately 100

CONTROL RODS
137 Rods for each unit
Absorber material composition: typically Boron Carbine granules and
Hafnium rodlets in stainless steel Cladding:
Type 304 Stainless steel

EMERGENCY POWER SYSTEM
(Safety Related)
Diesel generators: 2 per unit + 1 shared
between them
Rated capacity: 3 MW each

REACTOR COOLANT SYSTEM (RCS)
The Reactor Coolant System consists of all piping directly connected to the reactor vessel inside the drywell. Operates at a nominal pressure of 1,035 psig (pounds per square inch gauge).

COOLING WATER SYSTEM (CWS)
The condenser is cooled by the circulating water system, which transfers heat to four mechanical forced draft cooling towers per unit. The water lost due to evaporation during the cooling process is replenished by water from the Altamaha River.