

RADIOLOGICAL EMERGENCY PREPAREDNESS

Florida's Preparedness and Response to
an Emergency at a Nuclear Power Plant



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Radiological Emergency Preparedness Plan



The possibility of an emergency occurring that could affect the health and safety of those people living within 10 miles of one of the three nuclear power plants in Florida or the plant in southeastern Alabama is not very likely.

However, even the low probability of this event occurring requires that State and local governments, as well as the utility operating the plant, prepare to respond and recover from such an emergency.



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Radiological Emergency Preparedness Plan

The State of Florida's Comprehensive Emergency Management Plan outlines the roles and responsibilities of those organizations that would respond to a nuclear power plant emergency in Annex A, Florida's Radiological Emergency Management Plan.

To further ensure that Florida's communities are prepared in the event of an emergency, annual exercises are conducted to test the integrated response capabilities of the State and local governments as well as the utility operating the nuclear plant.



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How a Nuclear Plant Works



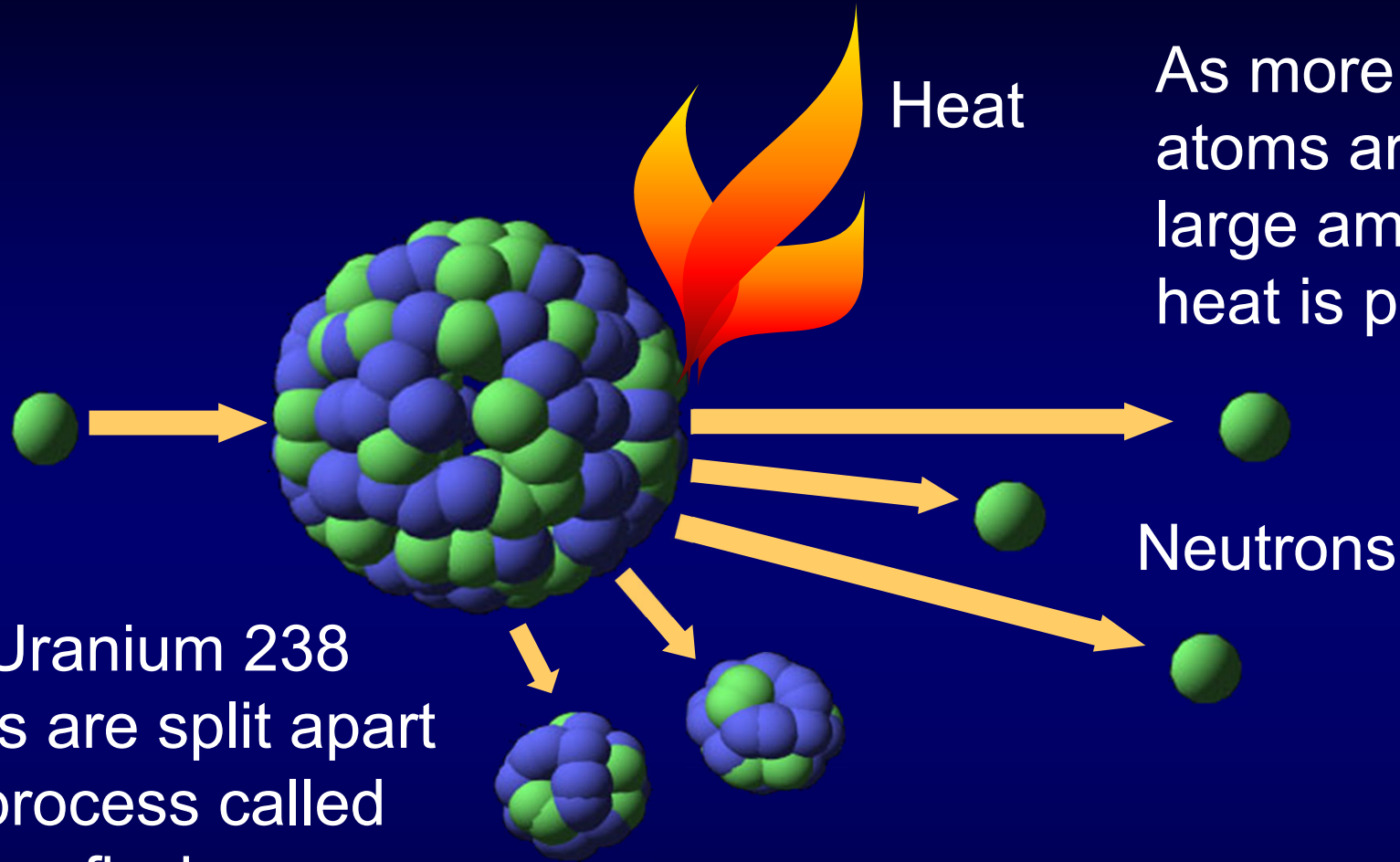
Uranium 235 is mined
at 0.7% pure.....

.....then refined to
produce Uranium 238
fuel pellets
at 3.5% pure



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How a Nuclear Plant Works



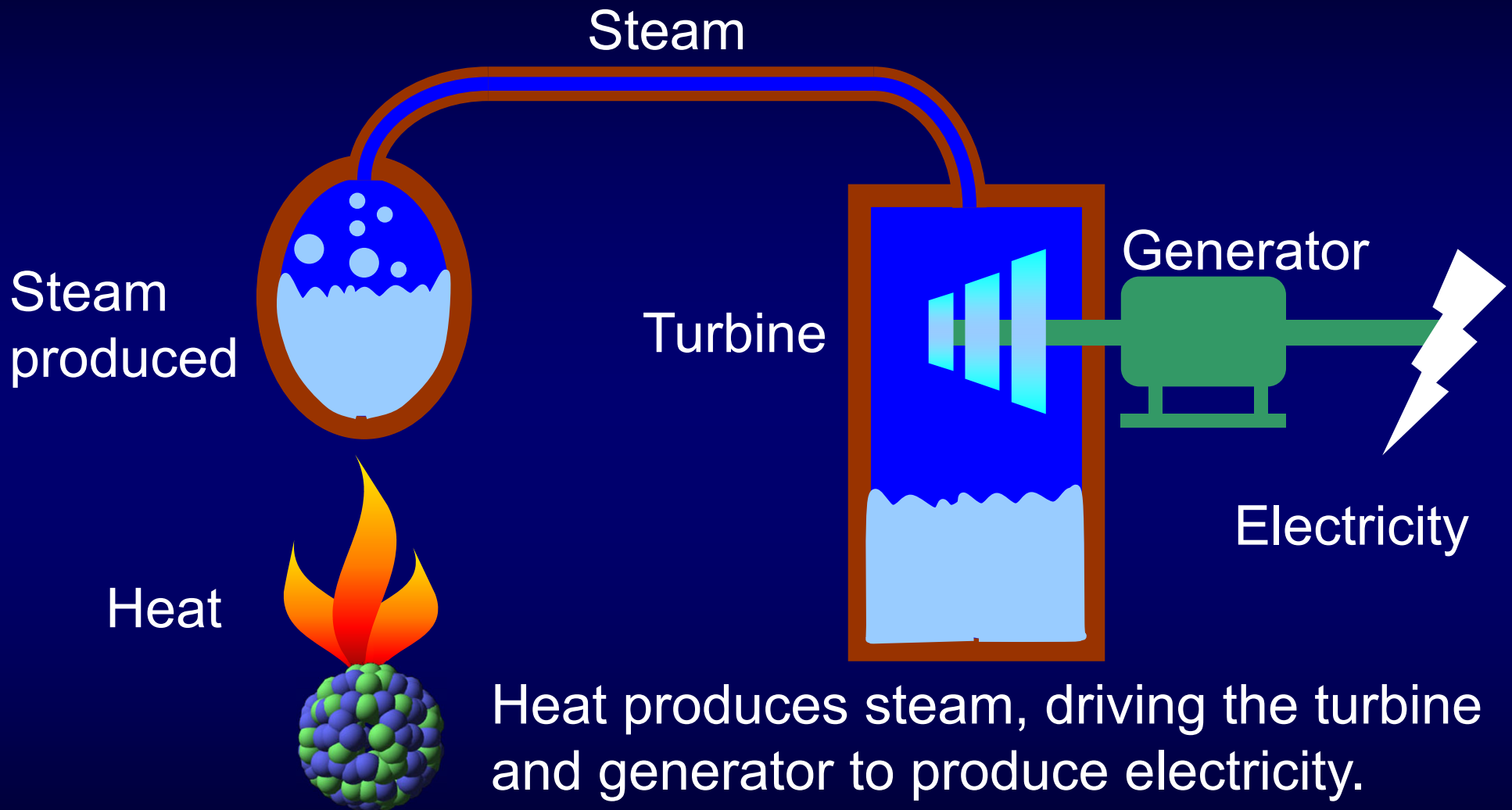
As more and more atoms are split, a large amount of heat is produced.

The Uranium 238 atoms are split apart in a process called nuclear fission.



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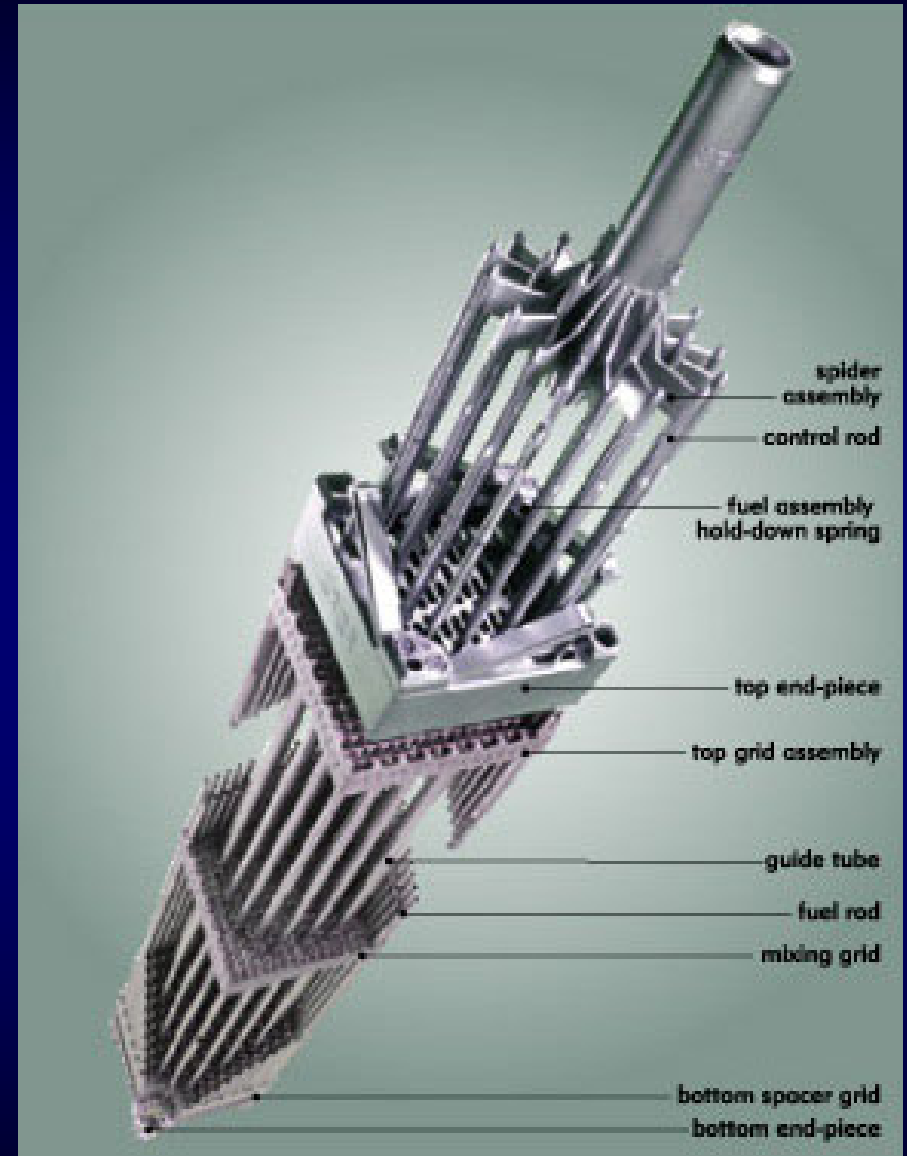
How a Nuclear Plant Works



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How a Nuclear Plant Works

- The reactor consists of 157 to 217 fuel assemblies.
- Each assembly contains 176 to 236 pressurized fuel rods.
- Each rod contains 326 fuel pellets.



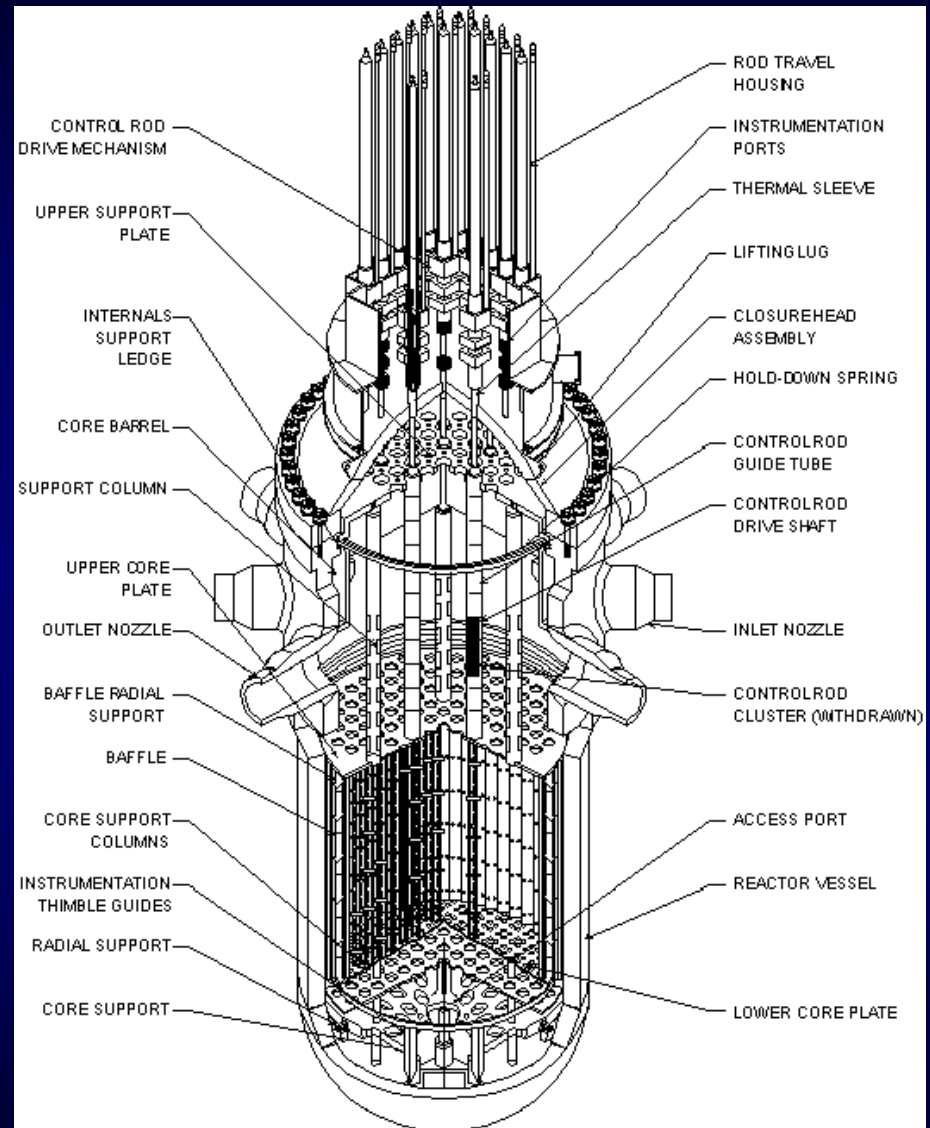
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How a Nuclear Plant Works

The fuel assemblies are housed in the reactor vessel.

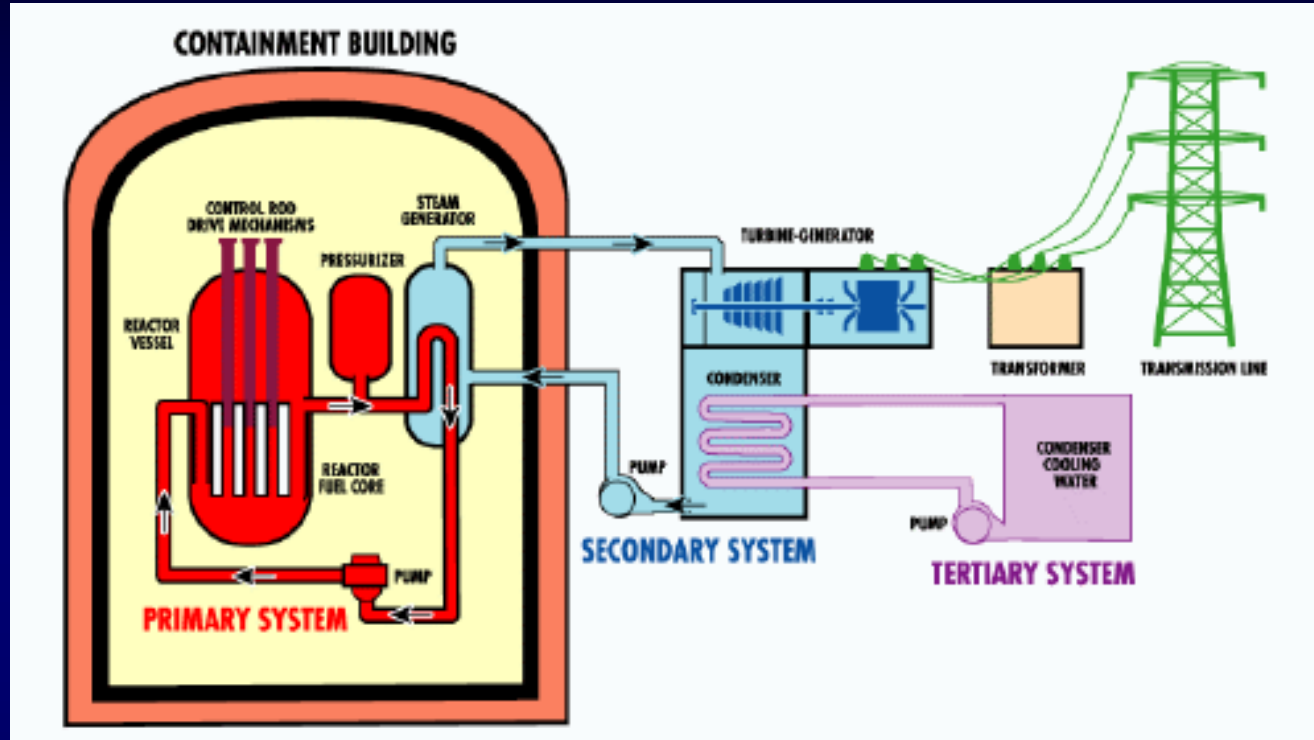
The reactor vessel has multiple barriers to protect the public from radiation:

- Zircaloy fuel rod cladding
- Control rods to control or shut down the nuclear fission process
- 8 inch steel reactor vessel wall



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Cooling the Reactor



There are three separate systems used to transfer and exchange the heat generated by the nuclear fission process, thereby keeping the reactor operating at a safe temperature.

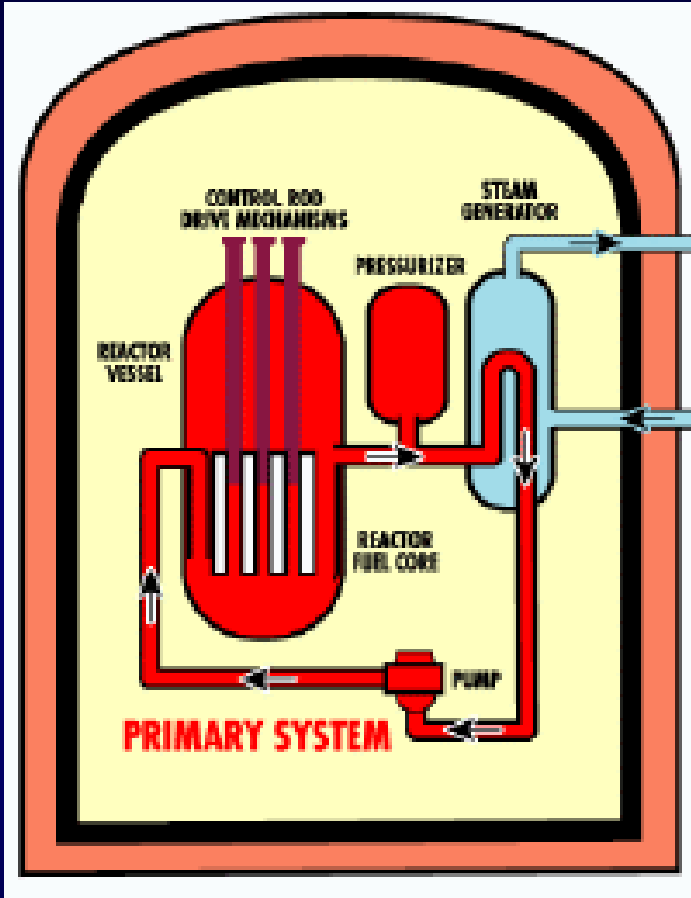


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Cooling the Reactor

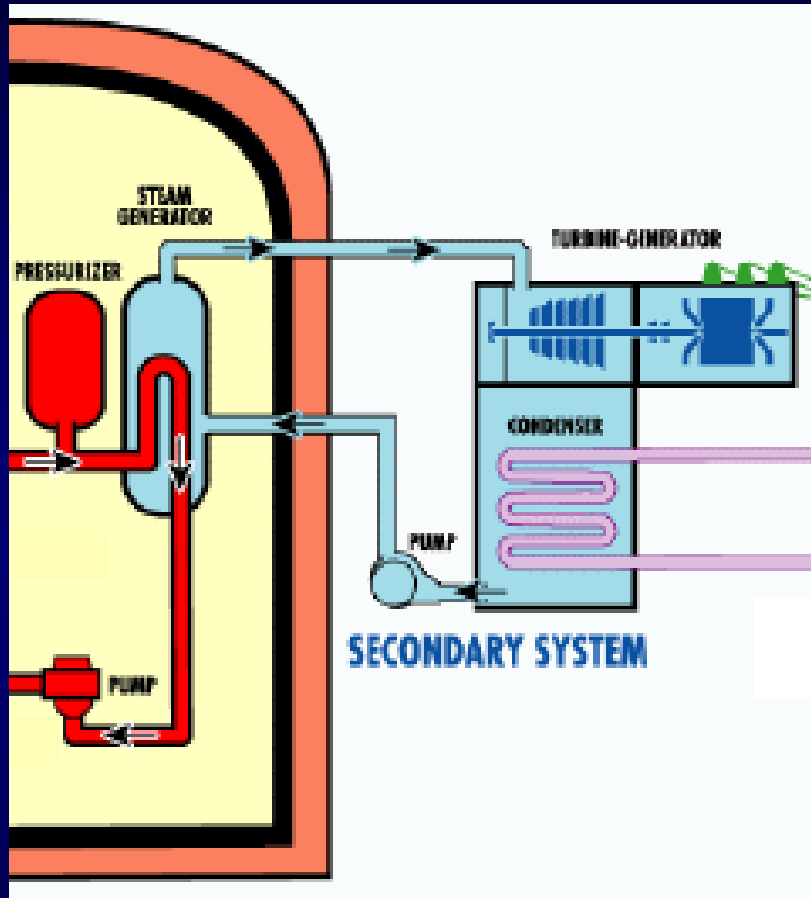
The water in the Primary System directly absorbs the heat generated in the reactor and is kept under pressure so that it does not boil.

The water passes through thousands of tubes in the plant's steam generator where the heat is transferred to the water in the Secondary System.



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Cooling the Reactor



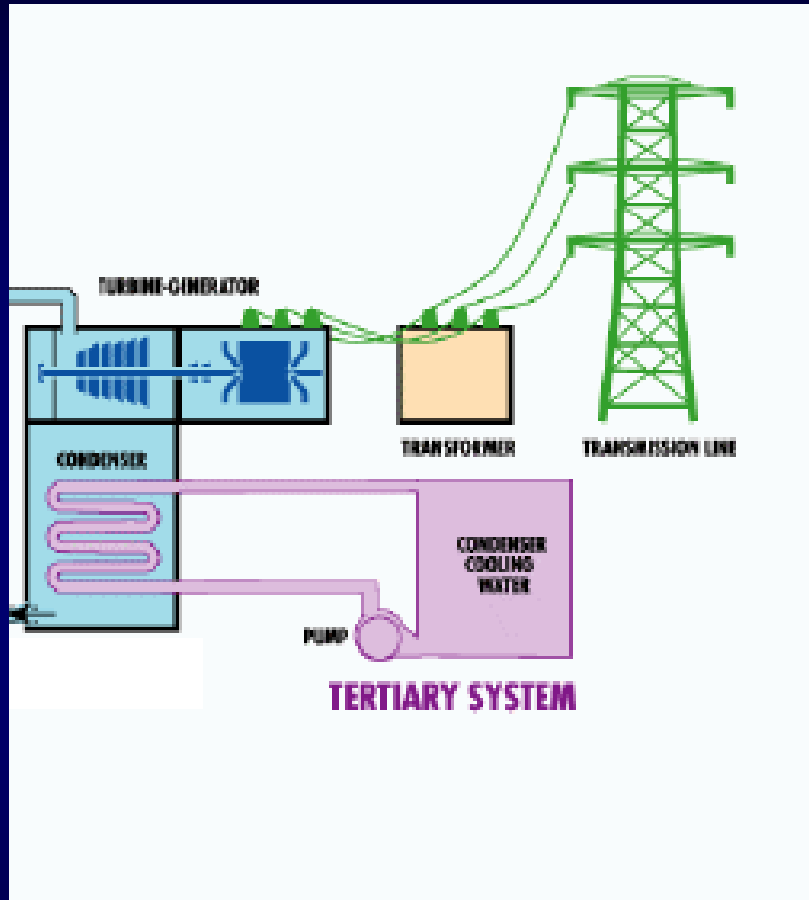
The water in the secondary system turns to steam when heated. The steam pushes against the blades of a turbine causing them to spin and produce electricity.

This is the same principle used in fossil fuel plants.



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Cooling the Reactor



As steam leaves the turbine, it passes over hundreds of pipes carrying cooler water from the tertiary system. As the water cools, it condenses from steam back to water for reuse in the steam generator.

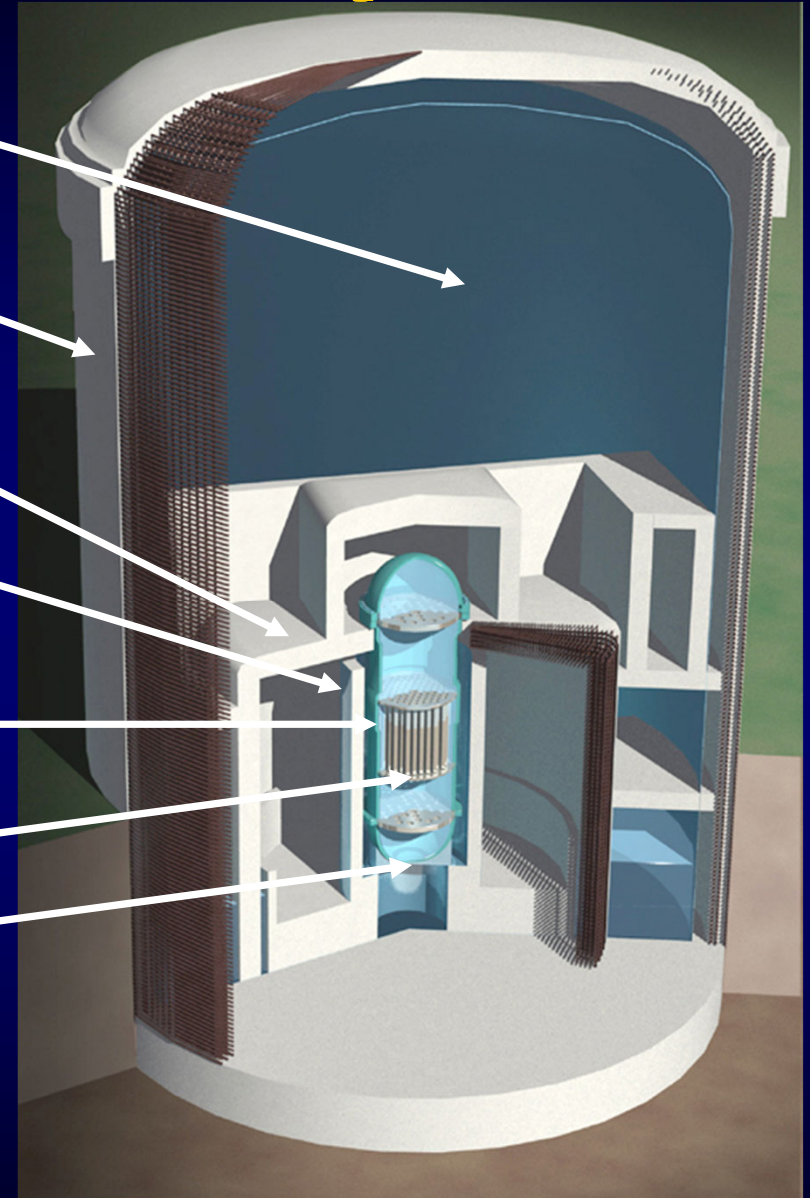
Water from each system is physically separated from water in the other systems.



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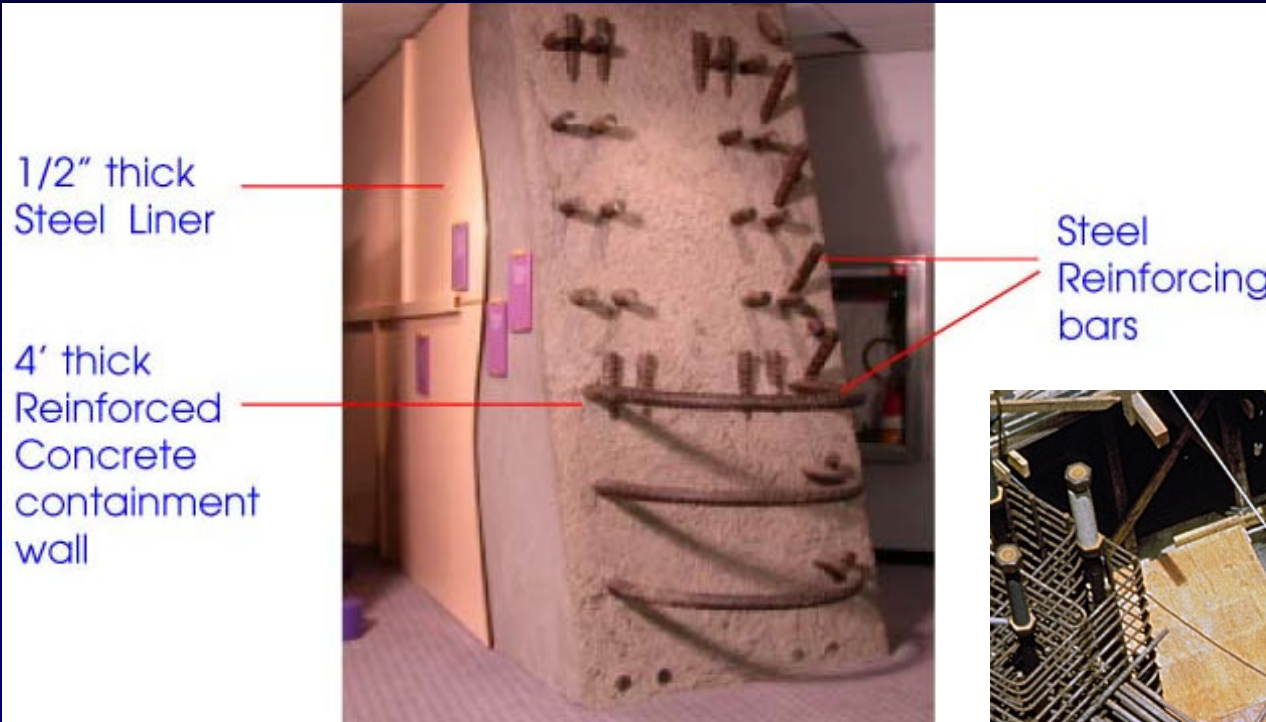
Multiple Layers of Safety

- Containment Vessel
1.5-inch thick steel
- Shield Building Wall
3 to 4 foot thick steel reinforced concrete
- Dry Well Wall
5 foot thick reinforced concrete
- Bio Shield
4 foot thick leaded concrete with
1.5-inch thick steel lining inside and out
- Reactor Vessel
4 to 8 inches thick steel
- Reactor Fuel
- Weir Wall
1.5 foot thick
concrete



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Multiple Layers of Safety



Containment Building Wall Construction



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Types of Radiation

All of a nuclear plant's safety systems are designed to prevent radiation from being released into the environment. There are three types of radiation produced in a nuclear reactor:

- Alpha Radiation
- Beta Radiation
- Gamma Radiation



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Types of Radiation

▶ Alpha Radiation

- Alpha particles are the least penetrating type of radiation.
- Particles can be stopped by a sheet of paper.

▶ Beta Radiation

- Beta particles are more penetrating than Alpha particles.
- Particles can be stopped by a piece of wood or a thin sheet of aluminum.

▶ Gamma Radiation

- Gamma particles are the most penetrating and dangerous form of radiation.
- Particles require heavy shielding such as concrete or steel.



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When an Emergency Occurs

If a nuclear plant declares an emergency, that does not mean that there is an immediate threat to the facility that requires a response.

An emergency declaration is intended to bring offsite agencies to a higher state of awareness and is based on a nuclear plant's emergency action levels.



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Emergency Action Levels

Pre-determined set of conditions that must be met to declare emergency.

Initially declared in Control Room.

Are the planning basis for the Emergency Classification Levels.



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Emergency Classification Levels

The emergency classification system is divided into four emergency declaration levels beginning with the least severe:

- ◆ Unusual Event
- ◆ Alert
- ◆ Site Area Emergency
- ◆ General Emergency



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Emergency Classification Levels



Unusual Event

Class Description:

- Unusual events are situations that either are in the process of occurring or have occurred which indicate a potential degradation of the level of safety at the plant.

Release Potential:

- No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Purpose:

- The purpose of offsite notification is to ensure that the first step in future response has been carried out, to bring the operations staff to a state of readiness, and to provide systematic handling of unusual event information and decision-making.



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Emergency Classification Levels



Alert

Class Description:

- Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant.

Release Potential:

- Any releases of radioactive materials are expected to be limited to small fractions of the Environmental Protection Agency Protective Action Guide exposure levels and will not significantly affect offsite areas.

Purpose:

- The purpose of this classification is to ensure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring if required, and provide offsite authorities current information on plant status and parameters.



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Emergency Classification Levels

◆ Site Area Emergency

Class Description:

- Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public.

Release Potential:

- Any releases of radioactive materials are not expected to exceed Environmental Protection Agency Protective Action Guide exposure levels except within site boundaries.

Purpose:

- The purpose of the Site Area Emergency declaration is to ensure that emergency response centers are staffed, to assure that monitoring teams are dispatched, to assure that personnel required for evacuation of near-site areas are at duty stations if the situation becomes more serious, to provide consultation with offsite authorities, and to provide updates to the public through government authorities.



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Emergency Classification Levels

◆ General Emergency

Class Description:

- Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity.

Release Potential:

- Releases of radioactive material can be reasonably expected to exceed Environmental Protection Agency Protective Action Guide exposure levels offsite.

Purpose:

- The purpose of the General Emergency declaration is to initiate predetermined protective actions for the public, to provide continuous assessment of information from the licensee and offsite organizational measurements, to initiate additional measures as indicated by actual or potential releases, to provide consultation with offsite authorities, and to provide updates for the public through government authorities.



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Radiological Emergency Preparedness

The area surrounding a nuclear power plant falls into one of two zones used for emergency planning:

▶ **Emergency Planning Zone (EPZ)**

- Extends 10 miles from the nuclear power plant
- Exposure through direct contact with or inhalation of radioactive particles released in a plume

▶ **Ingestion Pathway Zone (IPZ)**

- Extends 50 miles from the nuclear power plant
- Exposure through consumption of contaminated agricultural and dairy products



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Radiological Emergency Preparedness

The counties surrounding a nuclear power plant fall into one of three categories used for emergency planning:

▶ Risk County

- Applies to all counties within 10 miles of the nuclear power plant
- Shelter or evacuation orders are likely

▶ Host County

- Applies to counties outside of the 10 mile EPZ that have been designated to provide shelter for risk county evacuees

▶ Ingestion County

- Applies to all counties, including host counties, outside the 10 mile EPZ but within the 50 mile IPZ
- Agricultural embargoes likely to prevent the consumption of contaminated agricultural and dairy products



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Radiological Emergency Preparedness

To further ensure that the communities near a nuclear power plant are prepared for an emergency, annual exercises are conducted that are designed to test each response organization's response capabilities.

In addition, the Nuclear Regulatory Commission and the Federal Emergency Management Agency conduct evaluated exercises for each nuclear plant every two years. These evaluated exercises measure a response organization's efforts against an established list of criteria designed to ensure key response actions are met.



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Radiological Emergency Preparedness

All of the training and exercises that are required help to establish the areas around a nuclear power plant as some of the best prepared communities in the nation.

This level of preparedness is also quickly and easily adapted to other emergencies creating an “All Hazards” approach to emergency preparedness and response.



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Florida's Nuclear Plants

- St. Lucie
- Turkey Point
- Farley (Alabama)



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Florida's Nuclear Plants

St. Lucie

- Risk Counties
 - Martin
 - St. Lucie
- Ingestion Counties
 - Brevard
 - Indian River
 - Okeechobee
 - Osceola
 - Palm Beach
- Host Counties
 - Brevard
 - Indian River
 - Palm Beach



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Florida's Nuclear Plants

Turkey Point

- Risk Counties
 - Miami-Dade
 - Monroe
- Ingestion Counties
 - Broward
 - Collier



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Florida's Nuclear Plants

Farley (Alabama)

- Risk Counties
 - None
- Ingestion Counties
 - Bay
 - Calhoun
 - Gadsden
 - Holmes
 - Jackson
 - Liberty
 - Washington



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For More Information Please Contact:



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