

Storage of Spent Nuclear Fuel

What is Spent Nuclear Fuel?

Spent nuclear fuel refers to uranium-bearing fuel elements that have been used at commercial nuclear reactors and that are no longer producing enough energy to sustain a nuclear reaction. Once the spent fuel is removed from the reactor the fission process has stopped, but the spent fuel assemblies still generate significant amounts of radiation and heat.

For years, nuclear power plants have temporarily stored spent nuclear fuel in water-filled pools at the reactor site. The NRC has also authorized nuclear power plant licensees to store spent fuel at reactor sites in NRC-approved dry storage casks. Until a permanent repository for spent fuel and other high-level nuclear waste is available, spent nuclear fuel continues to be stored primarily in specially designed, water-filled pools and NRC-approved dry casks at individual reactor sites around the country. Periodically, about one-third of the nuclear fuel in an operating reactor needs to be unloaded and replaced with fresh fuel.

NRC regulations require stringent design, testing and monitoring in the handling and storage of spent nuclear fuel

The Nuclear Regulatory Commission (NRC) is an independent regulatory agency whose primary mission is to protect public health and safety, the common defense and security, and the environment in the use of nuclear materials. The agency regulates the possession, transportation, storage and disposal of spent fuel produced by nuclear reactors.

- For approval of cask designs, the NRC conducts tests and performs extensive analyses to ensure designs are safe and secure for use at any licensed nuclear power plant site in the country.
- The NRC's regulations are developed through a public process and provide a sound basis for determining whether use of a proposed storage system will protect public health and safety and the environment.
- The NRC regularly inspects the design, construction, and use of spent fuel pools and dry casks to ensure licensees and vendors meet NRC's radiation safety and security requirements.

Spent nuclear fuel pools adequately protect spent nuclear fuel

- Spent fuel pools are strong structures constructed of very thick steel-reinforced concrete walls with stainless steel liners located inside protected areas.

- Many fuel pools are located below ground level, many are shielded by other structures, and many have intervening walls that would obstruct an aircraft's or other object's impact.
- Spent fuel pools contain enormous quantities of water. Nuclear plants possess many other sources of water as backup supplies to the spent fuel pool.
- NRC has ordered licensees to develop guidance and strategies to maintain and restore spent fuel pool cooling using existing or available resources if cooling is lost for any reason. For many events, plant operators would have significant time to correct a problem, or implement fixes to restore cooling.

Spent nuclear fuel storage in casks is safe and environmentally sound

- Casks typically consist of a sealed metal cylinder containing the spent fuel enclosed within a metal or concrete outer shell. In some designs, casks are placed horizontally; in others, they are set vertically on a concrete pad.
- Casks are designed to resist situations such as floods, tornadoes, projectiles, and temperature extremes.
- Typically, the maximum heat generated in an hour from 24 fuel assemblies stored in a cask is less than that given off by a typical home heating system for the same amount of time.

Spent Nuclear Fuel Storage Facilities protect against sabotage, theft, and diversion

- The NRC sets the requirements and assesses compliance with the requirements, the licensees are responsible for providing the protection.
- The NRC has a threat assessment program to maintain awareness of the capabilities of potential adversaries and threats to facilities, material, and activities.
- The NRC's domestic safeguards program is focused on physically protecting and controlling spent nuclear fuel, against sabotage, theft, and diversion.
- Key features of the physical protection programs for spent nuclear fuel storage facilities include:
 - intrusion detection;
 - assessment of detection alarms to distinguish between false or nuisance alarms and actual intrusions and to initiate response;
 - response to intrusions; and
 - offsite assistance, as necessary, from local, State, and Federal agencies.
- Over the last 20 years, there have been no radiation releases which have affected the public and no known or suspected attempts to sabotage spent fuel casks or storage facilities.

The NRC responded to the terrorist attacks on September 11, 2001, by promptly developing and requiring security enhancements for both spent nuclear fuel storage in spent nuclear fuel pools and dry casks.

***NRC has taken action to ensure
the safe and secure storage of
spent nuclear fuel***