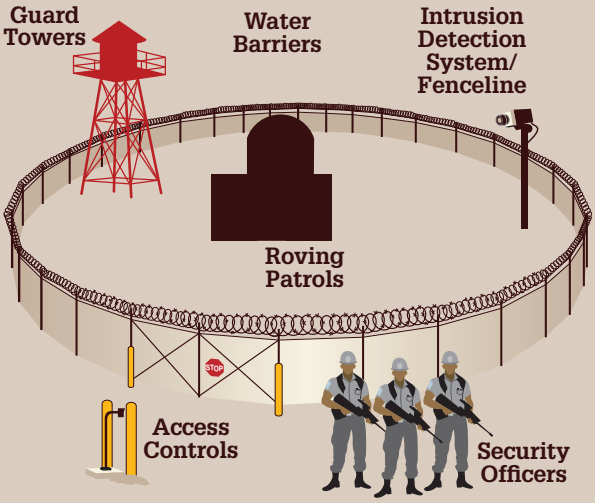
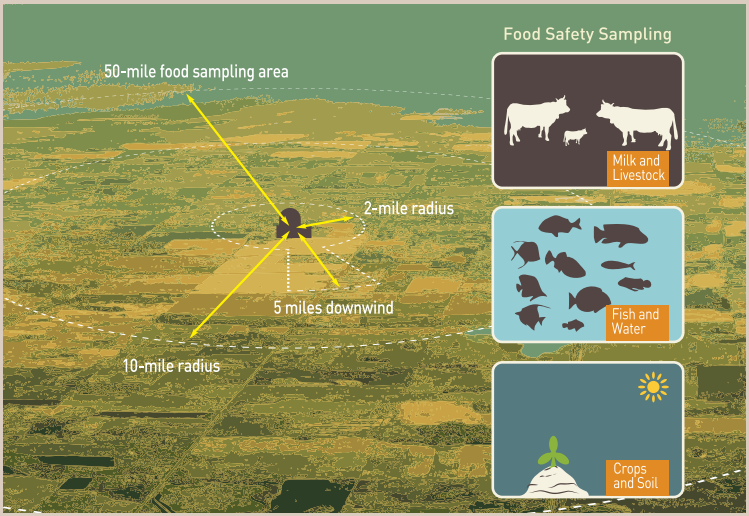
Security and Emergency Preparedness

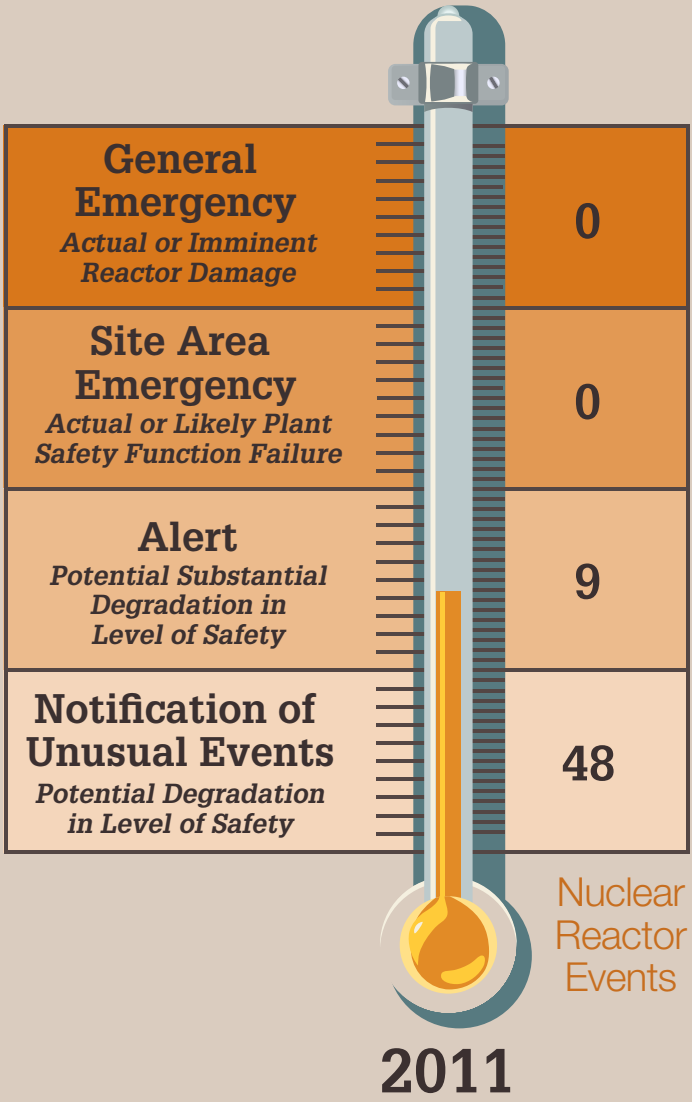
SECURITY COMPONENTS



Emergency Planning Zones



Emergency Classifications



Overview

Nuclear security is a high priority for the NRC. For the past several decades, effective NRC regulation and strong partnerships with a variety of Federal, State, Tribal, and local authorities have ensured effective implementation of security programs at the Nation's nuclear facilities and radioactive materials across the country. In fact, nuclear power plants are likely the best protected private sector facilities in the United States. However, given today's threat environment, the agency recognizes the need for continued vigilance and high levels of security.

In recent years, the NRC has made many enhancements to bolster the security of nuclear power plants. Because nuclear power plants are inherently robust structures, these additional security upgrades largely focus on the following improvements (see Figure 47):

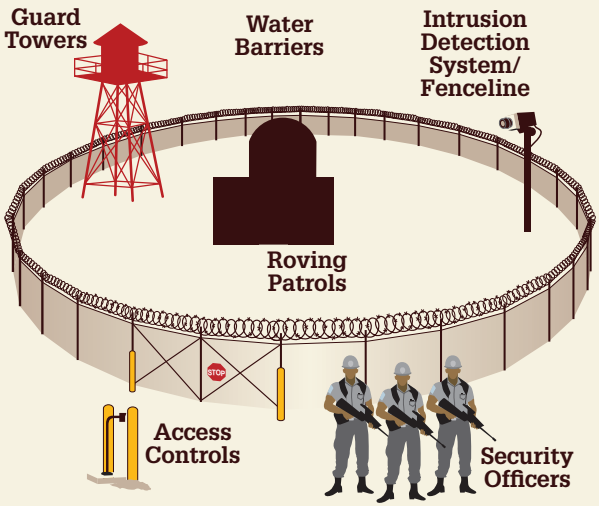
- well-trained and armed security officers;
- high-tech equipment and physical barriers;
- greater standoff distances for vehicle checks;
- intrusion detection and surveillance systems;
- tested emergency preparedness and response plans; and
- restrictive site access control, including background checks and fingerprinting of workers.

Additional layers of security are provided by coordinating and sharing threat information among DHS, the U.S. Federal Bureau of Investigation, intelligence agencies, the U.S. Department of Defense, and local law enforcement.

Facility Security

In accordance with NRC regulations, nuclear power plants and Category I fuel facilities must be able to defend successfully against a set of hypothetical threats that the agency calls the design-basis threat (DBT). This includes threats that challenge a plant's physical security, personnel security, and cyber security. The NRC does not make details of the DBT public because of security concerns. However, the agency continuously evaluates this set of hypothetical threats against real-world intelligence to ensure that the DBT remains current. To test the adequacy of a nuclear power plant's defenses against the DBT, the NRC conducts rigorous "force-on-force" inspections.

Figure 47. Security Components



Protecting nuclear facilities requires all the security features to come together and work as one.

Licensees are authorized to use deadly force while protecting nuclear facilities from intruders.

Access control security gates within a nuclear facility provide another layer of protection.

During these inspections, exercises are conducted in which a highly trained mock adversary force "attacks" a nuclear facility. Beginning in 2004, the NRC began conducting more challenging and realistic force-on-force exercises that also occur more frequently. To ensure that facilities meet their security requirements, the NRC inspects nuclear power plants and fuel fabrication facilities, spending about 16,000 hours a year scrutinizing security including 8,000 hours of force-on-force inspections). Publicly available portions of security-related inspection reports can be found on the NRC Web site (see the Web Link Index). Inspection reports are not available for the NRC-licensed highly enriched uranium fuel facilities.

Cyber Security

Nuclear facilities use digital and analog systems to monitor, control, and run various types of equipment and to obtain and store vital information. Protecting these systems and the information they contain from sabotage or malicious use is called "cyber security." However, nuclear plant reactor control systems are isolated from the internet to protect reactors. All nuclear power plants licensed by the NRC must have a cyber security program. A new cyber security rule, issued in 2009, requires each nuclear power facility to submit a cyber security plan and implementation timeline for NRC approval. Once the licensee has fully implemented its program, the NRC will conduct a comprehensive inspection on site. The NRC has formed a cyber security team that includes technology and threat experts who constantly evaluate and identify emerging cyber-related issues that could affect plant systems. This team makes recommendations to other NRC offices and programs on cyber security issues.

Materials Security

The security of radioactive materials is important for a number of reasons. For example, terrorists could use radioactive materials to make a radiological dispersal device such as a dirty bomb. The NRC works with its Agreement States, other Federal agencies, IAEA, and licensees to protect radioactive material from theft or diversion. The agency has made improvements and upgrades to the joint NRC-DOE database that tracks the movement and location of certain forms and quantities of special nuclear material. In early 2009, the NRC deployed its new NSTS, designed to track the most risk-sensitive sources on a continuous basis. Other improvements allow U.S. Customs and Border Protection agents to promptly validate whether radioactive materials coming into the United States are properly licensed by the NRC.

Emergency Preparedness

As a condition of their license, operators of nuclear facilities develop and maintain effective emergency plans and procedures. The NRC inspects licensees to ensure that they are prepared to deal with emergencies. In addition, the agency monitors performance indicators related to emergency preparedness (see Figure 48).

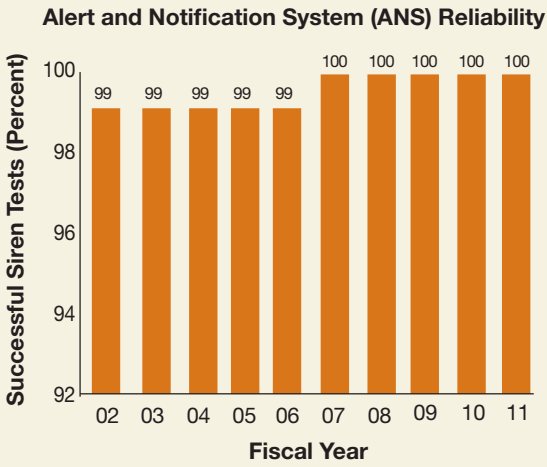
Well-developed and practical emergency preparedness plans ensure that a nuclear power plant operator can protect public health and safety in the unlikely event of an emergency.

See Appendix H for lists of industry performance indicators.

The NRC staff participates in emergency preparedness exercises, some of which include security- and terrorism-based scenarios. To form a coordinated system of emergency preparedness and response, as part of these exercises, the NRC works with licensees; Federal agencies; State, Tribal, and local officials; and first responders. This system includes public information, preparations for evacuation, instructions for sheltering, and other actions to protect the residents near nuclear power plants in the event of a serious incident.

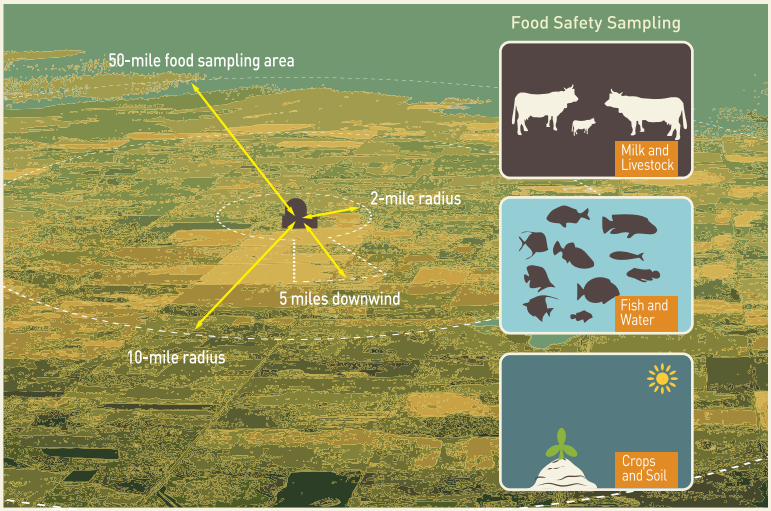
The NRC assesses the ability of nuclear power plant operators to respond to emergencies. For nuclear power plants, operators are required to conduct full-scale exercises with the NRC, the Federal Emergency Management Agency (FEMA), and State and local officials at least once every 2 years. These exercises

Figure 48. Industry Performance Indicators: FYs 2002–2011 Averages for 104 Plants



This shows the percentage of ANS sirens that successfully operated during periodic tests in the previous year. The result is an indicator of the reliability of the ANS to alert the public in an emergency.

Figure 49. Emergency Planning Zones



Note: A 2-mile ring around the plant is identified for evacuation along with a 5-mile zone downwind of the projected release path.

test and maintain the skills of the emergency responders and identify areas that need addressing. The NRC and FEMA evaluate these exercises. Between these 2-year exercises, nuclear power plant operators self-test their emergency plans in drills that NRC inspectors evaluate.

Emergency Planning Zones

Although emergency planning zones (EPZs) are meant to be expandable, as necessary, for planning purposes, the NRC defines two zones around each nuclear power plant. The exact size and configuration of the zones vary from plant to plant based on local emergency response needs and capabilities, population, land characteristics, access routes, and jurisdictional boundaries (see Figure 49 for a typical EPZ around a nuclear plant).

The two types of EPZs are as follows:

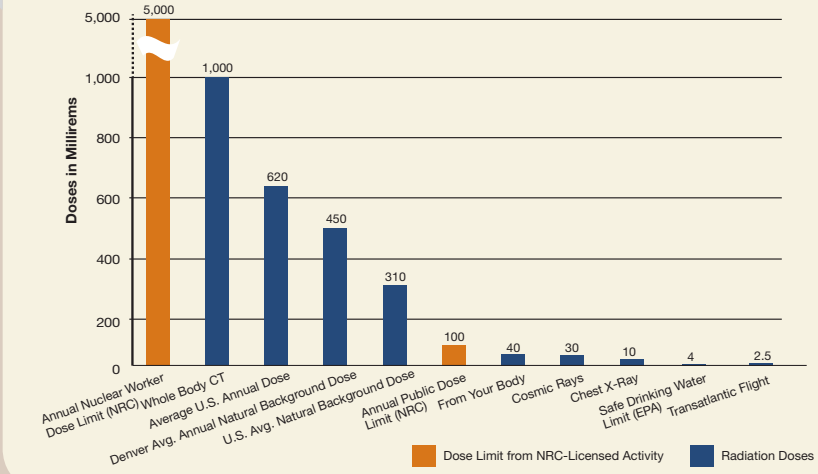
- The plume exposure pathway EPZ extends about 10 miles in radius around a plant. Its primary concern is the exposure of the public to, and the inhalation of, airborne radioactive contamination. Research has shown that the most significant impacts of an accident would be expected in the immediate vicinity of a plant, and any initial protective actions, such as evacuations or sheltering in place, should be focused there.
- The ingestion pathway EPZ extends about 50 miles in radius around a plant. Its primary concern is the ingestion of food and liquid that is contaminated by radioactivity.

See Glossary for radiation sources and exposure pathways.

Protective Actions

During an actual radiological event, the NRC would perform dose calculations using radiation dose projection models that analyze release paths from power reactors. The dose calculations would also take into account weather conditions to project radiation doses. The NRC would confer with appropriate State and county governments on its assessment results. Plant personnel would also provide assessments. State and local officials in communities within the EPZ have detailed plans to protect public health and safety in the event of a radiological release. These officials make the protective action decision, including evacuations, based on the assessments that they have received. See Figure 50 for dose regulatory limits.

Figure 50. Radiation Doses and Regulatory Limits



NRC staff provided support to overseas counterparts during the Japan nuclear accident and examined available information to understand the implications for the United States.

Evacuation, Sheltering, and the Use of Potassium Iodine

Protective actions considered for a radiological emergency include evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI) to protect the thyroid from absorbing radioactive iodine. Under certain conditions, evacuation may be preferred to remove the public from further exposure to radioactive material. However, under some conditions, people may be instructed to take shelter in their homes, schools, or office buildings. Depending on the type of structure, sheltering can significantly reduce a person's dose compared to the dose received if he or she remained outside. In certain situations, KI is used as a supplement to sheltering.

Evacuation does not always call for the complete evacuation of the 10-mile zone around a nuclear power plant. In most cases, the release of radioactive material from a plant during a major incident would move with the wind, not in all directions surrounding the plant. The release would also expand and become less concentrated as it travels away from a plant. Therefore, evacuations can be planned to anticipate the path of the release.

Sheltering is a protective action that keeps people indoors to reduce exposure to radioactive material. It may be appropriate to shelter when the release of radioactive material is known to be short term or is controlled by the nuclear power plant operator. Additional information on emergency preparedness is available on the NRC Web site (see the Web Link Index).

Incident Response

Sharing information quickly among the NRC, other Federal and State agencies, and the nuclear industry is critical to responding promptly to any incident. The NRC staff supports several important Federal incident response centers that coordinate assessments of event-related information. The NRC Headquarters Operations Center, located in the agency's Headquarters in Rockville, MD, is staffed around the clock to disseminate information and coordinate response activities. To ensure the timely distribution of threat information, the NRC reviews intelligence reports and assesses suspicious activity.

The NRC works within the National Response Framework to respond to events. The framework guides the Nation in how to respond to complex events that may involve a variety of agencies and hazards.

The NRC expanded to 24-hour coverage in its operations center following the March 2011 earthquake and tsunami event in Japan.

Under this framework, the NRC retains its independent authority and ability to respond to emergencies that involve NRC-licensed facilities or materials. The NRC coordinates the Federal technical response to an incident that involves one of its licensees.

The NRC may request DHS support in responding to an emergency at an NRC-licensed facility or involving NRC-licensed materials. DHS may lead and manage the overall Federal response to an event, according to Homeland Security Presidential Directive 5, "Management of Domestic Incidents." In this case, the NRC would provide technical expertise and help share information among the various organizations and licensees.

In response to an incident involving possible releases of radioactive materials, the NRC activates its incident response program at its Headquarters Operations Center and one of its four Regional Incident Response Centers. Teams of specialists assemble at these Centers to evaluate event information and independently assess the potential impact on public health and safety. The NRC staff provides expert consultation, support, and assistance to State and local

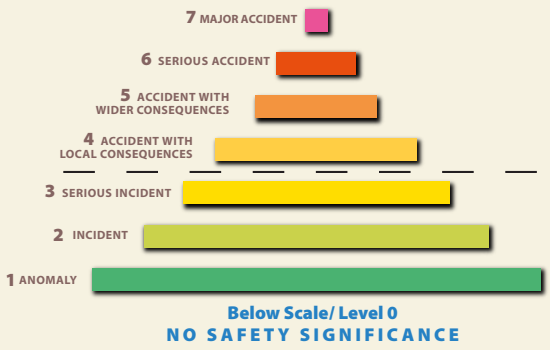
public safety officials and keeps the public informed of agency actions. Scientists and engineers at these Centers analyze the event and evaluate possible recovery strategies. Meanwhile, other NRC experts evaluate the effectiveness of protective actions the licensee has recommended that State and local officials implement. If needed, the NRC will dispatch a team of technical experts from the responsible regional office to the site of the incident. Augmenting the NRC's resident inspectors, who work at the plant, the team serves as the agency's onsite eyes and ears, allowing a firsthand assessment and face-to-face communications with all participants. The Headquarters Operations Center continues to provide around-the-clock Federal communications, logistical support, and technical analysis throughout the response.

The International Nuclear and Radiological Event Scale (INES) was introduced as a worldwide tool for promptly communicating to the public in a consistent way the safety significance of reported nuclear and radiological incidents and accidents (see Figure 51.) The scale can be applied to any event associated with nuclear facilities, as well as the transport, storage, and use of radioactive material and radiation sources.

The NRC does not require its licensees to classify events or to provide off-site notifications using the INES scale. The NRC has committed to transmit to the IAEA an INES-based rating for an applicable event occurring in the U.S.to events rated at Level 2 or above, or events attracting international public interest.

Figure 51. The International Nuclear and Radiological Event Scale

INES events are classified on the scale at 7–levels. Levels 1–3 are called "incidents" and Levels 4–7 "accidents." The scale is designed so that the severity of an event is about 10 times greater for each increase in level on the scale. Events without safety significance are called "deviations" and are classified as Below Scale or at Level 0.



Emergency Classifications

Based on NRC regulations, the emergency classifications are the sets of plant conditions that indicate various levels of risk to the public and that might require response by an offsite emergency response organization to protect citizens near the site.

Both nuclear power plants and research and test reactors use the following four emergency classifications (See Figure 52):

- **Notification of Unusual Event:** Events that indicate potential degradation in the level of safety of the plant are in progress or have occurred. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
- **Alert:** Events that involve an actual or potential substantial degradation in the level of plant safety are in progress or have occurred. Any releases of radioactive material are expected to be limited to a small fraction of the limits set forth by the U.S. Environmental Protection Agency (EPA).
- **Site Area Emergency:** Events that may result in actual or likely major failures of plant functions needed to protect the public are in progress or have occurred. Any releases of radioactive material are not expected to exceed the limits set forth by EPA except near the site boundary.
- **General Emergency:** Events that involve actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity are in progress or have occurred. Radioactive releases can be expected to exceed the limits set forth by EPA for more than the immediate site area.

Nuclear materials and fuel cycle facility licensees use the following emergency classifications:

- **Alert:** Events that could lead to a release of radioactive materials are in progress or have occurred. The release is not expected to require a response by an offsite response organization to protect citizens near the site.
- **Site Area Emergency:** Events that could lead to a significant release of radioactive materials are in progress or have occurred. The release could require a response by offsite response organizations to protect citizens near the site.

Figure 52. Emergency Classifications for Nuclear Reactor Events, 2011