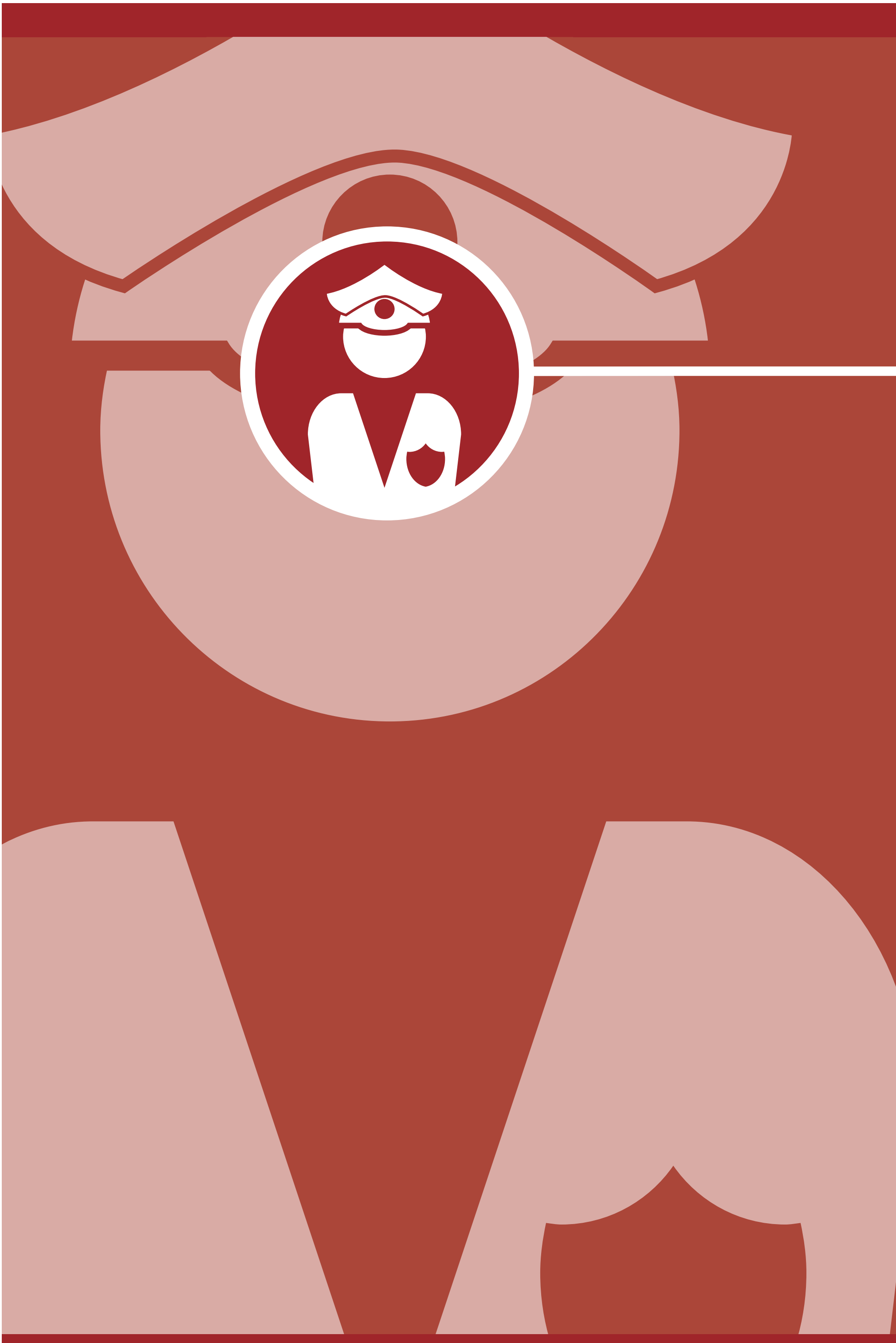
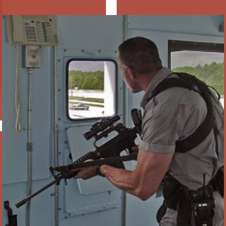


# SECURITY AND EMERGENCY PREPAREDNESS



# Overview

Nuclear security is a high priority for the NRC. For decades, effective NRC regulation and strong partnerships with Federal, State, Tribal, and local authorities have ensured effective implementation of security programs at nuclear facilities and radioactive materials sites 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 the security of nuclear power plants. Because nuclear power plants are inherently robust structures, these additional security upgrades (see Figure 40: Security Components) largely focus on:

- 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
- restrictive site-access control, including background checks and fingerprinting of workers

The NRC also coordinates and shares threat information with DHS, the U.S. Department of Defense, the Federal Bureau of Investigation, intelligence agencies, and local law enforcement.

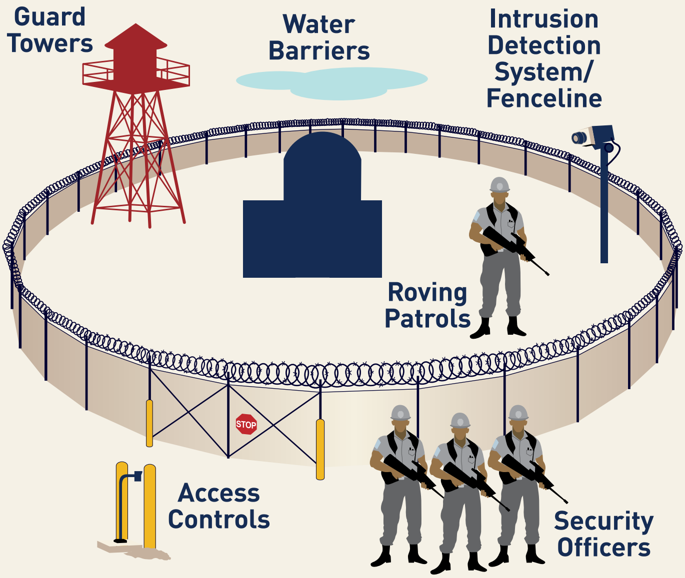
# Facility Security

Under NRC regulations, nuclear power plants and fuel facilities that handle highly enriched uranium must be able to defend successfully against a set of threats the agency calls the design-basis threat (DBT). This includes threats to a plant's or facility'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 threats against real-world intelligence to ensure the DBT remains current. To test the adequacy of a facility's defenses against the DBT, the NRC conducts rigorous force-on-force inspections at each facility every 3 years.

*See Glossary for definitions of the categories of special nuclear material.*

During these inspections, a highly trained mock adversary force "attacks" a nuclear facility. Beginning in 2004, the NRC made these exercises more realistic, more challenging, and more frequent.

**Figure 40. Security Components**




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

Publicly available portions of security-related inspection reports are on the NRC's Web site (see the Web Link Index). For security reasons, inspection reports are not available for the NRC-licensed fuel facilities that handle highly enriched uranium. Nuclear power plants that have begun decommissioning may therefore apply for exemptions from NRC security requirements.

## Cyber Security

Nuclear facilities use digital and analog systems to monitor, control, and run various types of equipment, as well as to obtain and store vital information. Protecting these systems and the information they contain from sabotage or malicious use is called cyber security. The reactor control systems of nuclear plants are isolated from the Internet, but for added security, all nuclear power plants licensed by the NRC must have a cyber security program.

In 2013, the NRC began regular cyber security inspections of nuclear power plants under new regulations designed to guard against the cyber threat. The experience that the NRC gained in developing the cyber security requirements for nuclear power plants provided a basis for developing similar cyber security requirements for nonreactor licensees and other nuclear facilities.

The NRC's cyber security team includes technology and threat experts who constantly evaluate and identify emerging cyber-related issues that could possibly endanger plant systems. The team also makes recommendations to other NRC offices and programs on cyber security issues. In October 2014, the NRC joined other independent regulatory agencies to create the Cyber Security Forum for Independent and Executive Branch Regulators. According to its mission statement, the forum aims to "increase the overall effectiveness and consistency of regulatory authorities' cyber security efforts pertaining to U.S. critical infrastructure, much of which is operated by industry and overseen by a number of federal regulatory authorities."

## Materials Security

Radioactive materials must be secured to reduce the possibility that terrorists could use them to make a radiological dispersal device, sometimes called an RDD or a dirty bomb. The NRC has established rules to provide the requirements for the physical protection of certain types and quantities of radioactive material. Additionally, the NRC works with the Agreement States, other Federal agencies, IAEA, and licensees to protect radioactive materials from theft and malicious use. In 2009, the NRC deployed the National Source Tracking System, designed to track the most risk-sensitive radioactive materials in sources. 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 or an Agreement State. In addition, the NRC improved and upgraded the joint NRC-DOE database tracking the movement and location of certain forms and quantities of special nuclear material.

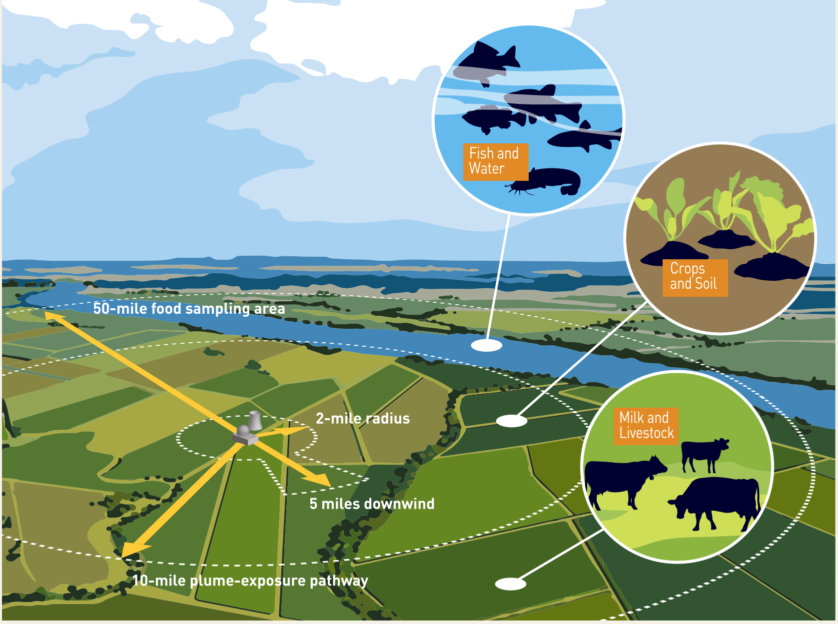
## Emergency Preparedness

Operators of nuclear facilities are required to develop and maintain effective emergency plans and procedures to protect the public in the unlikely event of an emergency. Emergency preparedness plans include 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 includes emergency preparedness in its inspections and monitors performance indicators associated with emergency preparedness. Nuclear power plant operators must conduct full-scale exercises with the NRC, the Federal Emergency Management Agency (FEMA), and State and local officials at least once every 2 years. Some of these exercises include security and terrorism-based scenarios. These exercises test and maintain the skills of the emergency responders and identify areas that need to be addressed. Nuclear power plant operators also conduct their own emergency response drills.

## Emergency Planning Zones

The NRC defines two emergency planning zones (EPZs) 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. The zone boundaries are flexible, and the NRC may expand these zones during an emergency if circumstances warrant. For a typical EPZ around a nuclear plant, see Figure 41: Emergency Planning Zones. The two types of EPZs are the plume-exposure pathway and ingestion pathway. The plume-exposure pathway covers a radius of about 10 miles (16 kilometers) from the plant and is the area of greatest concern about the public's exposure to and inhalation of airborne radioactive contamination. Research has shown 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, or food safety sampling area, extends to a radius of about 50 miles (80 kilometers) from the plant and is the area of greatest concern about the ingestion of food and liquid contaminated by radioactivity.

**Figure 41. 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.

## Protective Actions

During an actual nuclear power plant accident, the NRC would use radiation-dose projection models to predict the nature and extent of a radiation release. The dose calculations would account for weather conditions to project the extent of radiation exposure to the nearby population. 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 the public during a radiation release. These officials make their protective action decisions, including decisions to order evacuations, based on these and other assessments.

## Evacuation, Sheltering, and the Use of Potassium Iodide

Protective actions considered for a radiological emergency include evacuation, sheltering, and the preventive use of potassium iodide (KI) supplements to protect the thyroid from radioactive iodine, which can cause thyroid cancer.

Under certain conditions, it may be preferable to evacuate the public away from further exposure to radioactive material. However, a complete evacuation of the 10-mile (16-kilometer) zone around a nuclear power plant is not likely to be needed 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 traveled away from a plant. For these reasons, evacuations can be planned based on the anticipated path of the release. 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 someone's dose when compared to staying outside. In certain situations, KI may be used as a supplement to sheltering. 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.

The risk of an offsite radiological release is significantly lower and the types of possible accidents significantly fewer at a nuclear power reactor that has permanently ceased operations and removed fuel from the reactor vessel.

Nuclear power plants that have begun decommissioning may therefore apply for exemptions from these FEMA and NRC emergency planning requirements. Once the exemptions are granted, State and local agencies may apply their comprehensive emergency plans—known as all-hazard plans—to respond to incidents at the plant. Additional information on emergency preparedness is available on the NRC's Web site (see Web Link Index).


*During an exercise in the agency's Headquarters Operation Center, the NRC reactor safety team looks at simulated projected core temperature levels.*

# Incident Response

Quick communication among the NRC, other Federal and State agencies, and the nuclear industry is critical when responding to any incident. The NRC staff supports several Federal incident response centers where officials can 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. The NRC also reviews intelligence reports and assesses suspicious activity to keep licensees and other agencies up to date on current threats. The NRC works within the National Response Framework to respond to events. The framework guides the Nation in its response to complex events that might involve a variety of agencies and hazards. Under this framework, the NRC retains its independent authority and ability to respond to emergencies involving NRC-licensed facilities or materials. The NRC may request support from DHS 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 radiation releases, the NRC activates its incident response program at its Headquarters Operations Center and one of its four Regional Incident Response Centers. Teams of specialists at these centers evaluate event information, independently assess the potential impact on public health and safety, and evaluate possible recovery strategies.

The NRC staff provides expert consultation, support, and assistance to State and local public safety officials and keeps the public informed of agency actions. Meanwhile, other NRC experts evaluate the effectiveness of protective actions the licensee has recommended to State and local officials. If needed, the NRC will dispatch a team of technical experts from the responsible regional office to the site. This team would assist the NRC's resident inspectors who work at the plant. The Headquarters Operations Center would continue to provide around-the-clock communications, logistical support, and technical analysis throughout the response.

# Emergency Classifications

Emergencies at nuclear facilities are classified according to the risk posed to the public. These classifications help guide first responders on the actions necessary to protect the population near the site. Nuclear power plants use these four emergency classifications:

**Notification of Unusual Event:** Events that indicate a 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 the 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 the EPA for more than the immediate site area.

Nuclear materials and fuel cycle facility licensees use these 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 residents near the site.

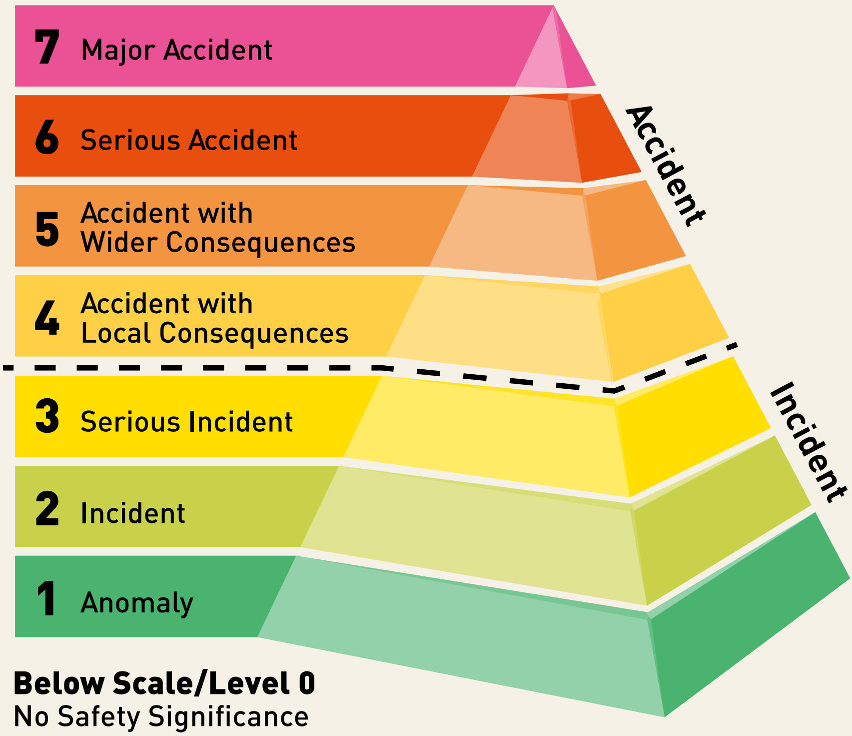
**Site Area Emergency:** Events that could lead to a significant release of radioactive materials are in progress or have occurred. The release could require a response by offsite response organizations to protect residents near the site.

# International Emergency Classifications

IAEA uses the International Nuclear and Radiological Event Scale (INES) as a tool for promptly and consistently communicating to the public the safety significance of reported nuclear and radiological incidents and accidents worldwide (see Figure 42: The International Nuclear and Radiological Event Scale).

The scale can be applied to any event associated with nuclear facilities, as well as to the transport, storage, and use of radioactive material and radiation sources. Licensees are not required to classify events or provide offsite notifications using the INES. But the NRC has a commitment to transmit to IAEA an INES-based rating for an applicable event occurring in the United States rated at Level 2 or above, or events attracting international public interest.

**Figure 42. The International Nuclear and Radiological Event Scale**




*INES events are classified on the scale at seven levels. Levels 1–3 are called incidents and Levels 4–7 are called 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.*

Source: *www.ns.iaea.org/emergency/ines.asp*