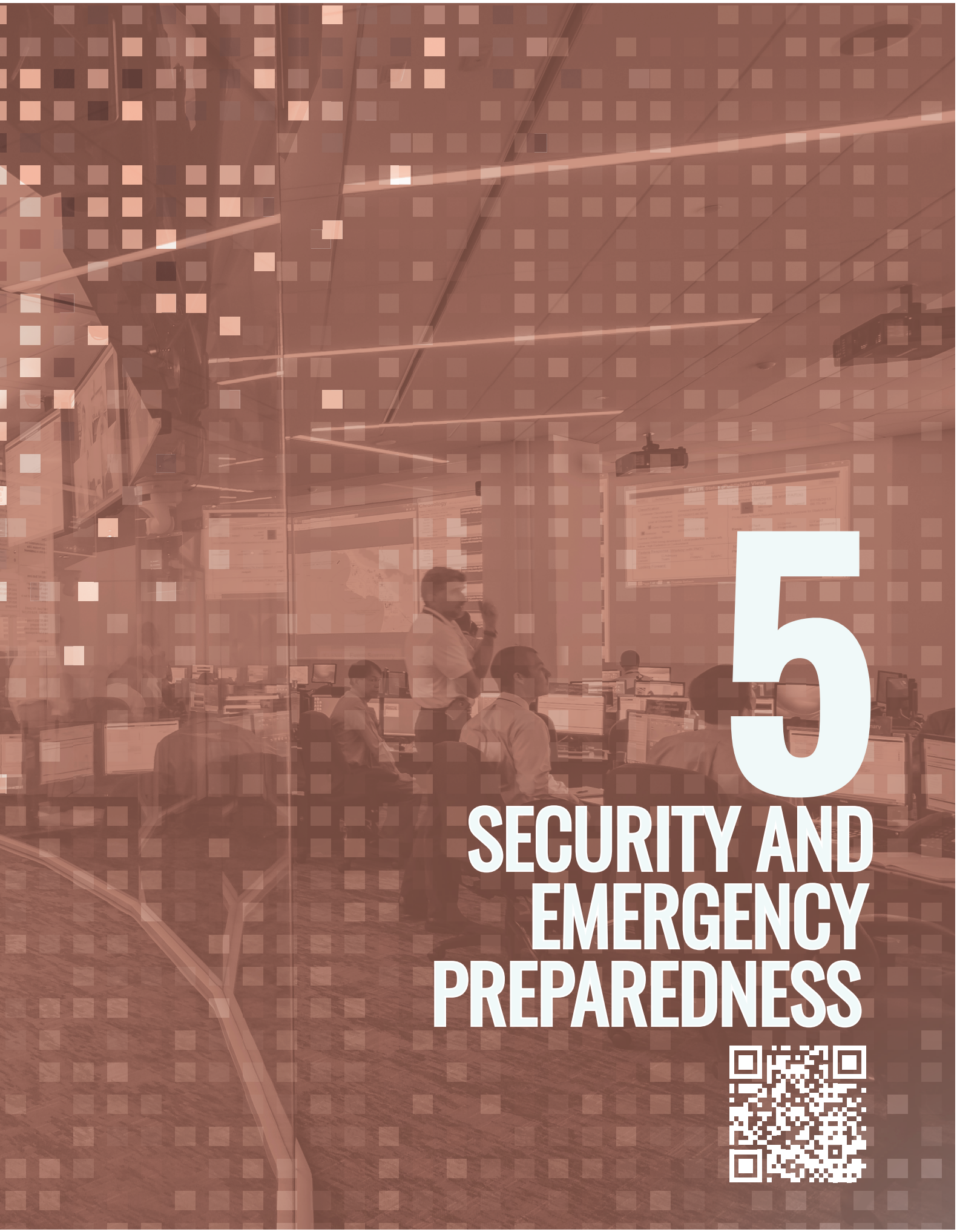


5

SECURITY AND EMERGENCY PREPAREDNESS

Nuclear security and emergency preparedness and response are high priorities. 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 and prepared 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 (See Figure 41. Security Components).

NRC regulations mandate security requirements for licensees to support national defense and safeguard the country's security. Below are examples of required security and emergency preparedness measures:

- *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.*
- *Controls to protect physical security, emergency preparedness, and safety systems from a cyberattack.*

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

The NRC is moving toward a risk-informed, performance-based, technology-inclusive regulatory framework for emergency preparedness. As with security, the NRC's approach to emergency preparedness is graded, using a risk-informed process in which the safety requirements and criteria are matched to the risk to the facility. This approach provides an appropriate level of protection to public health and safety without creating undue regulatory burden. In 2023, the NRC amended its regulations for emergency preparedness for SMRs and other new technologies. Major provisions of these regulations and guidance include the following:

- *An alternative performance-based framework for emergency preparedness.*
- *A required hazard analysis of nearby facilities that would adversely impact emergency preparedness.*
- *A scalable approach for determining the size of the emergency planning zone.*
- *A requirement to describe ingestion response capabilities and resources.*

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." Details of the DBT are not public because of security concerns, but it includes threats to a facility's physical security, personnel security, and cybersecurity and is based on realistic assessments of the tactics, techniques, and procedures used by terrorist groups. The NRC continually evaluates the threat environment and assesses the need to change the DBT.

The NRC, on a continuing regular basis, verifies that licensees are complying with security requirements through its baseline inspection program. This includes force-on-force inspections designed to test a facility's defenses against the DBT. Force-on-force inspections are held at each nuclear power plant once every 3 years, employing a highly trained mock adversary force to provide a realistic evaluation of the proficiency of licensees security forces against a threat consistant with DBT.

Publicly available portions of security-related inspection reports are on the NRC's website. For security reasons, inspection reports are not available for the NRC-licensed fuel facilities that handle highly enriched uranium.

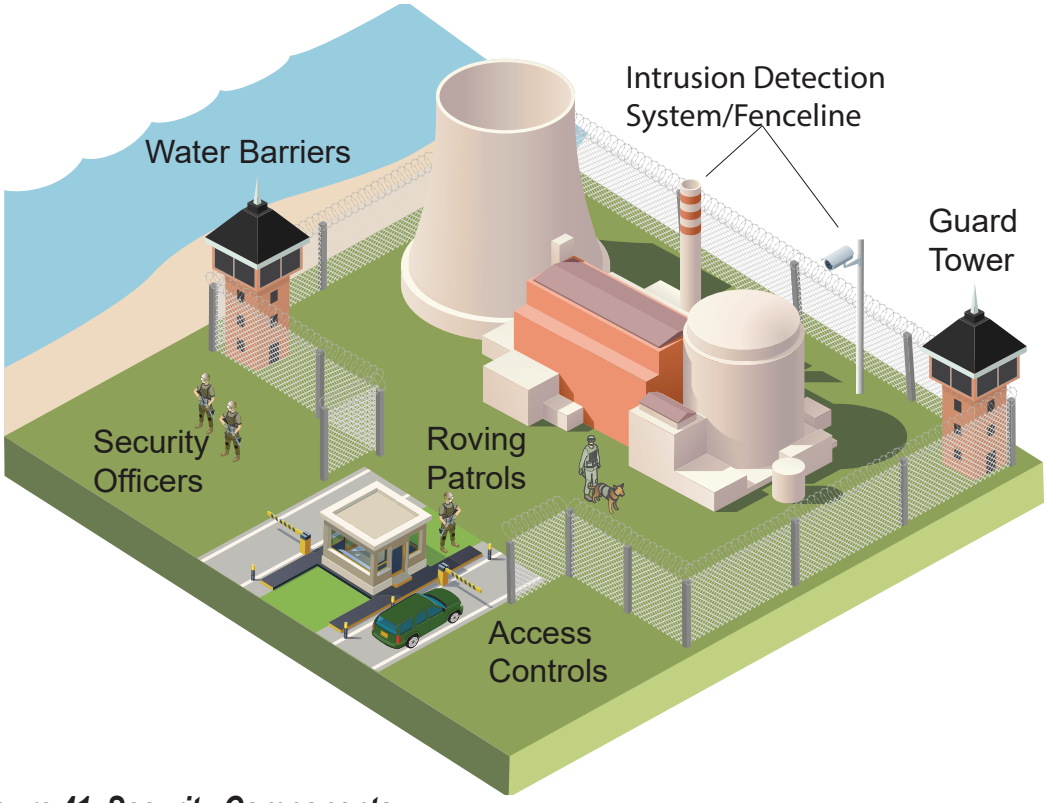


Figure 41. Security Components

CYBERSECURITY

Nuclear facilities use digital and analog systems to monitor and operate 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 “cybersecurity.” All nuclear power plants licensed by the NRC must have an approved cybersecurity plan to guard against malevolent cyberattacks against these facilities. For this reason, computer systems at nuclear power plants that monitor and operate safety and security systems are isolated from external communications, including the internet.

The NRC’s inspections of nuclear power plants’ cybersecurity programs provide reasonable assurance that the facilities adequately protect digital computers, communication systems, and networks associated with safety, security, and emergency preparedness. The experience that the NRC gained in developing the cybersecurity requirements for the current fleet of nuclear power plants provided a basis for developing cybersecurity requirements for nonreactor licensees and future advanced reactor licensees.

The NRC’s cybersecurity oversight team includes technology and threat experts who evaluate and identify emerging cyber-related issues that could endanger plant systems. The team also makes recommendations to other NRC offices and programs on cybersecurity oversight issues. The NRC has established working relationships with Federal agencies such as the DHS’s U.S. Cybersecurity and Infrastructure Security Agency; the DOE’s Office of Cybersecurity, Energy Security, and Emergency Response; and the FBI; as well as with international organizations such as the IAEA and the International Electrotechnical Commission. Such relationships are intended not only to share information but also to ensure effective coordination among Federal agencies if a cyberincident were to occur at a nuclear facility.

MATERIALS SECURITY

Radioactive materials must be secured to prevent terrorists from using them to make a radiological dispersal device, sometimes called an “RDD” or “dirty bomb.” The NRC requires the physical protection of certain types and quantities of radioactive material. The NRC also works with the Agreement States, other Federal agencies, the 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. 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

Emergency preparedness plans ensure U.S. nuclear power plants can implement adequate measures to protect the public in the event of a radiological emergency. 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, methods of emergency communication, preparations for evacuation, instructions for sheltering, and other actions to protect the residents near nuclear power plants in the event of a serious incident.

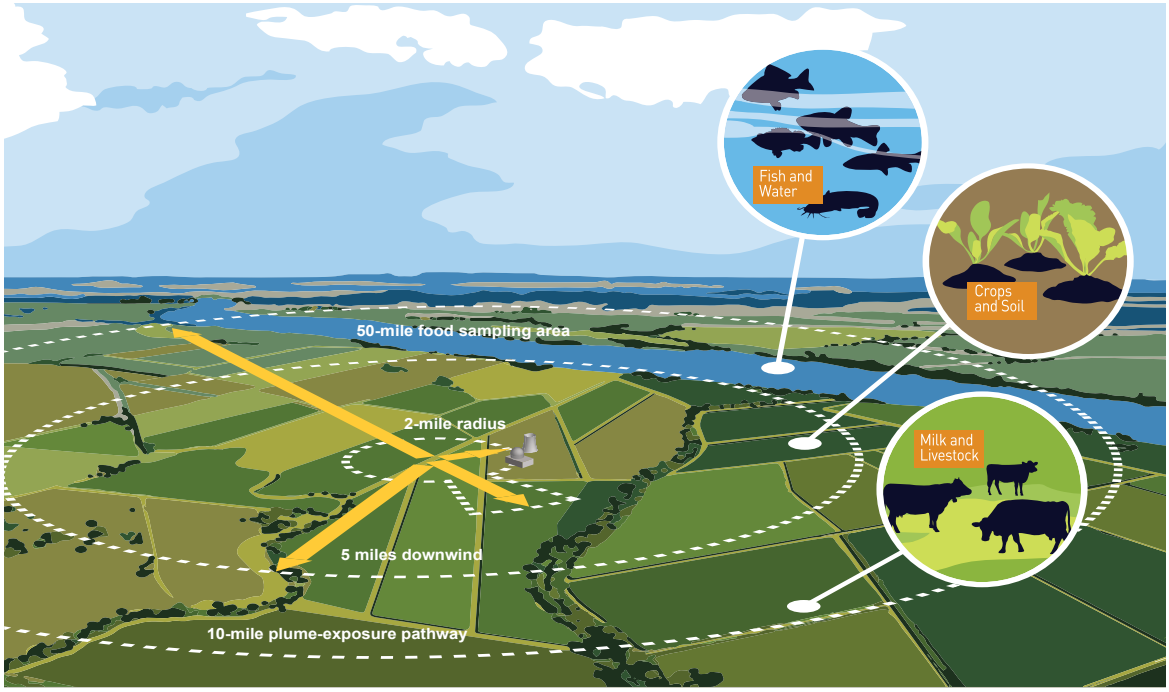
The NRC conducts inspections and monitors performance indicators associated with emergency preparedness programs. At least once every 2 years, nuclear power plant operators must conduct full-scale exercises in coordination with State and local officials, under evaluation by the NRC and the Federal Emergency Management Agency. Once during every 8-year exercise cycle, these exercises include hostile-action-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 emergency response actions may be expanded during an emergency if circumstances warrant.

Figure 42. Emergency Planning Zones depicts a typical EPZ around a nuclear plant. The two types of EPZs are the plume-exposure pathway and the 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 for 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 for the ingestion of food and liquid that may be contaminated by radioactive material.*



Note: A 2-mile (3.2-kilometer) ring around the plant is identified for evacuation, along with a 5-mile (8-kilometer) zone downwind of the projected release path.

Figure 42. Emergency Planning Zones

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 local 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 whether 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.

Under certain conditions, it may be advisable 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 “shelter in place” 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. 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. In certain situations, KI may be used as a supplement to either sheltering in place or evacuation.

In the event of a radiological emergency, if taken properly, KI may reduce how much radioactive iodine the thyroid gland is able to absorb, potentially mitigating an increase in the risk of developing thyroid cancers as a result of the emergency. The NRC’s regulations on the use of KI for radiological emergencies requires states that have population in the 10-mile emergency planning zone of a commercial nuclear power plant consider including KI in emergency plans as a protective measure.

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 certain NRC emergency planning requirements. If the exemptions are granted, State and local agencies may apply their comprehensive emergency plans—known as "all-hazards plans"—to respond to incidents at the plant.

INCIDENT RESPONSE

Quick and accurate communication among the NRC, other Federal and state agencies, and the nuclear industry is critical when responding to any incident. The NRC Headquarters Operations Center, located in the agency's headquarters in Rockville, Maryland, 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 the DHS in responding to an emergency at an NRC-licensed facility or involving NRC-licensed materials.

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 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 response 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 and provide licensee event information to the technical experts at the NRC region and headquarters.

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:

1. **Notification of Unusual Event:** *Events that indicate a potential degradation in the level of safety or indicate a security threat to the plant are in progress or have occurred. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.*
2. **Alert:** *Events that involve an actual or potential substantial degradation in the level of plant safety or security events that involve probable life-threatening risk to site personnel or damage to site equipment 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 EPA.*
3. **Site Area Emergency:** *Events that may result in actual or likely major failures of plant functions needed to protect the public or hostile actions that result in intentional damage or malicious acts are in progress or have occurred. Any releases of radioactive material are not expected to exceed the limits set by the EPA except near the site boundary.*
4. **General Emergency:** *Events that involve actual or imminent substantial core damage or melting of reactor fuel with the potential for loss of containment integrity or hostile actions that result in an actual loss of physical control of the facility 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.*

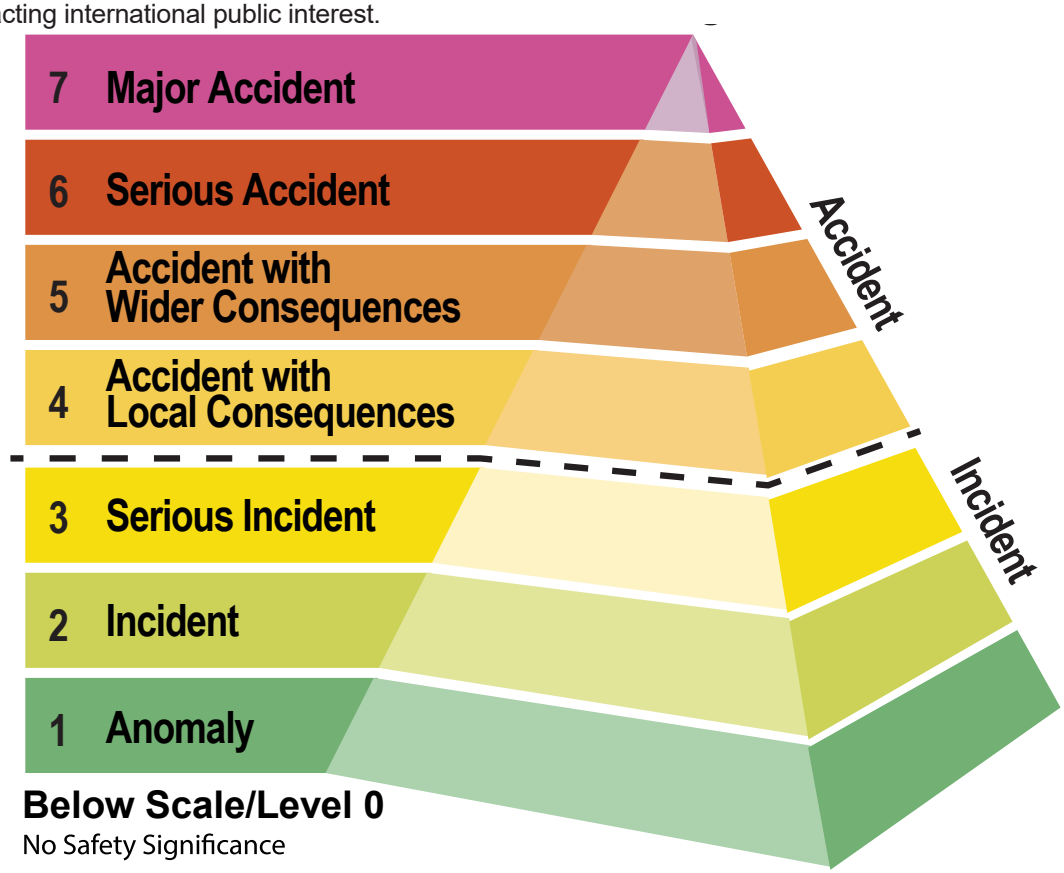
Nuclear materials and fuel cycle facility licensees use these emergency classifications:

1. **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.*
2. **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

The 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 43. 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. However, the NRC has a commitment to transmit to the IAEA an INES-based rating for an applicable U.S. event rated at Level 2 or above, or for events attracting international public interest.



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: https://www.iaea.org/topics/emergency-preparedness-and-response-epr/international-nuclear-radiological-event-scale-ines

Figure 43. The International Nuclear and Radiological Event Scale