Radiological Emergency Response

Information for the Public and the Media
**PROTECTED AREA** — The security area inside the double fence of a nuclear power plant.

**RAD** — Radiation Absorbed Dose, the unit of absorbed dose.

**RADIOACTIVITY** — The property of some nuclides of spontaneously emitting particles or electromagnetic rays.

**RADIOLOGICALLY CONTROLLED AREA** — Any area that requires radiological posting.

**RADIOSENSITIVITY** — The relative susceptibility of cells, tissues, organs, and organisms to the injurious action of radiation.

**REM** — Roentgen Equivalent Man, a unit of dose equivalent. 1 rem = 1000 millirem

**RESTRICTED AREA** — Any area where access is prohibited or controlled to protect against unnecessary exposure to radiation.

**ROENTGEN (R)** — A measurement of radiation effect in air from x-ray or gamma radiation. 1R = 1000 milliR

**SHIELDING** — A material, such as lead or concrete, around radioactive material used to prevent the escape of radiation and to protect workers and equipment.

**SITE BOUNDARY** — The boundary line that includes the property owned and controlled by a nuclear utility within which a nuclear plant is operated. The Protected Area is located within the Site Boundary.

**THERMOLUMINESCENT DOSIMETER (TLD)** — A device worn by emergency workers to record the accumulated amount of exposure during a given period of time.

**URANIUM** — A radioactive element, the basic fuel of a nuclear reactor.

**X-RAY** — Any penetrating electromagnetic radiation whose wavelength is shorter than that of visible light.
Eleven commercial nuclear power reactors used to generate electricity are currently operating at six sites in Illinois; no other state has as many nuclear reactors. In addition, there are two major nuclear research facilities in Illinois operated by the US Department of Energy (Argonne National Laboratory and FermiLab), uranium processing facilities at Metropolis and in nearby Paducah, Kentucky, several manufacturers of radiopharmaceuticals and other radioactive materials, thousands of radiation-producing machines used in medicine and industry, and a network of major arterial highways and rail lines over which radioactive material shipments move on a regular basis.

Protecting the health and safety of Illinois citizens and the environment from the potentially harmful effects of ionizing radiation is a key function of IEMA’s technical staff. That role is fulfilled through programs that monitor nuclear facilities around the clock, ensure the proper operation of radiation-producing equipment and the use of radioactive materials, and measure radioactivity in the environment to ensure no threats to public health exist.

- ELECTRON—A negatively charged particle that forms part of the atom outside the nucleus. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

- EXPOSURE—A measure of the ionization produced in air by x-rays or gamma radiation. The unit of exposure in air is the roentgen (R).

- GAMMA RAY—Any short-wavelength electromagnetic radiation that originates from within the nucleus of an atom.

- GEIGER COUNTER—An instrument for detecting and measuring beta and gamma radiation.

- HALF-LIFE, RADIOACTIVE—The time required for a radioactive substance to lose 50 percent of its activity by decay.

- ION—An atomic particle, atom, or chemical radical bearing an electric charge, either negative or positive.

- IONIZATION—The process by which a neutral atom or molecule acquires a positive or negative charge.

- ISOTOPE—The different forms of the same chemical element that are distinguished by having a different number of neutrons in the nucleus. A single element may have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium.

- MAXIMUM PERMISSIBLE DOSE—An established limit on the radiation exposure a member of the general public can legally receive from a nuclear power plant due to routine operations.

- NOBLE GASES—Those gases that do not combine chemically with other materials. The noble gases are helium, neon, argon, krypton, xenon, and radon. Radioactive isotopes of some noble gases are created by the fission process.

- NUCLEUS, NUCLEI—The small positively charged core of an atom. It is only about 1/10,000 the diameter of the atom (determined by the position of the electrons), but contains nearly all the atom’s mass. All nuclei contain both protons and neutrons, except the nucleus of ordinary hydrogen which consists of a single proton.

- OCCUPATIONAL DOSE—Any dose received while working with radioactive materials.

- OFFSITE—That area around a nuclear generating station that lies outside the station’s site boundary.

- PARTICULATES—Any microscopic particles that may be radioactive.

- PERSON-REM (Synonym, MAN-REM)—A unit of population exposure obtained by summing individual dose-equivalent values for all people in the population. Thus, the number of person-rem’s contributed by 1 person exposed to 100 rem is equal to that contributed by 100,000 people each exposed to 1 rem.
**Terms Used to Describe Radiation and Related Activities**

**ALARA**—A policy maintained for those individuals working with radiation that limits their occupational dose and the sum of doses received by all workers to a level as low as is reasonably achievable.

**ASSESSMENT ACTIONS**—Those actions taken during or after an emergency to obtain and process information that is necessary to make decisions to implement specific emergency measures.

**ATOM**—The smallest particle of an element. It consists of a nucleus and a less dense outer area of electrons in motion.

**BACKGROUND RADIATION**—The radioactivity in the environment including cosmic rays from space and radiation that exists everywhere—in the air, in the earth, and in manufactured materials that surround us. In the United States most people receive 300 to 400 millirems of background radiation per year.

**CONTAMINATION**—Any radioactive material where it does not belong.

**CONTROLLED AREA**—Any area that requires radiological posting.

**COUNTS PER MINUTE (CPM)**—The number of emitted radioactive particles or rays counted per unit time by a detector.

**CURIE (Ci)**—A unit of radioactivity $= 3.7 \times 10^{10}$ nuclear transformations (disintegrations) per second (dps). Common fractions are:  
- Millicurie—One thousandth of a curie (mCi)  
- Microcurie—One millionth of a curie (uCi)  
- Nanocurie—One billionth of a curie (nCi)  
- Picocurie—One millionth of a microcurie (pCi)

**DECAY HEAT**—The heat produced by radioactive atoms in a nuclear reactor after it has been shut down.

**DECAY, RADIOACTIVE**—The disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, electromagnetic rays, or both.

**DOSE**—A general term denoting the quantity of radiation or energy absorbed. The unit of dose is the rad.

**DOSE EQUIVALENT**—A quantity that expresses all radiation on a common scale per unit mass for calculating the effective absorbed dose. It is defined as the product of the absorbed dose in rads and certain modifying factors depending on the type of radiation involved. The unit of dose equivalent is the rem.

**DOSE RATE**—The absorbed dose delivered per unit time.

**DOSIMETER**—A device, such as a film badge, which can be worn and used to measure the radiation dosage a person receives over a period of time.

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**Facts on Radiation**

Radioactivity is a term used to describe the instability of an atom. Elements of our environment tend toward stability. A radioactive atom will emit energy in the form of ionizing radiation to become more stable. Ionizing radiation comes from natural sources such as the sun and certain rock formations, as well as from human-made sources such as x-ray machines and nuclear reactors.

Radiation has the capability to knock electrons out of atoms and leave them electrically charged or “ionized.” These charged particles known as “ions” can cause cell damage and alter the functions of the human body such as those involved in blood formation and infection resistance.

Examples of non-ionizing radiation are microwaves, radiowaves, and visible light. Non-ionizing radiation can also alter biological functions, but does so through different means such as heating.

Ionizing radiation occurs naturally in the environment. We are continuously exposed to cosmic rays from the sun and stars, and the earth emits radiation from materials such as granite, natural gas, phosphates, radium, and its decay product, radon. This type of radiation is referred to as “natural” or “background” radiation.

**The Electromagnetic Spectrum**

The average American receives a dose of approximately 360 millirems of radiation each year (a millirem is a unit of radiation dose equivalent, 1000 millirems = 1 rem). Of this, about 82 percent, or 295 millirems, comes from natural sources. Radon is the biggest contributor, at 200 millirems per year. This natural dose varies with such factors as geographical location, altitude, frequency of air travel, occupation, and the presence of radon in the home. On average, however, our bodies are being struck by some form of natural radiation at a rate of approximately 15,000 times per second.

In addition, the average American receives about 65 millirem each year from technological sources, mostly from medical and dental x-rays and procedures that use radioactive materials to detect (diagnostic) and treat (therapeutic) various medical conditions.

When radiation deposits energy in a human cell, several types of changes may occur. The radiation might pass through the cell causing no damage; damage the cell, but if the cell involved is slow in dividing, the cell can repair this damage; or damage the cell so self-repair is impossible or incomplete, especially in rapidly dividing cells. In this case, the cell may reproduce itself in the damaged form, or more likely, will not be able to divide at all.

Different cells within the human body respond differently to radiation. Cells that are dividing rapidly are most sensitive to radiation because they have very little time to repair themselves from...
radiation-induced damage. Thus, growing children and human fetuses are among the most susceptible to the harmful effects of radiation. At the same time, with certain types of cells that are dividing much more rapidly than normal (e.g., cancer cells), radiation becomes an effective tool to selectively destroy the cells before they can replicate.

Radiation, even at low doses, may result in some damage to living tissue, but it is difficult to quantify. Most of the evidence of human health risks associated with radiation exposure has been derived from the Japanese nuclear weapon survivors of World War II, patients in ongoing radiation therapy, and workers unnecessarily exposed to radiation in the days before radiation hazards were well known. Since these known effects are caused by high doses of radiation, there are little or no data to predict the health risks from very low doses. Low-dose effects generally are extrapolated from the known high-dose effects.

This degree of conservatism (not considering intracellular repair mechanisms) has been maintained with respect to the protection of the public. Studies involving large numbers of individuals exposed to low levels of radiation for extended periods of time have shown no serious detrimental effects. These studies show that for each millirem received by a member of the general public, the risk of dying from radiation-induced cancer **MAY** be increased by only one chance in two million.
The Illinois Plan for Radiological Accidents (IPRA)

The IPRA is a comprehensive emergency plan that outlines the coordination of government response to all types of radiological accidents. Such accidents are unique because radiation cannot be seen, felt, or smelled. The assessment and analysis of a radiation accident involves technical and scientific skills utilizing sensitive detection equipment. The appropriate protection of the public from the consequences of a radiation accident requires an integrated response effort at many levels. IPRA provides the direction for ensuring both aspects are addressed.

Development of IPRA began in 1980 following the adoption of new state and federal guidelines for radiological emergency preparedness that were the result of the 1979 Three Mile Island nuclear plant accident in Pennsylvania. IPRA is maintained in cooperation with other state agencies and local governments.

The objectives of IPRA are to protect the health and safety of the citizens and the environment during a radiological emergency in Illinois; organize and coordinate local, state, and federal emergency response functions; and ensure the continuing availability of resources and personnel to address emergency situations.

Organization of IPRA
IPRA consists of seven volumes of detailed instructions for emergency response workers and government agencies. The set includes the State General Plan (Volume I) and site-specific volumes for each of the operating commercial nuclear power installations in Illinois. Volume I also describes the process for addressing radiological incidents that might occur at other fixed facilities or during the transportation of radioactive materials.

- The State General Plan explains the mechanism for coordinating the responsibilities of state and local governments and the utilities that own and operate nuclear power facilities. The plan also describes emergency response roles, procedures, and responsibilities for local, state, and federal agencies.
- The site-specific volumes detail the functions and responsibilities of local governments that would be affected in the event of a radiological accident. Details include maps of the site and surrounding area, procedures for local officials, lists of local resources available during an accident, and names and telephone numbers of local officials.

The Governor of Illinois has overall command and control of emergency response. IEMA provides technical information and advice to assist the Governor’s decision-making and operational support and coordination to carry out the Governor’s decisions. IEMA technical support involves the use of professional staff and resources to assess the severity of a radiological accident and to recommend appropriate protective actions. IEMA operational support includes notification to local officials of the recommended protective actions and the provision of state resources, where necessary, to ensure actions are implemented effectively.

Food, Water, and Milk Control - The state may recommend that farmers within a designated radius of the plant shelter livestock and restrict them to stored feed and protected water. This action is taken before releases occur, if possible, to avoid ingestion by livestock of contaminated vegetation or water so harmful levels of radioactivity do not enter the food chain.

The public is warned to avoid consumption of food and water from areas affected by any release of radiation until sampling and testing is conducted to determine the extent of contamination. IEMA and the state departments of Natural Resources, Agriculture, and Public Health, and the Environmental Protection Agency work together to accomplish this task.
Regularly scheduled exercises ensure state and local emergency response teams are trained and knowledgeable and can effectively assess any situation and implement the necessary protective actions. These exercises are evaluated by the Federal Emergency Management Agency (FEMA) and the US Nuclear Regulatory Commission (NRC).

**IPRA Planning Basis**

A 10-mile radius around each commercial nuclear generating station is designated as the Emergency Planning Zone (EPZ) for that facility. A key objective for IEMA is to recommend protective actions for the EPZ population before any radioactive release occurs to ensure that no member of the public is unnecessarily exposed to a radiation hazard.

The 10-mile EPZ is required by the NRC for radiological emergency preparedness planning. It takes into account the various engineered safety features of nuclear reactors, the possible release pathways, and the quantities of radiation that may be released in an accident. In addition, planning includes a 50-mile ingestion exposure pathway planning zone for each nuclear plant. Emphasis in the zone between 10 and 50 miles is on protection against the consumption of contaminated food and water supplies. Protective actions in the ingestion pathway EPZ include extensive radiological monitoring and sampling concurrent with warnings to food producers and the public regarding the potential for contamination of such pathways as water supplies, crops, and livestock.

**Emergency Classification**

NRC regulations categorize radiological emergencies at nuclear power facilities into four severity classifications. Specific events at each facility are defined under one of these emergency levels.

- **Unusual Event.** This classification represents a deviation from normal operating conditions that involves a potential degradation of the safety level at a nuclear reactor. Operating status does not necessarily change, and no radioactive releases are expected during an unusual event. IEMA is notified, but no off-site actions are initiated.

- **Alert.** This condition involves the actual or potentially serious degradation of safety levels at a facility. Operating status may change, including such actions as reducing power and placing on-site personnel in emergency status. IEMA and key local governments are notified, and may elect to put key response personnel on stand-by. IEMA also initiates an ongoing technical assessment of the situation.

- **Site Area Emergency.** This level includes events that are in progress, or have occurred, involving the actual, or likely, major failure of station safety functions crucial to the protection of the public. Releases of radiation may occur that warrant the implementation of off-site protective actions. All emergency response personnel in IEMA, supporting state agencies, and key local governments within the EPZ are activated. IEMA may recommend precautionary protective actions for the public.

- **General Emergency.** This classification means events are in progress, or have occurred, that involve actual or imminent substantial reactor core damage. During a General Emergency, significant quantities of radioactivity may be released to the environment. Full activation of IPRA is required, and public notification and appropriate protective actions are implemented. Such an event would likely result in recommendations to evacuate or shelter populations downwind of the affected facility.

**IPRA Response Functions**

- **Notification of off-site authorities** occurs when the utility informs IEMA through the Nuclear Accident Reporting System (NARS) of an emergency classification. NARS is a dedicated

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**Emergency Response to Reactor Accidents in Illinois:**

**Protective Actions**

Protective actions are taken to avoid or reduce the projected radiation dose to the public that may result from a radiological release. Evacuation, to avoid any unnecessary exposure, is the preferred protective action for the general population. Sheltering in place also may be recommended in limited situations where evacuation is not feasible.

IPRA employs an emergency response methodology that is pre-emptive; that is to use the state’s diagnostic capabilities to forecast the potential consequences of a radiological accident as it develops and to prescribe protective actions early so that any risk of exposure to the public is minimized.

Protective Action Recommendations (PARs) are based on Protective Action Guidelines (PAGs) developed by the US Environmental Protection Agency and other federal agencies. Under most circumstances, IEMA is able to base PARs on its analysis of reactor conditions and sophisticated computer model predictions of radiation levels should a release to the environment occur. Once a release begins, a confirmatory assessment is performed by the IEMA Environmental Analyst Team based on the field data collected by the Radiological Assessment Team and computer model predictions.

- **Evacuation** - In a radiological emergency where evacuation is the preferable protective action, the Governor advises the residents in the areas downwind of the accident site to leave their homes and go to pre-established Reception Centers. Here people are monitored for contamination and decontaminated, if necessary. Volunteer organizations provide food, clothing, and social services. Temporary shelter will be arranged by the American Red Cross. Immobile populations, such as hospital or nursing home patients, are relocated to appropriate facilities outside of the Emergency Planning Zone (EPZ).

Evacuation recommendations usually affect the immediate two-mile radius around the nuclear plant and may affect areas five to ten miles downwind of the facility. Residents in adjacent sectors of the EPZ may also be urged to shelter in place as a precaution. The affected sectors are converted to recognizable geo-political boundaries for broadcast to the public over the Emergency Alert System. Since meteorological conditions determine the path of a radioactive plume, evacuation and shelter recommendations may change as the situation evolves based on changing weather conditions.

- **Take Shelter** - The public is advised to stay in their homes, stores, or places of business, and to remain inside until directed to do otherwise. People will be advised to keep their windows and doors shut, turn off heating and air conditioning units that draw in outside air, and to listen to radios or televisions for emergency broadcasts. Sheltering may be recommended if a small or short duration release of radioactivity has already occurred or if adverse weather conditions prohibit the effective implementation of a prompt evacuation.

- **Traffic and Access Control** - Law enforcement agencies staff pre-established checkpoints to control access to and from the affected areas of the EPZ.
available to provide radiological monitoring and decontamination services for other emergency workers responding to the accident, as well as for any individuals evacuated as a result of the situation. Results of RAFT environmental sampling are communicated to the Environmental Analyst Team in REAC. A confirming accident assessment is then formulated using RAFT sampling results and computer model predictions to evaluate the total radiological hazard to the public from any radioactive plume released during an accident and from radioactive materials inhaled from the air or ingested in food or water. Confirming accident assessments include the on-site consequences as determined by the affected utility and the off-site consequences developed by the Environmental Analyst Team.

The Radiological Operations Chief (ROC) directs and coordinates actions taken by Radiological Assessment teams and maintains contact with REAC via radio, telephone, and satellite communications links. The ROC also coordinates communication with field teams from other state and federal agencies.

Staff working under the direction of the ROC include:

- **RAFT Radiological Assessment Team Officer** responsible for tracking the gaseous radioactive plume that may be released in a severe accident;
- **Exposure Control Officers** responsible for protecting RAFT and other support personnel from excessive radiation exposure;
- **Contamination Control Officers** responsible for controlling and limiting radioactive contamination of RAFT;
- **Radiological Assessment Teams** responsible for performing radiological surveys and collecting environmental samples. Monitoring team members carry personal dosimeters to measure radiation so any exposures can be carefully monitored by the Exposure Control Officer. These personnel also monitor other RAFT personnel, equipment, and vehicles, as well as other emergency response personnel and members of the public, when necessary.

If people are evacuated from the area around a nuclear power plant, evacuees will be screened for contamination by Radiological Assessment teams before being provided with temporary shelter and necessities by the American Red Cross at pre-established Reception Centers. The location of such facilities will be announced over the Emergency Alert System. Local governments are responsible for establishing these centers; the Contamination Control Officer is responsible for coordinating radiation monitoring at these facilities.

- **Radiochemists** responsible for performing isotopic analysis of environmental samples.

RAFT equipment includes four-wheel-drive support vehicles to reach remote areas, sophisticated sampling and monitoring equipment, and personal dosimeters to measure radiation. Portable radiation instruments are used to measure radiation levels in the plume in the downwind sectors of the Emergency Planning Zone. Air, plants, soil, water, milk, and food samples are analyzed for specific radionuclides in the mobile radiochemistry laboratory or at the IEMA laboratory facilities in Springfield. Each RAFT member also is given potassium iodide (KI) tablets that may be taken before entering a contaminated area. Potassium iodide helps block the absorption of radioactive iodine by the thyroid gland, but is not effective in preventing detrimental health effects from other types of radioactivity.

emergency telephone system linking emergency response locations. IEMA then notifies locally affected municipalities and counties through the NARS. The Emergency Alert System (radio & TV), mobile public address systems, and sirens are used to notify local citizens.

- **Radiological accident assessment** is performed by IEMA technical staff. Data analysis personnel in Springfield use information generated by the IEMA Remote Monitoring System (RMS) and data collected by IEMA field teams to assess the severity of an accident.
- **Protective actions** include instructions for taking shelter, evacuation, traffic control, measures to protect against contamination of livestock and food supplies, and the interdiction of potentially contaminated food, water, and milk.
- **Supportive parallel actions** include activities such as emergency medical services, social services, radiological exposure control, and law enforcement.
- **Public and media information** includes pre-established meeting locations for the press, public information materials, rumor control mechanisms, and pre-written emergency announcement scripts on the Emergency Alert System.

**Past Performance of IPRA**

Since the creation of the IPRA, IEMA has responded to hundreds of radiological incidents. These included transportation accidents, industrial accidents, fires, and Unusual Events and Alerts at nuclear reactors. IPRA procedures have been followed in responding to these emergencies. None of these incidents have resulted in significant exposures of the public to radiation. To date, only Unusual Events and Alerts have occurred at the nuclear reactors in Illinois.

Under IPRA, training is provided by IEMA for more than 8,500 local officials, fire fighters, police, medical personnel, bus drivers, Red Cross volunteers, and other emergency workers to address a radiological emergency. Personal radiation dosimetry and potassium iodide tablets (a blocking agent to keep radioactive iodine from concentrating in the thyroid gland) are maintained for all emergency workers with assigned roles under the IPRA.

An emergency response exercise simulating a severe nuclear power plant accident is conducted for each of the state’s operating nuclear power plant sites every two years. State and local government performance in these exercises is evaluated by FEMA. The FEMA evaluations are part of the emergency preparedness requirements for the licensing of nuclear reactors, and form the basis for improving planning and response capabilities.
In addition to taking environmental samples, RAFT’s personnel are on-call 24 hours a day and can be mobilized within one hour of notification. RAFT is on call 24 hours a day and can mobilize within one hour of notification.

Radiological Assessment Field Team

During a reactor accident situation, Radiological Assessment Field Team (RAFT) personnel are dispatched to areas near the plant to monitor the levels and types of radioactive and radioactive materials in the environment. The team consists of more than 80 highly trained personnel, a mobile command and communications van, a mobile radiochemistry laboratory, and a fleet of more than 40 vehicles, many specifically equipped for radiological emergency response. Each vehicle is equipped with both radio and satellite communications capability. RAFT is on call 24 hours a day and can mobilize within one hour of notification.

In addition to taking environmental samples, RAFT’s personnel are

The IEMA Remote Monitoring System sends data through computer links to REAC for analysis. The system includes:
• A gamma detection network (GDN) consisting of pressurized ion chamber radiation detectors that are located radially at a distance of approximately 2 miles around each nuclear power station. The detectors measure gamma radiation in the environment and can detect radiation levels in a range from normal background to very high levels.
• A Gaseous Effluent Monitoring System (GEMS) installed inside each power station samples the station ventilation exhaust stack. The GEMS measures the quantities and types of gaseous radioactive materials that are released by the station through the stack.
• A direct data communication link (RDL) between the REAC computer and each reactor’s process computer provides continuous information on the status of safety systems, reactor auxiliary systems, in-plant radiation levels, and power generation levels. Hundreds of parameters are received from each reactor and updated every two to four minutes.

The REAC Manager is responsible for assessing the severity of an accident and providing advice on appropriate actions to recommend to the Governor to protect Illinois citizens. Within the REAC facility, the Manager’s staff is divided into two elements: the Reactor Analysis Team and the Environmental Analysis Team.
• Reactor Specialists monitor the condition of the reactor safety systems and communicate with the staff at the utility and the NRC to evaluate the course of events during an accident. This analysis can be used to predict the potential severity of an event, the potential radiological consequences, and when a release might occur.
• Environmental Specialists use computerized dose assessment models to forecast the potential offsite impact of an accident, and once a release occurs, use environmental sampling data collected by the RAFT personnel to analyze the consequences of a release to the environment.

Radiological Emergency Assessment Center

Accident analysis and field operations are directed from a technical control center in Springfield, Illinois, known as the Radiological Emergency Assessment Center (REAC). REAC houses an integrated computer system that continuously monitors thousands of incoming data sources from the IEMA Remote Monitoring System (RMS).

The REAC Manager is supported by a technical staff of nuclear engineers, health physicists, and environmental analysts who are on-call 24 hours a day and can be mobilized within one hour of notification.

The REAC facilities consist of the emergency command center supported by an independent mainframe computer center. Special equipment in REAC includes computer graphics monitors; computer terminals for analysis teams; telephone links to the Illinois State Emergency Operations Center, local emergency operations facilities, and the nuclear utilities; maps of the 10- and 50-mile Emergency Planning Zones for each power station; an extensive technical library; software to analyze the incoming data; and back-up power systems. REAC maintains communications with the Radiological Assessment Field Team (RAFT), and integrated radiation measurements taken by radiological assessment teams into their accident analysis. (All emergency communications are recorded.)

Environmental Specialists

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