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Backgrounder: Nuclear Power Plant Emergency

Since 1980, each utility that owns a commercial nuclear power plant in the United States has been required to have both an onsite and offsite emergency response plan as a condition of obtaining and maintaining a license to operate that plant. Onsite emergency response plans are approved by the Nuclear Regulatory Commission (NRC). Offsite plans (which are closely coordinated with the utility's onsite emergency response plan) are evaluated by the Federal Emergency Management Agency (FEMA) and provided to the NRC, who must consider the FEMA findings when issuing or maintaining a license.

Federal law establishes the criterion for determining the adequacy of offsite planning and preparedness, i.e: "Plans and preparedness must be determined to adequately protect the public health and safety by providing reasonable assurance that appropriate measures can be taken offsite in the event of a radiological emergency."

Although construction and operation of nuclear power plants are closely monitored and regulated by the NRC, an accident, though unlikely, is possible. The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like) formation. The area the radioactive release may affect is determined by the amount released from the plant, wind direction and speed and weather conditions (i.e., rain, snow, etc.) which would quickly drive the radioactive material to the ground, hence causing increased deposition of radionuclides.

If a release of radiation occurs, the levels of radioactivity will be monitored by authorities from Federal and State governments, and the utility, to determine the potential danger in order to protect the public.

What Is Radiation?

Radiation is any form of energy propagated as rays, waves or energetic particles that travel through the air or a material medium.

Radioactive materials are composed of atoms that are unstable. An unstable atom gives off its excess energy until it becomes stable. The energy emitted is radiation. The process by which an atom changes from an unstable state to a more stable state by emitting radiation is called radioactive decay or radioactivity.

People receive some natural or background radiation exposure each day from the sun, radioactive elements in the soil and rocks, household appliances (like television sets and microwave ovens), and medical and dental x-rays. Even the human body itself emits radiation. These levels of natural and background radiation is normal. The average American receives 360 millirems of radiation each year, 300 from natural sources and 60 from man-made activities. (A rem is a unit of radiation exposure.)

Radioactive materials--if handled improperly--or radiation accidentally released into the environment, can be dangerous because of the harmful effects of certain types of radiation on the body. The longer a person is exposed to radiation and the closer the person is to the radiation, the greater the risk.

Although radiation cannot be detected by the senses (sight, smell, etc.), it is easily detected by scientists with sophisticated instruments that can detect even the smallest levels of radiation.

Preparing For An Emergency

Federal, State and local officials work together to develop site-specific emergency response plans for nuclear power plant accidents. These plans are tested through exercises that include protective actions for schools and nursing homes.

The plans also delineate evacuation routes, reception centers for those seeking radiological monitoring and location of congregate care centers for temporary lodging.

State and local governments, with support from the Federal government and utilities, develop plans that include a plume emergency planning zone with a radius of 10 miles from the plant, and an ingestion planning zone within a radius of 50 miles from the plant.

Residents within the 10-mile emergency planning zone are regularly disseminated emergency information materials (via brochures, the phone book, calendars, utility bills, etc.). These materials contain educational information on radiation, instructions for evacuation and sheltering, special arrangements for the handicapped, contacts for additional information, etc. Residents should be familiar with these emergency information materials.

Radiological emergency plans call for a prompt Alert and Notification system. If needed, this prompt Alert and Notification System will be activated quickly to inform the public of any potential threat from natural or man-made events. This system uses either sirens, tone alert radios, route alerting (the "Paul Revere" method), or a combination to notify the public to tune their radios or television to an Emergency Alert System (EAS) station.

The EAS stations will provide information and emergency instructions for the public to follow. If you are alerted, tune to your local EAS station which includes radio stations, television stations, NOAA weather radio, and the cable TV system.

Special plans must be made to assist and care for persons who are medically disabled or handicapped. If you or someone you know lives within ten miles of a nuclear facility, please notify and register with your local emergency management agency. Adequate assistance will be provided during an emergency.

In the most serious case, evacuations will be recommended based on particular plant conditions rather than waiting for the situation to deteriorate and an actual release of radionuclides to occur.

Emergency Classification Levels

Preparedness for commercial nuclear power plants includes a system for notifying the public if a problem occurs at a plant. The emergency classification level of the problem is defined by these four categories:

Notification of Unusual Event is the least serious of the four levels. The event poses no threat to you or to plant employees, but emergency officials are notified. No action by the public is necessary.

Alert is declared when an event has occurred that could reduce the plant's level of safety, but backup plant systems still work. Emergency agencies are notified and kept informed, but no action by the public is necessary.

Site Area Emergency is declared when an event involving major problems with the plant's safety systems has progressed to the point that a release of some radioactivity into the air or water is possible, but is not expected to exceed Environmental Protection Agency Protective Action Guidelines (PAGs) beyond the site boundary. Thus, no action by the public is necessary.

General Emergency is the most serious of the four classifications and is declared when an event at the plant has caused a loss of safety systems. If such an event occurs, radiation could be released that would travel beyond the site boundary. State and local authorities will take action to protect the residents living near the plant. The alert and notification system will be sounded. People in the affected areas could be advised to evacuate promptly or, in some situations, to shelter in place. When the sirens are sounded, you should listen to your radio, television and tone alert radios for site-specific information and instructions.

If You Are Alerted

- Remember that hearing a siren or tone alert radio does not mean you should evacuate. It means you should promptly turn to an EAS station to determine whether it is only a test or an actual emergency.
- Tune to your local radio or television station for information. The warning siren could mean a nuclear power plant emergency or the sirens could be used as a warning for tornado, fire, flood, chemical spill, etc.
- Check on your neighbors.
- Do not call 911. Special rumor control numbers and information will be provided to the public for a nuclear power plant emergency, either during the EAS message, in the utilities' public information brochure, or both.
- In a nuclear power plant emergency, you may be advised to go indoors and, if so, to close all windows, doors, chimney dampers, other sources of outside air, and turn off forced air heating and cooling equipment, etc.

If You Are Advised to Evacuate the Area

- Stay calm and do not rush
- Listen to emergency information
- Close and lock windows and doors
- Turn off air conditioning, vents, fans, and furnace
- Close fire place dampers

Take a few items with you. Gather personal items you or your family might need:

- Flash light and extra batteries
- Portable, battery operated radio and extra batteries
- First aid kit and manual
- Emergency food and water
- Essential medicines
- Cash and credit cards

Use your own transportation or make arrangements to ride with a neighbor. Public transportation should be available for those who have not made arrangements. Keep car windows and air vents closed and listen to an EAS radio station.

Follow the evacuation routes provided. If you need a place to stay, congregate care information will be provided.

If Advised to remain at Home

- Bring pets inside.
- Close and lock windows and doors
- Turn off air conditioning, vents, fans and furnace
- Close fireplace dampers
- Go to the basement or other underground area
- Stay inside until authorities say it is safe

When Coming In From Outdoors

- Shower and change clothing and shoes
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- Put items worn outdoors in a plastic bag and seal it.

The thyroid gland is vulnerable to the uptake of radioactive iodine. If a radiological release occurs at a nuclear power plant, States may decide to provide the public with a stable iodine, potassium iodide, which saturates the thyroid and protects it from the uptake of radioactive iodine. Such a protective action is at the option of State, and in some cases, local government.

Remember your neighbors may require special assistance--infants, elderly people, and people with disabilities.

School Evacuations

If an incident involving an actual or potential radiological release occurs, consideration is given to the safety of the children. If an emergency is declared, students in the 10-mile emergency planning zone will be relocated to designated facilities in a safe area. Usually, as a precautionary measure, school children are relocated prior to the evacuation of the general public.

For Farmers and Home Gardeners

If a radiological incident occurs at the nuclear facility, periodic information concerning the safety of farm and home grown products will be provided. Information on actions you can take to protect crops and livestock is available from your agricultural extension agent.

Crops

Normal harvesting and processing may still be possible if time permits. Unharvested crops are hard to protect.

Crops already harvested should be stored inside if possible.

Wash and peel vegetables and fruits before use if they were not already harvested.

Livestock

Provide as much shelter as possible. Take care of milk-producing animals.

Provide plenty of food and water and make sure shelters are well-ventilated. Use stored feed and water, when possible.

Three Ways to Minimize Radiation Exposure

There are three factors that minimize radiation exposure to your body: Time, Distance, and Shielding.

Time--Most radioactivity loses its strength fairly quickly. Limiting the time spent near the source of radiation reduces the amount of radiation exposure you will receive. Following an accident, local authorities will monitor any release of radiation and determine the level of protective actions and when the threat has passed.

Distance--The more distance between you and the source of the radiation, the less radiation you will receive. In the most serious nuclear power plant accident, local officials will likely call for an evacuation, thereby increasing the distance between you and the radiation.

Shielding--Like distance, the more heavy, dense materials between you and the source of the radiation, the better. This is why local officials could advise you to remain indoors if an accident

occurs. In some cases, the walls in your home or workplace would be sufficient shielding to protect you for a short period of time.

What you can do to stay informed:

Attend public information meetings. You may also want to attend post-exercise meetings that include the media and the public.

Contact local emergency management officials, who can provide information about radioactivity, safety precautions, and state, local, industry and federal plans.

Ask about the hazards radiation may pose to your family, especially with respect to young children, pregnant women and the elderly.

Ask where nuclear power plants are located.

Learn your community's warning systems.

Learn emergency plans for schools, day care centers, nursing homes--anywhere family members might be.

Be familiar with emergency information materials that are regularly disseminated to your home (via brochures, the phone book, calendars, utility bills, etc.) These materials contain educational information on radiation, instructions for evacuation and sheltering, special arrangements for the handicapped, contacts for additional information, etc.

***Last Updated: Friday, 22-Oct-2004 21:19:00
EDT***

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