



Nuclear Failure

General

Through a Memorandum of Understanding (MOU), the Nuclear Regulatory Commission (NRC) and the Federal Emergency Management Agency (FEMA) share federal oversight for radiological emergency response planning matters for licensed nuclear power plants. Their mutual efforts will be directed toward more effective plans and related preparedness measures at and in the vicinity of nuclear reactors and fuel cycle facilities. The MOU between the agencies was signed on January 14, 1980 in response to the president's 1979 decision that FEMA should: coordinate all federal planning for the offsite impact of radiological emergencies; take the lead for assessing offsite radiological emergency response plans and preparedness; make findings and determinations as to the adequacy and capability of implementing offsite plans; and communicate those findings and determinations to the NRC. The NRC reviews FEMA findings and determinations in conjunction with the NRC onsite findings to determine the overall state of emergency preparedness.

A separate MOU, dated October 22, 1980, deals with NRC/FEMA cooperation and responsibilities in response to an actual or potential radiological emergency. Operations Response Procedures have been developed that implement the provisions of the Incident Response MOU. These documents are intended to be consistent with the Federal Radiological Emergency Response Plan, which describes the relationships, roles, and responsibilities of federal agencies for responding to accidents involving peacetime nuclear emergencies.

Following the accident at Three Mile Island in 1979, the NRC reexamined the role of emergency planning for public protection in the vicinity of nuclear power plants. The NRC issued regulations requiring that before a plant could be licensed to operate, the NRC must have "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." The regulations set forth 16 emergency planning standards and define the responsibilities of the licensee, and state and local organizations involved in emergency response. The added feature of emergency planning to the NRC's "defense-in-depth" philosophy provides that even in the unlikely event of a release of radioactive materials to the environment, there is reasonable assurance actions can be taken to protect the population around nuclear power plants.

Regulations

For planning purposes, FEMA and the NRC have defined the plume exposure pathway emergency planning zone (EPZ), also known as an "at risk area," as an area about 10 miles in radius and an ingestion pathway EPZ about 50 miles in radius around each nuclear power plant. EPZ size and configuration may vary in relation to local emergency response needs and capabilities affected by such conditions as demography, topography, land characteristics, access routes, evacuation routes, and jurisdictional boundaries. Counties within the ingestion



exposure pathway are considered “support counties.” FEMA and the NRC’s requirements for emergency planning are contained in Title 10 of the Code of Federal Regulations, Part 50.47 and cover the following topics:

- assignment of responsibility
- emergency response support and resources
- notification methods and procedures
- public education and information
- accident assessment
- radiological exposure control
- recovery and reentry planning and post-accident operations
- responsibility for the planning effort
- development, periodic review and distribution of emergency plans
- onsite emergency organization
- emergency classification system
- emergency communications
- emergency facility and equipment
- protective response
- medical and public health support
- exercises and drills
- radiological emergency response training

The Pennsylvania Emergency Management Agency (PEMA), in conjunction with the Commonwealth’s risk counties (including Snyder), has identified the specific EPZ around each of the five nuclear power plants in Pennsylvania. As such, there are onsite and offsite Radiological Emergency Response Plans for each power plant. Each plant owner is required to exercise its emergency plan with offsite authorities at least once every two years to ensure state and local officials remain proficient in implementing the plan.

History

Pennsylvania is home to the worst nuclear facility accident in the history of the nation. Although it did not occur in Snyder County, the effects were felt nationwide. After the accident at Three Mile Island, state, county, and municipal entities designed plans for handling future accidents, so safety could be assured for all residents. However, many “unusual events” and “alerts” occur every year at the 100-plus nuclear facilities across the nation. These events require the notification of local emergency managers. In 1997 alone, there were 40 notifications of unusual events and three alert-level notifications, nationwide.

Three Mile Island





Vulnerability

In the wake of an accident, the primary nuclear exposure for the immediate area around a nuclear power plant can last from hours to months. The health of the citizens in the surrounding area is the primary immediate concern, followed by the long-term environmental impact. Livestock, livestock by-products, and crops can be contaminated for many years after a nuclear incident. The health effects reported from the psychological stress of individuals living in the immediate area will strain stress management and disaster psychology resources.

Snyder County is located in the ingestion pathway EPZ for Three Mile Island (TMI) and the Peach Bottom nuclear facilities. The County is not located within the 10-mile at-risk area for either of these facilities.

As seen below, and as defined by the Nuclear Regulatory Commission, there are three different types of nuclear accidents: criticality, loss of coolant, and loss-of-containment.

Nuclear Accident Categories	
Criticality	Accidents that involve a loss of control of nuclear assemblies or power reactors
Loss-of-Coolant	Accidents that involve a reactor coolant system experiencing a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating makeup system
Loss-of-Containment	Accidents that involves the release of radioactivity and have involved materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium

Source: U.S. Nuclear Regulatory Commission (NRC)

Probability

Pennsylvania is home to the only nuclear power plant in the United States to have reached the emergency classification level of “General Emergency.” Since the 1979 incident at the Three Mile Island nuclear power plant, nuclear power has become one of the safest and most heavily regulated industries in the nation. The frequency of nuclear accidents in the United States is extremely low. Likewise, the likelihood of an incident at Three Mile Island or the Peach Bottom nuclear power plant is low, with the possibility of an occurrence approximately once every 30 years.

Maximum Threat

The effects and impacts of a nuclear accident depend on the type of radiation released, the duration of the release, volume of the release, and the existing weather conditions, such as wind direction and speed. Since Snyder County is outside the 10-mile at-risk area, but within the ingestion pathway (EPZ) for Three Mile Island, the greatest threat and highest impact would be to the health and safety of citizens. Additionally, the potential exists for catastrophic impacts



on property, facilities, and infrastructure; a high impact on the delivery of essential services; and a significant impact to the environment and the County's economy.

Dense population concentrations in Selinsgrove, Middleburg, and Shamokin Dam Boroughs and outlying residential areas along the southeastern and eastern municipalities of Snyder County could experience the greatest impact as a result of radiation particulate ingestion. They could also experience a potentially catastrophic impact from radionuclide contamination to structures, facilities, and critical infrastructure. The disruption of essential services in these areas could have a significant impact. The County's western and northern municipalities could experience the greatest environmental impact.

Secondary Effect

The most likely secondary effect could be partial or total power failure. More serious secondary effects could also occur, among them a public health emergency resulting from widespread radionuclide ingestion and/or radiation fallout.

Radionuclide contamination could have lasting impacts on structures, facilities, and infrastructure in the affected areas, primarily in urban and residential areas along Snyder County's eastern tier municipalities. Radionuclide ingestion by domesticated farm animals could force agricultural product embargoes, placing a severe strain on commercial agriculture operations and agribusiness in western municipalities. Decline in agricultural productivity may cause population displacements, as traditional family farm operations in Amish, Mennonite, and Plain Sect communities are forced to close or relocate. Radiological particulate contamination of the environment may impact natural resource production operations in rural areas, as local supply becomes untenable. Embargoes, disruption of critical services, work cessation, evacuations, and other response measures that result from the event could contribute to damaging, long-term effects on the County's economy.