

Crisis Preparation in a Nuclear Age

By **Tim Devik**

“Too cheap to meter” was the catch-phrase of the fledgling nuclear energy industry. The rosy expectations of the nuclear energy industry has given way to concerns regarding high level radioactive waste, terrorism threats and widespread effects of an accident. As the nuclear plants age, concerns arise as to the efficacy of safety measures and the emergency plans at these sites. With the recent surge of license renewals being sought this aging will continue.

What may not be known is that the emergency plans are not evaluated as part of the license extension efforts. This is because the emergency plans are looked at almost continually by the state and federal agencies and the evaluated exercises are monitored by the Nuclear Regulatory Commission (NRC). What the average individual may not know is that the company that operates the plant does not control the emergency plan of the local or state government. The Federal Emergency Management Agency (FEMA) and the state/local emergency management agencies work together to provide for the evacuation and emergency plan actions. However, as was seen in New Orleans and in Texas, sometimes the coordination, planning and execution are not as effective as they could be.

It would be beneficial to understand how the evacuation for a nuclear event compares with the recent hurricanes and with other ‘natural’ disasters. What follows is a short description of some nuclear events that have occurred over the last 48 years. These events were significant for their impact on the local population, the way the world looked at nuclear power, the economic impacts and the demonstration of a ‘fear factor’ associated with nuclear power.

The events of the Windscale fire in England, SL-1 in Idaho, Three Mile Island in Pennsylvania, Chernobyl in the former USSR and the fuel reprocessing plant in Tokaimura Japan have provided some information and data on the effects of a nuclear incident. While none of these events were the result of a ‘nuclear’ explosion, the public reaction and effects were, and are, important.

1957 – A combination of human error and erroneous indication led to a fire at a weapons plant that produced weapons-grade plutonium. The fire caused a release of radio-nuclides into the environment through ventilation shafts. Workers at the plant were evacuated. The local officials received ‘inadequate’ information and a local evacuation was not performed.

1961 – The US Army’s SL-1 reactor outside of Idaho Falls, Idaho, was critically damaged. The bodies of three men involved were buried in lead coffins due to the amount of radioactive contamination. The building that the reactor was housed in contained most of the contamination, although high levels of Iodine-131 were detected downwind on vegetation for several days. The cleanup cost millions of dollars and the exposure of crews to high levels of radiation.

1979 – Following a reactor scram at Three Mile Island, a power-operated relief valve (PORV) failed open. This caused indications that the operators were not expecting and thus they overrode safety system initiations and a partial core melt occurred due to over-heating. This accident led to a drastic curtailment of nuclear plant construction and severely crippled the nuclear energy industry in the United States.

While causing a release of radiation, but no immediate loss of life, the US Nuclear Regulatory Commission stated in a fact sheet that the accident “... brought about sweeping changes involving emergency response planning, reactor operator training, human factors engineering, radiation protection, and many other areas of nuclear power plant operations”.

As for the ‘evacuation’ of the population:

There “... was a series of misunderstandings caused, in part, by problems of communication within various state and federal agencies. Because of confused telephone conversations between people uninformed about the plant’s status, officials... believed that another hydrogen explosion was possible, that the Nuclear Regulatory Commission had ordered evacuation and that a meltdown was conceivable. Garbled communications reported by the media generated a debate over evacuation. Whether or not there were evacuation plans soon became academic. What happened on Friday was not a planned evacuation but a weekend exodus based not on what was actually happening at Three Mile Island but on what government officials and the media imagined might happen {emphasis added}. On Friday confused communications created the politics of fear.” From *Crisis Contained*, The Department of Energy at Three Mile Island, by Philip L Cantelon and Robert C. Williams, 1982.

1986 – During special testing at the Chernobyl nuclear facility, a rapid power rise caused a steam explosion and fire that destroyed the containment structure and released a large amount of radioactivity into the environment. As of 2004, approximately 56 deaths are attributed to this accident, with the long-term effects of the radiation exposure being unknown. The evacuation of the local area was conducted by the Soviet military and there has been much criticism as to the adequacy and timeliness of the procedures used. The effects of this accident have been seen worldwide with the monitoring of vegetation and livestock for contamination.

1999 – As workers were setting up to process uranium for making nuclear fuel in Tokaimura Japan, too much uranium was added to the container and a nuclear reaction occurred. The workers saw a blue flash and vacated the area immediately. The resultant reaction continued for up to 20 hours and was halted by severing the cooling water lines to the container. Neutron radiation was detected at remote sites, but the increase in readings was initially assumed to be ‘background noise’. This incident affected the health of workers and has caused a detrimental economic impact in the region based on the fear of contamination.

In each case, the public took actions based on the ‘perceived danger’ and not on the actual danger presented. The response of the public does not need to be based on an actual release of radioactivity, but on what would be considered the danger of release by a member of the public. Whether or not the population will follow the directives of the local and state officials or act on their own remains to be seen. This presents great difficulty in the evaluation of the emergency plans when they require evacuation of only a few areas and shelter of others. How can you effectively anticipate or practice the independent action of the population? What controls you will need, and the health effects on personnel providing those controls should be determined.

There does not appear to be an effective evaluation method that incorporates the recent changes in population flow and configuration in the emergency plan areas. For example, the Pilgrim Nuclear Power Station in Plymouth Massachusetts has an emergency plan that does not take into account the number of households that have both parents working in Boston, located 45 miles away. This presents a problem during an evacuation in that the parents may need to take public transportation from Boston to the affected area(s) to get their vehicles and then go to the collection sites to pick up their child(ren). Some parents drive their own cars to Boston instead of relying on public transportation. Will the parents be allowed to return? What if the children are not picked up in a timely fashion from the collection areas? Will there be food and water for the children? Would the children be removed to another location? Where? These are concerns that are not unique to this particular plant or location.

A major difference between the evacuation due to a hurricane and one due to a nuclear incident is that the population has warning of a hurricane, but not of the nuclear event. No real ‘pre-planning’ can be performed by the population for the evacuation. It could be ordered at any time. In addition, any real or perceived terrorist attack on a nuclear facility will generate panic, whether or not radiation is released. Where the ‘evacuation’ plans calls for people to remain in their homes (sheltered), how is this to be controlled?

A method that takes into account the potential population reaction as well as the problems noted above is required to accurately measure the effectiveness of evacuation plans and procedures. Based on the events of Hurricanes Katrina and Rita, it is not immediately apparent that the local, state or federal government agencies recognize this as a danger or have such an effective evaluation tool. The current method of table top discussions and mock evacuations using relatively clear roads and ideal conditions will not work and can lead to complacency if the officials and population believe that all variables are addressed and planned for.

WHAT WE’VE LEARNED

What we have learned from incidents like TMI, Chernobyl and the others is that the public’s perceptions regarding nuclear events is important. Whether or not radiation is released, the public will most likely act on what they believe the danger to be, not on what the actual danger is. Without understanding this, the entire emergency network from the top management to the first responders is risking object failure by underestimating the panic that could ensue from a nuclear accident or event.

With the proliferation of cell phones and the efficient mass media delivery systems in place, misinformation transmission will be a factor. Look at the Sago Mine misinformation and what the impact that it had on the story. The American nuclear industry is only now beginning to emerge from the effects of TMI, what will be the impact of another event in this country, whether caused by accident or terrorists?

In addition, the economic impact of an accident is felt throughout a region. If radioactive material is released, property values become worthless due to contamination, while the people who own the homes still have to make the mortgage payments. Some

will want to return, but that would depend on the contamination and cleanup events that are conducted by the Local, State and Federal agencies. Widespread default can occur from homeowners and local businesses, further degrading the local economy. This is different than Katrina because new houses can be built on the existing properties, while that may not be the case if radioactivity is involved.

About the Author

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