

**From:** James O'Brien *RES*  
**To:** Jason Schaperow  
**Date:** Tue, Mar 23, 1999 2:44 PM  
**Subject:** PERMANENT SHUTDOWN CONSEQUENCE ANALYSIS

Jason,

I was told that you guys are being tasked to evaluate the potential consequences associated with a spent fuel pool "fire".

I was also tasked to do this. I think you all are the better people do this this evaluation but I would like to work with you so that I can 1) provide an EP perspective and 2) understand better what all the assumptions are.

I had tried to obtain the MACCS input file from BNL for the work on NUREG.CR 6451. I was unable to get it. (excuses about contract being closed and people relocated) It seems to me that it would be beneficial to get this file to save analysis time and so that we can explain why we come up with any differences than BNL.

As far as the basis for EP and consequence analysis, you might want to refer to NUREG-0396. I have attached an excerpt from a commission paper on EP for advanced reactors which provides some insight.

Let me know if (and how) we can work together on this.  
Thanks

**CC:** Diane Jackson, Joseph Staudenmeier, Thomas Essig

*C/2*

## Part 1: Review of NUREG-0396 Rationale, Criteria, and Methods

NUREG-0396, issued in December 1978, presents the results of a study to develop a technical basis for EP. The study was performed by a task force comprising of U.S. Nuclear Regulatory Commission (NRC) and Environmental Protection Agency (EPA) representatives. NUREG-0396 recommended that the objective of EP should be to produce dose savings for a wide spectrum of accidents that could potentially lead to offsite doses in excess of the EPA protective action guidelines (PAGs). The PAGs represent radiation doses that warrant preselected protective actions for the public if the projected dose received by an individual would exceed the PAGs. The PAGs, in essence, correspond to a 1-rem total effective dose equivalent and a 5-rem committed dose equivalent to the thyroid. The task force determined that the following three elements needed to be considered in establishing requirements for EP:

### 1. Review of the Basis for the Size of the Emergency Planning Zone (EPZ)

The most important element to be considered in establishing requirements for EP is the distance from the nuclear power plant over which emergency actions need to be planned. Two areas were identified: (1) a plume exposure pathway EPZ for planning for prompt actions to protect the public and (2) an ingestion pathway zone for planning for actions to prevent radioactive material from entering the food chain. Several rationales were considered for establishing the size of the EPZ. These included risk, probability, cost effectiveness, and accident consequence spectrum. The task force chose to base the rationale on a full spectrum of accidents and corresponding consequences tempered by probability considerations. It was the consensus of the task force that emergency plans could be based upon a generic distance within which predetermined actions would provide a dose saving for any such accidents.

The following criteria were used to determine the generic distance for the plume exposure pathway EPZ:

- The EPZ should encompass those areas in which projected dose from design-basis accidents could exceed the EPA PAGs.
- The EPZ should encompass those areas in which consequences of less severe Class 9 (core melt) accidents could exceed the EPA PAGs.
- The EPZ should be of sufficient size to provide for substantial reduction in early severe health effects in the event of the more severe Class 9 accidents.

Detailed planning within the EPZ was expected to provide a substantial base for expanding response efforts should expansion be necessary for those low probability, high consequence events whose effects extend beyond the EPZ.

To determine the areas in which these criteria were met, the task force evaluated design-basis accident data from licensees' final safety analysis reports and accident sequence and source term data from NRC document WASH-1400, "Reactor Safety Study" (1975). Specifically, the task force calculated (1) the fraction of plants that exceeded PAG doses beyond 10 miles for design-basis accidents, (2) the probability of exceeding various dose thresholds as a function of distance from the reactor, and (3) the benefit of various protective action strategies.

On the bases of these analyses, the task force recommended that emergency plans should be developed for an area within a radius of about 10 miles of the reactor for the plume exposure pathway. Using a similar rationale and considering the expected dispersal and deposition of the radioactive material and the conversion of atmospheric iodine to chemical forms that do not readily enter the ingestion pathway, an area within a radius of about 50 miles of the reactor was selected for the ingestion pathway.