SEARCH TECHNICAL SERVICES
PO BOX 14209
PORTLAND OREGON 97214 ■ (503) 235-0059

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Mr. Don Godard
Oregon Department of Energy
Labor & Industries Building
Salem, Oregon 97310

REFERENCE: HAZARD EVALUATION OF AIRBORNE ASH AT TROJAN PLANT SITE

Project: 1363

Dear Don:

In your Memo of 29 April 1981, concerning the 8 April meeting with PSR, you noted that an assessment of Mt. St. Helens hazards should be made with reference to Mt. St. Helens, herself.

This can be done for events with sufficiently high probability of occurrence so that the short historical record of Mt. St. Helens activity will suffice.

USGS Bulletin 1383-C (1978, p. C6) maps areas covered by Mt. St. Helens' ash deposits greater than 7.9" thick. Layer W_n, which is about 500 years old, is shown with this 7.9" depth as far as 31 miles from the mountain, suggesting at least 5" depth 34 miles from the mountain. Layer Y_n, which is about 4000 years old, has greater than 7.9" of ash more than 50 miles from the summit. From this it appears that at least two events in the last 4000 years have produced ash deposits greater than 5" in thickness, 34 miles from the volcano. Based on this record, the mean probability per year of such an ash fall 34 miles from Mt. St. Helens is at least

$$2/4000 \text{ yr} = 0.5\times10^{-3}/\text{yr}$$

This probability is for a 5" ash fall somewhere around Mt. St. Helens, at a 34-mile radius...not necessarily at the Trojan Plant site. In our report of 5 October 1980, it was estimated that there was only a 20% chance of a given, heavy ash fall being directed toward Trojan. Thus, the mean probability per year of such an ash fall at the Trojan site is about

$$0.1\times10^{-3}/\text{yr}$$

Finally, one must correct for the times in which we live. Obviously, ash falls occur only when Mt. St. Helens is active. The record (for example, Fire and Ice, 1980, pp. 174-175) suggests that active periods occur less than 10% of the time. Since the present is an active period, the probability for the present time is increased at least ten-fold.

On this basis, I estimate that the present probability per year of an ash fall at Trojan, equivalent to 5" of compacted ash, is

$$1\times10^{-3}/\text{yr}$$

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Of course, that which will end up as 5" of compacted ash in the geologic record may start out as considerably more, fresh, wet ash.

In glancing back over these considerations, I note that the estimates are quite cautious in the sense of not overestimating the severity of the problem. That is, one might argue that the situation is actually worse.

As you know, Trojan has a set of building design criteria which have been reported as an ability to withstand 4½" of wet ash. The above calculation suggests that there is about a 4% chance that this condition will be exceeded during a 40-year plant life.

Unfortunately, there is no solid basis for evaluating this problem. The consequences of exceeding the building design criteria are apparently unknown. An NRC official has noted that this is not a proper area of NRC concern. He noted that bridge designers are not concerned with the consequences of a potential bridge collapse. A more cautious approach would be to assume that, in the absence of contrary information, the above probability represents the probability of severe core damage...from an ash fall event.

Furthermore, the overall probability of severe core damage at Trojan must be greater than the probability of severe core damage due to one event type--ash fall. But how much greater?

R. Bernero, Director of NRC's Systems and Reliability Research has suggested that with severe core damage probabilities in the range of 10^{-2} to 10^{-3}/yr, corrective action should be taken within months. In this case, corrective action could include:

-- installation of sloping roofs on critical structures

-- provision of secure sources of emergency cooling water and power

-- development of realistic emergency procedures

-- investigation of other failure modes associated with high ash fall

SEARCH has begun an evaluation of likely failure modes due to ash fall at Trojan. A scenario-development approach is being tried. A first pass suggests interest in air quality systems failures with secondary failures. Also of interest is a scenario involving a dry ash fall. As the ash accumulates toward dangerous levels, emergency removal procedures would apply water to wash away ash. This would render the ash electrically conductive and more dense, potentially precipitating electrical and mechanical failures.

Your comments are welcome.

Very truly yours,

Norman Buske

xc: USNRC, Washington
PSR, Portland

SEARCH.