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Memorandum

50-263

TO : Edson G. Case, Assistant Director
Division of Reactor Licensing

DATE: October 26, 1966

FROM : Harold Bernard, Acting Chief
Environmental & Sanitary Engineering Br., RDT

SUBJECT: HAZARDS SUMMARY REPORT

RDT:NS

Reference is made to your letter of August 15, 1966, to the Environmental Science Services Administration requesting comments on the following:

Northern States Power Company
Monticello Nuclear Generating Plant, Unit 1
Facility Description and Safety Analysis Report
Volume 1 and 2 dated August 8, 1966

The comments of the Environmental Meteorological Research Branch, ARL, are attached.

Attachments:
Comments (orig. & 1 cy.)

Comments on

Northern States Power Company
Monticello Nuclear Generating Plant, Unit 1
Facility Description and Safety Analysis Report
Volume 1 and 2 dated August 8, 1966

Prepared by

Environmental Meteorology Branch
Institute for Atmospheric Sciences
October 24, 1966

The Monticello site is located in the Northern Great Plains area which is characterized by frequent storm center passages with their associated cloudiness and high winds, particularly from late fall to early spring. The net result is a relatively low frequency of low level inversions amounting to about 30% of the total time over a year [1] and confined largely to the nighttime hours.

In the computation of downwind surface concentrations and dosages of radioactivity the most sensitive parameter, besides the source strength emitted to the atmosphere, is the assumption of a 290 ft high release point. The maximum ground concentration from an elevated source will be higher during unstable conditions than during stable regimes since during periods of instability (rapid diffusion rates) the stack effluent reaches the ground much closer to the stack location than is the case during stable conditions. As a consequence the controlling atmospheric condition at the nearest site boundary 1600 feet to the south is one of rapid vertical dilution. This is evident from the relative concentrations shown in Table XIII-4-4 of the report. It is graphically shown in figure 7 of Slade [2], where for a 260 ft stack height (to account for higher terrain at site boundary) and a wind speed of 1 m/sec a maximum surface concentration of 2.5×10^{-5} Ci/m^3 per Ci/sec results under type B (moderately unstable) diffusion at the nearest site boundary. This compares well with the U-2 category shown in Table XIII-4-4. Locally high concentrations can occur during fumigation conditions, that is, at the time the nighttime surface inversion is destroyed. Assuming a mixing depth of 80 m, a wind speed of 1 m/sec and a σ_y value of 30 m, surface concentrations of 1.7×10^{-4} Ci/m^3 per Ci/sec released could occur at the nearest site boundary. This value is an order of magnitude higher than the highest value in Table XIII-4-4. Consequently this condition could be a controlling situation even though fumigationsof this type last on the average for periods of only about 1/2 hour.

In the accident case of a radioactive superheated steam cloud issuing from the turbine building after portions of the roof and siding were blown out, the model used to predict the height of rise of the centerline of the cloud does not seem appropriate for the conditions being considered. The reference (Singer, Frizzola and Smith [3]) cited in the report points out the empirical nature of the height of the plume centerline prediction equation, the meagerness of the data and the narrow range of observed centerline heights. A summary of their test data shows a maximum observed rise of 160 feet and a wind speed range of from 2 to 11 miles per hour. An extrapolation of a rise to 3780 feet and of a wind of 50 mph, as was done in the safety analysis, would seem a questionable procedure.

In summary, the general diffusion climate of the site is somewhat better (higher dilution rates) than the average condition in the United States. However, because of the assumption of a 290 ft stack release, the controlling condition for off-site radioactive doses is one of rapid rather than poor dilution in the vertical.

References

[1] Hosler, C. R., 1961: "Low-level Inversion Frequency in the Contiguous United States". Monthly Weather Review, Vol. 89, pp. 319-339.

[2] Slade, D. H., 1966: "Estimates of Dispersion from Pollutant Releases of a Few Seconds to 8 Hours Duration". ESSA Technical Note 39-ARL-3, 26 pp.

[3] Singer, I. A., Frizzola, J. A., and Smith, M. E., 1964: "The Prediction of the Rise of a Hot Cloud from Field Experiments". APCA Journal, Vol. 14, No. 11, pp. 455-458.