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# AN EXAMINATION OF THE ENVIRONMENTAL MONITORING PROGRAM FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT NEAR RED WING, MINNESOTA

by

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## GENERAL COMMENTS

This monitoring program is much like others which the company is carrying out at the coal-fired Allen S. King plant and the Monticello nuclear reactor. It suffers from many of the same deficiencies, several of which have been noted by me in reviews of the monitoring programs at these sites (see my MCEI review of the King plant dated 6 Nov 1969; and two reviews of early versions of the Monticello program, the first dated 9 July 1968 and the second dated 24 October 1968, both of which I submitted to the Minnesota Pollution Control Agency and other interested bodies). The major deficiency is the absence of radial transect studies beginning at the point of effluent discharge and continuing outward with a gradually increased spacing in several directions from the discharge canal. A second major deficiency lies in the absence of a plan for determining (a) what is an adequate series of samples to provide satisfactory statistics for the various parameters to be measured, and (b) whether upstream sites are sufficiently like downstream sites to be adequate for providing background data against which downstream data can be assessed once the plant is in operation. (It can be assumed, for biological parameters at least, that 2 years of preoperational background data are inadequate, so that comparability -- or the lack of it -- in upstream and downstream data is a point of great importance to establish.)

Although many of the criticisms made in this review could be obviated only by increased effort and funding, a

good deal of improvement could be achieved by redesign of the proposed program without further expenditure. In addition to the general criticisms already made, a series of particular comments follows on various specific aspects of the program.

## RADIATION MONITORING PROGRAM

A. Air Particulate

1. A ring of sample stations is employed, with only one station on site and 8 at about 5-12 miles radius. Radial transects at several compass directions would be preferable.
2. No provision has been made for detailed radionuclide analysis of filters exhibiting unusually high activity.
3. Monthly test of charcoal cartridges is too infrequent in view of rapid decay of radioiodine.

B. Gamma Background Radiation

1. A greater array of TLD devices and film badges should be used, following the radial transect principle; and analogous to the backup of $SO_2$ recorders at the King plant with many more lead peroxide candles. This would be an especially useful measure in delimiting effects of any major accidental emission which might occur.

C. River Samples

1. No mention is made of any studies to show whether a grab sample 500 ft downstream of the plant site will necessarily pick up radioactive effluent. The pattern of water movement will probably be such that effluent will be far from uniformly diluted horizontally and vertically at

that distance, particularly if the effluent is at higher than river temperature. The cross-sectional distribution of effluent will also vary widely with daily and seasonal changes in temperature and flow rate, so that one station will be quite inadequate.

2. Are the monthly tritium analysis and the quarterly Sr-90 analysis to be on composite samples? One would hope so, in which case the separate samples minus the composite aliquots should be retained for more thorough testing if the composites are unusually high. Provision should be made for more detailed analysis of such unusual samples.
3. Bottom sediments should be more thoroughly and frequently sampled (see comment C 1 above on the adequacy of a single site 500 ft downstream from plant site, which applies equally to sediment). A sediment survey should be undertaken, so that if different types exist (as they almost certainly do) they can all be sampled. Provision should again be made for more detailed analysis of unusual samples.
4. Vegetation sampling and analysis is inadequate in the same sense as noted in C 1 and C 3 above.
5. Fish sampling is likewise inadequate, with the additional point that some attention ought to be paid to sampling fish occupying different trophic levels in the food chain.
6. It might be worthwhile installing clams from a good clam-producing site in various parts of the river, as extremely efficient bioassay organisms for radioactive pollution.

7. Again, the locations for plankton, algae, or insects may not be those which are most exposed to the radioactive effluent (see C 1 above). Considerable effort should be devoted to overcoming this deficiency.
8. The lake samples ought to be more frequent, and to include a thorough food-chain study through to predatory fish at the top of the chain.

D. Terrestrial Samples

1. Analysis of natural vegetation as well as crops should be attempted. Mosses and lichens are especially efficient fallout accumulators, and would be especially suitable for gross beta and gamma scan (and more detailed analysis of unusually high samples). Radial transect studies would be useful.
2. Soil sampling is grossly inadequate. A radial transect approach with many more samples would be useful here too, if it is borne in mind that the organic content of the soil can have a strong influence on radioactivity.

E. Raw Milk

1. Because of the short half-life of radio-iodine, fortnightly samples would be better.
2. Four sites are specified, within 10 miles N, S, E and W of the plant. An attempt should be made to find the sites closest to the plant, and a 10-mile distance should not be allowed if a closer site can be found.

F. Precipitation

1. One site is inadequate. Why not at least have a fallout pot with each air sampler, and composite the samples if necessary because of analytical expense?
2. Is monthly analysis sufficient to get a clear picture of the variability of radioactivity in individual rainfalls? And will a one-month collection period allow much of the radioactivity to decay before analysis, i.e. is the "half-life" of the mixed batch of emitted isotopes of the order of days, weeks, months, or years? (This question arises with all the proposed monitoring procedures.)

G. On-Site Monitoring

1. No mention is made of a charcoal cartridge being employed for analysis of radio-iodine. This is the most important site for such analysis, being the nearest to the point of emission.
2. Why are the gamma scans only monthly, and not weekly like the beta counts? (Note query in F 2 on half-life of mixed batch of emitted isotopes.)

ECOLOGICAL MONITORING PROGRAM

H. Phytoplankton

1. At the very least, there ought to be several sampling points very close to the point of heated discharge within the zone of warmed water, to see if high populations build up there and could serve as inocula for the rest of the river.

2. In addition to a series of up- and down-stream sites, a set of radial transects should be employed, with spacing closer together as one approaches the focus on the point of discharge.
3. Conceivably the heated plume could follow the western shore. If so, sampling stations should be sited there, between the bank and the adjacent island.
4. Some regular samples should be taken in winter, close to the point of discharge, to see whether high populations are maintained which could serve as inocula in spring for the main river. (Could such early inocula lead to buildup of greater nuisance blooms than would otherwise appear in the main river?)
5. No studies of nanno-plankton or periphyton seem to be planned, yet both could be significantly affected by radioactive or thermal pollution.

I. Zooplankton Study, Invertebrate Study

1. Comments H 1 - H 4 apply also to zooplankton, invertebrates, and fish.
2. It is not clear from page 17 whether additional radiobiological study of fish, bottom organisms, and aquatic plants is planned, beyond that described on page 5. Certainly such additional study is desirable, but page 17 does not indicate clearly the nature and thoroughness of any additional studies.

J. Aquatic Plants

1. Why restrict studies to sectors C and D?

2. Citation is needed for the paper by Jessen & Lound.

K. Water Quality

1. Comments H 1 - H 4 apply here also.

2. More detailed temperature monitoring, both horizontally and vertically, would be desirable to establish the limits and paths of the heated effluent as it emerges from the discharge canal at various times of year. Aerial IR photography should be instituted on a regular basis once the plant goes into operation, until the seasonal variation in effluent flow patterns is thoroughly established.

L. Meteorological Surveys

1. Were estimates of tornado probability made for the area?