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U.S. Nuclear Regulatory Commission
Washington, D.C., 20555

Attention:

Director, Division of Licensing

Dear Director:

Enclosed are my comments on the Draft Environmental Statement related to the operation of the Catawba Plant units 1 and 2, NUREG-0921. Please note that the opinions and calculations presented do not necessarily reflect the position of the Pennsylvania State University.

I will be looking forward to the Final Environmental Statement. Would you also please send me a copy of that Final EIS when it is available.

Sincerely,

William A. Lochstet

Wm. A. Lochstet, Ph.D.

C002

Some Health Consequences of Catawba 1 and 2

by

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The Nuclear Regulatory Commission (NRC) has attempted to evaluate the health consequences of the operation of the Catawba nuclear power plants in the Draft Environmental Statement, NUREG-0921 (Ref. 1). The health consequences of the radon-222 released from the mill tailings and mines needed to fuel the plant, are evaluated for the first 1000 years in Appendix C. This evaluation states that the radon emissions increase with time (Page C-4, Ref. 1), and there us no suggestion that there is any reason to believe that these emissions will stop after 1000 years, or even to decrease.

In fact, these emissions continue for a very long time, being governed by the 80,000 year half life of the thorium-230, and the 4.5 billion year half lifeof the uranium-238 in the mill tailings. The amount of material covering the tailings also effects the amount of radon released to the atmosphere. The thorium situation has been adequately discussed by Pohl (Ref. 2) in 1976. The impact of the uranium-238 as a source of radon was recognized by the NRC in GESMO (Ref. 3), which is one of the references of Appendix C of this Draft Report (Ref. 1).

Appendix C of this Draft (Ref. 1) is written on the presumption of a 1000-MWe LWR plant operated at an 80% capacity factor (Page C-1). This will require about 29 metric tons of reactor fuel. With uranium enrichment plants operating at a

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0.2% tails assay, 146 metric tone of natural uranium will be required, and 117 metric tons of depleted uranium will be left over. With a uranium mill which extracts 96% of the uranium from the ore, a total of 90,000 metric tons of ore is mined, containing 152 metric tons of uranium (Ref. 4). The uranium mill tailings will contain 2.6 kilograms of thorium-230 and 6 metric tons of uranium. As Pohl has pointed out (Ref.2), the thorium decays to radium-226, which in turn decays to radon-222. This process results in the generation of 3.9×10^{8} curies of radon-222, on a time scale determined by the 8×10^{4} year half life of thorium-230.

The 6 metric tons of uranium contained in the mill tailings decays by several steps thru thorium-230 to radon-222. This process occurs on a time scale governed by the 4.5×10^{9} year half life of the uranium-238, the major isotope present(99.3%). The total amount of radon-222 which will result from this decay is 8.6×10^{11} curies.

The 117 metric tons of depleted uranium from the enrichment process is also mainly uranium-238, which also decays. The decay ofthese enrichment tails results in a total of 1.7×10^{13} curies of radon-222. The impact of these decays were listed by the NRC in GESMO (Ref. 3).

The population at risk is taken to be a stabilized USA at its present level and present distribution. This is similar to that taken by the Draft (Page C-3, Ref. 1). The NRC has suggested that a release of 4,800 curies of radon-222 from the mines would result in 0.023 excess deaths (Ref. 5). This provides a ratio of 4.8×10^{-6} deaths per curie.

At present some recent uranium mill tailings piles have two feet of dirt covering. In this case, the EPA estimate (Ref. 4) is that about 1/20 of the radon produced escapes into the air. Thus, of the 3.9×10^{8} curies of radon from the thorium in the

mill tailings, only 1.9×10^{7} curies will get into the air. With the estimate of 4.8×10^{-6} deaths per curie, this results in a total of 90 deaths.

The 8.6×10^{11} curies of radon produced by the uranium in the mill tailings will similarly have 1/20 escape to the air. With the same method as was used above, the result is 200,000 deaths.

The uranium enrichment tailings are presently located in the eastern part of the USA. If these are buried near their present location it is taken that 1/100 of the radon will escape to the air, due to the higher moisture content of the covering soil. An additional reduction factor of 2 is taken to account for the more eastern location, and the fewer people downwind, to the east of the sites. With the NRC estimate of 4.8×10^{-6} deaths per curie, the result is 400,000 deaths.

The NRC estimate is about 2 deaths in the draft (Ref. 1) is thus more than 100,000 times too low as compared to the sum of 600,000 deaths as shown above. This is due largely to the arbitrary, erronious, immoral, incorrect procedure of stopping at the end of the first 1000 years.

The fact that these doses and death rates are less than background is interesting (Page C-4, Ref. 1), but absolutely irrelevant. The major federal action to be considered by the the NRC is not whether or not to license background radiation, but whether or not to license the Catawba plants. This is what NEPA requires.

Rebaselining:

The NRC has attempted to evaluate the impact of "class 9" accidents which might occur at Catawba. Unfortunately, the few pages of this report (Ref. 1) devoted to this topic are not adequate to describe the calculation that was modified

from the presentation in the eight volumes of the Reactor Safety Study (RSS), WASH-1400 (Ref. 6). It should be noted that for severe accidents, the assessment is carried out considering the entire population within radii of 80 km (50 mi) and 563 km (350 mi)(Ref.1, Section 5.9.4.5 (2)). It is unclear what evaluation is considered outside 563 km, considering the population statement on page 5-37 (Ref. 1). It is necessary to use very large radii. At larger distances, the exposure per person is less, but the number of people exposed increases. Thus, it was recognized in the 1975 APS study (Ref. 7) that the major health impact may be located at larger distances from the reactor site.

The present study (Ref. 1) seems to be based on the RSS (Ref. 6) with modifications to include improvements since the publication of the RSS. In its January 1979 statement of policy, the NRC took the following action:

> The Peer Review Process:The Commission agrees that the peer review process followed in publishing WASH-1400 was inadequate and that proper peer review is fundamental to making sound, technical decisions. The Commission will take whatever corrective action is necessary to assure that effective peer review is an integral feature of the NRC's risk assessment program.
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> Accident Probabilities: The Commission accepts the Review Group Report's conclusion that absolute values of risks presented by WASH-1400 should not be used uncritically either in the regulatory process or for public policy purposes and has taken and will continue to take steps to assure that any such use in the past will be corrected appropriately. In particular, in light of the Review Group conclusions on accident probabilities, the Commission does not regard as reliable the Reactor Safety Study's numerical estimate of the overall risk of a reactor accident.
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> (Ref. 8, page 3).

The second statement would preclude the use of the results from the RSS in this action. The first requires a thorough peer review process for any such study. It is here suggested that the "rebaselining" has undergone less peer review than the RSS of 1975.

The present work is too incomplete for any attempt at peer review of it. It is suggested that the NRC publish a new version of the "rebaselined" RSS. Thorough peer review would be needed on the scale of the 1975 RSS.

It is hoped that these comments are useful in preparing the Final EIS.

References

1 Draft Environmental Statement related to the operation of Catawba Nuclear Station, Units 1 and 2.; NUREG-0921, Draft, NRC, August 1982

2 R.O. Pohl, "Health Effects of Radon-222 from Uranium Mining", Search, 7(5), 345 - 350 (August 1976)

3 "Final Generic Environmental Statement on the Use of Recycled Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors", NUREG-0002, NRC, (August 1976)

4 "Environmental Analysis of The Uranium Fuel Cycle, Part I - Fuel Supply" EPA-520/9-73-003-B, U.S. E.P.A., (October 1973)

5 "Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives" NUREG-0332, Draft, U.S. N.R.C., (September 1977)

6 "Reactor Safety Study", WASH-1400, (NUREG-75/014), 1975

7 "Report to the American Physical Society by the Study Group on light - water reactor safety", H.W. Lewis, et al., Reviews of Modern Physics, Vol 47, Supp. No. 1, Summer 1975

8 "NRC Statement on Risk Assessment and the Reactor Safety Study Report (WASH-1400) in light of the Risk Assessment Review Group Report", NRC, January 18, 1979.