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8 August 1983

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 Limerick Generatine Station, Units 1 and 2, NUREG-0974. 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

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Some Health Consequences
of Limerick 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 Limerick nuclear power plants in the Draft Environmental Statement, NUREG-0974 (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-5, Ref. 1), and there is 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 life of 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

* Affiliation for identification purposes only.

0.2% tails assay, 146 metric tons 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 of these 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, erroneous, 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-6, 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 Limerick plants. This is what NEPA requires.

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

Limerick
August 1983

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References

- 1 Draft Environmental Statement related to the operation of Limerick Generating Station, Units 1 and 2.; NUREG- 0974, Draft, NRC, June 1983
- 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-520/9-73-003B, EPA, (October 1973)
- 5 "Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives", NUREG-0332, Draft, NRC, (September 1977)