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PDR

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January 3, 1978

Director of Nuclear Reactor Regulation
U S Nuclear Regulatory Commission
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Replacement of Spent Fuel Pool Storage Racks - Supplement 2

On August 17, 1977, we submitted a document entitled, "Design Report and Safety Evaluation for Replacement of Spent Fuel Pool Storage Racks, August 1977". Supplement 1 was submitted on December 8, 1977. Attached is Supplement 2 to the report, which includes replacement pages for the cover sheet and Page 35. This supplement was requested by members of your staff. It incorporates experience from the Fall 1977 Monticello Refueling Outage which more clearly supports the original hypothesis.

As was done with the previous supplement, please file Supplement 2 as follows:

1. Remove the cover sheet and Page 35 of the report which should now be filed with Supplement 1 incorporated.

2. Insert the attached cover sheet and Page 35 which are identified as Supplement 2, January 1978.

3. Pages removed in step 1 above should either be discarded or attached to the end of the updated report for future reference. If the latter option is exercised, mark each of the obsolete pages conspicuously with the words, "SUPERSEDED-JANUARY 3, 1977".

L. O. Mayer

L O Mayer, PE
Manager of Nuclear Support Services

LOM/MHV/deh

cc: J G Keppler
G Charnoff
MPCA
Attn: J W Ferman

Attachment

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MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263 License No. DPR-22

August 1977

DESIGN REPORT AND SAFETY EVALUATION

FOR

REPLACEMENT OF SPENT FUEL POOL STORAGE RACKS

Incorporating:

Supplement 2
January 1978

radiation level existing over the pool. The proposed storage racks are designed having the maximum practical density. Calculations performed for other similar situations have verified that due to self-shielding, the radiation level over a spent fuel pool will decrease as the density of fuel assemblies in storage increases.

Realizing that calculations of personnel exposure attributed to shine from irradiated fuel in the proposed high density storage racks could be expected to show a decrease, an effort was made to define an empirical, conservative upper bound of the exposure with no credit for self-shielding.

The radioactivity of fission products in discharged spent fuel assemblies decays at the half-life of the respective isotopes. Approximately ten days are generally required to remove the spent fuel from the reactor. The radiation from the freshly discharged batch is a factor of five greater than the batch discharged the previous year and a factor of 25 greater than that discharged seven to eight years earlier. The FSAR considered two annual quarter core discharge batches in the spent fuel pool. The reracked pool would allow storage of 12 such additional batches. Because of the radioactive decay, the source term of the 12 long term batches is only about 50% of that of the two recent batches. (It is conservative to assume the actual time period of 10 days for the removal of spent fuel from the reactor, rather than the minimum time assumed for analyzing the adequacy of the Spent Fuel Pool Cooling System. Radioactive decay of the discharge batch is substantial during these ten days whereas it is quite insignificant for the older batches. Using the actual ten-day cooldown period therefore results in a realistic interpretation of the data.)

For calculational purposes an outer bound for the radiation level over the present spent fuel pool due to direct shine is assumed to be 1 mr/hr. In reality the shine contribution to the level over the pool is not distuinguishable because of the relatively larger contribution from residual impurities in the water. In early refueling outages, where fuel defects were known to exist, the radiation level over the spent fuel pool spiked at 10 mr/hr early in the refueling outage, but decreased to 1 mr/hr by the end of the outage and for the duration of the cycle. During the Fall, 1977 refueling outage, where there were no indications of fuel defects, there was no measurable change in the radiation level over the pool. Two conclusions can be drawn from these facts. First, the observed spikes were due to crud activation products and fission products from defective fuel which were removed by the cleanup system or decayed rapidly as was the case for I-131. Second, the residual activity level of 1 mr/hr is predominantly from the water and not the shine from the fuel, since the fuel source term was increased significantly without a noticeable increase in activity over the pool. Nevertheless, the 50% increase in source term discussed in the above paragraph was applied to the 1 mr/hr residual activity, resulting in an upper limit for shine dose over the reracked spent fuel pool of 1.5 mr/hr. (This is not to suggest that a 50% increase is expected or that it is even a realistic upper bound. It is used to show with existing data that even an ultra conservative upper bound does not result in a significant incremental increase in occupational exposure.)

Activity over the spent fuel pool requires, based on a very conservative projection, 3,000 man hours annually. An incremental increase of up to 0.5 mr/hr will result in a total of up to 1.5 man-rem/year averaged over the 30 men involved, or an average of 0.05 rem/year each. These numbers, although very small already, should be recognized as conservative, upper bounds that completely disregard self-shielding due to higher