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May 26, 1988

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC. 20555

Subject: Byron Station Units 1 and 2
Application for Amendment to Facility
Operating Licenses NPF-37 and NPF-66,
Appendix A, Technical Specifications
NRC Docket Nos. 50-454 and 50-455

References (a): September 3, 1986 letter from K.A. Ainger
to H.R. Denton

(b): April 20, 1988 letter from L.N. Olshan
to L.D. Butterfield

Gentlemen:

The NRC staff requested additional information concerning our application for a license amendment documented in reference (a) to increase the storage capacity of the spent fuel racks at Byron Station. Reference (b) contained several questions regarding occupational exposure resulting from "wet" reracking. Enclosed with this letter are Commonwealth Edison's responses to the NRC questions.

Please direct any further questions regarding this matter to this office.

Very truly yours,

K. A. Ainger

K. A. Ainger
Nuclear Licensing Administrator

/klj

Encl.

cc: Byron Resident Inspector
NRC Region III Office
L. N. Olshan (NRR)

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## REQUEST FOR ADDITIONAL INFORMATION

## BYRON STATION UNITS 1 AND 2

## SPENT FUEL STORAGE

### QUESTION 1

Provide a description of fission and corrosion product sources in the spent fuel pool (SFP) water from: (a) introduction of primary coolant into SFP water, (b) movement of fuel from the core into the pool, and (c) defective fuel stored in the pool. Include a listing of the radionuclides and their concentrations (expressed in uCi/mL) expected during normal operation and refueling. The radionuclides of interest should include $^{58}Co$, $^{60}Co$, $^{134}Cs$ and $^{137}Cs$.

### Response

Primary coolant is introduced through the fuel transfer tube at the rate of 55 cubic feet for each pair of fuel assemblies. During a normal refueling, approximately 2000 cubic feet of reactor cavity water can be transferred to the transfer canal. A full core discharge could transfer 4800 cubic feet of the water.

Leaking fuel assemblies are not expected to cause a significant increase in pool water activity because almost all of the radioactivity available for release will be collected by the waste gas system during vessel depressurization and venting.

The following is a list of actual measured concentrations from April, 1988.

| | |
|---|---|
| Co58 | 3E-5 uCi/mL |
| Co60 | 1E-4 uCi/mL |
| Cs134 | 5E-5 uCi/mL |
| Cs137 | 8E-5 uCi/mL |
| Mn54 | 5E-6 uCi/mL |
| Sb125 | 7E-6 uCi/mL |

These concentrations are anticipated to fluctuate slightly during normal operations and are typical of what a diver would be exposed to during the reracking operation.

QUESTION 2

Dose Rates from Fuel Assemblies, Control Rods, and Burnable Poison Rods

a. Provide a description of the dose rate at the surface of the pool water from the fuel assemblies, control rods, burnable poison rods or any miscelleanous materials that may be stored in the pool. Additionally, provide the dose rate from individual fuel assemblies as they are being placed into the fuel racks. Information relevant to the depth of water shielding the fuel assemblies as they are being transferred into the racks should be specified. If the depth of water shielding over a fuel assembly while it is being transferred to a spent fuel rack is less than 10 feet, or the dose rate 3 feet above the spent fuel pool (SPF) water is greater than 5 mR/hr above ambient radiation levels, then submit a Technical Specification specifying the minimum depth of water shielding over the fuel assembly as it is being transferred to the fuel rack and the measures that will be taken to assure that this minimum depth will not be degraded.

Response

The depth of water shielding a fuel assembly while it is being transferred into the spent fuel racks is always 10 feet. This is controlled by a geared limit switch on the fuel handling machine. erefore, per the FSAR, there should be no more than 2.5 mR/hr at the su e of the water from all radiation sources.

QUESTION 2b

Address the dose rate changes at the side of the pool concrete shield walls, where occupied areas are adjacent to these walls, as a result of the modification. Increasing the capacity of the pool may cause spent fuel assemblies to be relocated close to the concrete walls of the pool, resulting in an increase of radiation levels in occupied areas. Please evaluate this potential problem.

Response

The design of the Fuel Handling Building does not permit uncontrolled access to the areas that are adjacent to the spent fuel pool walls up to elevation 411'-0". Since the top of the racks reside at elevation 401'-3", there is at least 12 feet of water and 6 feet of concrete between the active fuel and the nearest potential uncontrolled area, which would be the new fuel vaults when they are not being used.

The new spent fuel storage design will have an impact at the 401'-0" elevation if more than one newly removed core is stored in the racks at a single location at either the north or the south pool wall. The pipe penetration areas have a design dose rate of 60 mrem/hr (see FSAR Figure 12.3-32). This level would be exceeded for several weeks if more than 1.25 fresh cores are simultaneously stored near one of these walls. A normal refueling will produce radiation levels that are well below the design levels for the spent fuel pool. Normal health physics surveys would note any elevation in radiation levels and appropriate action would be taken to assure no personnel hazard exists.

QUESTION 3

Dose Rates from SFP Water

Provide information on the dose rates at the surface of SFP water resulting from radioactivity in the water. Include: (1) dose rate levels in occupied areas and along the edges and center of the pool and on the fuel handling crane; (2) effects of crud buildup; and (3) based on refueling water activity, the dose rates before, during and after refueling.

Response

Present dose rates at the surface are less than .2 mR/hr and are not expected to exceed 1 mR/hr at the surface even after refueling. This higher level would be reduced due to the SFP filter and demineralizer system. Therefore, the dose rates at the sides of the pool, above the pool, and in occupied areas would permit continous occupancy.

QUESTION 4

Dose Rates from Airborne Isotopes

Based on the source terms, provide the dose rates from submersion and dose commitments from exposure to the concentration of $^{85}Kr$ and $^{3}H$.

Response

After two refuelings, the spent fuel pool is estimated to contain 0.16 uCi/ml of tritium and 0.12 uCi/ml of krypton-85. These two isotopes are assumed to evaporate at the same rate as the pool water, which is estimated to be 0.02% per day. The fuel handling building HVAC continuously exhausts 21,000 cfm and results in a total airborne concentration for these two isotopes that is less than 0.05 MPC. The airborne dose rate contribution from these two isotopes is $3.5x10^{-3}$ mrem/hr wholebody and $1.0x10^{-2}$ mrem/hr to exposed skin.

The dose commitment for the station involves radiation exposure from all sources on a quarterly basis, i.e., 1250 mrem per quarter for whole body dose and 7500 mrem per quarter for skin dose. Airborne radiation is not singled out; but the station's health physics program requires radiation surveys which include sufficient air sampling and analysis to maintain radiation exposure to station workers ALARA.

QUESTION 5

Dose Assessment from Modification Procedures

Discuss the manner in which occupational exposure will be kept ALARA during the modification. Include the need for and the manner in which cleaning of the crud on the SFP walls will be performed to reduce exposure rates in the SFP area.

Response

a. The following ALARA situations have been addressed:

1. Submersion dose from suspended contaminants is minimal because there is only a single core off load in the pool presently and the filtration and demineralization systems filter out suspended contaminants.

2. Dose rates from plate-out on the walls and floor is also minimal for the above stated reasons.

3. A pre-job survey, daily re-verification surveys, and surveys following fuel movement will be used to guide the diver around hot areas and determine when vacumming (see response to Q5b) will be necessary.

4. Underwater communication is maintained with the diver.

QUESTION 5b

Discuss vacuum cleaning of SFP floors if divers are used and the distribution of existing spent fuel stored in racks to allow maximum water shielding to reduce dose rates to divers.

Response

Cleaning of the pool walls and floors is not warranted at this time based on recent survey data. Only one refueling process has taken place to date resulting in a minimal amount of floor and wall crud contamination. However, if surveys prior to the job indicate the need for cleaning, the process will be accomplished with an underwater vacuum system. Existing spent fuel consists of the first one third core of unit one and occupies one rack in the south portion of the pool. The plan is to install racks in the north section of the pool, move the fuel to a northern rack, survey, clean (if necessary) and resume re-racking.

QUESTION 5c

Describe plans for cleanup of the SFP water to minimize radioactive contamination and to ensure fuel pool clarity and underwater lighting acceptance criteria to help ensure good visibility.

Response

The system was designed with adequate filtration and demineralization which will maintain water clarity and reduce deposited and suspended contaminants. Portable underwater lighting is available to install, as required, to ensure good visibility.

QUESTION 5d

Discuss underwater radiation surveys that will be made before any diving operation. These surveys should be performed before or after any fuel movements or movements of any irradiated components stored in the pool.

Response

Radiation surveys are covered under ALARA considerations in part (a) and address these concerns.

QUESTION 5e

State your intent to equip each diver with a calibrated alarming dosimeter and personnel monitoring dosimeters, which should be checked periodically to ensure that prescribed dose limits are not being exceeded.

Response

The diver will be multiple badged on the whole body and extremities with TLDs and SRDs and will carry two underwater probes with surface read-out (one of which has alarming setpoint capabilities).

QUESTION 5f

Discuss any preplanning of work by divers as required.

Response

Preplanning is accomplished through an ALARA pre-job meeting attended by all workers and supervisors involved in the work.

QUESTION 5g

Discuss your provision for surveillance and monitoring of the spent fuel pool work area by Health Physics personnel during the modification.

Response

A dual (redundant) underwater probe will be used with two separate read-outs. One read-out is typically monitored by the radiation protection technician and the other by a health physicist. One of these individuals will be required to provide timekeeping for the diver.

QUESTION 6

Provide an estimate of the total man-rem to be received by personnel occupying the spent fuel pool areas based on all operations in that area including those resulting from (2), (3), and (5) above. Describe the impact of the spent fuel storage rack modification on these estimates.

Response

The diver will take approximately 15 working days to install the racks at an estimated 75 mrem/day. The support personnel will receive $<1$ mrem/day due to no detectable dose levels at the general area of the spent fuel pool. Thus, total estimated man-rem for the re-racking is 1.1 man-rem.