**Commonwealth Edison**
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690 - 0767

May 17, 1988

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

Subject: LaSalle County Station Unit 2
Proposed Amendment to Technical
Specification for Facility Operating
License NPF-18 to Install High Density
Fuel Racks
NRC Docket No. 50-374

References (a): Letter dated September 19, 1986 from
C.M. Allen to H.R. Denton.

(b): Letter dated August 18, 1987 from
C.M. Allen to H.R. Denton.

Gentlemen:

Pursuant to 10 CFR 50.90, Commonwealth Edison proposed to amend Appendix A, Technical Specification, to Facility Operating License NPF-18 in Reference (a). That proposal was amended by Reference (b).

During review of that review proposal your staff had additional questions discussed in a telecom and meeting held with your reviewer. The response to these questions are enclosed in Attachment A.

If you have any additional questions regarding this matter, please address them to this office.

Very truly yours,

C M Allen

C. M. Allen
Nuclear Licensing Administrator

CMA/lm

Attachment

cc: Region III Inspector - LSCS
P. Shemanski - NRR
M. C. Parker - IDNS

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## SUPPLEMENTAL RESPONSES TO NRR QUESTION ON ENCLOSURE B

Questions specifically requested additional information regarding the CECo letter to NRR dated August 18, 1987, regarding the Radiological Consequences (Enclosure B) of implementing High Density Spent Fuel Racks.

**Item 1 - Regarding CECo's position to accomplish the reracking modification in a wet or dry pool condition.**

QUESTION:

Your current response addresses both a wet as well as a dry pool condition for the modification of the Unit 2 pool. Is Edison in a position yet to commit to either one?

RESPONSE:

The rack removal and installation work will be competitively bid, with the bidders providing a base and alternate bid to perform the work in either condition. Based on the bid evaluation process, CECo will determine the most cost effective and ALARA conscious scheme. Therefore, CECo shall retain the option to perform the reracking modification in either pool a wet or dry condition or a combination thereof.

**Item 2 - Regarding the reracking modification under dry pool conditions.**

QUESTION:

Your current response addresses both a wet as well as a dry pool condition for the modifications of the Unit 2 pool. Is Edison in a position yet to commit to either one? [See Item 1 for response] If not, additional information is required for a dry condition - such as - specified in the control of airbornes, pool cleaning procedure and acceptance criteria, and possible water loss in the Unit 1 pool through the transfer canal when Unit 2 pool is drained?

RESPONSE:

For a dry pool condition, the reracking modification will be completed in seven major steps, involving crew training, installation of a radioactivity control system, decontamination of existing rack components, rack removal operations, cutting operations to separate the existing rack support/shim plates and installation of new support/shim plates, pool vacuuming, and installation of high density spent fuel racks.

Training will be conducted to ensure ALARA objectives are met, to reduce the probability of operator error and minimize risk to the crew.

CECo will install a radioactivity control system which includes HEPA filters over the spent fuel pool, if necessary. The system would be capable of controlling the airborne radioactivity generated by evaporated spent fuel pool water, decontamination and rack removal operations. This control system would be positioned as required to improve control and operational efficiency in any step of the modification. Unsubmerged surfaces of the pool liner and existing rack surfaces will be kept as wet as necessary to aid in the control of airborne radiation.

Demolition of the existing spent fuel racks involves three tasks. The rack components must be released from the pool liner plates, decontaminated, and then lifted/hoisted out of the spent fuel pool.

The existing rack components bear on support/shim plates which must be removed from the pool floor liner. Following removal of the existing plates, a new support plate system will then be installed.

Prior to the final step which involves the installation and leveling of the high density spent fuel racks, a thorough vacuuming will be completed. The vacuuming will be performed prior to completely draining the pool.

CECo will establish a radiation controlled work area for cutting and packaging operations. During the cutting of the decontaminated rack components, the airborne exposure rate is expected to be less than $10^{-3}$ of a maximum permissible concentration (MPC), as defined in Appendix B of 10CFR20 for radiation workers. The rack components will be decontaminated in the pool.

CECo health physics staff and/or the ALARA coordinator shall survey existing conditions and determine the required personnel protection. Worker training and administrative requirements are governed by CECo procedures.

Pool cleaning, including hydrolasing of the rack components and pool liner surfaces is part of the progress of work. The hydrolasing will be performed prior to rack demolition operations and the pool surfaces will be maintained in a clean wet condition, if necessary, through the completion of the high density racks installation. Cleanup of the radiation controlled work area will be in accordance with CECo procedures to maintain ALARA program objectives.

The lessons learned and experience gained from the Dresden and Quad Cities reracking modifications will be incorporated wherever practical.

In the unlikely event that the Unit 1 spent fuel pool gate seals fail, the condition was assessed to have a negligible impact on the pool's performance. Each spent fuel pool has gasketed gates and the pools are separated by the transfer channel and cask storage area. Seal failure of the Unit 1 gate seals would reduce the pools water level by approximately one foot.

The independent gates assures one set of seals is available to prevent pool draining or for pool isolation in the unlikely failure of one unit's gate seals. In the worst case scenario, simultaneous failure of each unit's gate seal results in a pool water level of 18.8 feet. Under the worst case scenario, the Unit 1 pool will maintain water level at approximately 4 feet above the active zone of the stored fuel bundles.

Draining of the unit 1 pool via a gate leak will take hours because of the hydraulic resistance of the gate doors. The flow restriction through the key-lock gate design allow sufficient time to take corrective action. The condensate storage tanks can provide the necessary makeup water to replenish any lost water from the Unit 1 spent fuel pool.

A crud sample from the Unit 2 spent fuel pool was analyzed and found to have an activity of 310 $\mu$Ci/gm. Ninety-seven percent of this activity comes from Mn-54 and Co-60. The estimated maximum crud film on submerged surfaces is 3 gm/$m^2$ with a resultant dose rate of 6.5 mr/hr.

After decontamination, the contact dose rate is reduced to approximately 0.5 mr/hr. These dose rates were used to calculate the estimated extremity dose of 4 man-rem. The estimated 5 man-rem whole body dose is based on the following radiation environments:

a. This modification is expected to involve approximately 40,000 man-hours which includes both station and contract personnel.

b. The airborne radiation is expected to be 320 MPC hours to a minimum of 36 people over a period of approximately 100 working days.

c. The direct dose to the divers from the radiation sources in the pool is expected to be less than 250 mrem. This includes the training and the 8 days estimated for rack and liner decontamination.

d. The direct dose to workers in the pool area is estimated to be 2,600 mrem. This dose includes the radiation from the pool water, the radiation from the decontaminated fuel racks, and the radiation from the decontaminated pool liner surfaces.

e. The workers in the cutting and packaging area are expected to receive a total direct radiation exposure of less than 1,200 mrem.

**Item 3 - Regarding the concentration of radionuclides and the dose rates discussed in Paragraph 2.3, "Operating Experience."**

QUESTION:

In paragraph 2.3, "Operating Experience," how is the concentration of radionuclides of $10^{-4}$ to $10^{-2}$ µCi/ml related to dose rate?

RESPONSE:

Based on calculations, the projected concentration of radionuclides in the spent full pool water prior to the start of the the reracking modification is $2.8 \times 10^{-3}$ µCi/cc, of which $2.4 \times 10^{-3}$ µCi/cc is attributed to tritium. With the exception of the airborne contamination (see Item 7), tritium does not impact the diving crew, because the diving suits have sufficient thickness to absorb the beta energy. The dose from the remainder of the radionuclides is 2.1 man-rem gamma whole body and 0.5 man-rem beta to the protected diver's skin. The dose attributed to the crud sources is discussed in Item 6.

**Item 4 - Regarding the total dose rate expected after the modification discussed in paragraph 2.b, "Radionuclide Release to Air."**

QUESTION:

In paragraph 2.6, "Radionuclide Release to Air," What is the total dose rate expected to be after the modification accounting for direct shine and Item 3 above? What is the resulting dose rate above the pool?

RESPONSE:

At the completion of the modification the immersion dose rate is expected to be approximately 0.3 mr/hr, and the dose rate above the spent fuel pool is expected to be approximately 0.15 mr/hr. The increased spent fuel storage capacity will not exceed the acceptance criteria of the direct dose rate at the pool side or on the refueling bridge. The increased spent fuel storage capacity will not exceed 2.5 mr/hr whole body at these structures. Since Co-60 and Mn-54 are the dominant isotopes, the expected whole body immersion dose rate will be between 4 and 5 mr/hr.

After fuel unloading operations are completed, the average dose rate on the refueling bridge and at the outside surface (side walls) of the spent fuel pool is expected to be less than 1 mr/hr. The increased storage of fuel elements produces a negligible increase to the dose rate at these locations. During operating conditions, the airborne exposure rate is expected to be less than $10^{-3}$ of MPC, as defined in Appendix B of 10CFR20 for radiation workers.

**Item 5** - **Regarding specific references pertaining to NUREG-0575 (Reference 1), the following provides page and paragraph references.**

RESPONSE

The specific NUREG-0575 references in Enclosure B are:

| ENCLOSURE B PAGE (SECTION) | NUREG-0575 PAGE | NUREG-0575 PARAGRAPH | TOPIC |
|---|---|---|---|
| B-2 (2.2) | 4-15 | 4.2.2.2 | Kr-85 Release |
| B-2 (2.2) | 4-15 | 4.2.2.2 | Kr-85 Release |
| B-2 (2.2) | 4-25 | 4.2.2.3 | Cs-134 & Cs-137 Release |
| B-2 (2.2) | 4-25 | 4.2.2.3 | Cs-134 & Cs-137 Release |
| B-5 (2.8) | 4-15<br>4-17 | 4.2.2.2<br>4.2.2.10 | Release of Kr-85 and other elements |
| B-5 (2.3) | 4-15<br>4-17 | 4.2.2.2<br>4.2.2.10 | Release of Kr-85 and other elements |
| B-5 (2.8) | 4-15 | 4.2.2.3 | Airborne Activity |
| B-5 (2.8) | 4-16 | 4.2 2.6 | Cs-134 & Cs-137 Release |
| B-5 (2.8) | 4-17 | 4.2.2.6 | Cs-134 & Cs-137 Release |
| B-5 (2.8) | General reference to NUREG-0575 and Reference 2 (BNWL-2256) report. Sentence is discussing pellet inertness in pool water. | | |
| B-5 (2.8) | 4-15 | 4.2.2.4 | Element Release & Cladding Defects |

**Item 6** - **Regarding the dose rate contribution from the radionuclides in water discussed in paragraph 2.4, "Spent Fuel Pool Shielding."**

QUESTION:

In paragraph 2.4, "Spent Fuel Pool Shielding," the dose rates are stated for stored fuel only. What is the contribution to dose rate for radionuclides in water as in paragraph 2.3 above? What is the expected amount of curd which will be stirred up during modification and the resulting concentrations and dose rates?

RESPONSE:

The dose rate outside the pool walls due to activity in the pool is negligible. The pool shielding is designed to protect personnel from the radiation emitted by a discharged core. The design basis radiation field from a discharged core is at least $10^6$ times greater than that produced by the same pool water surrounding the core. Therefore, the dose rate contributed by the radionuclides ($1 \times 10^{-6}$ mr/hr) in the pool water was not included in paragraph 2.4, because, it is insignificant compared to other radiation environments that will be experienced during the reracking modification.

The suspended crud in the spent fuel pool water during the reracking modification will average 200 grams (0.06 Curies) which is equivalent to a concentration of $4.2 \times 10^{-5}$ $\mu$Ci/cc. The maximum crud concentration is not expected to exceed $1.23 \times 10^{-4}$ $\mu$Ci/cc. The average dose rate in the pool water due to suspended crud is 0.19 mr/hr, corresponding to the dose rate of 0.09 mr/hr at the pool side. The total integrated dose to the diving crew is 0.7 man-rem. The skin dose to the divers is negligible, because very little beta energy penetrates through the divers' diving suits.

Item 7 - **Regrading the applicability of Reference 2 and industry experience to LaSalle County Station.**

QUESTION:

In paragraph 2.5, "Radionuclide Release," how is Reference 2 and industry experience applicable to this LaSalle Modification? If the modification is done wet, how will LaSalle monitor possible increases in dose rate due to stirred up crud, etc? How will LaSalle perform cleanup, if applicable? Relate expected concentration to dose rate.

RESPONSE:

The BNWL-2256 report (Reference 2) and industry experience are applicable to the reracking modification, because the reported behavior of zircaloy-cladded fuel rods is applicable to BWR and PWR fuel rods.

The only sources of suspended and dissolved radioactivity are the crud deposited on the existing fuel racks, because no fuel assemblies or core internals will be present during the reracking process. The mixing mechanism during the dives is principally due to the movement of the divers and from equipment handling, because the spent fuel pool cleanup system is not expected to not be operating when the divers are in the pool. Negligible mixing action is expected resulting in negligible flow past the passive inline liquid radiation monitoring subsystem. Consequently, it is impractical tc use the subsystem to monitor pool water activity during dives.

CECo determined the following method will be used to monitor the pool water activity during dives. The diving crew will be equipped with remote readout underwater detectors (wired/sonar type link up- the modified Xetex 503A Teledose System)[1]. In addition, CECo will monitor the spent fuel pool water for increased suspended crud using an underwater dose rate instrument similar to an Eberline R07.

Although high water borne crud levels are not expected, if they are observed the divers can temporarily leave the pool while the Spent Fuel Pool Cleanup (FC) system is utilized to remove most of the crud. The FC system is capable of removing 50 percent of the Cesium and 90 percent of other crud with its demineralizers (at a capacity of 1500 gpm).

The FC system is capable of removing 50 percent of the mass of Iodine -131, Cesium and other long lived isotopes in 3.30, 6.05 and 3.36 hours, respectively. With both FC trains operating, the FC system is capable of doing the removal work in half the time. Therefore, the FC system can theoretically remove 99 percent of the spent fuel pool's activity in approximately 15 hours (assuming two demineralizers operating and less than 58 percent of the initial activity is contributed by Cesium).

The total dose rate in the spent fuel pool water is contributed by the activity of the radioactive decay from diluted reactor water and suspended crud. The dose rates tabulated below are based on a concentration of $1.0 \times 10^{-3}$ µCi/cc, however, the reactor water and crud concentrations are estimated to be less than $1.0 \times 10^{-3}$ µCi/cc. (See Response to Item 6).

| CONTRIBUTOR | UNPROTECTED BETA IMMERSION | GAMMA IMMERSION | GAMMA AT POOL SIDE |
|---|---|---|---|
| Tritium | 0.006 mr/hr | None | None |
| Reactor Water | 0.30 mr/hr | 1.9 mr/hr | 0.9 mr/hr |
| Crud | 0.07 mr/hr | 4.5 mr/hr | 2.1 mr/hr |

1. H. E. Clow, G. Emmons, "Underwater Remote Reading Dosimeter Evaluation," Radiation Protection Management, Volume 2, No. 2, page 71, the Techrite Company, Marietta, Georgia, January 1985.

**Item 8 - Regarding page B-6, "Wet Pools", the response below discusses control of divers as it pertains to ALARA concerns and radiation monitoring to control diver exposure.**

RESPONSE:

CECo will conduct training as discussed in Item 2 to assure program is properly implemented. Diving operations will be governed by procedure LRP-2100-12, Radiation Protection Practices for Divers

Used For Maintenance Or Inspection Within The Spent Fuel Storage Pool Or Reactor/Refuel Fuel Cavities. The procedure meets the intent of IE Information Notice No. 84-61. CECo will have radiation surveys of the affected area performed before any diving operation, using one radiation exposure monitoring device. CECo is justified using a single monitoring device, because survey instruments are functionally (response) checked daily before diving operations and the XETEX 503A Teledose System could be used to confirm dose rate instrument readings.