123 Main Street
White Plains, New York 10
914 681.6240

New York Power Authority

John C. Brons
Executive Vice President
Nuclear Generation

May 26, 1989
IPN-89-033

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
Spent Fuel Pool Expansion (TAC 68233)

Reference 1: Letter from Mr. John C. Brons to the NRC, dated May 9, 1988 entitled: "Proposed Technical Specifications Regarding Spent Fuel Pool Storage Capacity Expansion."

Dear Sir:

Reference (1) submitted proposed changes to the Indian Point 3 (IP-3) Technical Specifications regarding the replacement of the existing spent fuel storage racks with maximum density storage racks. This replacement will result in an increase in the spent fuel storage capability of the IP-3 spent fuel pool. Attachment I provides additional information concerning radiological protection for this project.

Should you or your staff have any questions regarding this matter, please contact Mr. P. Kokolakis of my staff.

John C. Brons
John C. Brons
Executive Vice President
Nuclear Generation

cc: See next page

A001
1/1

cc: Mr. Joseph D. Neighbors, Sr. Proj. Mgr.
Project Directorate I-1
Division of Reactor Projects - I/II
U.S. Nuclear Regulatory Commission
Mail Stop 14B2
Washington, D.C. 20555

Resident Inspector's Office
Indian Point Unit 3
U.S. Nuclear Regulatory Commission
P.O. Box 337
Buchanan, NY 10511

U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

ATTACHMENT I TO IPN-89-033

ADDITIONAL INFORMATION REGARDING
RADIOLOGICAL PROTECTION FOR THE INDIAN POINT 3
SPENT FUEL POOL EXPANSION

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
DPR-64

RPB #1

A. Sources In The Spent Fuel Pool (SFP) Water

Provide a description of fission and corrosion product sources in the SFP from:

a) introduction of primary coolant into SFP water
b) movement of fuel from the core into the pool
c) defective fuel stored in the pool
d) list radionuclides and their concentrations expected during normal operations and refueling

Response

a&b) Nearly all of the primary coolant that is introduced into the SFP comes during refueling activities when the SFP gate is open. An extremely small quantity of primary water can be introduced into the SFP as makeup from the Primary Water Storage Tank (PWST) during normal plant operations. In either case, the radioactive materials deposited in the SFP from such sources as primary water or crud from fuel movement is filtered and removed from the SFP via the SFP cooling and purification system.

The fuel itself is also contaminated with corrosion products, which either remain on the fuel or fall to the bottom of the SFP during fuel handling operations.

c) Although there are four known defective fuel assemblies currently in the SFP, the percentage of total activity attributed to defective fuel is negligible. The four defective assemblies have pinhole or tight crack leaks, and no major concentration of fission products have been found in the SFP water.

d) An isotopic analysis of SFP water under normal operations indicates the following radionuclides and concentrations:

Radionuclide	Activity
Co-57	9.533 E-6 uCi/ml
Co-58	1.072 E-3 uCi/ml
Co-60	2.855 E-3 uCi/ml
Cs-137	2.880 E-5 uCi/ml

During refueling conditions, average isotopic activities increase to about 1.5E-2 uCi/ml for Co-58 and 1.5E-3 for Co-60.

B. <u>Airborne Radioactive Sources</u>

Provide a description of radioactive materials that may become airborne as a result of failed fuel and evaporation (e.g., Kr-85 and H-3 respectively). The radionuclide description should include calculated or measured concentrations expected during normal operations and during refuelings.

<u>Response</u>

There is no anticipated or previous experience of airborne concentrations of krypton or tritium in any significant quantity in the Fuel Storage Building (FSB). Actual measured values are as follows:

Tritium as measured from the plant vent in 1988 is as follows:

Maximum	1.165E-8 uCi/cc
Minimum	3.965E-10 uCi/cc
Average	4.714E-9 uCi/cc

It should be noted that since these numbers represent total tritium releases from both the Fuel Storage Building, Containment, and ventilation air from the Primary Auxiliary Building, they bound the tritium release from the SFP.

It is expected that the reracking effort will not increase tritium output from the SFP in any way. Most tritium comes from high neutron flux interactions with materials such as lithium or water. The greatest source of tritium in the SFP will be from activated primary coolant brought into the SFP during refueling and, to a lesser extent, SFP water activated by the most recently discharged fuel. Increasing the capacity of the SFP will not affect the tritium content. The total amount of tritium in the SFP is independent of the number of fuel assemblies in the SFP except for beyond the most recently discharged fuel.

Krypton is measured as part of the total airborne noble gas activity, which is below 1E-6 uCi/cc.

In addition, the effluent release from the FSB is monitored as part of the plant vent releases. The limit for this release point is 20 millirad/quarter, and actual readings are well below 1 millirad/quarter.

C. Miscellaneous Sources of Exposure

Address the effects of more frequent replacement of demineralizer filters on cumulative dose equivalent if this is a factor that results from the modification.

Response

It is not expected that the installation of maximum density SFP racks will result in more frequent replacement of demineralizer filters. These filters are exhausted based on chemical performance (i.e. Cl breakpoint), not on exposure.

RPB #2

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

A. 1) 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 other miscellaneous materials that may be stored in the pool. Will the anticipated dosage in man-rem/year increase after reracking?

Response

The dose rate from fuel assemblies at the surface of the pool has been calculated to be 1-2 mr/hr. This is consistent with measured values. Dose rates from miscellaneous materials in the SFP at the surface of the water is negligible. As the principal source of radiation from fuel comes only from the most recent offload, it is anticipated that the annual man-rem dosage will not observably increase.

It should be noted here that, once the maximum density racks have been installed, the fuel will be lower than it is at present by approximately four inches, thereby increasing the amount of water shielding and lowering the dose rate accordingly.

2) Provide the dose rate from individual fuel assemblies as they are placed into the fuel racks.

Response

The dose rate from a single fuel assembly being transferred is indistinguishable from the 1-2 mrem/hr dose rate from the rest of the fuel in the SFP. Actual measurements taken at the time of fuel assembly lift show no change at the fuel handling bridge while the assembly is moving from the fully inserted to the full up position.

3) 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 SFP 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

As stated in (A) above, the dose rate at the surface of the pool is 2-6 mr/hr. It is anticipated that the dose rate 3 feet above the pool surface will be below 5 mr/hr.

According to NYPA's calculations the minimum height of water over the active fuel in the pins is 10 ft. and the minimum height of water over the top of the fuel assembly nozzle is 8.95 ft. The fuel handling equipment is not being altered in any way as a result of the reracking efforts; therefore, the amount of water over a transferred fuel assembly will be the same after reracking as it is now and as it always has been. It is the Power Authority's position that no Technical Specification change is necessary since no change to the fuel handling equipment or procedures is being made.

B. Address the dose rate changes at the sides 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, as well as its effect on annual occupational dose.

Response

According to SFP layout drawings depicting the location of the existing racks, the closest that a fuel assembly could be to the southern SFP wall is 3.5". The new racks are to be installed such that the nearest fuel assembly will be 4.10" from the southern wall. This is the only wall of the SFP that would have personnel working on the opposite side. This effect of the more closely-packed fuel array has been analyzed, assuming that a semi-infinite array of freshly discharged fuel was loaded into the SFP at the southern edge. Results of these calculations showed that personnel working on the other side of the wall would receive maximum doses of 0.55 mr/hr, which is not significantly higher than they would receive at present. The annual occupational dose increase would therefore be similarly negligible.

RPB #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:

a) dose rate levels in occupied areas and along the edges and center of the pool and on the fuel handling crane
b) effects of crud buildup
c) based on refueling water activity, the dose rates before, during and after refueling

Response

(a)(b)(c) As stated in response to RPB #2.A.3, the dose rate from radioactivity in the Fuel Handling Building at all the areas of concern is 5 mr/hr or less, at a height of 3' above the pool surface. This value is accurate for both refueling and non-refueling circumstances. The crud deposits in the SFP water are filtered and removed by the SFP cooling and purification system. Refer to NYPA's response to RPB #1.A for further information.

It should be noted here that during any operations involving fuel movement, such as refueling, Health Physics (HP) personnel will be monitoring the fuel handling equipment for hot particles as fuel is raised from the racks. This is done by both airborne, underwater and direct radiation monitors.

RPB #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 Kr-85 and H-3.

Response

As per the response to RPB #1 B, no significant dose from Kr-85 and H-3 is expected. Details on total anticipated exposure are given in the response to RPB #6.

RPB #5

Dose Assessment From Modifications Procedures

a) 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.

b) 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.

c) 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.

d) 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.

e) 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.

f) Discuss any preplanning of work by divers as required.

g) Discuss your provision for surveillance and monitoring of the SFP work area by Health Physics personnel during the modification.

Response

a) The reracking scheme in its present form minimizes the use of divers by relying as much as practical on the use of remote tooling. In addition to this, underwater alarms and remote (radio contact) dosimetry will be used for diver ALARA protection. For surface work, HP will provide the usual complement of radiation monitors, as well as personnel making necessary surveys whenever work is going on in the FSB. Special surveys of lifting cables will be performed whenever old racks are being removed from the SFP. The Spent Fuel Pit rerack job will fall under the IP-3 ALARA program and will require pre-job briefings, man-rem estimates and exposure tracking. There will be continuous Health Physics coverage to assure that ALARA principles are being followed.

b) HP has an underwater vacuum filter cask system that can be used for cleanup of SFP walls and floor as needed. As stated in (a), divers will be separated from fuel assemblies by at least three empty rows at all times.

c) Cleanup of the SFP water will be done using the skimmer and ion exchange beds. An underwater filter system is available if necessary. Underwater lighting will be provided as needed for visibility; this includes augmentation of existing SFP lighting with portable or temporary lights as appropriate.

d) All underwater surveys as needed will be performed in accordance with plant approved procedure REA 4-16. A copy of the procedure is attached for your review.

e) This is currently part of established HP procedures.

f) Preplanning of divers' work will be performed in accordance with plant HP procedures so as to minimize exposure to divers. Each dive will be treated individually, and planning will include contractor, engineering and HP concurrence.

g) Constant HP coverage will be provided for the duration of the removal/installation project. Surveillance details are covered under response a) above.

General) Specific details on installation and removal ALARA precautions are not available at this time. This information will be available upon selection of a contractor for the installation/removal.

RPB #6

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

Response

A preliminary estimate was previously provided in NYPA's May 9, 1988 submittal as 3-9 man-rem. Contractor estimates received recently provide a range from 10 man-rem to 15 man-rem. More details on the anticipated dosage will be available upon selection of a contractor for the installation/removal.