VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 15, 1977

Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
Attn: Mr. Robert W. Reid, Chief
Operating Reactors Branch No. 4
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 369/081877
PO&M/HSM:bep/mc
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

Dear Mr. Case:

RESPONSE TO REQUEST ADDITIONAL INFORMATION
HIGH DENSITY SPENT FUEL STORAGE RACKS
SURRY POWER STATION UNITS 1 AND 2

The attached information concerning the High Density Spent Fuel Storage Racks for Surry Units 1 and 2 is being provided in response to your letter of August 18, 1977.

Also attached are 40 copies of a revision to our High Density Spent Fuel Rack submittal forwarded to you in our letter of May 27, 1977. This revision is necessary due to changes in the detailed design of the High Density Spent Fuel Storage Racks.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President - Power Supply
and Production Operations

Attachments

cc: Mr. James P. O'Reilly
Office of Inspection & Enforcement
Region II

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Question 1: Provide the volume of material to be removed from the spent fuel pool (e.g. spent fuel racks, seismic restraints) because of the proposed modification.

Response:

The only items to be removed from the spent fuel pool during this modification will be the existing spent fuel racks. There are twenty-nine (29) rack spaces in the pool, but only twenty-six (26) racks are currently installed. Each rack weighs approximately 3300 pounds. This means that a total of 85,800 pounds of stainless steel, in the form of spent fuel racks, will be removed from the spent fuel pool. The demensions of each rack are 6'10 1/8" x 6'10 1/8" x 13'10". Each rack occupies 648 cubic feet. The total volume of the 26 racks to be removed is 16,850 cubic feet.

Question 2: Explain why no equipment modifications for the Fuel Pool Purification System were proposed. Consider that the proposed SFP modification may result in a factor of approximately ten times more fuel movements during the modification than during a normal refueling which may increase the level of crud in the pool above that expected during a normal refueling. Justify why the Fuel Pool Purification System is adequate to maintain low fuel pool concentrations of radioactivity including crud so that there are reasonably low exposure levels in and around the fuel pool area during and after the modification.

Response:

It is true that this modification will result in many more fuel movements than during a normal refueling (~370 assemblies moved rather than ~1/3 to ~1/2 of a core or ~50 to ~80 assemblies). A point which should be considered, however, is the time period during which this fuel movement takes place. A normal refueling shuffle optimally takes place in about 5 days whereas the fuel rack installation and associated fuel movement will take place over a period of about 45 days or more. Operational experience at Surry has shown the purification system to be adequate during normal refuelings. Therefore, based on the time period involved and the acceptable operation of the system to date, it should be adequate for this modification. If necessary the filters and resins in the fuel pool purification system will be changed out during this modification. The criteria for changing these filters and resins are discussed in the response to question 3.

Question 3: Provide the following information on the operation of the Fuel Pool Purification System (FPPS) and discuss any expected changes due to the proposed modification: (1) when during a year the FPPS is normally run, (2) whether both the filter and the demineralizer are operating when the FPPS is run, (3) the normal flow rate through the FPPS when it is run and (4) the basis for changing the filter and the demineralizer. Specify the expected change in the frequency of changing the filter and demineralizer resin due to the proposed modiciations. Estimate the change in plant man-rem exposure for more frequent changing of the filter and demineralizer resin.

Response:

Operational experience to date indicates that the purification system has performed satisfactorily. The normal flow rate for the purification system is 110 gpm and remains in operation continously to maintain a clean and clear pool. The maximum allowable differential pressure across the filter is 15 psi. The maximum allowable differential pressure across the demineralizer is 25 psi. If the ΔP across the filter or demineralizer exceeds the allowable value, the filter is replaced or the resin is replenished respectively.

The radiation levels at the demineralizer are usually from 1 R/hr to 4 R/hr. The filters are normally changed because of high ΔP and usually have radiation levels of about 100 mR/hr. The filters are normally changed prior to each refueling, i.e. twice per year. In changing the filters an individual receives an exposure of about 150 mR. In replacing the resins in the demineralizer, approximately 55 mR is received. This exposure is divided among three individuals.

This information is also provided on page 17 of the Surry Power Station Spent Fuel Rack Submittal dated May 20, 1977.

During the high density spent fuel rack modification the filters and resins will be changed out based on the criteria stated above. Based on past experience and the number of fuel assemblies to be transferred versus the number of assemblies normally moved per year, it is estimated that the filters and resins will be changed a maximum of six times. This would result in an additional 1.025 man-rem over the normal annual inplant man-rem exposure.

Question 4: Specify the average burnup expected for the spent fuel in the pool.

Response:

The maximum average expected burnup of the fuel to be stored in the spent fuel pool is 35,000 MWD/MTU.

Question 5: Provide an estimate of the man-rem exposure that will be received during the removal and disposal of the old racks and the installation of the new ones. The estimate should include the number of workers involved in each phase of the operation including divers, if any, the duration of the operation, the exposure rate for each phase of the operation, and the total man-rem received by all workers involved. Relevant experience may be cited.

Response:

The installation of the new high density spent fuel racks is presently planned to be done remotely from poolside without the use of divers. It is conservatively estimated that 6 workers will be required for this operation and that one rack can be installed during two (2) eight (8) hour shifts (12 hours work in the fuel building). For the 29 racks to be installed, it is estimated that the total exposure will be 3.2 Rem. Removal of the old spent fuel racks will be a very straight-forward procedure as they will be lifted out of the pool and washed down with demineralized water. Experience at Maine Yankee has shown this procedure will decontaminate racks like the Surry racks to levels less than 25 mR/hr. Any hot spots will be eliminated through use of a hydrolaser, (high pressure water spray). It is planned that the old spent fuel racks will be wrapped in polyethylene sheet and stored on site temporarily until ultimate disposal. To lift the old racks out of the pool, decontaminate them, and wrap them in polyethylene sheets should take no more than half an 8 hour shift (3 hours work) and a crew of 4 rem. This results in a total exposure for removal of 26 racks of 7.8 man-rem. The total exposure for this modification will be conservatively 11.0 man-rem.

Question 6: Provide an estimate of the annual man-rem expected from all operations in the spent fuel pool (SFP) area based on the present concentration of the radionuclides identified in the SFP water and the crud build-up along the sides of the pool and its removal. Describe the impact of the proposed modification (e.g. additional elements and crud) on this estimates.

Response:

The concentrations of radionuclides identified in the spent fuel pool water and the crud buildup along the sides of the pool result in an insignificant part of the exposure levels currently experienced. The exposure levels noted on page 19 of the Surry High Density Spent Fuel Rack Submittal are primarily a result of the radiation levels of the spent fuel stored in the pool and not of the radionuclides in the water and the crud on the sides of the pool. As noted on page 45 of the Surry High Density Spent Fuel Rack submittal, it is expected that as a result of the proposed change the exposure rates presently experienced during unit operation will increase slightly. However, even if those exposure rates were to increase by a factor of 5, the exposure would still be a relatively minor contribution to the total station exposure.

6.0 DESIGN OF HIGH DENSITY SPENT FUEL STORAGE RACKS

6.1 Design Bases

The high density spent fuel storage racks are designed to provide storage locations for up to 1044 fuel assemblies and are designed to maintain the stored fuel, having an equivalent uranium enrichment of 3.5 weight percent U-235 in UO_2, in a safe, coolable, and subcritical configuration under all conditions.

6.2 Storage Rack Description

Each new fuel storage rack consists of a six by six array of fuel storage cells which are square stainless steel boxes spaced nominally 14 inches on centers. The rack is shown on the general arrangement drawing (Figure 6.0-1), attached.

The fuel storage rack has two basic components: the support structure and the fuel storage cell. The support structure consists primarily of the four corner storage cells which interface with the spent fuel pool floor pads and two horizontal grid members which are supported by the four corner cells and which maintain the horizontal position and vertical alignment of the remaining thirty-two (inner) storage cells. The inner storage cells rest directly on the spent fuel pool floor. Diagonal bracing is provided on the structure to accommodate the loads imposed by rack installation, by fuel handling and by the seismic events.

The horizontal seismic loads are transmitted from the rack structure to the spent fuel pool floor through restraint devices which capture the existing spent fuel pool floor pads and which mate with the fuel rack structure corner cells. Leveling of the fuel racks will be accomplished through the use of shims and will require no modification of the existing fuel rack support pad. The vertical seismic loads are essentially transmitted directly to the pool floor by each storage cell. No bracing to the pool wall is required to support the racks during a seismic event.

Each corner storage cell is nominally 9.44 inches square (O.D) by ∿172 inches long with 0.250 inch walls. Each of the thirty-two inner storage cells is nominally 9.12 inches square (O.D) by ∿170 inches long with 0.090 inch walls. The cells are flared at the top to aid in insertion of the fuel assembly into the cell. Attached to the bottom of each cell are four stainless steel posts which support the fuel assembly. The posts attached to the thirty-two inner cells rest directly on the floor of the spent fuel pool and space the cells off the pool floor a sufficient distance to assure adequate area for cooling flow. To accomodate any unlevelness in the pool floor liner, the rack is designed to permit the inner cells to move vertically within the rack structure (a± 1 inch motion is provided). The inner cells, however, are positively locked into the support structure so that they cannot be inadvertantly lifted out of the rack.