Dominion Nuclear Connecticut, Inc.
Millstone Power Station
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Dominion

April 1, 2004

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

Serial No.	04-173
MPS Lic/MAE	R0
Docket No.	50-245
License No.	DPR-21

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
FUEL STORAGE REQUIREMENTS, TECHNICAL SPECIFICATION 4.2

In a letter dated September 18, 2003, Dominion Nuclear Connecticut, Inc. (DNC) proposed to amend License DPR-21 by incorporating changes to the Millstone Unit 1 Technical Specifications through changes to Design Features Technical Specification 4.2, "Fuel Storage."

On March 11, 2004, DNC received a Request for Additional Information from the Nuclear Regulatory Commission staff regarding the September 18, 2003, submittal. Attachment 1 contains the DNC response to that request. The additional information provided in this letter does not affect the conclusions previously submitted in the Safety Summary or the Significant Hazards Consideration discussion contained in the letter of September 18, 2003.

If you have any questions or require additional information, please contact Mr. Paul R. Willoughby at (804) 273-3572.

Very truly yours,

David A. Christian
Senior Vice President - Nuclear Operations and
Chief Nuclear Officer

Attachment

A001

Commitments made in this letter: None.

cc: U.S. Nuclear Regulatory Commission
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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by David A. Christian, who is Senior Vice President - Nuclear Operations and Chief Nuclear Officer of Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 1st day of April, 2004.

My Commission Expires: 3/31/08.

Notary

SEAL

ATTACHMENT 1

LICENSE BASIS DOCUMENT CHANGE REQUEST 01-03-02
FUEL STORAGE REQUIREMENTS, TECHNICAL SPECIFICATION 4.2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Question No. 1:

The licensee used the SCALE-4.4 code package to benchmark 95 experiments during their criticality analysis. Results of these experiments were organized in an Excel spreadsheet, then graphically plotted by variable. The licensee performed a least mean squares linear regression to fit the data of K_{eff} as a function of each independent variable.

The staff observed equations on Figures 1 through 6 (Attachment 4, pages 5-8 of the September 18, 2003 submittal) pertaining to the least mean squares linear regression fit. These equations do not correspond to the equations listed in Table 2 on page 4 of Attachment 4. The staff requests the licensee to provide the derivation of the equations located in Table 2, located on page 4 of Attachment 4 of the same submittal.

Response:

As stated in Attachment 4 of our submittal dated September 18, 2003, the Oak Ridge National Lab (ORNL) computer program USLSTATS was used for the determination of the Upper Subcritical Limit (USL) for the Millstone Unit 1 spent fuel pool. A detailed description of USLSTATS is contained in NUREG/CR-6361, Criticality Benchmark Guide for Light Water Reactor Fuel in Transportation and Storage Packages, 1997 (Reference 1 in Attachment 4).

Figures 1 through 6 of Attachment 4 of our submittal show Excel plots for K-effective for each variable of interest for the analyzed criticality experiments, along with a least mean squares linear regression fit to the data. The linear regression fit shown in Figures 1 through 6 was performed using both Excel and USLSTATS. The results from both methods were in agreement.

In Table 2 of Attachment 4, there is a column labeled "Equation". The results in this "Equation" column are taken directly from the output of the USLSTATS computer program. These equations use USL Method 1 (Confidence Band with Administrative Margin) from the USLSTATS program. The administrative margin is .05 (i.e. Keff $\leq$ 0.95) and the confidence level is 0.95 (95%). Thus the equations from USLSTATS shown in Table 2 in the column "Equation" contain both an allowance for the confidence band and an allowance for the administrative margin required to maintain Keff below critical.

The staff questioned the difference between the equations shown in Figures 1 through 6 and the equations shown in Table 2. As noted above, the equations shown in Figures 1 through 6 are used to provide the least mean squares linear regression fit to the data for agreement with criticality experiments. The equations shown in Table 2 are direct outputs from the USLSTATS program using USL Method 1. These direct outputs show what the required USL would be based on the criticality experiment data and with allowance for the confidence band and administrative margin.

An example of this is provided with the USLSTATS computer program output for the average energy of the fission-causing neutron (AEF) variable at the end of Attachment 4. This USLSTATS output shows the linear regression fit of the criticality data that agrees with the linear regression fit displayed in Figure 6 of Attachment 4. This is shown in Attachment 4 (sheet 10 of 11) in the line labeled:

Linear regression, k (X) 0.9989 + (8.6356E-03)*X

Also shown in this USLSTATS output are the USL Method 1 limits, which are then placed directly into Table 2. This is also shown in Attachment 4 (sheet 10 of 11) in the line labeled:

USL Method 1 (Confidence Band with Administrative Margin)
USL1= 0.9402 + (8.6356E-03)*X (X < 0.12988)
= 0.9413 (X >=0.130)

From this USLSTATS output, if the value of X (where X is AEF in this case) is > or = to 0.130, then the USL is 0.9413. If the value of X is < 0.12988, then the USL must be calculated from the equation:

USL= 0.9402 + (8.6356E-03)*X

As shown in Table 2 of Attachment 4, the Millstone Unit 1 (MS) value of AEF is 0.15707, so the USL limit for AEF for Millstone Unit 1 is 0.9413. For simplicity in Table 2, since the Millstone Unit 1 value of AEF is 0.15707, which is larger than 0.130, the Equation column of Table 2 shows only the USLSTATS equation of USL= 0.9413, which is applicable to AEF values > 0.130.

The other variables, Enrichment, Pin Pitch, Assembly spacing, H/X, and Water : Fuel Volume ratio, are handled in a similar fashion as AEF.

Question No. 2:

The staff requests that the licensee define the term 'MS Value.' The licensee should reveal the derivation of the MS Values in Table 2 (Attachment 4, page 4 of the same submittal).

Response:

MS is an abbreviation for Millstone. The MS values shown in Table 2 of Attachment 4 of our submittal refers to the Millstone (MS) Unit 1 values for each variable. For example, the pin pitch for Millstone 1 fuel is 1.6256 cm and the fuel assembly spacing is 16.002 cm. These are Millstone Unit 1 specific values for the spent fuel pool and are required to determine the USL from USLSTATS in the manner described above in the response to question 1. As can be seen from Table 2 of Attachment 4, the Millstone Unit 1 spent fuel pool enrichment of 2.08 w/o U-235 produces a USL value of 0.9403, which is the limiting (smallest) USL determined from the USLSTATS program. The value of 2.08 w/o U-235 as the appropriate Millstone Unit 1 fuel enrichment is explained in Attachment 3, in the section labeled "Determination of Representative Fuel Assembly".

Question No. 3:

The licensee has considered several accident scenarios for their methodology. The staff requests to know if the licensee has addressed the double contingency considerations. If so, what results did the licensee obtain (i.e. K_{eff}, boron requirements, etc)? If not, the staff requests that the licensee explain the absence of double contingency considerations.

Response:

Double Contingency Considerations were applied. Both Normal Conditions and Abnormal Conditions are described below.

Normal Conditions

Attachment 3, Table 1 (case 1) of our submittal shows that for normal conditions, the maximum Millstone Unit 1 spent fuel pool k-effective (without bias or uncertainties) is calculated to be 0.8799. As shown in Tables 1 and 2, the total bias value for various tolerance conditions (cases 2, 3, 4 and 5) is 0.0186. The sigma value for each of these KENO calculations is shown to be 0.0002. The USL limit (from USLSTATS) shown in Table 3 is 0.9403. Thus for normal conditions, the maximum k-effective with bias and uncertainties must be less than the USL using the equation shown at the end of Attachment 3:

Maximum Keff = (Most Limiting Keff + net bias +3sigma) < USL
= (0.8799 (normal conditions) + .0186 + 3*(0.0002)) < 0.9403
= 0.8891 < 0.9403

Thus for normal conditions, the K-effective of the Millstone 1 spent fuel pool, including biases and uncertainties is far below the USL. Abnormal conditions are considered next.

Abnormal Conditions and the Double Contingency Principle

The criticality analysis should consider all credible incidents and postulated accidents. However, by virtue of the double-contingency principle, two unlikely and independent incidents or postulated accidents happening concurrently are beyond the scope of the required analysis. At Millstone 1 there is no soluble boron present in the spent fuel pool water (i.e., the boron concentration = 0 ppm). Therefore, for any credible incident or accident K-effective must remain below the K-effective USL of 0.9403.

There were 3 abnormal/accident conditions that were considered credible for the Millstone Unit 1 spent fuel pool (SFP). Each of these 3 conditions was evaluated with KENO calculations and the results are described in Table 1 of Attachment 3. As described in Attachment 3, the 3 abnormal/accident conditions were boiling spent fuel pool water, a dropped fuel assembly, and a misloaded fuel assembly. As shown in Table 1 of Attachment 3, boiling conditions in the SFP (case 6) or a dropped fuel assembly (case 7) resulted in a slight increase in K-effective over the baseline K-effective (case 1). As shown in Table 1 of Attachment 3, a misloaded fuel assembly results in the largest increase in K-effective of the SFP, with a value of 0.9174 shown in Table 1 of Attachment 3.

Thus, as shown at the end of Attachment 3, for accident conditions, the maximum K-effective with bias and uncertainties, must be less than the USL:

Maximum Keff = (Most Limiting Keff + net bias +3sigma) < USL

= (0.9174 (accident conditions) + 0.0186 + 3*(0.0002)) < 0.9403
= 0.9366 < 0.9403

Thus for abnormal/accident conditions, the K-effective of the Millstone 1 spent fuel pool, including biases and uncertainties is below the USL.

Double Contingency Principle

By the double contingency principle, a concurrent SFP boiling condition, dropped fuel assembly, or misloaded fuel assembly need not be considered. Also by the double contingency principle, multiple dropped fuel assemblies or multiple misloaded fuel assemblies need not be considered.