VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

May 27, 2004

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

Serial No.	03-464E
NL&OS/ETS	R0
Docket Nos.	50-338
	50-339
License Nos.	NPF-4
	NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED TECHNICAL SPECIFICATION CHANGES
IMPLEMENTATION OF ALTERNATE SOURCE TERM
REQUEST FOR ADDITIONAL INFORMATION
METEOROLOGICAL DATA AND DOSE ASSESSMENT

In a letter dated September 12, 2003 (Serial No. 03-464), Virginia Electric and Power Company (Dominion) requested amendments, in the form of changes to the Technical Specifications to Facility Operating Licenses Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed changes were requested based on the radiological dose analysis margins obtained by using an alternate source term consistent with 10 CFR 50.67. In an April 28, 2004 facsimile the NRC staff requested additional information regarding meteorological data and X/Q estimates. The information requested is provided in the attachment to this letter.

If you have any further questions or require additional information, please contact Mr. Thomas Shaub at (804) 273-2763.

Very truly yours,

Eugene S. Grecheck
Vice President – Nuclear Support Services

Attachment

Commitments made in this letter: None

cc: U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, Georgia 30303

Mr. J. E. Reasor, Jr.
Old Dominion Electric Cooperative
Innsbrook Corporate Center
4201 Dominion Blvd.
Suite 300
Glen Allen, Virginia 23060

Commissioner
Bureau of Radiological Health
1500 East Main Street
Suite 240
Richmond, Virginia 23218

Mr. M. T. Widmann
NRC Senior Resident Inspector
North Anna Power Station

Mr. S. R. Monarque
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 8-H12
Rockville, Maryland 20852

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President - Nuclear Support Services, of Virginia Electric and Power Company. 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 27th day of May, 2004.

My Commission Expires: March 31, 2008.

Maggie McCune
Notary Public

(SEAL)

Attachment

Proposed Technical Specification Changes
Implementation of Alternate Source Term
Request for Additional Information
Meteorological Data & X/Q Estimates

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

NORTH ANNA ALTERNATIVE SOURCE TERM

In a letter dated September 12, 2003 (Serial No. 03-464), Virginia Electric and Power Company (Dominion) requested amendments, in the form of changes to the Technical Specifications to Facility Operating Licenses Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2, respectively. The proposed changes were requested based on the radiological dose analysis margins obtained by using an alternate source term consistent with 10 CFR 50.67. In an April 28, 2004 facsimile the NRC staff requested additional information regarding meteorological data and X/Q estimates. The information requested is provided below.

Meteorological Data

NRC Question 1

With respect to atmospheric stability, during the five-year period between 1997 and 2001, some conditions were reported with a higher variability or occurrence than expected at a typical site. For example, stability class A was reported to occur approximately 4 percent of the time in 1996 and 21 percent of the time in 2001, In addition, there were about 25 occurrences of extremely unstable (class A) conditions for periods longer than 12 consecutive hours during the five year period. The longest occurrence was 59 hours. Also, during several years, there appear to be some intermittent measurements of very unstable lapse rates (A and B stability classes) during the night and very stable lapse rates (F and G stability classes) during the day. Typically, neutral or stable lapse rates occur at night and neutral or unstable conditions during the day. Did the licensee observe such occurrences in their review of the data? If so, to what is this attributed?

Dominion Response:

- During the review of the data, performed both daily and monthly, we did observe periods of extremely unstable conditions in excess of 12 hours. Synoptic conditions and the occurrence of similar indications concurrently at the Surry nuclear meteorological site convinced us that the measurements were indicative of the actual conditions.
- The Surry meteorological data exhibit a similar increased percentage of “A” stability readings in 1997. We have no explanation for these data.
- All the identified variation in the years in the 1997 – 2001 time period can reasonably and confidently be attributed to local weather/climate variations over time.
- The small (125.9 ft) ΔT at the North Anna primary meteorological tower has the potential to exaggerate some unstable readings as defined by the Pasquil-ΔT method in Regulatory Guide 1.23. As an example, an absolute temperature difference between 33.0 and 158.9 feet of -1.3°F or more will result in an “A”/“Extremely Unstable” Pasquil categorization.

We believe that the water temperature of Lake Anna has a small, but observable, effect on the stability measurements at the primary meteorological tower. The primary meteorological tower is situated on a peninsula, and the lake is less than 300 feet from the tower in several directions. The effect of the lake is observable primarily in the leading autumn month (September) and the trailing spring month (April), when winds off the lake can warm / cool the lowest layers of the atmosphere, enhancing the instability or stability respectively of the atmosphere.

NRC Question 2

During 1997 through 2001, there appears to be a low occurrence of winds from roughly the south southeast direction in comparison to the 1974 through 1987 wind patterns in the North Anna Updated Final Safety Analysis Report. To what is this attributed?

Dominion Response:

Prior to 1977, the meteorological sensors were located on a transmission structure and were used for pre-construction measurements. In mid-1976, a new meteorological tower and sensors were installed at their present location at the primary meteorological tower site. The data and the instruments from the newer site improved over previous data due to both improved instrument siting and the use of higher quality instrumentation. When wind roses for the time periods 1974-1987, 1977-1987, 1997-2001, 1974-1976, and 1978-1980 were examined, it was apparent that all the discrepancy observed between the 1974-1987 and the 1997-2001 data can be explained by the data recorded in the 1974-1976 time frame. When the 1974-1976 data are excluded, the wind roses for all of these time periods are similar.

EAB and LPZ Relative Concentration (X/Q) Estimates

NRC Question 3

Attachment 1 of the September 12, 2003 submittal states that the exclusion area boundary (EAB) and low population zone (LPZ) X/Q values used in the dose assessment are part of the existing design basis. When were these values previously approved by the NRC staff?

Dominion Response:

The EAB X/Q value (3.10E-04 sec/m^3) was originally submitted as part of the North Anna Units 1 and 2 Preliminary Safety Analysis Report evaluations of the design basis accidents. The LPZ X/Q values were originally submitted as part of supplemental information requested of the Final Safety Analysis Report design basis accident analyses (Comment 15.5). This supplemental information was documented in a letter to the NRC dated, May 5, 1975.

The NRC staff performed confirmatory dose consequence calculations of the North Anna design basis accidents, which are documented in NUREG-0053 (Section 15). These confirmatory dose calculations included calculation of offsite X/Q estimates using North Anna Meteorological data from September 16, 1971 through September 15,1972 (NUREG-0053 Section 2.3 and 2.4). In NUREG-0053 Sections 6.2 and 15.4, based upon their confirmatory calculations, the NRC staff concluded that the dose consequences of the design basis accidents were well within the limits of 10 CFR 100. Additionally, in NUREG-0053, Supplement 10, Section 15.1 for North Anna Unit 2, the NRC staff indicated that the LOCA and rod ejection accident reviews were complete and concluded that the analysis methods were found acceptable.

Control Room X/Q Estimates

NRC Question 4

Attachment 1 of the November 20, 2003 submittal provides X/Q calculations for approximately 119 source/receptor pairs. On page 20 it is stated that the largest applicable X/Q values are used in the dose assessment. This is easy to discern when comparing some of the X/Q values in Table 4 (e.g., the power operated relief valve estimates), but is not quite as clear for some of the other sources. What determines which source/receptor locations are assumed, when the various intakes are open, and how quickly the intakes are assumed to be opened or closed? For example, Table 3.1-4 in Attachment 1 of the September 12, 2003 submittal lists seven source/receptor pairs, but only three pairs were used in the dose assessment. Only one of the three chosen was among the group of three having the highest X/Q values. Which X/Q values are used for unfiltered inleakage for each of the postulated accidents?

Dominion Response:

Table 4 of the November 20, 2003 submittal is a comprehensive examination of the possible source-receptor pairs required to model the North Anna design basis accidents. In order to simplify the presentation of source-receptor pairs within that table the largest atmospheric dispersion factors that could exist, considering source category, operational line-ups and accident timing, were selected and are shown in Table 5 of the same November 20, 2003 submittal. The source categories were the three Unit 1 PORVs, the three Unit 2 PORVs, the RWST vents, the vent stacks, the vent stack blowout panels, the auxiliary building louvers, the containment equipment hatches, and the containment structures. The X/Q values listed for the emergency control room intake next to column C-6 were included for information only and were not included in evaluating the largest atmospheric dispersion factor for a given source. This intake is excluded because the fan for that intake will be limited to the recirculation alignment by procedures as described in the proposed changes to the Technical Specification Bases 3.7.10 and 3.7.14. In cases where there was not a single set of atmospheric dispersion factors with the largest value for each time step from 0 to 720 hours, a composite set of factors were chosen using the largest value between the two sets. The selection of atmospheric dispersion factors in Table 4 from the November 20, 2003 submittal that were used in the LOCA, SGTR, MSLB, LRA and FHA accident analyses are listed in Table 5 of the same submittal. The basis for the selection of these atmospheric dispersion factors is explained in the following discussion.

LOCA

For the LOCA control room dose analysis, contributions from three different sources, which involved atmospheric dispersion factors, were considered: 1) ECCS leakage, 2) RWST leakage, and 3) containment leakage. The control room isolates in less than three seconds on a Safety Injection (SI) signal after a LOCA. Control room isolation stops airflow from the normal control room intake, two trains of control room emergency ventilation automatically start in the recirculation mode and the bottled air system is actuated to provide fresh air and pressurize the control room. When the bottled air system is depleted (about 60 minutes) the ventilation is switched to provide filtered pressurization air into the control room through the control room emergency air intakes.

ECCS leakage starts as early as about five minutes after the LOCA as a result of the containment sump fluid flowing through the outside recirculation spray pumps that are located in the safeguards building. As early as 32 minutes after the LOCA, the containment sump fluid can start flowing through the charging pumps located in the basement of the auxiliary building. The auxiliary building ventilation system would entrain any airborne iodine, which evolves from ECCS leakage in the safeguards building and would be released from one of the vent stacks as an effluent. Similarly, the airborne iodine that evolves from ECCS leakage in the basement of the auxiliary building would be entrained by the auxiliary building central area ventilation system and released from one of the vent stacks. If the iodine that evolves from the ECCS leakage in the auxiliary building is not entrained by the auxiliary building central area ventilation system, then it would flow out of one of the louvers at the top level of the auxiliary building (E Aux Bld louver and W Aux Bld louver). Also, if there was a seismic event concurrent with the LOCA, the vent stack blowout panels might open. These vent stack blowout panels (U1 blowout panel and U2 blowout panel) could become another leak path to the environment for the iodine that evolves from the ECCS leakage. Of these three possible flow paths, none of potential paths would cause effluents to reach the control room prior to the control room being isolated. Therefore, the only sets of atmospheric dispersion factors considered for use in modeling the control room dose from ECCS leakage were those with the emergency control room intakes as receptors, (i.e., C-4, C-11 and C-10). Looking at Table 4 of the November 20, 2003 submittal, vent stack A and B had the largest set of atmospheric dispersion factors for the emergency control room intake receptors from among the sources for the vent stack blowout panels, the vent stacks and the auxiliary building louvers. A composite set of atmospheric dispersion factors, composed of the largest values for each time step from the vent stack A and B atmospheric dispersion factors, are shown in Table 5 of the November 20, 2003 submittal and identify which source-receptor combination applies to each value. These atmospheric dispersion factors were used for the ECCS leakage dose calculations and are listed in Table 3.1-4 of the September 12, 2003 submittal.

The RWST leakage contribution to control room dose consists of ECCS fluid, which leaks past isolation/check valves and seeps into the RWST. Once in the RWST, the iodine that evolves from the ECCS fluid makes its way to the environment via the gooseneck vent pipe at the top the RWST. The only leak path to the environment is out this gooseneck vent pipe. The earliest that the RWST leakage can start after the LOCA occurs is approximately 30 minutes. Thus, by the time that the RWST leakage starts, the control room is isolated and only the control room emergency intakes are possible receptors. The largest set of atmospheric dispersion factors for the RWST vents in Table 4 of the November 20, 2003 submittal, with the control room emergency intakes as receptors, was used to calculate the control room dose consequences from the RWST leakage. The values are shown in Table 5 of the November 20, 2003 submittal and are noted as to which source-receptor combination they apply. These atmospheric dispersion factors are listed in Table 3.1-4 of the September 12, 2003 submittal.

The containment leakage contribution to the control room dose is from the airborne radionuclides inside the containment that leak out and are transported to the control room air intakes. Prior to the radioactivity reaching the control room intakes, the control room will be isolated. Therefore, the normal control room intake is not a receptor from this source and is excluded from X/Q consideration. From Table 4 of the November 20, 2003 submittal, there was no single largest set of atmospheric dispersion factors for all time steps from either the containment buildings or the equipment hatches to the control room emergency intakes. A composite of the largest atmospheric dispersion factors for each time interval to two different receptor intakes (C-4 and C-11) was used to compute the control room dose consequences from the containment leakage. The composite atmospheric dispersion factors are shown in Table 5 of the November 20, 2003 submittal and are noted as to which source-receptor combination they apply. These atmospheric dispersion factors are listed in Table 3.1-4 of the September 12, 2003 submittal.

Other source-receptor combinations are listed in Table 3.1-4 that were included in the determination of highest atmospheric dispersion factors for the three different LOCA pathway sources (i.e., RWST, ECCS, and containment). The largest values between all applicable and comparable sources for each pathway are shown in Table 5 of the November 20, 2003 submittal.

SGTR, LRA and MSLB

During the SGTR, LRA, and MSLB accidents, steam-containing radionuclides from the primary and secondary coolant is released out of the steam generator power operated relief valves (PORVs). From Table 4 of the November 20, 2003 submittal, the largest atmospheric dispersion factors for the PORV's is the set with the Unit 1 PORV B as the source and the normal control room intake as the receptor. These atmospheric dispersion factors were used for the control room dose analyses for the SGTR, LRA and MSLB accidents. The use of these atmospheric dispersion factors was consistent with the way the control room was modeled for these accidents since the control room was not assumed to be isolated. This meant that all the air flowing into the control room via the normal control room intake was modeled as being unfiltered. For the MSLB accident, this modeling approach is conservative because a MSLB generates a Safety Injection signal, which would isolate the control room. Therefore, the air supplied to the control room would realistically be filtered through the emergency intakes. For the SGTR and LRA accidents, the vertical velocity of the steam exiting the PORV's is high enough to qualify for the reduction by a factor of five. Therefore, for the SGTR and LRA control room dose analyses the atmospheric dispersion factors from the Unit 1 PORV B to the normal control room air intake were divided by a factor of five. These atmospheric dispersion factors are shown in Table 5 of the November 20, 2003 submittal with a note as to which source-receptor combination applies. These atmospheric dispersion factors are listed in Tables 3.3-3 and 3.4-2 of the September 12, 2003 submittal.

FHA

During a FHA accident, gaseous radionuclides are released from a dropped fuel assembly submerged in the spent fuel pool in the fuel building or submerged in the refueling pool in the containment. The limiting dose consequences were obtained for the FHA in the containment. The potential release paths by which the radionuclides can reach the environment for the FHA inside containment are the equipment hatch, the personnel airlock, piping penetrations and the containment ventilation system. If the radionuclides exit the containment via the personnel airlock they can reach the atmosphere by flowing out the louvers on the upper level of the auxiliary building. If the radionuclides exit the containment through a piping penetration they will either be entrained by the auxiliary building ventilation system and exhausted from a vent stack or flow out of the louvers at the upper level of the auxiliary building. If the radionuclides are entrained by the containment ventilation system they are exhausted to the atmosphere from a vent stack. For the FHA in the fuel building, the only path of egress for the released radionuclides is the fuel building ventilation system to one of the vent stacks. This covers the possible pathways for the release from FHA. For the FHA, it was assumed that no operator action was taken to isolate the control room and that the control room will remain on the normal control room air intake. This means that the only FHA receptor will be the normal control room air intake. As noted in Table 4 of the November 20, 2003 submittal, the largest atmospheric dispersion factors with the normal control room air intake as the receptor and the vent stacks, the equipment hatches or the auxiliary building louvers as sources, are those for the eastern auxiliary building louvers to the normal control room intake. These atmospheric dispersion factors were used to calculate the control room dose consequences from a FHA and are listed in Table 5 of the November 20, 2003 submittal with a note as to which source-receptor combination applies and in Table 3.2-4 of the September 12, 2003 submittal.

Unfiltered inleakage X/Q values

The atmospheric dispersion factors used for the control room intakes (either normal or emergency) were also used for the control room unfiltered inleakage. That is, only one set of atmospheric dispersion factors was entered into RADTRAD-NAI for the control room and this one set of factors was applied to both the control room forced intake and inleakage. As stated above in the response to part 1 of question 4, for each accident the worst case control room atmospheric dispersion factors that were applicable to that accident were used. This means that for accidents, which used the control room emergency intakes as receptors, the worst case atmospheric dispersion factors for the emergency intakes were used. For accidents, which used the control room normal intake as the receptor, the worst case atmospheric dispersion factors for the normal intake were used. In some cases a composite set of worst case atmospheric dispersion factors was made from the two sets of atmospheric dispersion factors with the largest values. The combining of the two sets of atmospheric dispersion factors depended upon which set had the largest atmospheric dispersion factor for each time interval from 0 to 720 hours. Table 5 of the November 20, 2003 submittal indicates how this was done for the “Vent Stack” and “Containment” sources.

NRC Question 5

Under circumstances where more than one release scenario to the environment could occur for a postulated design basis accident (e.g., due to single failure or loss of offsite power), were the more limiting atmospheric dispersion factors used in the dose calculations?

Dominion Response:

In all cases with more than one release scenario, the more limiting release path was modeled. See the response to question 4 for more details. No benefit was derived from plant equipment susceptible to single failure or loss of offsite power in the selection of atmospheric dispersion factors.