VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

September 11, 1992

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

Serial No. 92-450A
NL&P/JBL: R3
Docket Nos. 50-338
50-339
License Nos. NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
EXEMPTION REQUEST FROM THE REQUIREMENTS OF 10 CFR 50.49
ENVIRONMENTAL QUALIFICATION OF CONTROL ROOM CHILLERS
DURING SERVICE WATER SYSTEM RESTORATION PROJECT

Virginia Electric and Power Company has informed the NRC of plans to perform extensive refurbishment activities for restoration of certain portions of the service water system common to North Anna Units 1 and 2. By letter dated July 16, 1992 (Serial No. 92-450), a temporary exemption pursuant to 10 CFR 50.12 was requested from the requirements of 10 CFR Part 50, Appendix A, Criterion 2 (GDC-2), "Design basis for protection against natural phenomena," for North Anna Power Station Units 1 and 2 for implementation of Phase 1 of the service water system restoration project. The basis for that request and supporting justification were provided in Attachment 2 to our July 16, 1992 letter.

We have recently reached the 70% review milestone in developing the detailed design change package that supports the activities described in our July 16, 1992 letter. During that review, an additional issue was identified for which a temporary exemption from the governing regulation appears to be the most appropriate resolution. This issue is further discussed below.

During the first stage of the service water restoration project, it will be necessary to isolate service water from the Unit 1 control room chillers for the majority of the North Anna Unit 1 steam generator replacement outage. It is planned to provide a temporary water supply and return path to the Unit 1 control room chillers from the common bearing cooling water system to provide normal control room temperatures and provide a reliable backup cooling system to the Unit 2 air conditioning design basis. However, it was recently determined that this will affect the normal environmental qualification design basis for the Unit 2 control room chillers. Therefore, pursuant to 10 CFR 50.12(a), Virginia Electric and Power Company supplements its previous request and further requests a temporary exemption from the requirements of 10 CFR 50.49, Environmental Qualification of Electric Equipment Important to Safety for

A001

Nuclear Power Plants, for environmental qualification of the North Anna Unit 2 control room chillers for approximately the duration of the North Anna Unit 1 steam generator replacement outage.

The provisions of 10 CFR 50.12 provide that specific exemptions from the requirements of 10 CFR Part 50 may be granted provided the exemptions are authorized by law, are consistent with the common defense and security, are accompanied by special circumstances, and do not present an undue risk to the public health and safety. Virginia Electric and Power Company concludes that the activities sought to be conducted under this exemption request are clearly authorized by law and are consistent with the common defense and security.

As described in 10 CFR 50.12(a)(2), special circumstances must be present for the NRC to consider granting an exemption. Three of the examples of special circumstances stated in the regulation apply in this case. The first special circumstance is that compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted. The second special circumstance is that the completion of the project as proposed would result in an overall benefit to the public health and safety that compensates for any decrease in safety that may result from the granting of the exemption. The third special circumstance is that the exemption provides only temporary relief from the applicable regulation and that the licensee has made good faith efforts to comply with the regulation. Further description of these special circumstances is provided in the attachment to this letter. In addition, the attachment provides information on the environmental qualification requirements for the Unit 2 control room chillers and an evaluation that ensures the effects resulting from the implementation of this temporary exemption will not adversely affect the health and safety of the public.

The changes to the facility will be in the form of temporary piping to the Unit 1 control room chillers from the bearing cooling system to provide normal temperature control in the control room and provide a reliable backup cooling system to the Unit 2 air conditioning chillers. These proposed temporary changes have been evaluated in accordance with the requirements of 10 CFR 50.59. Conditional on the acceptance of this exemption request, it has been determined that the changes to the control room air conditioning system as described in the attachment do not involve an unreviewed safety question. This exemption request has been reviewed and approved by the Station Nuclear Safety and Operating Committee and has been reviewed by the Management Safety Review Committee.

In as much as the criteria established by 10 CFR 51.21 may require the NRC to perform an environmental assessment for the regulatory action of granting this temporary exemption request, we have reviewed the proposed temporary plant modifications and determined that they will have no significant effect on the quality of the human environment. A discussion of our evaluation is provided in the attachment.

North Anna Unit 1 is currently scheduled to conclude Cycle 10 operation and begin the steam generator replacement outage on January 2, 1993. In our July 16, 1992 letter, we requested your approval of the exemption request from GDC-2 by November 13, 1992 to support implementation of Phase I, Stage 1 of the service water restoration

project. We request NRC approval of this supplemental exemption request from the requirements of 10 CFR 50.49 by that date.

If you have any questions or require additional information, please contact us.

Very truly yours,

W. L. Stewart
Senior Vice President - Nuclear

Attachment

cc: U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

Mr. M. S. Lesser
NRC Senior Resident Inspector
North Anna Power Station

ATTACHMENT

TEMPORARY EXEMPTION FROM 10 CFR 50.49 REQUIREMENTS FOR THE UNIT 2 CONTROL ROOM AIR CONDITIONING CHILLERS SERVICE WATER SYSTEM RESTORATION PROJECT NORTH ANNA POWER STATION

VIRGINIA ELECTRIC AND POWER COMPANY

TEMPORARY EXEMPTION FROM 10 CFR 50.49 REQUIREMENTS FOR THE UNIT 2 CONTROL ROOM AIR CONDITIONING CHILLERS SERVICE WATER SYSTEM RESTORATION PROJECT NORTH ANNA POWER STATION

1.0 BACKGROUND

Virginia Electric and Power Company is planning an extensive refurbishment project for the existing uncoated, buried, and concrete encased 24-inch service water pipe sections. As discussed in our letter dated July 16, 1992 (Serial No. 92-450), the overall objective of the project is to clean and restore internal pipe surfaces as required to assure continued structural integrity and to apply a protective coating to minimize or eliminate further corrosion. In general, the refurbishment process will only be used on concrete encased pipe sections. Sections of 24-inch pipe that are direct buried will be replaced with new piping similarly coated internally and protected externally from corrosion. Attachment 2 to the July 16, 1992 letter described the sequence of work activities required to perform the repair and replacement activities on these pipe sections during the upcoming Unit 1 steam generator replacement outage.

As part of Phase I, Stage 1 of the service water restoration project, it is proposed to isolate the service water headers to the Unit 1 recirculation spray heat exchangers during the Unit 1 1993 steam generator replacement outage. As discussed in our August 25, 1992 meeting, isolating service water from the recirculation spray heat exchangers will also temporarily isolate the service water supply and return to the Unit 1 control room chillers. To maintain normal control room temperatures and provide a reliable backup to the Unit 2 air conditioning system, it is proposed to supply bearing cooling water to the Unit 1 control room chillers during the outage period. The portion of the bearing cooling system to be used to supply the Unit 1 chillers can be fed from either the Unit 1 or Unit 2 bearing cooling water pumps.

However, during a review of the engineering package for Phase I, Stage 1 of the service water restoration project, a concern was identified in that a preliminary engineering evaluation had previously identified an environmental qualification concern for the control room chillers. In general, following a certain main steam line break accident scenario, the chiller room of the affected unit may become a harsh environment. Therefore, to meet the 10 CFR 50.49 environmental qualification requirements, at least one of the opposite unit's chillers must remain operable to provide air conditioning to the control room.

2.0 SUPPLEMENTAL EXEMPTION REQUEST

An exemption from 10 CFR 50.49 for the North Anna Unit 2 chillers is requested for the period the service water system is isolated from the recirculation spray heat exchangers and the control room chillers. This supplemental exemption request was discussed with the NRC staff in our meeting on August 25, 1992.

Environmental Qualification Requirement

Each unit has three control room air conditioner chillers located in a missile protected room of the service building off the respective unit's turbine building basement. Ventilation for each unit's chiller room is taken from and exhausted to the respective unit's turbine building basement. Hence, the chillers for each unit are located in the same environmental zone which is also common to the unit's turbine building basement. Therefore, as the result of an environmental qualification evaluation of the control room air conditioning systems, a station standing order was issued to require at least one of the opposite unit's chillers to remain operable while shutdown. Specifically, the station standing order requires that at least one control room chiller on the unit in Mode 5 or 6 be maintained operable while the other unit is in Mode 4 or above. This measure assures that the air conditioning system serving the control room and emergency switchgear room would be available during a certain postulated main steam line break accident in the turbine building.

However, with bearing cooling water supplied to the Unit 1 chillers instead of service water, the reliability of the Unit 1 chillers is called into question because bearing cooling is not safety-related. Bearing cooling would not be available in the event of a loss of offsite power event or design basis earthquake coincident with the main steam line break accident in the turbine building. Therefore, an exemption from 10 CFR 50.49 for the North Anna Unit 2 chillers is requested for the period the service water system is isolated from the recirculation spray heat exchangers and the control room chillers.

While the shutdown unit's Technical Specifications do not require the air conditioning systems to remain operable in Modes 5 and 6, the environmental qualification design basis for the operating unit's air conditioning systems requires at least one of the shutdown unit's chillers to be operable as a backup to operating unit.

Detailed Discussion of Exemption Period

During the Unit 1 steam generator replacement outage, a portion of the service water system servicing Unit 1 is scheduled to be isolated from the main service water system. As a compensatory measure, bearing cooling water will supply cooling to the Unit 1 control room chillers instead of service water to provide normal cooling to the common control room.

The required exemption period is technically from entry into the second 168-hour action statement through the clearing of the fifth 168-hour action statement for the work activities associated with Phase I, Stage 1 service water restoration project to be performed during the outage. A detailed description of the use of the 168-hour action statements is provided in Attachment 2 of our July 16, 1992 letter. The period for the Unit 1 chillers to be operating on bearing cooling water is projected to be between 90 and 120 days.

Accident Scenario of Concern

The situation of concern is an environmental condition in the Unit 2 chiller room for which the Unit 2 control room chillers are not qualified and may cease to function properly. The only postulated accident event that could cause this condition is the failure of a main steam line in the turbine building basement in proximity of the Unit 2 chiller room. However, in order to have sufficient steam concentration in the area to disable the Unit 2 chillers, the main steam trip valve on the line would also have to fail to close.

This is unlikely because the trip valves are essentially check valves reversed to the flow of steam with the check disk physically held out of the steam flow path. Failure to hold the disk out of the steam flow path would cause the trip valve to slam shut. Failure of the valve where the disk is stuck open is unlikely.

Because the Unit 1 chillers provide backup to the Unit 2 chillers, the Unit 1 chillers would have to also fail to provide cooling. Because bearing cooling water is supplied to the Unit 1 chillers for the exemption period, the failure of the bearing cooling system would also have to occur. Bearing cooling is a non-safety related system. Therefore, bearing cooling is assumed to be lost in the event of either a loss of offsite power or a design basis earthquake event.

Engineering Evaluation of System Reliability

A Probabilistic Risk Assessment (PRA) of the postulated accident scenario and the affected systems was performed to support this exemption request. A number of combinations and sequences were considered in this evaluation. The specific sequences are described in the attached supplement to the PRA. The sequences can be grouped into two categories as described below:

1) Main steam line rupture in the Unit 2 turbine building with concurrent loss of the bearing cooling backup on Unit 1. The loss of bearing cooling backup could be a result of loss of offsite power or other loss of bearing cooling system components.

2) Design basis earthquake (DBE) resulting in main steam line rupture and loss of bearing cooling.

Quantification of the various event probabilities was performed using fault tree models and results from the North Anna Individual Plant Examination (IPE). The worst case probability for the sequences considered in Item 1 above was 2.5×10^{-9}. Based on these probabilities, we conclude that the events associated with Item 1 are not credible and do not warrant further analysis.

Both the Electric Power Research Institute (EPRI) and the Lawrence Livermore National Laboratory (LLNL) seismic curves were used to evaluate Item 2 above. The change in failure probability of the Unit 2 air conditioning system for the event described in Item 2 was calculated to be 1.4×10^{-6} to 6.8×10^{-6} using the EPRI and LLNL seismic hazard curves, respectively. The change in core

damage probability (CDP) could be substantially less than this value. However, without performance of a seismic PRA, the change in CDP cannot be specifically calculated. Thus, the range calculated above is used as an upper bound change in CDP. This is judged to be an acceptable level of risk and implementation of this temporary bearing cooling supply is justified.

The results of the PRA reported here for Items 1 and 2 above are based on a conservative 120-day period of providing bearing cooling water to the control room chillers instead of service water. The attached supplement to the PRA includes evaluations for both a 90-day period and a 120-day period.

In addition, it should be noted that at least one Unit 1 bearing cooling water pump and flow path will remain operable and will supply the Unit 1 chiller piping while the normal service water source is unavailable. The Unit 2 bearing cooling system will also be available to supply this system if required.

3.0 BASIS FOR EXEMPTION REQUEST

As discussed in our July 16, 1992 letter, the exemption from GDC-2 is necessary to permit restoration activities to the service water system piping without extension of the North Anna Unit 1 steam generator replacement outage schedule. When completed, these modifications will result in increased reliability of the service water system. Completing the necessary excavation work during this non-outage exemption period will allow the restoration work to be performed more efficiently. For Phase I, Stage 1, the exemption is necessary primarily for the 30-day period from early-December, 1992 until the beginning of the 1993 steam generator replacement outage and for a 30-day period following completion of the outage.

At the time of the July 16, 1992 submittal, it was determined that Unit 2 was not affected by the partial isolation of the service water system during Phase I, Stage 1 of the project. However, it will be necessary to isolate service water from the Unit 1 control room chillers for the majority of the North Anna Unit 1 steam generator replacement outage. It is planned to provide a temporary water supply and return path to the Unit 1 control room chillers from the bearing cooling water system to provide normal control room temperatures and provide a reliable backup cooling system to the Unit 2 air conditioning design basis. However, it was recently determined that this will affect the normal environmental qualification design basis for the Unit 2 control room chillers. Therefore, pursuant to 10 CFR 50.12(a), Virginia Electric and Power Company also requests an exemption from the requirements of 10 CFR 50.49, Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants, for environmental qualification of the North Anna Unit 2 control room chillers for approximately the duration of the North Anna Unit 1 steam generator replacement outage. This exemption will permit the temporary use of bearing cooling water to the Unit 1 control room chillers instead of the normal cooling water supply from the service water system during the service water restoration project.

The procedures set forth in 10 CFR 50.12 provide that specific exemptions from the requirements of 10 CFR Part 50 may be granted which:

- are authorized by law,
- are consistent with the common defense and security,
- will not present an undue risk to the public health and safety, and
- are accompanied by special circumstances.

Virginia Electric and Power Company submits that the activities sought to be conducted under this exemption request are clearly authorized by law and are consistent with the common defense and security. As detailed below, the remaining standards for the exemption are also satisfied.

No Undue Risk to Public Health and Safety

The likelihood of the accident scenario discussed above removing all control room chillers from service is small at the North Anna site during the periods for which the requested exemption would apply. The principal risk is a main steam line break inside the Unit 2 turbine building basement. In addition, the risk associated with failures due to seismic events or combinations of main steam line break accidents coincident with a loss of offsite power is unlikely to cause a total loss of control room chilling. An engineering evaluation and probabilistic risk assessment have been performed for this accident scenario. We have assessed the likelihood of such an event using regional meteorological information and concluded that the risk is acceptably low.

Moreover, the proposed exemption will not otherwise affect radiological plant effluents, nor result in any significant occupational exposure. Thus, there are no significant radiological or non-radiological environmental impacts associated with the proposed exemption.

Special Circumstances Exist

Special circumstances are present to warrant granting the requested exemption. Three of the examples of special circumstances, as provided in 10 CFR 50.12(a)(2)(iii), (iv), and (v), apply in this case. The first special circumstance, paragraph (iii), is that compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted. The second special circumstance, paragraph (iv), is that the completion of the project as proposed would result in an overall benefit to the public health and safety that compensates for any decrease in safety that may result from the granting of the exemption. The third special circumstance, paragraph (v), is that the exemption provides only temporary relief from the applicable regulation and that the licensee has made good faith efforts to comply with the regulation. It has been determined by PRA methods that the temporary relief does not affect the safe operation of either unit.

Providing a safety-related water supply to the Unit 1 chillers would result in an unnecessary additional expense without a significant increase in system reliability or safety. Any other options would result in an extended unplanned outage or a dual unit outage situation. As the NRC is well aware, replacement power costs result in substantial undue hardship to the Company. In addition, the exemption will indirectly result in benefits to the public from increased unit availability by combining planned outage activities and not requiring a dual unit outage. Finally, the exemption would provide only temporary relief from the applicable regulations. The exemption is requested only for a specified period time, i.e., from the end of the second 168-hour action statement through the end of the fifth 168-hour action statement (between approximately 90 and 120 days) during the steam generator replacement outage. We are committed to making good faith efforts to provide control room cooling during the exemption periods.

Special circumstances exist in that we have made a good faith effort in considering alternatives to an exemption request and have concluded that the project could only be conducted without an exemption by an extensive temporary safety-related service water supply or during a period when both units are shutdown. As there are no dual unit outages planned or scheduled, we believe that this alternative represents an undue hardship. The impact of scheduling such a dual unit outage would have potentially significant consequences in terms of power supply and replacement power costs. We believe that it was never the intent of the regulation to require such actions to ensure compliance with the design criterion. Also, the schedule that we are proposing for this portion of the service water project will accelerate the timetable for restoring the portions of the service water system that have become degraded. Therefore, we conclude that several of the criteria described in the special circumstances portion of the regulations are met.

4.0 DISCUSSION OF SERVICE WATER SYSTEM INTEGRITY

The service water restoration project work activities to be performed in conjunction with the North Anna Unit 1 steam generator replacement outage have been evaluated to ensure safe operation of the plant. As part of our engineering evaluation of these efforts, a Probabilistic Risk Assessment (PRA) was performed for both units by Halliburton NUS Environmental Corporation. Per your request at our August 25, 1992 meeting, the following is a discussion of the conservatism built into the PRA with respect to the current material condition of the service water system. In addition, a copy of the PRA report is attached for your review.

A number of methods are available to quantify the pipe rupture frequency for use in this assessment. The three methods evaluated for applicability to the service water restoration project are listed below:

1) Application of a generic failure probability model as presented in the WASH-1400 Reactor Safety Study.

2) Empirical correlations based on actual service failure statistics and piping characteristics (known as Thomas correlation model).

3) Calculation using a log-linear model which considers system specific failures based on actual failure events reported for the U.S. nuclear power industry.

Evaluation of specific North Anna service water system piping was performed using the three approaches described above. The log-linear model yielded the most conservative values and was used to support the PRA.

5.0 ENVIRONMENTAL ASSESSMENT

Pursuant to 10 CFR 50.12(a), Virginia Electric and Power Company is requesting an exemption from the requirements of 10 CFR 50.49, Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants, for the environmental qualification of the North Anna Unit 2 control room chillers for approximately the duration of the North Anna Unit 1 steam generator replacement outage. This exemption will permit temporary cooling of the Unit 1 control room chillers from the common bearing cooling water system to provide normal control room temperatures and provide a reliable backup cooling system to the Unit 2 air conditioning design basis. The proposed exemption is needed in order to permit the completion of repair and replacement activities on the service water system without unduly extending the next several scheduled refueling outages.

The proposed exemption does not involve any measurable environmental impact during normal operation since the plant configuration is changed only minimally and operation of Unit 2 is not changed. The likelihood of the above accident scenario during the time the exemption would be in effect is low. Thus, the proposed exemption would not significantly affect the probability or consequences of potential reactor accidents and would not otherwise affect radiological plant effluents. Consequently, there are no significant radiological impacts associated with the proposed exemption.

With regard to potential non-radiological impacts, the proposed exemption involves features located entirely within the restricted area as defined in 10 CFR Part 20. It does not affect non-radiological plant effluents and has no other environmental impact. Therefore, we conclude that there are no significant non-radiological environmental impacts associated with the proposed exemption.

The principal alternative to requesting the temporary exemption for the Unit 2 chillers would be to comply with the requirements of 10 CFR 50.49. However, this alternative would not significantly enhance the protection of the environment, and would result in a significant loss of power generation as the next several refueling outages for North Anna Units 1 and 2 would have to be extended considerably.

Based on the above assessment, we conclude that the NRC granting of the requested exemption discussed above would not have a significant effect on the quality of the human environment.