

April 16, 1998

Senior Vice President Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS
REGARDING A PROPOSED TECHNICAL SPECIFICATION CHANGE ON TURBINE
THROTTLE AND GOVERNOR VALVES SURVEILLANCE FREQUENCY
(TAC NOS. MA0172 AND MA0173)

Dear Mr. O'Hanlon:

The Commission has issued the enclosed Amendment Nos. 210 and 191 to Facility Operating License Nos. NPF-4 and NPF-7 for the North Anna Power Station, Units No. 1 and No. 2 (NAPS-1&2). The amendments consist of changes to the Technical Specifications (TS) in response to your letter dated November 18, 1997.

The amendments revise Surveillance Requirements 4.7.1.7.2.a.1 and 4.7.1.7.2.a.2 for both units for the turbine throttle and governor valves.

A copy of the Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,
Original signed by:
N. Kalyanam, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosures:

1. Amendment No. 210 to NPF-4
2. Amendment No. 191 to NPF-7
3. Safety Evaluation

cc w/encls: See next page

DISTRIBUTION

See attached sheet

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OFFICE	PM:PDII-1	LA:PDII-1	D:PDII-1	OGC	DSSA BRCH: SPLB
NAME	NKalyanam <i>KAP</i>	Dunnington <i>ETD</i>	PTKuo <i>PTD</i>	<i>CB</i>	LB Marsh <i>LM</i>
DATE	4/2/98	4/2/98	4/16/98	4/15/98	4/19/98
COPY	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

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Mr. J. P. O'Hanlon
Virginia Electric & Power Company

North Anna Power Station
Units 1 and 2

cc:

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DATED: April 16, 1998

AMENDMENT NO. 210 TO FACILITY OPERATING LICENSE NO. NPF-4-NORTH ANNA UNIT 1
AMENDMENT NO. 191 TO FACILITY OPERATING LICENSE NO. NPF-7-NORTH ANNA UNIT 2

Docket File

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-338

NORTH ANNA POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 210
License No. NPF-4

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Virginia Electric and Power Company et al., (the licensee) dated November 18, 1997, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.D.(2) of Facility Operating License No. NPF-4 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 210, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION



P. T. Kuo, Acting Director
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 16, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 210

TO FACILITY OPERATING LICENSE NO. NPF-4

DOCKET NO. 50-338

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page as indicated. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove Page

3/4 7-15

Insert Page

3/4 7-15

PLANT SYSTEMS

TURBINE OVERSPEED

LIMITING CONDITION FOR OPERATION

3.7.1.7 At least one turbine overspeed protection system shall be OPERABLE.

APPLICABILITY: MODE 1, 2 and 3

ACTION:

With the above required turbine overspeed protection system inoperable, within 6 hours either restore the system to OPERABLE status or isolate the turbine from the steam supply.

SURVEILLANCE REQUIREMENT

4.7.1.7.1 The provisions of Specification 4.0.4 are not applicable.

4.7.1.7.2 The above required turbine overspeed protection system shall be demonstrated OPERABLE:

- a. By cycling each of the following valves through at least one complete cycle from the running position and verifying movement of each of the valves through one complete cycle from the running position by direct observation:
 1. Four Turbine Throttle valves at least once per 92 days,
 2. Four Turbine Governor valves at least once per 92 days, *
 3. Four Turbine Reheat Stop valves at least once per 18 months, and
 4. Four Turbine Reheat Intercept valves at least once per 18 months.
- b. At least once per 18 months, by performance of CHANNEL CALIBRATION on the turbine overspeed protection instruments.
- c. At least once per 40 months **, by disassembly of at least one of each of the above valves and performing a visual and surface inspection of all valve seats, disks and stems and verifying no unacceptable flaws or corrosion. If unacceptable flaws or excessive corrosion are found, all other valves of that type shall be inspected unless the nature of the problem can be attributed to a service condition specific to that valve.

* Testing of the turbine governor valves may be suspended during end-of-cycle power coastdown operation between 835 MWe and 386 MWe.

** For reheat stop and reheat intercept valves, the inspection cycle may be increased to a maximum of once per 60 months provided there is no indication of operational distress.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-339

NORTH ANNA POWER STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 191
License No. NPF-7

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Virginia Electric and Power Company et al., (the licensee) dated November 18, 1997, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-7 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 191, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION



P. T. Kuo, Acting Director
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 16, 1998

ATTACHMENT TO LICENSE AMENDMENT NO. 191

TO FACILITY OPERATING LICENSE NO. NPF-7

DOCKET NO. 50-339

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page as indicated. The revised page is identified by amendment number and contains a vertical line indicating the area of change.

Remove Page

3/4 7-12

Insert Page

3/4 7-12

PLANT SYSTEMS

TURBINE OVERSPEED

LIMITING CONDITION FOR OPERATION

3.7.1.7 At least one turbine overspeed system shall be OPERABLE.

APPLICABILITY: MODE 1, 2 and 3

ACTION:

With the above required turbine overspeed protection system inoperable, within 6 hours either restore the system to OPERABLE status or isolate the turbine from the steam supply.

SURVEILLANCE REQUIREMENT

4.7.1.7.1 The provisions of Specification 4.0.4 are not applicable.

4.7.1.7.2 The above required turbine overspeed protection system shall be demonstrated OPERABLE:

- a. By cycling each of the following valves through at least one complete cycle from the running position and verifying movement of each of the valves through one complete cycle from the running position by direct observation:
 1. Four Turbine Throttle valves at least once per 92 days,
 2. Four Turbine Governor valves at least once per 92 days, *
 3. Four Turbine Reheat Stop valves at least once per 18 months, and
 4. Four Turbine Reheat Intercept valves at least once per 18 months.
- b. At least once per 18 months, by performance of CHANNEL CALIBRATION on the turbine overspeed protection instruments.
- c. At least once per 40 months **, by disassembly of at least one of each of the above valves and performing a visual and surface inspection of all valve seats, disks and stems and verifying no unacceptable flaws or corrosion. If unacceptable flaws or excessive corrosion are found, all other valves of that type shall be inspected unless the nature of the problem can be attributed to a service condition specific to that valve.

* Testing of the turbine governor valves may be suspended during end-of-cycle power coastdown operation between 835 MWe and 386 MWe.

** For reheat stop and reheat intercept valves, the inspection cycle may be increased to a maximum of once per 60 months provided there is no indication of operational distress.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NOS. 210 AND 191 TO
FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7
VIRGINIA ELECTRIC AND POWER COMPANY
OLD DOMINION ELECTRIC COOPERATIVE
NORTH ANNA POWER STATION, UNITS NO. 1 AND NO. 2
DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By application dated November 18, 1997, Virginia Electric and Power Company (the licensee) submitted a request for changes to the North Anna Power Station, Units 1 and 2, Technical Specifications (TS). The proposed amendment revises surveillance requirement (SR) 4.7.1.7.2.a.1 and 4.7.1.7.2.a.2 for the overspeed protection system. On the basis of past operational experience, Westinghouse's recommendations for inspection intervals, and the results of the Westinghouse evaluation proprietary report WCAP-14732 (nonproprietary version WCAP-14733), dated June 1997, the licensee proposes to increase the surveillance test interval for the turbine governor and throttle valves from "at least once per 31 days" to "at least once per 92 days." The disassembly inspection intervals for these valves will continue to be in accordance with the current TS SRs.

2.0 BACKGROUND

North Anna Units 1 and 2 are each equipped with a Westinghouse turbine generator. The Westinghouse turbine is a conventional 1800-rpm, tandem-compound unit consisting of one double-flow, high-pressure cylinder and two double-flow, low-pressure cylinders. The turbine is provided with four moisture separator reheaters located between the high-pressure and the low-pressure cylinders.

Each high-pressure steamline to the high-pressure cylinder contains a stop-trip (throttle) valve and a governor control valve. A reheat stop valve and an intercept valve are provided in the crossover piping between each moisture

separator reheater and the low-pressure turbine cylinders. The function of these valves is to control and limit the turbine speed and, in case of loss of load, trip the turbine by stopping the steam supply.

The turbine generator system is equipped with overspeed protection to minimize the probability of the generation of turbine missiles to ensure conformance with General Design Criterion (GDC) 4; "Environmental and Dynamic Effects Design Bases." To demonstrate the operability of the turbine overspeed protection system, TS 4.7.1.7.2.a currently requires that the four turbine throttle valves and the four turbine governor valves be tested every 31 days and that the four turbine reheat stop valves and the four turbine reheat intercept valves be tested every 18 months.

The licensee proposes that the throttle valves and the governor valves be demonstrated operable by testing the valves once every 92 days instead of once every 31 days. The licensee stated that the turbine governor and throttle valves have been tested monthly with no failures attributable to valve or control system malfunctions and that operational experience has shown that the valves have not failed to close in response to turbine trip demands and have not experienced valve stem sticking while the units were carrying load. The reheat stop valves and the reheat intercept valves would continue to be tested every 18 months.

To establish the effects of turbine valve testing on plant equipment and electrical power generation, Westinghouse Electric Corporation performed an evaluation of the probability of generating turbine missiles as a direct function of the reduced testing frequency of the turbine governor valves and the throttle valves for nuclear power plants with Westinghouse BB-296 turbines. The results of its evaluation are discussed in Westinghouse evaluation report WCAP-14733, "Probabilistic Analysis of Reduction in Turbine Valve Test Frequency for Nuclear Plants with Westinghouse BB-296 Turbines with Steam Chests," dated June 1997. The Westinghouse evaluation contains the results of extending the test interval of turbine valves on the annual probability of turbine missile ejection due to overspeed, using BB-296 turbine throttle and governor valve failure rates and system separation frequency.

The evaluation focused on destructive overspeed (runaway speed in excess of approximately 180%). Destructive overspeed occurs when one governor valve and one throttle valve in the same steam chest fail to close after a system separation (sudden and total loss of load on the generator, such as the load loss that is experienced if the generator output breakers opened while the plant is at full power). North Anna turbines are of the heavy hub design, which reduces the probability of turbine-generated missiles from disk failure resulting from a destructive overspeed. Design overspeed (approximately 120% of rated turbine speed) and intermediate overspeed (approximately 130%) were not explicitly calculated for this evaluation. The missile ejection frequency results in the 1987 Westinghouse report WCAP-11525, "Probabilistic Evaluation of Reduction in Turbine Valve Test Frequency," for BB-296 steam chests indicated that the design and intermediate overspeed failure probabilities were not major contributors to turbine missile ejection probability for BB-296 turbines. The turbine missile ejection frequencies for varying valve test intervals presented in the 1997 report were calculated following the applied basic methodology described in the 1987 Westinghouse report WCAP-11525, "Probabilistic Evaluation of Reduction in Turbine Valve Test Frequency." In a supplemental safety evaluation dated November 2, 1989, issued to Westinghouse Electric Corporation, the NRC staff accepted this methodology for use in the determination of the probability of turbine missile generation.

After determining that the valve failure rates used in WCAP-11525 for the BB-296 steam chest were no longer valid, due to several incidents of sticking of governor and throttle valves in Westinghouse BB-296 steam chests, the failure rates for the BB-296 steam chest were recalculated in 1988. The resultant probabilities of turbine destructive overspeed were sent to all operating plants with BB-296 steam chests in Westinghouse Operations and Maintenance Memorandum 093. Included in the WCAP-14733 report were the revised failure rates for BB-296 steam chest valves for the operating years since the 1988 study. Six years, 1990 - 1995, were used for data collection. This time period provided failure rates based on current valve design and maintenance practices while retaining adequate time for rare events to occur. Using updated failure and operating data, probabilities of turbine missile ejection for destructive overspeed events were calculated for turbine valve test intervals of 1 week, 1 month, 3 months, 6 months, and 12 months. To account for the probability of overspeed from the design and intermediate overspeed

events and any model uncertainties, Westinghouse suggested that an allowance be added to the destructive overspeed probabilities in order to obtain the conditional probability of missile ejection from overspeed.

Since the destructive overspeed model was constructed assuming that a loss of load or system separation occurred, the annual frequency of system separation was calculated to be .29 per year. However, a more conservative value of .4 for system separation was used. The conditional probability of missile ejection was then multiplied by the frequency of system separation to obtain the frequency of missile ejection per year.

3.0 EVALUATION

For determining maintenance and testing schedules for turbine control and overspeed protection systems, the NRC staff recommended that the annual probability of turbine missile ejection not exceed $1.0E-5$ a year for unfavorably oriented turbines and $1.0E-4$ for favorably oriented turbines. North Anna Units 1 and 2 turbines are unfavorably oriented. For all test intervals analyzed (i.e., 1 week, 1 month, 3 months, 6 months, and 12 months), the missile ejection frequency met the acceptance criteria of $1.0E-5$ a year. However, since the governor and throttle valve failure rates are based on plant operating experience (primarily monthly testing), sufficient failure information for longer test intervals does not currently exist. Westinghouse supports quarterly testing until reasonable failure rate data can be accumulated. For quarterly testing, the total probability of turbine missile ejection was determined to be $8.8E-7$ a year.

The staff found that safety could be improved, equipment degradation decreased, and an unnecessary burden on personnel eliminated by reducing the amount of testing that the TS require during power operation. Generic Letter 93-05, "Line-Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation," provided guidance to implement these recommendations as line-item TS improvements. These line-item TS improvements are reported in NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," dated December 1992.

Section 5.13 of NUREG-1366 provides a comprehensive evaluation of Turbine Overspeed Protection System Testing and contains NRC recommendations for the frequency of testing of turbine valves. NUREG-1366 recommends that where the turbine manufacturer agrees, the turbine valves testing frequency should be changed to one test done quarterly (i.e., the surveillance interval could be extended for up to 3 months if such a change is supported by the turbine manufacturer's generic data and the licensee follows the manufacturer's methodology using plant-specific data to justify the new test frequency.)

Section 10.2 of the Standard Review Plan (SRP), NUREG-0800, provides guidance on evaluating the surveillance testing of steam valves. The purpose of the guidance is to ensure that the turbine overspeed protection system will perform in a manner that meets the requirements of GDC 4 of Appendix A to 10 CFR Part 50 with regard to the protection of structures, systems, and components important to safety from the effects of turbine missiles.

The proposed TS amendment to increase the surveillance test interval for the turbine governor and throttle valves from at least once every 31 days to at least once every 92 days was found to be within the boundary of the guidance provided in NUREG-1366. The proposed amendment complies with the requirements of GDC 4 of Appendix A to 10 CFR Part 50 with regard to the protection of structures, systems, and components important to safety from the effects of turbine missiles and the intent of the guidance of Section 10.2 of the SRP.

Operational experience has shown that the turbine governor and throttle valves have not failed to close in response to turbine trip demands and have not experienced valve stem sticking while the units were carrying load. Furthermore, the probability of turbine-generated missiles is within NRC limits. On the basis of the staff's evaluation of the licensee's amendment request, the proposed changes to TS 4.7.1.7.2.a.1 and 4.7.1.7.2.a.2 for the turbine overspeed protection system are, therefore, acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Virginia State official was notified of the proposed issuance of the amendments. The State official had no comment.

5.0 ENVIRONMENTAL CONSIDERATION

These amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change a surveillance requirement. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that these amendments involve no significant hazards consideration and there has been no public comment on such finding (62 FR 66146). Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

Based on the our review of the licensee's submittal, the staff finds the proposed TS changes for the request to increase the surveillance test interval for the turbine governor and throttle valves from at least once every 31 days to at least once every 92 days acceptable.

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Reviewer: Coretta Y. Saadu

Date: April 16, 1998