



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NOS. 205 AND 186 TO  
FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7  
VIRGINIA ELECTRIC AND POWER COMPANY  
OLD DOMINION ELECTRIC COOPERATIVE  
NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated December 17, 1996, Virginia Electric and Power Company (licensee) requested temporary changes to Technical Specifications (TS) 3.7.3.1, "Component Cooling Water (CCW) Subsystem - Operating," and 3.7.4.1, "Service Water System (SWS) - Operating," for North Anna Power Station, Units 1 and 2. The proposed changes would allow one of the two service water (SW) loops to be isolated from the component cooling water heat exchangers (CCHXs) during two-unit power operation to facilitate repair of the concrete-encased portions of the isolated SW headers. The licensee proposed one time (temporary) TS changes to Unit 1 and 2 for two periods of up to 35 days each.

The exposed portions of these SW lines were repaired under TS Amendment No. 194 for Unit 1 and TS Amendment No. 175 for Unit 2. Prior to issuing Amendment Nos. 194 and 175, service water pipe refurbishment work had been implemented by using the current Action Statement "d" of TS 3.7.4.1, which allows one of the two redundant SW loops to be removed from service for up to 7 days for SWS upgrades.

2.0 BACKGROUND

The plant SWS consists of two redundant loops which are shared between Unit 1 and Unit 2. The SW pumps (two for each unit) can be aligned to either of the SW loops. During normal operation, one SW pump is usually running on each SW loop that provides the required cooling water for one CCHX, three charging pump lube-oil, gear box, and seal coolers, two air compressors, and one main control room (CR) air conditioning condenser. During design basis accident (DBA) conditions, at least one SW pump is running on each SW loop to provide the required cooling water for the following loads: two recirculation spray heat exchangers (RSHXs) on the accident unit; three charging pump lube-oil, gear box, and seal coolers; one air compressor; one main CR air conditioning

condenser; and one CCHX on the non-accident unit initially and two CCHXs placed in service later for cooldown of the non-accident unit. With the exception of the RSHXs, the components that are cooled by the SWS can be aligned to either of the main SW loops. Two of the RSHXs in each unit (four total) are cooled by one SW loop, and the remaining four RSHXs are cooled by the other SW loop. Each unit requires only two RSHXs to mitigate the effects of an accident.

In order to minimize corrosion, prolong the remaining service life of the piping system, and repair/replace the degraded piping sections, the licensee initiated an SWS restoration project. The scope of the project includes refurbishment of the 24-inch concrete-encased SW headers (35-40 ft of encased portion for each SW pipe, four pipes total) and short sections (10-15 ft) of exposed portion of each SW pipe (four pipes total) up to the first isolation valve on the header. All four 24-inch SW headers are connected to the main 36-inch concrete-encased SW headers.

Each 35-day period is based on the following work activity schedule:

- 1) Approximately 7 days to isolate one main SW loop, install plugs inside the 24" supply and return lines in concrete-encased sections, remove the supply and return valves to/from the CCHX header, and install the 24" blind flanges. Simultaneously install the cross-connect piping which will provide a bypass flow path for this partially isolated main SW loop and connect temporary SW lines to supply second source of SW to the charging pump coolers, air compressor coolers, SFP coolers and Unit 2 CR chillers. These activities are performed within the 168-hour action statement allowed by TS 3.7.4.1.
- 2) Approximately 21 days for piping refurbishment.
- 3) Approximately 7 days to isolate one main SW loop, remove crossconnect with temporary piping, remove plugs from inside of 24" to/from CCHXs, remove the 24" blind flanges and reinstall the valves. These activities are performed within the 168-hour action statement allowed by TS 3.7.4.1.

### 3.0 EVALUATION

In order to proceed with the SW refurbishment activities, the licensee requested revision to TS 3.7.3.1 (Component Cooling Water System) with a "\*\*\*" footnote which allows operation of the SWS with one independent source of SW to/from the Unit 1 and Unit 2 CCHXs for two periods of up to 35 days each. In conformity with the change, TS 3.7.4.1 (Service Water System) is also revised with a "\*" footnote which allows one of the two SW loops to temporarily bypass the CCHXs, provided all other requirements in the TS are met. The footnote provides clarification that the provisions of TS 3.0.4 are not applicable provided two SW loops are capable of providing cooling for the other operable plant components.

The SWS is needed for normal plant operation and to mitigate the effects of a DBA. With one of the two SW loops isolated, the reliability of the CCW system

and all of the equipment cooled by the CCW system will be affected. To assure that the SWS and CCW cooling functions are not jeopardized during the SWS piping refurbishment, the licensee evaluated the impact on initiating event frequency of previously analyzed design basis events for the TS changes.

The licensee evaluated the SWS and CCW system operability during DBA conditions for operating the single SW loop with temporary cross-connect installed. A hydraulic analysis was performed to verify whether adequate SW flow will be provided to the containment RSHXs assuming the occurrence of the most limiting single failure. In addition, the automatic closure feature of the SW valves serving the CCHXs will be defeated in order to avoid the undesired interruption of CCW cooling to the unaffected unit in an accident condition. The defeating of the automatic valve operation will be addressed by station administration procedures.

The hydraulic and heat transfer analyses for the CCW system were performed and the following facts were indicated:

- Normal CCW heat transfer loads can be met with two CCHXs operated on one SW header with two SW pumps.
- The fast cooldown heat transfer loads can be met with three CCHXs operated on one SW header with two SW pumps, but the SW supply temperature must be less than or equal to 75° F. For SW temperature between 75° F to 78.5° F, a slow cooldown can be achieved with the same system configuration.
- Containment atmospheric temperature limits can be maintained since the containment heat removal portion of the SWS is not affected by the SWS refurbishment activities.

The staff finds that the licensee's safety analyses and results for the SWS refurbishment activities are comprehensive.

To reduce risk of damage to the operating SW header and to provide backup means of cooling equipment, the licensee proposed to implement the following contingencies or compensatory actions:

- During periods of operation in Action Statement "d" of TS 3.7.4.1 (168-hour action statement) when the SW system is on one header, a temporary source of cooling water to the charging pumps coolers will be provided from the fire protection or primary grade water systems should the SW supply be interrupted.
- Further, an alternate source of cooling water to the control room/emergency switch gear room (CR/ESGR) air conditioning system will be provided as a precautionary measure in the event that a loss of service water occur. The use of this alternate cooling water source is addressed in Abnormal Procedure O-AP-12, "Loss of Service Water." Operators are trained in the use of Abnormal Procedure O-AP-12 for loss of service water.

- During portions of the 35-day periods of operation with only one SW loop available to/from the CCHXs, the automatic closure feature of the SW isolation valves to the CCHXs will be defeated to prevent unnecessarily isolating the CCHXs and assure that all four SW pumps (two on each loop) will be available to the single SW loop.
- To avoid operation of the SW pump at abnormal conditions (low flow) on this partially deadlocked header, a temporary cross-connect (with a manually operated control valve) will be installed between the supply and return headers of the affected main SW loop to provide a flow path bypassing the CCHXs.
- The pipe refurbishment work will be scheduled when SW supply temperatures can be maintained at 75° F (typically October through April) to minimize the flow demands to the CCHXs for plant cooling.
- The temporary cross-connect and temporary piping to the charging pump, air compressor, and SFP coolers and Unit 2 CR chillers will be seismically designed and qualified in accordance with the safety-related piping design criteria.
- During the two 35-day periods, temporary pipe clamps and emergency repair equipment will be staged in the auxiliary building to facilitate the capability for emergency repair of the SWS piping in case the SWS header is ruptured.
- When operating with one available SW header supplying the CCHXs, no major maintenance or testing will be planned on the SW pumps. Routine periodic tests and maintenance work will be scheduled before or after the 35-day periods. If an SW pump is rendered inoperable, an operable SW pump from the other header will be realigned to this header to maintain at least two operable pumps available to the SW header.
- No planned outages will be allowed during the 35-day periods. In the event of an unplanned unit shutdown, all pipe refurbishment work will be stopped and actions will be determined based on the status of the refurbishment.

The compensatory actions discussed above are based on the licensee's safety analyses for the TS changes and are plant specific. From engineering considerations, the staff finds that the licensee's safety analyses and compensatory actions are rational and justified.

The licensee also performed a Probability Safety Assessment (PSA) to evaluate the impact on initiating event frequency based on the Electric Power Research Institute (EPRI) PSA Application Guide TR-105396. The licensee developed a PSA model for Individual Plant Examination (IPE) for the North Anna plant. However, the staff's review and approval of this temporary TS change request

is not an endorsement of the licensee's PSA work. The staff's acceptance is based on the licensee's safety evaluations and the compensatory actions performed for these TS changes as discussed above.

#### 4.0 SUMMARY

The staff has reviewed the licensee's submittal for the temporary TS changes, which permits one of the two service water loops to be isolated from the component cooling water heat exchangers during two-unit power operation. The licensee has justified its position that these SWS refurbishment activities will not adversely affect safe operation of the plant. The licensee also performed safety evaluations for the design basis conditions for the 35-day periods that the temporary TS changes are valid. Based on this review, the staff concludes that the temporary TS changes for North Anna Unit 1 and Unit 2 are acceptable on the basis that:

- the TS changes are justified by the licensee with technical bases that have been reviewed by the staff.
- the licensee has evaluated the functional capability and availability of the SWS and CCW system to maintain safe plant operation.
- the licensee has performed safety evaluations for the DBA conditions and determined that the SWS will remain capable of performing its function during normal plant operation as well as during accident conditions.

Beyond these measures necessary for the approval of the TS changes, the licensee has proposed to implement contingencies and compensatory actions to assure continued operability and availability of the SWS and CCW system.

#### 5.0 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.

#### 6.0 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. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents 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 6580). 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.

7.0 CONCLUSION

Based on the considerations discussed above, the staff concludes 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.

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