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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 215 AND 196 TO

FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNIT NO. 1 AND NO. 2

DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated November 6, 1996 the Virginia Electric and Power Company, the licensee for the North Anna Power Station, proposed changes to the plant technical specifications (TS). Additional information was provided by letters dated April 15, July 14, and October 16, 1998. The requested changes included: (1) the modification of the existing TS addressing reactor coolant system (RCS) loop stop valve operation and (2) adding an additional TS that allows RCS loop stop valve operation with the associated isolated portion of the RCS drained. The existing TS relating to loop stop valve operation prohibits operation of the loop stop valves when the associated loops are not full. The Westinghouse Standard Technical Specifications do not address or permit this particular evolution. The Pressurized Water Reactor (PWR) Section of the Reactor Systems Branch (SRXB), with the help of the Instrumentation and Controls Branch (HICB), has reviewed the submittals and the TS changes and concluded that the changes to the TS and licensing basis are acceptable.

2.0 BACKGROUND

The original North Anna design and was intended to allow power operation with one of the reactor coolant loops isolated from the RCS. This configuration has never been permitted at North Anna and is now prohibited by the TS. As a result, the TS that currently address loop stop valve operation while at power or in startup (modes 1 and 2) are no longer necessary because TS 3.4.1.1 requires all three loops in service and power removed from the open stop valves during these modes. The original design basis requires that a loop be filled with the reactor coolant pump (RCP) having been operated with a flow of greater than 125 gpm for at least 90 minutes prior to opening a loop stop valve. Additionally, the specification requires that the temperature and boron concentration of the isolated portion of the loop be sampled frequently prior to putting an isolated loop into service. These restrictions are necessary to assure there are no boron dilution or temperature excursions when the filled loop is unisolated. However, if the loops are drained, all of these restrictions are not necessary. A new specification has been added to allow loop stop valve operation with drained loops in cold shutdown and in refueling (modes 5 and 6). With a drained loop, there is no possibility of diluted water from the isolated loop entering the reactor. Additionally, the potential for a volume of cold water from the isolated loop entering the reactor is also not possible. If the loops are not

drained, the modified TS continue to require that all of the same current restrictions are maintained, regardless of the mode of operation. The new specification does require the removal of some of the loop stop valve interlocks; however, these restrictions will continue to be maintained administratively in the TS.

Although allowing the opening of a loop stop valve with the loop drained and the removal of the interlocks preventing this is not addressed in the Westinghouse standard TS, a similar specification was approved by the staff in April of 1993 for the Surry Nuclear Power Station.

The benefit of this new specification is that it prevents the necessity of always requiring 90 minutes of relief line flow using the RCPs and reduces the number of RCP starts necessary to unisolate a loop. This increases the useful life of the RCPs and speeds up the startup process.

3.0 EVALUATION

Opening the loop stop valves in a drained loop in modes 5 and 6 is acceptable because the licensee has addressed the safety issues associated with the evolution. The new TS 3.4.1.6 limits the evolution to modes 5 and 6. This bounds the temperature extremes where the evolution can occur and requires a minimum amount of shutdown margin. The licensee performed an evaluation to show that, if the evolution occurs at the temperature extremes permitted by the specification, the temperature excursions are acceptable. For a colder secondary side than primary side, the reactivity addition associated with the cooldown was found to be acceptable (see below). Additionally, when the primary system is colder than the secondary system, the heatup was evaluated and verified to be acceptable. The expansion of the RCS due to the heatup will not cause an unacceptable system pressure transient and the expansion rate is well within the capacity of both one pressurizer power-operated relief valve and one residual heat removal (RHR) relief valve.

TS 3.4.1.6.a.1 will require that the loops be drained and verified drained prior to opening a stop valve and this will prevent a boron dilution from occurring and causing a reactivity excursion. Additionally, a calculation performed by the licensee indicated the worst possible temperature change that could occur as a result of opening the isolation valves will not cause a significant reactivity excursion. The calculated reactivity change caused by the temperature change is less than one half the minimum shutdown margin required by the TS for these modes. Additionally, TS 3.4.1.6.a.3 requires the source range instrumentation to be operable and monitored to provide some assurance that, even if a reactivity excursion occurs, it will be identified and mitigated.

The controls in TS 3.4.1.6 include the requirement to maintain a water volume of 450 ft^3 in the pressurizer prior to and during the loop filling. This amount of water is sufficient to maintain an adequate RHR suction source even if all three RCS loops were opened simultaneously. The value of 450 ft^3 ensures that there continues to be a good deal of margin if all three loops are opened simultaneously with one of the three loops at a vacuum. The licensee has evaluated the instrument uncertainty associated with the safety-related pressurizer level instrumentation that will be used to verify that the TS-required volume in the pressurizer is sufficient. The 450 ft^3 in the TS includes sufficient margin to account for the instrument uncertainties associated with the hot-calibrated channel adjusted for cold conditions with

considerable margin. The analysis to support volume of 450 ft^3 is conservative because the TS bases allow the backfill evolution in a controlled manner to one isolated loop at a time, while the analysis is performed assuming that all three loops are fully opened at once. Therefore the volume of 450 ft^3 is acceptable. The backfill evolution should not reduce inventory sufficiently to challenge RHR cooling and is acceptable.

The portion of the loop isolation valve interlocks that deals with the temperature and relief line flow will be eliminated. These interlocks are not required while operating the isolation valve in a drained loop. However, Specification 3.4.1.5 and the associated operating procedures retain the restrictions previously imposed by the interlocks for the case of restoring a filled and isolated loop in a controlled manner such that the potential for inadvertant criticality during restoration of a filled, isolated loop has not increased.

The requirements in the TS and the administrative controls are acceptable for these applications and the elimination of those portions of the interlocks is acceptable.

4.0 TS Changes

Each TS was individually reviewed and found to be acceptable. A summary of the changes and justifications are provided below.

TS 3.4.1.4

The specification has been modified to change the modes of applicability of the isolated loop specification from all modes to modes 3, 4, 5, and 6. The modes of applicability modification is acceptable because the TS do not permit mode 1 or 2 operation with loops isolated. As a result, the specification is not applicable in modes 1 and 2 and the change is acceptable.

The references to the boron sampling of an isolated loop were modified to require boron sampling of an isolated undrained loop. It is not necessary to sample the boron concentration in a drained loop and, as a result, this change is acceptable.

TS 3.4.1.5

The specification has been modified to change the modes of applicability of the isolated loop specification from all modes to modes 3, 4, 5, and 6. The modes of applicability modification is acceptable because the TS do not permit mode 1 or 2 operation with loops isolated. As a result, the specification is not applicable in modes 1 and 2 and the change is acceptable.

The specification is also being changed to only apply when the loops are not drained. This is acceptable because a new specification TS 3.4.1.6 is being added to address loop startup while drained. Additionally, the specification is being modified to require that an isolated loop have the A.C. power removed and the breaker locked open for the associated loop stop valves. This prevents inadvertent operation of the isolation valves and is acceptable. A note has been added to allow the valve to be closed for 2 hours for maintenance or testing without power being removed and the breaker being locked open. Two hours is acceptable to perform maintenance and testing with power to the valves. As a result, the specification is acceptable.

TS 3.4.1.6

This specification has been added to allow opening a loop stop valve with the associated loop being drained. The new specification is acceptable because sufficient controls are in place to assure the filling of the isolated loop is performed safely. The controls in TS 3.4.1.6 include the verification of the loop being drained, a pressurizer water volume of 450 ft^3 (includes sufficient margin to account for expected instrument uncertainty), and the source range neutron flux monitor being operable. During the loop filling, the specification requires that pressurizer water volume remain above 450 ft^3, the source range count rate shall be monitored and not increase by a factor of more than two, and the hot and cold leg stop valves shall be fully opened within 2 hours after the filling of the drained loop is complete. The licensee has performed conservative analyses to show that the potential temperature and reactivity changes that may occur as a result of the evolution are acceptable. As a result, the staff finds the specification acceptable.

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 and change surveillance requirements. 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 (61 FR 64396). 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

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.

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Date: October 30, 1998