Attachment 1

Proposed Technical Specification Changes

North Anna Power Station Units 1 and 2

Virginia Electric and Power Company

PLANT SYSTEMS

AUXILIARY FEEDWATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 At least three independent steam generator auxiliary feedwater pumps and associated flow paths shall be OPERABLE with:

a. Two motor driven auxiliary feedwater pumps, each capable of being powered from separate emergency busses, and

b. One steam turbine driven auxiliary feedwater pump capable of being powered from an OPERABLE steam supply system.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one auxiliary feedwater pump inoperable, restore the required auxiliary feedwater pumps to an OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the following 6 hours.

b. With two auxiliary feedwater pumps inoperable be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

c. With three auxiliary feedwater pumps inoperable, immediately initiate corrective action to restore at least one auxiliary feedwater pump to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

4.7.1.2 Each steam generator auxiliary feedwater subsystem shall be demonstrated OPERABLE by:

a. Testing the auxiliary feedwater pumps pursuant to Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable to steam driven pump testing.

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 31 days verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. At least once per 18 months during shutdown:

1. Verifying that each automatic valve in the flow path actuates to its correct position on an auxiliary feedwater actuation test signal.

2. Verifying that each auxiliary feedwater pump starts automatically upon receipt of an auxiliary feedwater actuation test signal.

d. The auxiliary feedwater system shall be demonstrated OPERABLE prior to entry into MODE 3 following each COLD SHUTDOWN by performing a flow test to verify the normal flow path from the emergency condensate storage tank through each auxiliary feedwater pump to its associated steam generator.

PLANT SYSTEMS

AUXILIARY FEEDWATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 At least three independent steam generator auxiliary feedwater pumps and associated flow paths shall be OPERABLE with:

a. Two motor driven auxiliary feedwater pumps, each capable of being powered from separate emergency busses, and

b. One steam turbine driven auxiliary feedwater pump capable of being powered from an OPERABLE steam supply system.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one auxiliary feedwater pump inoperable, restore the required auxiliary feedwater pumps to an OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the following 6 hours.

b. With two auxiliary feedwater pumps inoperable be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

c. With three auxiliary feedwater pumps inoperable, immediately initiate corrective action to restore at least one auxiliary feedwater pump to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

4.7.1.2 Each steam generator auxiliary feedwater subsystem shall be demonstrated OPERABLE by:

a. Testing the auxiliary feedwater pumps pursuant to Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable to steam driven pump testing.

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 31 days verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. At least once per 18 months during shutdown:

1. Verifying that each automatic valve in the flow path actuates to its correct position on an auxiliary feedwater actuation test signal.

2. Verifying that each auxiliary feedwater pump starts automatically upon receipt of an auxiliary feedwater actuation test signal.

d. The auxiliary feedwater system shall be demonstrated OPERABLE prior to entry into MODE 3 following each COLD SHUTDOWN by performing a flow test to verify the normal flow path from the emergency condensate storage tank through each auxiliary feedwater pump to its associated steam generator.

The following pages contain the MERITS TS version of the proposed change and marked-up pages of the current specification to illustrate the change. The enclosed MERITS TS pages are identical to those submitted in our October 16, 1989 letter (Serial No. 89-725) transmitting the North Anna MERITS TS.

3.6 PLANT SYSTEMS

3.6.5 Auxiliary Feedwater System

LCO 3.6.5 Three steam generator Auxiliary Feedwater (AFW) pumps and their associated flow paths shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One AFW pump inoperable.	A.1 Restore AFW pump to OPERABLE status.	72 hours
B. Two AFW pumps inoperable. OR Required Action for Condition A not met within required Completion Time.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Three AFW pumps inoperable.	----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until at least one AFW pump is restored to OPERABLE status. ---------- C.1 Initiate action to restore one AFW pump to OPERABLE status. AND C.2 Continue action as required in C.1.	15 minutes Until one AFW pump is restored to OPERABLE status

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	Verify each motor-driven AFW pump's developed head at the flow test point is ≥ the required developed head.	As specified by SR 3.0.5
SR 3.6.5.2	----------NOTE---------- SR 3.0.4 is not applicable for entry into MODE 3. ---------- Verify the turbine-driven AFW pump's developed head at the flow test point is ≥ the required developed head.	As specified by SR 3.0.5

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.3	Verify each AFW manual, power-operated, and automatic valve (excluding check valves) in the flow path, that is not locked, sealed, or otherwise secured in position, is in its correct position.	31 days
SR 3.6.5.4	Verify each automatic valve (excluding check valves) actuates to its correct position on an AFW actuation signal.	18 months
SR 3.6.5.5	Verify each AFW pump starts automatically on an AFW actuation signal.	18 months
SR 3.6.5.6	Verify required AFW flow paths by flowing to each steam generator.	-----NOTE----- Only required for units that do not use AFW system for Startup/ Shutdown operations ---------- Prior to entering MODE 2, whenever unit has been in MODE 5 for > 30 days

CROSS-REFERENCES

TITLE	NUMBER
Containment Integrity	3.5.1

PLANT SYSTEMS

AUXILIARY FEEDWATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 At least three independent steam generator auxiliary feedwater pumps and associated flow paths shall be OPERABLE with:

a. Two motor driven auxiliary feedwater pumps, each capable of being powered from separate emergency busses, and

b. One steam turbine driven auxiliary feedwater pump capable of being powered from an OPERABLE steam supply system.

28

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one auxiliary feedwater pump inoperable, restore the required auxiliary feedwater pumps to an OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the following 6 hours.

b. With two auxiliary feedwater pumps inoperable be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

28

c. With three auxiliary feedwater pumps inoperable, immediately initiate corrective action to restore at least one auxiliary feedwater pump to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

~~4.7.1.2 In addition to the requirements of Specification 4.0.5, each~~ The auxiliary feedwater pumps ~~shall be demonstrated OPERABLE~~ testing pursuant to Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable to steam driven pump testing.

~~a. At least once per 31 days by:~~

~~1. Verifying that each motor driven pump develops a discharge pressure of greater than or equal to 1250 psig at a flow of greater than or equal to 53 gpm.~~

~~2. Verifying that the steam turbine driven pump develops a discharge pressure of greater than or equal to 1380 psig at a flow of greater than or equal to 35 gpm on recirculation flow. The provisions of Specification 4.0.4 are not applicable.~~

4.7.1.2 Each steam generator auxiliary Feedwater subsystem shall be demonstrated OPERABLE by:

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 31 days ~~31 days~~ Verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. At least once per 18 months during shutdown ~~SR~~:

1. Verifying that each automatic valve in the flow path actuates to its correct position on an auxiliary feedwater actuation test signal. 28

2. Verifying that each auxiliary feedwater pump starts automatically upon receipt of an auxiliary feedwater actuation test signal.

d. The auxiliary feedwater system shall be demonstrated OPERABLE prior to entry into MODE 3 following each COLD SHUTDOWN by performing a flow test to verify the normal flow path from the emergency condensate storage tank through each auxiliary feedwater pump to its associated steam generator.

PLANT SYSTEMS

AUXILIARY FEEDWATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 At least three independent steam generator auxiliary feedwater pumps and associated flow paths shall be OPERABLE with:

a. Two motor driven auxiliary feedwater pumps, each capable of being powered from separate emergency busses, and

b. One steam turbine driven auxiliary feedwater pump capable of being powered from an OPERABLE steam supply system.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one auxiliary feedwater pump inoperable, restore the required auxiliary feedwater pumps to a OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the following 6 hours.

b. With two auxiliary feedwater pumps inoperable be in at least HOT STANDBY within 6 hours and in HOT SHUTDOWN within the following 6 hours.

c. With three auxiliary feedwater pumps inoperable, immediately initiate corrective action to restore at least one auxiliary feedwater pump to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

~~4.7.1.2 In addition to the requirements of Specification 4.0.5, each~~ The auxiliary ~~feedwater pumps shall be demonstrated OPERABLE~~ testing pursuant to Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable to steam driven pump testing.

~~a. At least once per 31 days by:~~

~~1. Verifying that each motor driven pump develops a discharge pressure of greater than or equal to 1250 psig at a flow of greater than or equal to 53 gpm.~~

~~2. Verifying that the steam turbine driven pump develops a discharge pressure of greater than or equal to 1380 psig at a flow of greater than or equal to 35 gpm on recirculation flow. The provisions of Specification 4.0.4 are not applicable.~~

4.7.1.2 Each steam generator auxiliary feedwater subsystem shall be demonstrated OPERABLE by:

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 31 days ~~g.~~ Verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. ~~g.~~ At least once per 18 months during shutdown ~~by~~:

1. Verifying that each automatic valve in the flow path actuates to its correct position on an auxiliary feedwater actuation test signal.

2. Verifying that each auxiliary feedwater pump starts automatically upon receipt of an auxiliary feedwater actuation test signal.

d. ~~f.~~ The auxiliary feedwater system shall be demonstrated OPERABLE prior to entry into MODE 3 following each COLD SHUTDOWN by performing a flow test to verify the normal flow path from the emergency condensate storage tank through each auxiliary feedwater pump to its associated steam generator.

Attachment 2

Safety Evaluation

Discussion of Proposed Technical Specification Change

Introduction

The proposed change to North Anna Units 1 and 2 Technical Specification 4.7.1.2 deletes the 31 day test frequency for the auxiliary feedwater pumps but retains reference to Section XI of the ASME Code which requires quarterly testing.

The reduced testing frequency will not reduce pump reliability. Rather, safety will be enhanced because the monthly test, which is done at a flow rate below the design flow, has been found to degrade the pumps.

Background

NRC Bulletin 88-04: "Potential Safety-Related Pump Loss" identified concerns with minimum flow designs of safety related pumps and requested licensees to investigate these concerns and correct them where applicable. Virginia Electric and Power Company responded to these concerns in a letter to the NRC on August 8, 1988 (Serial No. 88-275B). As part of the response we committed to disassemble and inspect the Auxiliary Feedwater Pumps at North Anna Power Station for any signs of degradation. The inspection schedule was to be one pump per unit per outage, with any signs of degradation resulting in immediate inspection of the other pumps on the affected Unit.

As a result of initial inspections performed on both Units during the 1989 refueling outages, all six pumps were disassembled and inspected. Numerous problems were discovered, including diffuser vane cracks, scored bearings, and tolerances out of specification. A root cause evaluation attributed part of these problems to the way in which the pumps are tested. The pumps were not designed to run on recirculation for long periods of time, which is the current practice. During the recirculation mode of operation, the recirculation line orifice restricts flow to less than 20% of best efficiency point flow. The pumps experience increased vibration and axial thrust, which in turn leads to increased wear.

Several engineering studies to correct this problem have been undertaken (see attached reference list). Their recommendations have consistently addressed both design deficiencies and test frequencies as major contributors to pump degradation.

To minimize future pump wear and ensure long term reliability of the auxiliary feedwater pumps, several courses of action are being pursued:

- Minimize operation of the pumps at low flow. This includes limiting use of the pumps for steam generator leak testing, revising procedures for the quarterly ASME test and applying for a Technical Specification change to eliminate the requirement for a monthly test on recirculation flow.

- Install a larger recirculation line.

- Change the design of various mechanical components. This includes reducing the use of cast iron and improving lubrication.

Description of the Proposed Change

1. A new sentence is added before the existing 4.7.1.2 Specification: "4.7.1.2 Each steam generator auxiliary feedwater subsystem shall be demonstrated OPERABLE by:"

2. The existing "4.7.1.2" is replaced by "a".

3. The phrase "In addition to the requirements of Specification 4.0.5, each auxiliary feedwater pump shall be demonstrated OPERABLE" is replaced by "Testing the auxiliary feedwater pumps pursuant to Specification 4.0.5. The provisions of Specification 4.0.4 are not applicable to steam driven pump testing." The exclusion of Specification 4.0.4 from steam driven pump applicability is not new, it was in 4.7.1.2.a.2 which is to be deleted.

4. Existing sections 4.7.1.2.a, 4.7.1.2.a.1 and 4.7.1.2.a.2 are deleted.

5. Existing section 4.7.1.2.a.3 is changed to 4.7.1.2.b and the phrase "At least once per 31 days" is inserted in front. The "31 day" modifier for the new 4.7.1.2.b (valve line-up verification) is inserted because of the 4.7.1.2.a deletion.

6. The labels for 4.7.1.2.b and c are changed to c and d.

7. The word "by" in the new 4.7.1.2.c after "during shutdown" is deleted.

Safety Analysis

The change deletes the surveillance requirement to demonstrate at least every 31 days that the pumps can develop at least 1250 psig at 53 gpm for the motor driven pumps and at least 1380 psig at 35 gpm for the turbine driven pump. The test is done by pumping through an orificed recirculation line at a flow rate far below the design parameters. The current Specification test conditions (pressure and flow) require that the tests be performed in the recirculation mode of operation.

The proposed change retains the requirement that the pumps be tested in accordance with Specification 4.0.5, which refers to Section XI of the 1980 ASME Boiler and Pressure Vessel Code. The Code requires testing every three months. The tests include measurements of the inlet pressure, differential pressure, flow rate, vibration amplitude, speed of the turbine driven pump and observation of lubricant level or pressure. The first test when the pumps are new or overhauled is used to establish reference data. The Code defines acceptable ranges for these parameters which are functions of the reference data. Outside the acceptable range is an "alert range." The Code requires the test frequency to be doubled if any parameters are in the alert range. Beyond the alert range is the "required action range." If any parameters are in this range, the pump is declared inoperable. Reference parameters were originally established using the orificed recirculation lines. The current T.S. values are based on these tests. Because the pumps were recently overhauled, new reference ASME data has been established. The new parameters were obtained by pumping to the steam generators at a much greater flow rate. The new test procedure minimizes the time on recirculation flow to the time required to obtain T.S. required data. ASME required

data is obtained at a flow close to design best efficiency point flow. Obtaining data at this point is much more meaningful for pump performance assessment.

Changing the testing frequency of the auxiliary feedwater pumps to quarterly will serve to reduce the wear on pump internals and increase overall reliability of the pumps. The present configuration for testing the pumps involves a low flow recirculation path. This fact, combined with continued monthly testing, is expected to result in long term pump wear, as evidenced by the recent onsite inspections. The decreased testing frequency will result in lower wear rates and increased long-term pump reliability.

Because the auxiliary feedwater pumps fall under the jurisdiction of the ASME Section XI testing program, the pump testing frequency will automatically double should any indication of pump degradation arise. Experience has shown that recent pump degradation occurred over a long period of time. Tracking the pumps' performance under the Section XI IWP program will provide ample opportunity to detect anomalies or variations in pump performance, and will allow ample opportunity to take corrective actions when needed. Since the pumps are not run routinely and not used for startup, (most of the run time is used for testing) no degradation between tests is expected. The recent overhaul of the pumps allowed the opportunity to establish solid baseline data on which to compare future results.

Despite the deficiencies found on these pumps during recent inspections, the auxiliary feedwater pumps have proven themselves to be reliable. The testing history for these pumps indicates that performance has been adequate.

References

1. Mechanical Engineering Report No. ME-0023, Auxiliary Feedwater Pump Technical Specification Change Request for North Anna Power Station, Rev 0, August 1989.

2. NAPS Technical Report No. SE-002, Evaluation of Auxiliary Feedwater Pumps, Rev 0, April 1989.

3. NAPS Technical Report No. SE-002, Addendum No. 1, Evaluation of Auxiliary Feedwater Pumps, July 1989.

4. Memorandum from R. W. Riley to Distribution, June 22, 1989, Subject: NP-2051, Auxiliary Pump System Upgrade.

Attachment 3

10 CFR 50.92 Evaluation

Basis for No Significant Hazards Determination

The proposed change does not involve a significant hazards consideration as defined in 10 CFR 50.92 because operation of North Anna Units 1 and 2 in accordance with this change would not:

(1) involve a significant increase in the probability or consequence of an accident previously evaluated. This change does not alter the conditions or assumptions of the accident analysis or the basis of the current Technical Specification. The consequence of an auxiliary pump failure is unchanged. The probability of such a failure is actually reduced because a source of pump degradation is minimized.

(2) create the possibility of a new or different kind of accident from any accident previously identified. This change does not alter the conditions or assumptions of the accident analysis or the basis of the current Technical Specification. This is not an actual hardware change.

(3) involve a significant reduction in a margin of safety. This change does not alter the conditions or assumptions of the accident analysis or the basis of the current Technical Specification. It is not an actual hardware change.

Therefore, pursuant to 10 CFR 50.92, based on the above considerations, it has been determined that this change does not involve a significant hazards consideration.