POWER AUTHORITY OF THE STATE OF NEW YORK

10 COLUMBUS CIRCLE NEW YORK, N. Y. 10019

(212) 397-6200

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Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Albert Schwencer, Chief
Operating Reactors Branch No. 1
Division of Operating Reactors

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
NRC Requirements for Auxiliary Feedwater Systems

Dear Sir:

The purpose of this letter is to respond to Mr. Eisenhut's letter to Mr. G. Berry, dated November 7, 1979 regarding auxiliary feedwater systems.

Attachment (1) contains the recommendations of and responses to enclosure (1) of the November 7 letter. The information requested by enclosure (2) of the November 7 letter will be provided as soon as is practicable.

Very truly yours,

Paul J. Early
Assistant Chief Engineer-Projects

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ATTACHMENT 1
AUXILIARY FEEDWATER SYSTEM
RECOMMENDATIONS AND RESPONSES

Recommendation GS-1

The licensee should propose modifications to the Technical Specifications to limit the time that one AFW system pump and its associated flow train and essential instrumentation can be inoperable. The outage time limit and subsequent action time should be as required in current Standard Technical Specifications; i.e., 72 hours and 12 hours, respectively.

Response

The Power Authority of the State of New York will propose modifications to the Technical Specifications by January 1, 1980, to limit the time that one Auxiliary Feedwater System pump and its associated flow train and essential instrumentation can be inoperable.

Recommendation GS-2

The licensee should lock open single valves or multiple valves in series in the AFW system pump suction piping and lock open other single valves or multiple valves in series that could interrupt all AFW flow. Monthly inspections should be performed to verify that these valves are locked and in the open position. These inspections should be proposed for incorporation into the surveillance requirements of the plant Technical Specifications. See Recommendation GL-2 for the longer term resolution of this concern.

Response

Located in the line coming from the Condensate Storage Tank to the AFW pump suction piping are two series valves whose closure would interrupt all AFW flow. As per our existing administrative procedures, these two valves are locked in the open position during plant operation above cold shutdown and are reverified on a monthly basis using the "Locked Valve Check-off List". This verification is performed as part of the general surveillance requirements as established by Technical Specification 6.8.1 which states that procedures be established, implemented, and maintained. This criteria insures that the "Locked Valve Check-off List" will be performed to insure the proper positioning of these two valves and, as such, no further changes to the Technical Specifications are required.

There are no other single or multiple valves in series whose closure would interrupt all AFW flow.

Recommendation GS-3

The licensee has stated that it throttles AFW system flow to avoid water hammer. The licensee should reexamine the practice of throttling AFW system flow to avoid water hammer.

The licensee should verify that the AFW system will supply on demand sufficient initial flow to the necessary steam generators to assure adequate decay heat removal following loss of main feedwater flow and a reactor trip from 100% power. In cases where this reevaluation results in an increase in initial AFW system flow, the licensee should provide sufficient information to demonstrate that the required initial AFW system flow will not result in plant damage due to water hammer.

Response

We have reviewed our practice of throttling AFW system flow to avoid water hammers and have found it to be acceptable and desirable The throttling condition is required during start-up of an AFW system pump to avoid a possible water hammer. Once the pump has been started, the operator is permitted to increase flow as required except if the feed ring is uncovered (identified when level is <15% for >5 minutes without feedwater flow). Once the level returns to >15% this restriction is removed. In any case, the above limitation will provide sufficient flow to the steam generators to assure adequate decay heat removal following a loss of main feedwater flow and a reactor trip from 100% power.

Recommendation GS-4

Emergency procedures for transferring to alternate sources of AFW supply should be available to the plant operators. These procedures should include criteria to inform the operator when, and in what order, the transfer to alternate water sources should take place. The following cases should be covered by the procedures:

The case in which the primary water supply is not initially available. The procedures for this case should include any operator actions required to protect the AFW system pumps against self-damage before water flow is initiated; and,

The case in which the primary water supply is being depleted. The procedure for this case should provide for transfer to the alternate water sources prior to draining of the primary water supply.

Recommendation GS-4

Response

We will develop and implement procedures for transferring to alternate sources of AFW supply by January 1, 1980. These procedures will include the cases in which the primary water supply is not initially available as well as when the primary water supply is being depleted.

Recommendation GS-6

The licensee should confirm flow path available ability of any AFW system flow train that has been out of service to perform periodic testing or maintenance as follows:

> Procedures should be implemented to require an operator to determine that the AFW system valves are properly aligned and a second operator to independently verify that the valves are properly aligned.
>
> The licensee should propose Technical Specifications to assure that prior to plant startup following an extended cold shutdown, a flow test would be performed to verify the normal flow path from the primary AFW system water source to the steam generators. The flow test should be conducted with AFW system valves in their normal alignment.

Response

After completion of a periodic test on an AFW system flow train, the procedure requires that the system's valves be properly aligned to assure that a flow path is available. This valve alignment verification is performed by a nuclear plant operator assigned to the operations department and highly trained in the operational aspects of the plant. However, to insure that the flow path has been reestablished, a second verification will be made by a different operator as per the procedure. The procedure will be reviewed and updated to reflect this second verification by January 1, 1980.

As for other work which affects the flow train of the AFW system, the existing administrative controls concerning the work clearances provide sufficient assurance that the flow train is reestablished. This is accomplished in the realignment of the valves by the operator as well as by retesting the equipment to insure operability after maintenance has been performed on the equipment. The auxiliary feedwater system is the only means of supplying feedwater to the steam generators during all plant start-ups from cold shut down and, as such, removes the necessity for a Technical Specification requirement for a flow test prior to plant start-up.

Recommendation GS-7

The licensee should verify that the automatic start AFW system signals and associated circuitry are safety-grade. If this cannot be verified, the AFW system automatic initiation system should be modified in the short-term to meet the functional requirements listed below. For the longer term, the automatic initiation signals and circuits should be upgraded to meet safety-grade requirements as indicated in Recommendation GL-5.

> The design should provide for the automatic initiation of the auxiliary feedwater system flow.
>
> The automatic initiation signals and circuits should be designed so that a single failure will not result in the loss of auxiliary feedwater system function.
>
> Testability of the initiation signals and circuits shall be a feature of the design. The initiation signals and circuits should be powered from the emergency buses.
>
> Manual capability to initiate the auxiliary feedwater system from the control room should be retained and should be implemented so that a single failure in the manual circuits will not result in the loss of system function.
>
> The alternating current motor-driven pumps and valves in the auxiliary feedwater system should be included in the automatic actuation (simultaneous and/or sequential) of the loads to the emergency buses.
>
> The automatic initiation signals and circuits shall be designed so that their failure will not result in the loss of manual capability to initiate the AFW system from the control room.

Response

See our response to NUREG-0578, item 2.1.7.a.

Additional Recommendation (Short Term) No. 1

The licensee should provide redundant level indications and low level alarms in the control room for the AFW system primary water supply to allow the operator to anticipate the need to make up water or transfer to an alternate water supply and prevent a low pump suction pressure condition from occurring. The low level alarm setpoint should allow at least 20 minutes for operator action, assuming that the largest capacity AFW pump is operating.

Response

The Power Authority of the State of New York will provide a redundant level indication and low level alarm system on the primary water supply for the auxiliary feedwater pumps with annunciation in the control room.

We are presently reviewing the design criteria and determining the availability of the equipment and will inform the Commission, based on lead times, when we anticipate completing the installation of this system.

Additional Recommendation (Short Term) No. 2

The licensee should perform a 72-hour endurance test on all AFW system pumps, if such a test or continuous period of operation has not been accomplished to date. Following the 72-hour pump run, the pumps should be shut down and cooled down and then restarted and run for one hour. Test acceptance criteria should include demonstrating that the pumps remain within design limits with respect to bearing/bearing oil temperatures and vibration and that pump room ambient conditions (temperature, humidity) do not exceed environmental qualification limits for safety related equipment in the room.

Additional Recommendation (Short Term) No. 2

Response

A 72-hour endurance test on all AFW system pumps has been performed as a matter of course at our facility. The motor-driven AFW pumps are the only source of feedwater during start-up from cold shutdown and, as such, have been used in excess of 72 continuous hours on many occassions.

As for the steam driven AFW pump, we are presently in a refueling and turbine maintenance outage and will perform this seventy-two hour endurance test when we heat up to return to service.

Additional Recommendation (Short Term) No. 3

The licensee should implement the following requirements as specified by Item 2.1.7.b on page A-32 of NUREG-0578:

> "Safety-grade indication of auxiliary feedwater flow to each steam generator shall be provided in the control room. The auxiliary feedwater flow instrument channels shall be powered from the emergency buses consistent with satisfying the emergency power diversity requirements for the auxiliary feedwater system set forth in Auxiliary Systems Branch Technical Position 10-1 of the Standard Review Plan, Section 10.4.9".

Response

See our response to NUREG-0578, item 2.1.7.b.

Additional Recommendation (Short Term) No. 4

Licensees with plants which require local realignment of valves to conduct periodic tests on one AFW system train, and there is only one remaining AFW train available for operation should propose Technical Specification to provide that a dedicated individual who is in communication with the control room be stationed at the manual valves. Upon instruction from the control room this operator would realign the valves in the AFW system train from the test mode to its operational alignment.

Response

The monthly surveillance test for the three AFW system pumps will be revised by January 1, 1980 to add the requirement that the operator of the test is to be in contact with the CCR and to immediately realign the system for normal operation if the AFW system is required while the test is being conducted. Therefore, no additional Technical Specification proposals are required.

It is noted that the valves required to be realigned in the field are located in the same room with the pump and communication with the CCR is also in the same room.

Additionally, the design of our NSSS is such that a delay of up to approximately 25 minutes in auxiliary feedwater flow would not have any immediate effect on the safe shutdown of the reactor. In light of this time interval and the fact that a highly trained nuclear plant operator conducts the test, we believe adequate assurance is provided that the auxiliary feedwater system would be available for service if required.

Recommendation GL-2

Licensees with plants in which all primary and alternate water supplies to the AFW systems pass through valves in a single flow path should install redundant parallel flow paths (piping and Valves).

Licensees with plants in which the primary AFW system water supply passes through valves in a single flow path, but the alternate AFW system water supplies connect to the AFW system pump suction piping downstream of the above valve(s) should install redundant valves parallel to the above valve (s) or provide automatic opening of the valve(s) from the alternate water supply upon low pump suction pressure.

Recommendation GL-2 (cont'd)

The licensee should propose Technical Specifications to incorporate appropriate periodic inspections to verify the valve positions.

Response

The Authority does not agree with the above recommendation to install redundant valves parallel to the series isolation valves as this does not provide assurance that all isolation valves will be opened anymore than our present system. As we discussed in our response to Recommendation GS-2, the two series isolation valves are locked in the open position and verified on a monthly basis whenever the unit is above the cold shutdown condition. To increase the operators' confidence that these valves are correctly positioned, we will initiate a design to install limit switches on each valve with indication in the CCR by January 1, 1981.

In light of the above, no additional Technical Specification requirements are necessary as they would only be redundant.

Recommendation GL-5

The licensee should upgrade the AFW system automatic initiation signals and circuits to meet safety-grade requirements.

Response

As stated in our response to NUREG-0578, item 2.1.7.a, our AFW System presently complies with the above stated recommendation.

Recommendation (Long-Term Item 3)

The two motor-driven pumps and the turbine driven pump are located in the same room. The licensee should evaluate the capability of the design to withstand a) environmental conditions (steam, flooding, pipe whip and jet impingement) resulting from a pipe break, b) internally generated missiles.

The licensee should evaluate the postulated pipe breaks stated above and (1) determine any AFW system design changes or procedures necessary to detect and isolate the break and direct the required feedwater flow to the steam generator(s) before they boil dry or (2) describe how the plant can be brought to a safe shutdown condition by use of other systems which would be available following such postulated events.

Response

In the Indian Point Unit No. 3 Safety Evaluation Report, dated September 21, 1973, the staff concluded on page 10-7 that:

(1) Breaks in a steam line or feedwater line outside of the auxiliary feed pump (AFP) building will not prevent safe shutdown.

Recommendation (Long-Term Item 3)

Response (con't)

(2) Breaks in high energy lines within the AFP building will not cause the loss of essential equipment and will not over-pressurize any section of the AFP building.

(3) Jet impingement effects have been found to be negligible and pipe whip restraints are adequate to prevent one broken high energy line from rupturing another.

(4) Design modifications have been made to prevent (a) flooding in the pump room, (b) concrete spalling, (c) interactions between a failed steam supply of the turbine AFP and the electric driven auxiliary feed pumps, and (d) loss of auxiliary feedwater lines due to pipe whip of a feedwater line.

The item (4) modifications were found acceptable to the staff (pp. 10-6, 10-7).

The staff based its conclusions on the applicants reports submitted on May 14, 1973 and June 8, 1973. Based on the above, the Authority believes that the capability of the design to withstand environmental conditions has been adequately demonstrated.

The Authority will evaluate the capability of the design to withstand internally generated missiles. Any modifications deemed necessary as a result of this evaluation will be performed prior to January 1, 1981. A description of the results of the evaluation will be provided prior to the implementation of any resultant corrective measures.