Omaha Public Power District
1623 Harney Omaha, Nebraska 68102
402/536-4000

June 18, 1985
LIC-85-259

Mr. Hugh L. Thompson, Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Reference: Docket No. 50-285

Dear Mr. Thompson:

Staff Recommended Actions Stemming from NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity (Generic Letter 85-02)

The Omaha Public Power District received the subject letter dated April 17, 1985. Please find enclosed the District's responses to the various inquiries. The past correspondence between the District and the Nuclear Regulatory Commission listed below should be used as references in evaluating this submittal.

1) Letter from NRC (J. T. Collins) to OPPD (W. C. Jones) dated (June 5, 1984)
2) Letter from OPPD (W. C. Jones) to NRC (J. T. Collins) dated June 19, 1984 (LIC-84-196)
3) Letter from OPPD (R. L. Andrews) to NRC (R. D. Martin) dated February 2, 1985 (LIC-85-040)
4) Letter from OPPD (R. L. Andrews) to NRC (J. R. Miller) dated March 1, 1985 (LIC-85-091)
5) Letter from NRC (R. P. Denise) to OPPD (R. L. Andrews) dated March 27, 1985

Sincerely,

R. L. Andrews

R. L. Andrews
Division Manager
Nuclear Production

RLA/DJM/dao

Attachments

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, DC 20036

Mr. E. G. Tourigny, NRC Project Manager
Mr. L. A. Yandell, NRC Senior Resident Inspector

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Attachment 1

The April 17, 1985 Generic Letter 85-02 requested responses to "Staff Recommended Actions Stemming from NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity" and "Request for Information Concerning Category C-2 Steam Generator Tube Inspections."

The District's responses are as follows:

1.a PREVENTION AND DETECTION OF LOOSE PARTS (INSPECTIONS)

Staff Recommended Action

Visual inspections should be performed on the steam generator secondary side in the vicinity of the tubesheet, both along the entire periphery of the tube bundle and along the tube lane, for purposes of identifying loose parts or foreign objects on the tubesheet, and external damage to peripheral tubes just above the tubesheet. An appropriate optical device should be used (e.g., mini-TV camera, fiber optics). Loose parts or foreign objects which are found should be removed from the steam generators. Tubes observed to have visual damage should be eddy current inspected and plugged if found to be defective.

These visual inspections should be performed: (1) for all steam generators at each plant at the next planned outage for eddy current testing, (2) after any secondary side modifications, or repairs, to steam generator internals, and (3) when eddy current indications are found in the free span portion of peripheral tubes, unless it has been established that the indication did not result from damage by a loose part or foreign object.

For PWR OL applicants, such inspections should be part of the preservice inspection.

For steam generator models where certain segments of the peripheral region can be shown not to be accessible to an appropriate optical device, licensees and applicants should implement alternative actions to address these inaccessible areas, as appropriate.

Licensees should take appropriate precautions to minimize the potential for corrosion while the tube bundle is exposed to air. The presence of chemical species such as sulfur may aggravate this potential, and may make exposure to the atmosphere inadvisable until appropriate remedial measures are taken.

District Response

Detailed secondary inspections are conducted during each refueling outage in both Fort Calhoun steam generators. These inspections involve a detailed crawl-through of the secondary sides of the steam generators to ascertain that components are properly secured and in good condition, sludge and scaling sampling and analysis, inspection of steam generator internals from the handholes, and photographic documentation. Any loose parts or foreign objects observed during these inspections are removed from the steam generators.

During the 1984 refueling outage, CE attempted to perform annulus inspections of both steam generators using a remotely controlled inspection cart. These inspections would also enhance detection and removal of foreign objects from the steam generators.

The District utilizes wet lay-up with hydrazine and make-up from the emergency feedwater storage tank to minimize steam generator corrosion. The steam generators are exposed to air only when work inside the steam generators will not permit wet lay-up.

1.b PREVENTION AND DETECTION OF LOOSE PARTS (QUALITY ASSURANCE)

Staff Recommended Action

Quality assurance/quality control procedures for steam generators should be reviewed and revised as necessary to ensure that an effective system exists to preclude introduction of foreign objects into either the primary or secondary side of the steam generator whenever it is opened (e.g., for maintenance, sludge lancing, repairs, inspection operations, modifications). As a minimum, such procedures should include: (1) detailed accountability procedures for all tools and equipment used during an operation, (2) appropriate controls on foreign objects such as eye glasses and film badges, (3) cleanliness requirements, and (4) accountability procedures for components and parts removed from the internals of major components (e.g., reassembly of cut and removed components).

District Response

Standing Order M-10 establishes tool accountability standards for primary and secondary sides of the steam generators when their access ways have been opened. Tool accountability logs are maintained where necessary to minimize the possibility of introducing foreign materials into the steam generator. Current procedures require a tool accountant to be assigned to the area when work is in progress. According to M-10, any items such as film badges and eye glasses must be secured by tape or a cord. Any parts or components removed from the steam generators are recorded on the tool accountability log as they exit the steam generators. After work is completed in either the primary or secondary sides of the steam generators, a quality control inspector performs a closeout inspection prior to closing the system to again check for foreign objects and monitor the general cleanliness of the area.

2.a INSERVICE INSPECTION PROGRAM (FULL LENGTH INSPECTION)

Staff Recommended Action

The Standard Technical Specifications (STS) and Regulatory Guide 1.83, Part C.2.f, currently define a U-tube inspection as meaning an inspection of the steam generator tube from the point of entry on the hot-leg side completely around the U-bend to the top support of the cold-leg side. The staff recommends that tube inspections should include an inspection of the entire length of the tube (tube end to tube end) including the hot leg side, U-bend, and cold leg side.

This recommended action does not mean that the hot leg inspection sample and the cold leg inspection sample should necessarily involve the same tubes. That is, it does not preclude making separate entries from the hot and cold leg sides and selecting different tubes on the hot and cold leg sides to meet the minimum sampling requirements for inspection.

Consistent with the current STS requirement, supplemental sample inspections (after the initial 3% sample) under this staff recommended action may be limited to a partial length inspection provided the inspection includes those portions of the tube length where degradation was found during initial sampling.

District Response

The District currently performs full length (tube end to tube end) inspections during eddy current examinations of the Fort Calhoun Station steam generators.

2.b INSERVICE INSPECTION PROGRAM (INSPECTION INTERVAL)

Staff Recommended Action

The maximum allowable time between eddy current inspections of an individual steam generator should be limited in a manner consistent with Section 4.4.5.3 of the Standard Technical Specifications, and in addition should not extend beyond 72 months.

District Response

Standard Technical Specification (STSs) Section 4.4.5.3 is consistent with Fort Calhoun Technical Specification (FC-TS) 3.3(c) regarding eddy current inspection frequency. These allow regularly scheduled inspections to be limited to one steam generator on a rotating schedule. Both (STSs and FC-TSs) maintain that if two consecutive inspections result in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months. For the two steam generators at Fort Calhoun, this could result in an interval of 80 months between required inspections on an individual steam generator. Although the Technical Specification allows such an inspection interval, the District has made a commitment to ensure steam generator integrity and this would minimize the possibility of operating for such a period without performing appropriate steam generator tube inspections.

3.a SECONDARY WATER CHEMISTRY PROGRAM

Staff Recommended Action

Licensees and applicants should have a secondary water chemistry program (SWCP) to minimize steam generator tube degradation.

The specific plant program should incorporate the secondary water chemistry guidelines in SGOG Special Report EPRI-NP-2704, "PWR Secondary Water Chemistry Guidelines," October 1982, and should address measures taken to minimize steam generator corrosion, including materials selection, chemistry limits, and control methods. In addition, the specific plant procedures should include progressively more stringent corrective actions for out-of-specification water chemistry conditions. These corrective actions should include power reductions and shutdowns, as appropriate, when excessively corrosive conditions exist. Specific functional individuals should be identified as having the responsibility/authority to interpret plant water chemistry information and initiate appropriate plant actions to adjust chemistry, as necessary.

The referenced SGOG guidelines above were prepared by the Steam Generator Owners Group Water Chemistry Guidelines Committee and represent a consensus opinion of a significant portion of the industry for state-of-the-art secondary water chemistry control.

District Response

In Appendix A, Fort Calhoun secondary water chemistry limits and corrective actions are compared to EPRI/SGOG PWR Secondary Water Chemistry Guidelines, Revision 1, June 1984. District management is strongly committed to operating the Fort Calhoun Station with prudent chemistry control. Secondary chemistry guidelines and operating limits, which are consistent with the current recommendations of both Combustion Engineering and Steam Generator Owners Group II, have been formally adopted. Hold points for chemistry during startup have been mandated to ensure optimum chemistry conditions in the generators. These guidelines and limits include corrective action levels, shutdown levels, and the actions necessary to return chemistry parameters to within specifications.

The present low pressure feedwater heaters at Fort Calhoun Station are equipped with copper alloy tubes. The District has purchased replacement stainless steel tube bundles, which will be installed during the 1985 refueling outage. This will reduce the further deposition of copper and copper oxides in the steam generators and will allow operating chemistry parameters to be adjusted to provide optimal corrosion control.

3.b CONDENSER INSERVICE INSPECTION PROGRAM

Staff Recommended Action

Licensees should implement a condenser inservice inspection program. The program should be defined in plant specific safety-related procedures and include:

1. Procedures to implement a condenser inservice inspection program that will be initiated if condenser leakage is of such a magnitude that a power reduction corrective action is required more than once per three month period;

2. Identification and location of leakage source(s), either water or air;

3. Methods of repair of leakage;

4. Methodology for determining the cause(s) of leakage; and

5. A preventive maintenance program.

District Response

The District is committed to prompt and prudent corrective action in the event that secondary chemistry operating limits, including those relating to condenser inleakage, are exceeded. The chemistry operating limits are outlined in Appendix A. As an example of this commitment, prompt investigative action was taken during December when an increase in the dissolved oxygen content in the condensate was noted. This problem was traced to air inleakage at a condensate pump. The pump was removed from service and corrective maintenance was performed. The dissolved oxygen content was brought back within specifications within the action level time frame specified in the chemistry procedures.

Air inleakage is identified by measuring oxygen at the condensate pump discharge. Excessive air inleakage is also found by readings of the rotometers which measure condenser off gas flow at the condenser evacuation pumps. Leaks can then be located by using helium as a tracer gas.

Water inleakage during operation is first detected by using sodium analyzers and cation conductivity meters installed on the blowdown. To find the exact location of the leak, the plant is brought down to half load. This is done so that one of the condensers can be taken out of service at a time, but a vacuum is still maintained. Then helium is introduced into the condenser waterbox which is out of service and the mass spectrometer analyzes the offgas for any trace of the helium.

The other method utilized to locate water inleakage is practiced just prior to startup, after an extended outage. This method involves flooding the shellside of the condenser with water and fluorescent dye. Blacklights are then used to locate any fluorescent dye which may have leaked through a tube or tube to tubesheet joint.

Repairs made for air inleakage problems will usually differ with each situation. In some cases the repair may call for a replacement of seals in either valves, pumps or condenser joints. In other cases, the problem may be operational, i.e., a valve left open, too low of a level in the gland steam condenser, etc.

Air inleakage causes are determined on a case by case basis.

For water inleakage, tubes are plugged on both ends with a rubber stopper which has a bolt in it. Tightening down on the bolt causes the stopper to expand and effectively seal off the tube. Tube to tubesheet joints are re-rolled if found to be leaking.

To aid in determining the cause(s) of water inleakage, a metallurgical analysis will be performed on three tubes during the fall refueling outage. The three tubes will be identified as "known" failed tubes, then the tubes will be pulled and sent off for analysis. The analysis should help to determine the failure mechanism(s) present in the condenser environment and enable corrective actions to be developed, if necessary. Eddy current testing, also to be performed during the upcoming outage, will also provide insight as to the possible failure mechanism(s) by identifying affected areas, pitting, tube wear and other possible agents.

For preventive maintenance, annual checks are made for air inleakage with the helium gas method. This frequency may be increased if a problem arises.

The condenser tubes are cleaned every extended outage, otherwise the circulating water flow is maintained in order to eliminate stagnant flow conditions which would enhance a corrosive environment. Also, eddy current testing will be performed on 10 to 20% of the tubes during the 1985 refueling outage. Similar inspections may be performed during future outages depending on the results of this inspection.

4. PRIMARY-TO-SECONDARY LEAKAGE LIMIT

Staff Recommended Action

All PWRs that have Technical Specification limits for primary-to-secondary leakage rates which are less restrictive than the Standard Technical Specifications (STS) limits should implement the STS limits.

District Response

Standard Technical Specification Section 3.4.6.2 is consistent with Fort Calhoun Station Technical Specification Section 2.1.4 in that primary-to-secondary leakage through the steam generator tubes shall be limited to 1 gpm total for both steam generators. Following the tube rupture event of May 16, 1984, Special Order No. 35 entitled, "Allowable Primary-to-Secondary Reactor Coolant System Leak Rate" was issued to establish an interim primary-to-secondary leakage limit through the steam generator tubes of 0.3 gpm total for both steam generators.

5. COOLANT IODINE ACTIVITY LIMIT

Staff Recommended Action

PWRs that have Technical Specification limits and surveillance for coolant iodine activity that are less restrictive than the Standard Technical Specification (STS) should implement the STS limits. Those plants identified above that also have low head high pressure safety injection pumps should either: (1) implement iodine limits which are 20% of the STS values, or (2) implement reactor coolant pump trip criteria which will ensure that if offsite power is retained, no loss of forced reactor coolant system flow will occur for steam generator tube rupture events up to and including the design basis double-ended break of a single steam generator tube, and implement iodine limits consistent with the STS.

District Response

Fort Calhoun Station has low head high pressure safety injection pumps. In Fort Calhoun Emergency Procedure EP-30 "Steam Generator Tube Leak/ Rupture," immediate action to be taken following such an event includes tripping two of the four reactor coolant pumps (one in each loop). This would ensure that no loss of forced reactor coolant system flow would occur. According to the Fort Calhoun Station Updated Safety Analysis Report Section 14.14, steam generator tube rupture incident analysis considers a double-ended break of a single steam generator tube.

Standard Technical Specification Section 3.4.8 states that the specific activity of the primary coolant shall be limited to ≤ 1.0 uCi/gram Dose Equivalent I-131 and ≤ 100/E uCi/gram total non-iodine activity. These limits are consistent with Fort Calhoun Technical Specification Section 2.1.3.

6. SAFETY INJECTION SIGNAL RESET

Staff Recommended Action

The control logic associated with the safety injection pump suction flow path should be reviewed and modified as necessary, by licensees, to minimize the loss of safety function associated with safety injection reset during an SGTR event. Automatic switchover of safety injection pump suction from the boric acid storage tanks (BAST) to the refueling water storage tanks should be evaluated with respect to whether the switchover should be made on the basis of low BAST level alone without consideration of the condition of the SI signal.

District Response

At the Fort Calhoun Station, safety injection pumps take suction from the safety injection and refueling water tank. The switchover of safety injection pump suction from the boric acid storage tanks to the refueling water storage tanks, therefore, does not apply to Fort Calhoun Station operation.

7. REQUEST FOR INFORMATION CONCERNING CATEGORY C-2 STEAM GENERATOR TUBE INSPECTIONS

Information Requested

The enclosed draft NUREG-0844 Section 2.2.1.2 describes certain limitations which the staff believes to be inherent in the present Technical Specification steam generator ISI requirements pertaining to Category C-2 inspection results. Licensees and applicants are requested to provide a description of their current policy and actions relative to this issue and any recommendations they have concerning how existing Technical Specification steam generator ISI requirements pertaining to Category C-2 inspection results could be improved to better ensure that adequate inspections will be performed. This description should include a response to the following questions:

1. What factors do, or would, the licensee or applicant consider in determining (a) whether additional tubes should be inspected beyond what is required by the Technical Specifications, (b) whether all steam generators should be included in the inspection program, and (c) when the steam generators should be reinspected?

2. To what extent do these factors include consideration of the degradation mechanism itself and its potential for causing a tube to be vulnerable to rupture during severe transients or postulated accident before rupture or leakage of that tube occurs during normal operation?

District Response

Fort Calhoun Technical Specification 3.3(2) describes the surveillance program for the steam generator tubes. This defines in-service inspection as being performed on each steam generator on a rotating schedule encompassing a minimum of 300 tubes of the total 5,005 tubes per steam generator. Table 3-8 outlines when additional tubes should be inspected and whether both steam generators should be included in the inspection program. Section C describes inspection frequencies.

While a 300 tube random sample is a reasonable proven starting point for eddy current inspection of a steam generator, the District frequently elects to examine more than the required minimum number of tubes. Depending on the nature and location of the indications obtained during the initial inspection, the scope of the exam could be expanded to better survey the areas of interest. This allows for a more accurate assessment of the condition of the steam generators.

The original inservice inspection plan for 1984 encompassed 1,454 tubes in steam generator "A" and 1,034 tubes in steam generator "B". The inspection was later expanded to encompass all accessible tubes in both steam generators "A" and "B" per letter from NRC (J. T. Collins) to OPPD (W. C. Jones) dated June 5, 1984. The scheduled inspection for 1985 includes approximately 500 tubes in each steam generator. The inspection pattern will be concentrated in specific areas where various indications have been detected during past inspections. The pattern will also include examination of those tubes with nonpluggable indications and a selection of tubes which will reveal if any of the types of problems which have been noted in other Combustion Engineering steam generators are present at Fort Calhoun. In the event that the results of the inspections show that the scope should be expanded, additional inspections will be conducted. The District believes that such an examination program will provide an accurate assessment of the condition of the Fort Calhoun steam generators and will provide adequate assurance of prolonged operational integrity.

EPRI/OPPD
SECONDARY SIDE CHEMISTRY PROGRAM COMPARISON
Blowdown

Parameter	**Action Level and Limit			*Action Level and Limit		
	1) EPRI	2)	3)	1) OPPD	2)	3)
pH	8.5 - 9.0	None	None	8.5 - 9.2	None	None

Comment: The District has adopted the CE limits as shown in Action Level 1).

Parameter	**Action Level and Limit			*Action Level and Limit		
	1) EPRI	2)	3)	1) OPPD	2)	3)
Cation Conductivity umho/cm	<0.8	>2	>7	None	None	None

Comment: OPPD installed on-line analyzers on blowdown for cation conductivity this spring. Limits for cation conductivity have been developed and are presently being approved by the plant staff. These closely approximate the suggested EPRI limits.

Parameter	**Action Level and Limit			*Action Level and Limit		
	1) EPRI	2)	3)	1) OPPD	2)	3)
Sodium ppb	<20	>100	>500	<20, 20-50***	≤100	500

***Increase blowdown if 20 <[sodium ppb] <50. If >50, initiate II.A.

Comment: On-line analyzers are installed, and operating on blowdown. Appropriate grab samples can be run, and will be run more frequently if all sodium and cation conductivity on-line analyzers are out of service. Action levels for sodium have been adopted to cover increased blowdown, power reduction and immediate shutdown.

Parameter	**Action Level and Limit			*Action Level and Limit		
	1) EPRI	2)	3)	1) OPPD	2)	3)
Chloride ppb	<20	100	None	<20	≤100	None

Comment: The OPPD limits are the same as the EPRI limits.

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*See "Secondary System Corrective Action" section. Definitions of 1, 2 and 3 are II.A.1, II.A.2 and II.A.3 for all parameters.

**See EPRI/SGOG PWR Secondary Water Chemistry Guidelines, Revision 1, June 1984 for EPRI Action Level Definitions of 1, 2 and 3.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Sulfate ppb	<20	None	None	<100	≤200	None

Comment: An ion chromatograph is now in service for grab samples. The District will develop a baseline for normal operation, startup, and shutdown before adopting lower limits and action levels.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Silica ppb	<300	None	None	<300	None	None

Comment: The OPPD limits are the same as the EPRI limits.

Feedwater

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
pH	8.8 - 9.2	None	None	8.8 - 9.2	None	None

Comment: The OPPD limits are the same as the EPRI limits.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Oxygen, ppb	<5	None	None	<5	<20	None

Comment: The OPPD limits are the same as, or more conservative than, the EPRI limits.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Iron, ppb	<20	None	None	<20	None	None

Comment: The OPPD limits are the same as the EPRI limits.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Copper, ppb	<2	None	None	<2	None	None

Comment: The OPPD limits are the same as the EPRI limits.

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Hydrazine, ppb	>20	None	None	10 - 50	50 - 100	None

Comment: The District has adopted these limits to allow for adjustment of the hydrazine based on our operational experience, so that oxygen and pH can be controlled seasonally. The District has adopted the Combustion Engineering limit.

Condensate

Parameter	**Action Level and Limit 1) EPRI	2)	3)	*Action Level and Limit 1) OPPD	2)	3)
Oxygen, ppb	<10	>30	None	<10	≤30	None

Comment: The OPPD limits are the same as, or more conservative than, the EPRI limits.

AUTHORITY OF OPERATING MANUAL

The Operating Manual prescribes the policies, procedures, and instructions to safely operate the Fort Calhoun Station Unit No. 1. Adherence to the Operating Manual is mandatory per Fort Calhoun Station Standing Order G-7. The Chemistry Manual is part of the station Operating Manual. The following is extracted from the Operating Manual Procedure CMP-5, Rev. 1, currently in effect and governing operations.

I. PRINCIPLES OF CORRECTIVE ACTION

Certain steps are mandatory in the resolution of any chemical system abnormality or out-of-specification result. They are:

A. Resample and reanalyze. Correct sampling procedures must be followed as described in OPPD Chemistry Manual, Section CMP-2. Correct analytical procedures must be followed as described in OPPD Chemistry Manual, Section CMP-3.

B. Verification of analytical instrument accuracy. The instrument(s) used must be checked for proper calibration and function. Any chemical reagents used must be verified to be of the proper type, strength, standardization and be known to be free of contamination.

C. Identification of system anomalies. The plant operations and maintenance staffs must be contacted to determine if those groups have taken any action or caused any situation that may have caused the problem being investigated.

D. Notify the Plant Chemist or Supervisor - C/RP immediately, except as noted below. Immediate notification is considered to be within two hours of completion of the analysis. These steps (A through C) may be deleted or modified only with the approval of the Plant Chemist or

I. <u>PRINCIPLES OF CORRECTIVE ACTION</u> (Continued)

Supervisor - C/RP. The resolution of any "out-of-spec" chemical condition or other unusual variation in chemical control may be achieved by, but not be limited to, adjustment to chemical feed rates, use or disuse of demineralizer systems, adjustment by plant operation of system flow rates, temperatures, and pressures, maintenance repair of systems, OPPD modification of systems.

II. <u>SECONDARY SYSTEM CORRECTIVE ACTION</u> (Condensate, Feedwater and Steam Generator Blowdown)

A. For All Parameters

1. When the <u>normal</u> range is exceeded, initiate immediate investigation of the problem, increase the sample frequency to once per eight-hour shift, and increase blowdown to approximately 1% of the main steaming rate as appropriate. The problem must be corrected and the parameter(s) returned to the normal range within one week. If this cannot be done, and the parameter has a listed <u>abnormal</u> range, power should be reduced to 25% as if the <u>abnormal range</u> had been exceeded.

2. When the <u>abnormal</u> range is exceeded, reduce power to 25%. Continued plant operation is then possible while corrective action is taken. Power reduction should be initiated within four hours of exceeding the <u>abnormal</u> range. The problem must be corrected and the parameter(s) returned to the <u>normal</u> range within one hundred (100 hours). If this cannot be done, the unit must be shut down as if an <u>immediate shutdown</u> limit had been exceeded.

3. When an <u>immediate shutdown</u> limit is exceeded, the unit must be shut down within four hours to prevent rapid steam generator corrosion.

B. Additional Corrective Action for pH and Conductivity

1. Verify that at least 12 hours have elapsed since any previous secondary system chemical feed alteration (or at least one hour if reactor power is being changed). Review reactor power and secondary system chemical feed history for the previous 48 hours.

2. Write a chemical instruction to alter, as appropriate, alkameen pump stroke. If alkameen feed is not in service then alter, as appropriate, hydrazine pump stroke. (If this is likely to cause hydrazine to go out of specification, notify the Plant Chemist).

3. If a pump stroke change of more than 5% appears to be needed during steady state power operation, notify the Plant Chemist immediately; otherwise, immediate notification of the Plant Chemist is not required.

4. Resample after the chemical instruction is implemented, normally within four hours.

II. SECONDARY SYSTEM CORRECTIVE ACTION (Continued)

C. Additional Corrective Action for Hydrazine

1. Verify that at least 12 hours have elapsed since any previous secondary system chemical feed alteration (or at least one hour if reactor power is being changed). Review reactor power and secondary system chemical feed history for the previous 48 hours.

2. Write a chemical instruction to alter, as appropriate, hydrazine pump stroke.

3. If a pump stroke change of more than 5% appears to be needed during steady state power operation, notify the Plant Chemist immediately; otherwise, immediate notification of the Plant Chemist is not required.

4. Resample after the chemical instruction is implemented, normally within four hours.

D. Additional Corrective Action for Blowdown Rate

1. For steam generator blowdown out-of-specification low but greater than 9000 pounds per hour, notify the Shift Supervisor.

R. Andrews