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July 17, 1985

Mr. Hugh L. Thompson, Jr., Director
Division of Licensing
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Subject: McGuire Nuclear Station, Docket Nos. 50-369 and 50-370
Catawba Nuclear Station, Docket Nos. 50-413 and 50-414
Generic Letter 85-02

Dear Mr. Thompson:

Please find attached our response to Generic Letter 85-02 for McGuire and Catawba Nuclear Stations concerning NRC staff recommendations for steam generator tube integrity and steam generator tube rupture mitigation.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

LTP/mjf

Attachments

cc: Dr. J. Nelson Grace, Regional Administrator
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Region II
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NRC Resident Inspector
Catawba Nuclear Station

NRC Resident Inspector
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Dr. K. N. Jabbour
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cc: (continued)

Mr. Darl Hood
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RESPONSE TO GL 85-02
MCGUIRE AND CATAWBA NUCLEAR STATIONS

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 tube sheet, 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.

Response

Extensive visual inspections have been performed on both McGuire steam generators and the Catawba steam generators. During these inspections, the vicinity of the tube sheet was examined to determine the presence of any loose parts or foreign objects on the tubesheet, and to determine if there is any external damage to the tubes as a result of loose parts or foreign objects. Based on the results of these inspections, Duke does not plan to perform extensive visual inspections at the planned outages for eddy current testing at McGuire/Catawba Nuclear Stations.

Extensive visual inspections would be performed after any significant secondary side modifications or repairs to steam generator internals. In addition, when any eddy current indications are found in the free span portion of peripheral tubes, every effort possible would be made to determine the cause. Based on the results of the evaluation of the damage, appropriate actions would be taken. These actions may include a secondary side visual inspection.

Prior to performing maintenance or inspections on the steam generators, they are placed in a wet layup condition. If draining is necessary, it is performed using nitrogen overpressure.

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).

Response

Based on current MNS/CNS Station practices, there is reasonable assurance that existing procedures are adequate to preclude the introduction of foreign objects into either the primary or secondary side of the steam generator whenever it is opened for maintenance and inspections. Procedures exist that provide a means by which all tools and equipment used during an operation are accounted for. When major repairs are made, procedures would be written to provide accountability for all parts and components that may be removed. There are appropriate controls on foreign objects which could be introduced into the steam generators when open, and cleanliness requirements are specified. Precautions are taken to minimize foreign objects such as film badges and eyeglasses. The precautions include, but are not limited to taping all film badges to protective clothing.

2.a INSERVICE INSPECTION PROGRAM (FULL LENGTH TUBE 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 requirements, 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.

Response

Currently tubes are inspected full length when possible. If any are inaccessible, additional tubes are inspected to meet the minimum sampling requirement. If degradation is found in neighboring tubes, the other leg would be opened to inspect those inaccessible tubes. Consistent with the Standard Technical Specifications, supplemental sample inspections of partial length of the tube is performed when degradation can be localized.

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.

Response

The McGuire and Catawba steam generator inspection intervals, as stated in their respective Technical Specifications, reflect those of Section 4.4.5.3 of the Standard Technical Specifications. Intervals between inspection of the four steam generators at McGuire Nuclear Station have been well below 72 months.

3.a SECONDARY WATER CHEMISTRY PROGRAM

Staff Recommended Action

Licenses 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 and consensus opinion of a significant portion of the industry for state-of-the-art secondary water chemistry control.

Response

Duke Power has been intimately involved with the development in the secondary water chemistry guidelines in SGOG special report EPRI-NP-2704, "PWR Secondary Water Chemistry Guidelines," October 1982. McGuire and Catawba Nuclear Stations have adopted the guidelines in principle and philosophy. Their respective programs, as referenced in these Guidelines, address measures to minimize steam generator corrosion. This includes progressive corrective actions and the identification of the functional individuals responsible for interpreting plant water chemistry information and initiating appropriate plant actions.

Based on McGuire and Catawba Station capabilities, operating goals for steady state chemistries that are more stringent than the SGOG Guidelines are specified. These goals include a few critical chemistry parameters and air ejector off-gas. A majority of the time, these stations meet or exceed these goals. Those which are not being met have an action plan in order to try to obtain these goals within a reasonable period of time.

A brief description of each station's secondary side water chemistry program is provided in Sections 10.3.5 and 10.4.5 of the Final Safety Analysis Reports (FSAR) for Catawba and McGuire, respectively.

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; and

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;

5. A preventive maintenance program

RESPONSE

A comprehensive condenser test program is performed at each refueling inspection, and includes eddy current testing of condenser tubes and a visual inspection of the condenser. The visual inspection includes, but is not necessarily limited to: the examination of the water boxes for corrosion; the examination of the tubes for pitting and inlet erosion; and the inspection of the steam side for steam erosion, baffle damage, and tube damage by loose parts.

In addition, during normal operation, the utilization of the Ambertap cleaning system contributes to condenser integrity and reliability.

Finally, Duke acknowledges that the staff recommendation in the generic letter states that... "The program should be defined in plant specific safety-related procedures...". A Review of NUREG-0844 reveals that the Staff Recommended Action (2.6.1) does not mention that the program be defined in safety-related procedures. Duke concurs with the Steam Generators Owners Group that condenser inspection and leakage are not safety issues. We believe that our overall condenser program is completely adequate and addresses all staff recommendations, and we also believe that a safety grade program will not improve condenser integrity.

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 Specification (STS) limits should implement the STS limits.

Response

The McGuire and Catawba Technical Specifications provide limits for primary to secondary leakage rates that are as restrictive as the Standard Technical Specification limits.

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.

Response

The McGuire and Catawba Technical Specifications provide limits for coolant iodine activity that are as restrictive as the Standard Technical Specification limits.

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 licenses, 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.

Response

The current Catawba/McGuire design is such that automatic switchover from the Volume Control Tank (VCT) to the Refueling Water Storage Tank (RWST) is accomplished on low VCT level or safety injection. These two signals act independently to affect automatic switchover, hence, low VCT level results in switchover regardless of the Safety Injection signal.

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. Licenses 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 license 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.

Response

1a) The factors which should be considered, when determining the basis for any follow-up inspections, are the results of previous inspections; information obtained from any pulled tubes; background information from similar units; the location of the defects; the defect type; and the size of the initial sample.

1b) The same factors addressed in the response to item 1a above should also be used to determine whether a particular defect is generic. If a defect is generic, then all steam generators should be inspected in the affected area. If, however, the defect is new or the mechanism is not well defined, then a statistically valid sample of the other steam generator would be more appropriate. IF a defect is not generic then only the affected units should be inspected.

1c) Reinspection should be based on understanding the cause of the defect. The factors that should be considered are the growth rate of the defect and the potential tube rupture during the interval.

2) Any test program must consider this aspect in some way. The best plan would use an understanding of the degradation mechanism where possible, and a statistically valid random sample in other cases. Understanding of the defect mechanism is gained using the factors cited in 1a) above.