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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Catawba Nuclear Station, Unit 1
Docket No. 50-413
Waiver of Compliance
Steam Generator Repair Criteria

On August 24, 1992, Catawba Nuclear Station submitted a proposed Technical Specification amendment. This proposed amendment was supplemented on September 2, 4, and 17, 1992. The proposed revisions change the Steam Generator repair criteria for Catawba Unit 1 Cycle 7 operation. This submittal is requesting a waiver of compliance with Technical Specification 3/4.4.5 which requires that the Steam Generators (SGs) be operable in Modes 1-4. Until approval of the amendment referenced above, Catawba cannot declare the SGs operable. Catawba is requesting a waiver to allow operation in Modes 3 and 4 until approval of the amendment. This period of time will be approximately four days. This waiver will allow startup, along with the associated testing to continue.

Attached is a discussion of the circumstances requiring a waiver to be necessary, a technical justification for the waiver, and a discussion of why the waiver does not involve a significant hazards consideration.

This waiver has received a review and approval by the Catawba Management Review Team.

Very truly yours,

M. S. Tuckman

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SGWAIV/mhh

Attachment

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CATAWBA NUCLEAR STATION

REQUIREMENT FROM WHICH RELIEF IS SOUGHT

Catawba Nuclear Station is requesting relief from TS 3/4.4.5 which requires that the SGs be operable in Modes 1-4. Catawba is requesting that operation in Modes 3 and 4 be allowed until approval of the Technical Specification amendment which was submitted on August 24, 1992. The TSs as submitted on August 24, 1992 will be administratively implemented until approval from the NRC is received. The duration of this waiver is expected to be approximately four days.

DISCUSSION OF CIRCUMSTANCES AND NEED FOR PROMPT ACTION

As discussed in Attachment 1 to Catawba's August 24, 1992 submittal, the amount of inspection and repair required for the Catawba SGs during EOC6 significantly exceeded projections. The scope of work, consequences to Duke Power, and the sequence of events leading up to the submittal of the TS change are outlined in this Attachment.

Since submittal of the request for an amendment to TS 3/4.4.5, Steam Generators, and 3/4.4.6, Reactor Coolant System Leakage, which support the use of a voltage based repair criteria, Duke Power and Westinghouse have been completing the technical justification for the proposed amendment.

A technical meeting was held with the NRC on August 28, 1992 to present the technical basis for the amendment. This meeting was followed up with additional technical information on September 2, and 4, 1992 with complete justification (WCAP-13494) being submitted on September 17, 1992. During this period of time, Catawba was in daily contact with the NRC to inform them of progress toward completion. As discussed with the staff, the complexity of the issues, the amount of data, and the review process required to produce the final product made it impossible to submit WCAP-13494 prior to September 17, 1992.

With the exception of approval of the amendment requested in the August 24, 1992 submittal, Catawba is currently in a position in the outage to proceed to Mode 4. The approval of this waiver from TS 3/4.4.5 to allow operation in Modes 3 and 4 would save 3 to 4 days of critical path time by allowing Catawba to continue with startup and the associated testing.

DISCUSSION OF COMPENSATORY ACTIONS

There are no compensatory actions appropriate for this waiver.

TECHNICAL JUSTIFICATION

DOSE CONSEQUENCES

The group of accidents which can yield offsite dose through the secondary side release pathway are: Reactor Coolant Pump Locked Rotor, Rod Ejection, Uncontrolled Rod Withdrawal, Main Steam Line Break, Steam Generator Tube Rupture, and Small Line Break Outside of Containment. As discussed in Catawba's previous submittals, Main Steam Line Break (MSLB) is the main accident of interest due to the differential pressure across the SG tube.

The source term for MSLB is iodine spike. No failed fuel results from this accident, and the initial condition for this transient is assumed to be full power operation for analysis purposes. Two types of iodine spike are postulated to occur: Pre-existent spike and coincident spike.

Neither the pre-existent iodine spike nor the coincident iodine spike is a concern prior to entering Mode 2. Core inventories for all of the iodine and noble gas isotopes were calculated using the computer code "ORIGEN," and these values were decayed with the Duke Power Company computer code "N237 Code For Shielding" for 75 days. The N237 code uses the bateman equations to account for decay chains (e.g., I-135 decays to Xe-135m, which decays to Xe-135, etc. Tellurium decay to iodine was ignored due to the fact that it does not migrate to the fuel pin plenum, and after it decays, the resulting iodine does not migrate to the plenum while the fuel pin is not being irradiated). After 75 days of decay, only 0.11% of the original I-131 dose equivalent activity remains, and only 2.6E-4 of the original Xe-133 dose equivalent activity remains from the discharged fuel at the end of the previous cycle (fuel pin plenum activity is dominated by iodine, noble gases, and cesium due to the boiling points). Only the following isotopes remain due to their longer half-life: I-131, Kr-85, Xe-131m, and Xe-133. Source term from recoil would not be a concern due to the fact that irradiation of the fuel will not occur in Mode 3. Additionally, slightly less than 2/3 of the reload core is previously irradiated fuel: slightly over 1/3 of the reload core is new fuel.

For a pre-existent iodine spike and at the decayed inventories, to cause the values of iodine activity assumed to be present in the reactor coolant system for dose analysis purposes (FSAR) would require burst of all 50,952 fuel pins in the core with the fuel pin plenum assumed to contain 10% of the total core inventory, released instantaneously (an extremely over-conservative assumption). The coincident iodine spike has been calculated to yield lower offsite dose results than the pre-existent iodine spike, and would also not be a concern due to the decay of the source term over the outage duration. Additionally, the phenomenon which yields a coincident iodine spike requires the existence of perforations in fuel pin cladding. Ultrasonic testing was performed for all of the fuel assemblies removed from the core after C1C6 for defects in the cladding. Only one leaking fuel pin out of 50,952 in the core was found. The assembly containing this fuel pin was discharged

and not reloaded into the core for C1C7. Consequently, there is believed to be no fuel pins in the reload core with perforations in the cladding.

As discussed above neither the pre-existing iodine spike nor the coincident iodine spike is a concern prior to entering Mode 2. The existing FSAR analysis is performed assuming full power operation. Due to the fact that the fission product inventory is significantly less BOC, and the fact that the fuel pins were examined using [illegible] and are expected to contain no perforations in the cladding, the doses during a MSLB would be significantly less than those assumed in the FSAR analysis. Additionally, due to the low decay heat load and no return to criticality postulated (due to positive moderator coefficient) the primary side cooldown will be quite rapid thus minimizing the length of time the tubes are subjected to a significant differential pressure thus minimizing the duration of the release.

SG TUBE INTEGRITY AND LEAKAGE

The requirement for the current TS is a 40% plugging limit based on tube wall thinning. The methodology used to determine this requirement is outlined in Draft Regulatory Guide 1.121 "Basis for Plugging Degraded Steam Generator Tubes." The principal requirement of the RG is to demonstrate margin against burst at three times normal operating differential pressure.

The use of the Interim Plugging criteria requested in the August 24, 1992 submittal can be favorably compared with the current 40% depth based plugging criterion. The nominal correlation burst pressure at 1.0 volt is 6920 psi. The nominal burst pressure at 40% depth for a 1.5 inch long uniformly thinned tube (general basis 40% limit) is 6110 psi. Thus at nominal values, the 1.0 volt burst capability exceeds that associated with the 40% thinned repair basis. Since the Alternate Plugging criteria is 2.5 volts and the amendment requested is 1.0 volt, the 1.0 volt represents additional margin of safety. The RG also requires allowances for flaw growth and NDE uncertianty. For the case of flaw growth this represents addition margins for the period of this waiver.

The proposed amendment allows for a 42% flaw growth rate for the current cycle of 0.96 EFPY. This waiver of compliance is requested for a period of approximately 4 days. The flaw growth during this period of time would represent only an extremely small portion of the overall growth component of that demonstrated in WCAP-13494. Since flaw growth will be small, this provides additional margin for the period of the waiver over what has been justified in WCAP-13494.

At the end of Cycle 6 there was no measurable SG leakage. Since that time the SGs have been inspected and tubes repaired based on the 1 volt repair criteria (IPC) justified in WCAP-13494. The tubes which were repaired at the tube support plates represent the largest flaws in the SGs and the locations most likely to leak. Therefore SG leakage is expected to be at or below EOC6 leakage levels at the beginning of the cycle. The MSLB

leakage would be expected to be 0.0 gpm above normal operating leakage using a voltage threshold at which leakage begins (WCAP-13494).

Additionally, an analysis has been performed to identify tubes at specific locations that might deform due to the combined loading of LOCA and SSE. Tubes that contain degradation might leak or rupture due to this deformation. Tubes with indications of degradation at these locations have been plugged.

NO SIGNIFICANT HAZARDS ANALYSIS

The changes requested under this waiver of compliance do not involve a significant hazards consideration. The following is a technical justification of the position based on the requirements given in 10 CFR 50.92.

1) The proposed waiver will not involve a significant increase in the probability or consequences of an accident previously evaluated in the FSAR.

   This proposed waiver will not significantly increase the probability or consequences of an accident previously evaluated. The main accident of interest with regard to this waiver is the Steam Generator Tube Rupture. As discussed above, the IPC used to repair the SGs during the EOC6 refuelling outage provides a margin of safety to burst similar to that provided by the 40% depth based limit in the current TS. It can also be noted that using the IPC, the most severe flaws were repaired during the outage, and since there was no measurable leakage at the end of Cycle 6, none would be expected at the beginning of Cycle 7. Due to the period of time that the waiver of compliance would be in effect (approximately 4 days) any flaws which were left in service would not be expected to have significant growth as compared to the 42% growth (WCAP-13494) demonstrated for a 0.96 EFPY Cycle.

   As discussed in the dose consequences section of the technical justification, the consequences of a MSLB, which is the accident which could be effected by this waiver, are significantly lower in Modes 3 and 4 after a refuelling outage, than those given in the FSAR dose analysis. Neither the pre-existent iodine spike nor the coincident iodine spike is a concern prior to entering Mode 2. For a pre-existent iodine spike and at the decayed inventories, to cause the values of iodine activity assumed to be present in the reactor coolant system for dose analysis purposes would require burst of all 50,952 fuel pins in the core with the fuel pin plenum assumed to contain 10% of the total core inventory, released instantaneously (an extremely over-conservative assumption). The coincident iodine spike has been calculated to yield lower offsite dose results than the pre-existent iodine spike, and would also not be a concern due to the decay of the source term over the outage duration. Additionally, the phenomenon which yields a coincident iodine spike requires the existence of perforations in fuel pin cladding. Ultrasonic testing was performed for all of the fuel

assemblies removed from the core after C1C6 for defects in the cladding. Only one leaking fuel pin out of 50,952 in the core was found. The assembly containing this fuel pin was discharged and not reloaded into the core for C1C7. Consequently, there is believed to be no fuel pins in the reload core with perforations in the cladding. It is therefore demonstrated that the consequences of a MSLB are significantly lower for the time period of this waiver than for the FSAR MSLB analysis.

At the end of Cycle 6 there was no measurable SG leakage. Since that time the SGs have been inspected and tubes repaired based on the 1 volt repair criteria (IPC) justified in WCAP-13494. The tubes which were repaired at the tube support plates represent the largest flaws in the SGs and the locations most likely to leak. Therefore SG leakage is expected to be at or below EOC6 leakage levels at the beginning of the cycle. The MSLB leakage would be expected to be 0.0 gpm above normal operating leakage, using a voltage threshold at which leakage begins (WCAP-13494). Since normal operating leakage will be administratively limited to 150 gpd per SG the consequences of a MSLB will be even further reduced as compared to the FSAR analysis.

2) This waiver does not create the possibility of a new or different accident from any previously evaluated. The only component affected by use of the voltage based plugging criteria is the SG tubes. The use of the Interim Plugging Criteria (IPC) requested in the August 24, 1992 submittal can be favorably compared with the current 40% depth plugging criterion. The nominal correlation burst pressures at 1.0 volt is 6920 psi. The nominal burst pressure at 40% depth for a 1.5 inch long uniformly thinned tube (general basis for 40% limit) is 6110 psi. Thus at nominal values, the 1.0 volt burst capability exceeds that associated with the 40% thinned repair basis.

An analysis has also been done for combined accident loadings. The combined LOCA + Safe Shutdown Earthquake was found to have significant enough loadings that possible tube deformation could occur. These tubes were excluded from application of the IPC, therefore there is no additional safety impact due to this waiver.

Due to the fact that the IPC compares favorably to the 40% depth based plugging limit, and the fact that the tubes which could be affected by the LOCA + Safe Shutdown Earthquake have been excluded from inclusion in the IPC, the possibility of a new or different accident from any previously evaluated has not been created.

3) This waiver will not involve a significant reduction in the margin of safety.

As discussed above the SG tubes are the only component affected by application of the IPC. From a burst integrity standpoint the IPC compares favorably with the 40%

depth based criteria of the current TS. It can also be noted that flaw growth during the period of time the waiver is in effect (approximately four days) will be negligible.

Any tubes which could be affected by combined accident loadings have been identified and excluded from the IPC. Additionally, since operational leakage will be limited to 150 gpd per generator, and there is expected to be no additional leakage due to a MSLB the dose consequences during the time this waiver is in effect will be significantly below those of the FSAR MSLB analysis. Additionally due to the low decay heat load and no return to criticality postulated (due to positive moderator coefficient) the primary side cooldown will be quite rapid thus minimizing the length of time the tubes are subjected to a significant differential pressure thus minimizing the duration of the release.

As discussed in the previous sections, the dose consequences of a MSLB in Modes 3 or 4 is less than the analyzed FSAR case due to reduced fission product inventory.

For the above reasons the waiver of compliance requested to enter Modes 3 and 4 will not cause a significant decrease in the margin of safety.