

METROPOLITAN EDISON COMPANY
JERSEY CENTRAL POWER & LIGHT COMPANY
AND
PENNSYLVANIA ELECTRIC COMPANY
THREE MILE ISLAND NUCLEAR STATION, UNIT 1

Operating License No. DPR-50
Docket No. 50-289
Technical Specification Change Request No. 199

This Technical Specification Change Request is submitted in support of Licensee's request to change Appendix A to Operating License No. DPR-50 for Three Mile Island Nuclear Station, Unit 1. As a part of this request, proposed replacement pages for Appendix A are also included.

GPU NUCLEAR CORPORATION

BY: *[Signature]*
Vice President & Director, TMI-1

Sworn and subscribed
to before me this 12th
day of March, 1990.

[Signature]
Notary Public

Notarial Seal
Linda L. Ritter, Notary Public
Middletown Boro, Dauphin County
My Commission Expires Feb. 26, 1994
Member, Pennsylvania Association of Notaries

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I. TECHNICAL SPECIFICATION CHANGE REQUEST (TSCR) NO. 199

GPUN requests that the following changed replacement pages be inserted into the existing Technical Specifications:

Revised pages: 4-78, 4-79, 4-80, 4-81 and 4-82

These pages are attached to this change request.

II. REASON FOR CHANGE

This change is requested to modify the TMI-1 Technical Specifications for unscheduled steam generator tube inspection requirements after a primary-to-secondary leak in excess of the limits of Specification 3.1.6.3. The proposed change specifies that: (1) when a leaking tube is located in Group A-1 ("lane wedge" area) all tubes in this group in only the affected steam generator need be inspected (current Technical Specifications are not explicit in this regard) to include those portions of the tubes where the leak was found, and if the results of the inspection fall into the C-3 Category, additional inspections will be performed in the same group in the other steam generator; and (2) when the leaking tube is not in Group A-1, an inspection will be performed on the affected steam generator in accordance with Table 4.19-2.

III. SAFETY EVALUATION JUSTIFYING CHANGE

TMI-1 Technical Specification Section 4.19.3.c.1 currently specifies that additional unscheduled inservice inspections shall be performed on each steam generator in accordance with Table 4.19-2 during shutdown following a primary-to-secondary tube leak (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.1.6.3.

The proposed change to limit the unscheduled inservice inspection to the leaking steam generator following primary-to-secondary leakage through the steam generator tubes which exceeded Technical Specification limits will both reduce personnel radiation exposure associated with the inspections which is consistent with ALARA goals, and provides adequate assurance of steam generator tube integrity. This provision does not reduce the effectiveness of the overall unscheduled steam generator tube inspection program. If the leaking tube is located in the "lane wedge" area and the results of the unscheduled inspection of the affected steam generator fall into the C-3 category, additional inspections will be performed in the same tube group in the other steam generator. If the leaking tube is not located in the "lane wedge" area the unscheduled inspection will be performed on the affected steam generator only, in accordance with existing Technical Specification Table 4.19-2.

OTSG industry experience has shown that the "lane wedge" area has been experiencing corrosion, fatigue, and fretting wear. This area is more susceptible to damage due to the proximity to the open lane which allows higher moisture carryover and highest cross flow since the steam changes direction from vertical to horizontal to exit the steam generators. Performing Technical Specification limited tube inspection in the area where leaks are found enhances plant safety by identifying potential additional tubes which may be experiencing similar wear and enabling appropriate corrective action to be taken to prevent further tube leakage.

This approach is consistent with the OTSG experience, industry experience as endorsed by EPRI in the PWR Inspection Guidelines, and is similar to a request previously approved by the NRC for the Oconee 1, 2 and 3 plants.

IV. NO SIGNIFICANT HAZARDS CONSIDERATION

GPUN has determined that the Technical Specifications Change Request involves no significant hazards considerations as defined by NRC in 10CFR50.92.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability of occurrence or the consequences of an accident previously evaluated. The proposed amendment limits the unscheduled inservice inspection to the leaking steam generator following primary-to-secondary leakage through the steam generator tubes which exceeded Technical Specification limits. The proposed amendment also limits this unscheduled inspection to the "lane wedge" area when the leaking tube is located in this area. The design basis accidents related to this change are accidents related to steam generator tube integrity. The probability of occurrence or the consequences of a steam generator tube rupture accident or a main steam line break accident, which assumes a 1 gpm primary-to-secondary leak rate, are not increased since adequate assurance of steam generator tube integrity is maintained by the proposed change. Limiting the unscheduled inservice inspection to the affected steam generator has no adverse affect on the adequacy of steam generator tube integrity. Limiting the unscheduled inservice inspection to the tubes in the "lane wedge" area when the leaking tube is in this area enhances plant safety by identifying potential additional tubes which may be experiencing similar wear, corrosion, or fatigue. Appropriate corrective actions are taken to prevent further degradation. The proposed change has no effect on the inspection methods or acceptance criteria; nor does it reduce the effectiveness of the overall unscheduled steam generator tube inspection program. Therefore, this change does not increase the probability of occurrence or the consequences of an accident previously evaluated.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed amendment limits the unscheduled inservice inspection to the leaking steam generator following primary-to-secondary leakage through the steam generator tubes which has exceeded Technical Specification limits. The proposed amendment also limits the unscheduled inspection to the "lane wedge" area when the leaking tube is located in this area. The proposed change has no effect on the inspection methods, nor does it reduce the effectiveness of the overall unscheduled steam generator tube inspection program. The proposed changes are related to steam generator tube integrity and tube rupture accidents only, which have been analyzed previously. Therefore, the change has no effect on the possibility of creating a new or different kind of accident from any accident previously evaluated.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in the margin of safety. The proposed amendment limits the unscheduled inservice inspection to the leaking steam generator following primary-to-secondary leakage through the steam generator tubes which exceeded Technical Specification limits. The proposed amendment also limits the unscheduled inservice inspection to the "lane wedge" area when the leaking tube is located in this area. Adequate assurance of steam generator tube integrity is maintained and plant safety is enhanced by identifying potential additional tubes which may be experiencing similar wear, corrosion, or fatigue in the area which is susceptible to such degradation. Appropriate corrective actions are taken to prevent further degradation. Performing a 100% inspection of the "lane wedge" area tubes following a tube leak in excess of the Technical Specification limits enhances plant safety by identifying tubes with similar degradation. The proposal has no effect on the inspection methods or acceptance criteria, nor does it reduce the effectiveness of the overall unscheduled steam generator tube inspection program. Therefore, it is concluded that operation of the facility in accordance with the proposed amendment does not involve a significant reduction in a margin of safety.

The Commission has provided guidelines pertaining to the application of these standards by listing specific examples in 45FR14870. The proposed amendment is considered to be the same category as example (i) of amendments that are considered not likely to involve significant hazards consideration in that the proposed change constitutes an administrative change to Technical Specifications. Limiting the unscheduled inservice inspection to the leaking steam generator is considered an administrative change since it provides clarification that the inspection is required only for the leaking steam generator. Limiting the unscheduled inservice inspection to 100% of the "lane wedge" area when the leaking tube is located in this area is considered an administrative

change since it focuses the appropriate inspection to the area that has experienced the most vulnerability to tube damage. Thus, operation of the facility in accordance with the proposed amendment involves no significant hazards considerations.

V. IMPLEMENTATION

It is requested that the amendment authorizing this change become effective upon issuance. In order to prevent unnecessary tube inspections during any future forced steam generator tube leak outage due to the lack of clarity of the requirements of the specification, the request for an interim waiver of compliance to Technical Specification Section 4.19.3.c. has been provided as outlined in the cover letter to this amendment change request, to be in effect until issuance of the proposed amendment. As requested above this TSCR should be processed on an exigent basis.

Waiver of Compliance
of
TMI-1 OTSG Tube Inservice Inspection

Requirement from Which Relief Is Requested

Relief is requested from the requirement to perform an additional unscheduled inservice inspection of 6% of the tubes in the affected steam generator following a shutdown for primary-to-secondary "lane wedge" tube leaks in excess of the limits of specification 3.1.6.3 (1 gpm total for both steam generators).

Technical Specification Change Request 199 (TSCR) proposes that if the leaking tube is identified to be within the boundary of the "lane wedge" area (tubes in rows 73 to 75 and 77 to 79 adjacent to the open inspection lane comprise the "lane" and those in the areas bounded by tubes 66-1, 75-1 and 75-15 and tubes 77-1, 77-15 and 86-1 comprising the "wedge"), in lieu of meeting the present Technical Specification inspection requirement (i.e. TS 4.19.3.c.1) all tubes in the "lane wedge" area will be inspected.

Event Circumstances and Need For Prompt NRC Action

On March 6 at 0912, TMI-1 began a plant shutdown because of a primary to secondary leak in the A OTSG. This occurred shortly after a refueling outage. The plant was shutdown and was subcritical at 10:42. It was cooled down at a rate to minimize possible increases in tube leakage.

Following cooldown, the A OTSG was opened and a bubble test performed on March 8th. The test identified tube 1 in row 77 (designated A77-1) as the leaking tube. This tube is in the "lane wedge" region of the OTSG and had been Eddy Current examined in January 1990 as part of the 8R refueling inservice inspection program. The 8R inspection identified no recordable indication of degradation on tube A77-1. Post leak Eddy Current inspection performed on March 9 identified that A77-1 had a through wall defect at the point where the tube exits the bottom of the upper tube sheet.

The failure of tube A77-1 at TMI-1 on 3/6/90 was identified as a circumferentially oriented approximately 360° crack. This is believed to be the result of environmentally assisted high cycle fatigue (HCF). This belief is based on ECT data and visual examination of tube A77-1 and on a comparison of the A77-1 failure and prior industry experience with environmentally assisted HCF cracking of OTSG tubes. Refer to the table provided in Attachment 1. The determination that "lane wedge" area tubes are susceptible to this failure mechanism is based on four tube samples from Oconee Nuclear Station removed and analyzed during the period from 1976 to 1982.

The failure was unforeseen and unavoidable because Eddy Current testing (ECT) performed for the inservice inspection program on tube A77-1 during January 1990 yielded no recordable indications of degradation. B&W industry experience confirms that this type of failure occurs rapidly and therefore

evidence of the condition may exist only shortly before leakage would be experienced. Tube inspection techniques do not effectively identify HCF precursor conditions unless they are performed just prior (e.g. hours) before tube failure. Mitigating actions in response to tube leakage are provided by Plant Normal and Emergency Procedures.

GPUN has completed an inspection of all tubes in the "lane wedge" area of the A OTSG in the area where the A77-1 leak was found. No imperfections of these tubes except A77-1, were identified which differ from the 8R Outage inspection results. It should be noted that one defective tube (A78-28) was found during examination of the "lane wedge" area following the A77-1 tube leak. The defect was a shallow inside diameter pit "called" at 41% through wall based on a less than 1 volt one coil indication on a 8x1 absolute ECT probe. A review of the 8R ECT data confirms that this defect existed then and was not called due to its very low signal level and shallow phase angle.

GPUN considers the A77-1 tube failure to be caused by HCF, an industry identified problem as characterized above. Since additional eddy current inspection in the "lane wedge" area of the A OTSG has essentially duplicated the results of inspections performed during the 8R outage inservice inspection, it is technically unnecessary to expand the present ECT beyond the "lane wedge" and perform an inservice inspection as required by our existing Technical Specifications section 4.19.1.a.

Prompt NRC action on this matter is required to prevent delay of the restart of the unit which would otherwise be necessary to perform testing per existing Technical Specifications. Additional testing adds negligible safety benefit and provides no significant additional information to minimize the possibility of recurrence of this event.

Compensatory Actions Taken by GPUN to Assure OTSG Integrity

To assure the integrity of the A OTSG, GPUN has performed drip and bubble tests to identify all possible leaking tubes and completed eddy current testing of all tubes in the "lane wedge" area between the upper tube sheet and the 14th support plate. Except as noted above, all test and inspection results were satisfactory. Tubes A77-1 and A78-28 were plugged.

Safety Significance of the Waiver of Compliance

The requested Waiver of Compliance permits resumption of plant operation without completing all Technical Specification required ECT examinations of the affected OTSG. Rather, a focused ECT program has been performed which inspects all unplugged "lane wedge" area tubes, which OTSG industry experience has demonstrated are prone to the HCF failure mechanism. This ECT has been performed down to the 14th support plate which includes all of the HCF failure-prone tube portions. This inspection resulted in the indications noted above. A drip test of the entire OTSG was performed to provide additional confidence in the integrity of the tubes, and showed no problems. A post-repair bubble test will also be performed.

Industry experience indicates that the failure of tubes in the area of tube A77-1 are due to HCF. This mechanism is a rapid failure mechanism and precursors may exist only briefly before failure occurs. There is no method to predict failures with such a rapid development. Leakage monitoring is an effective and safe means of detection and operator action, achieves safe plant conditions. Repeating random ECT of the A OTSG outside the "lane wedge" area would provide no additional technical information relevant to the current failure mechanism.

Duration of the Waiver of Compliance (WOC)

It is requested that this WOC remain in effect until such time as the NRC approves the attached TSCR. Further, we request that the TSCR be processed on an exigency basis to support the plant operational schedule. We anticipate your approval of the TSCR within about 25 days of the date of this letter.

No Significant Hazards Considerations (NSHC) for the Waiver of Compliance

GPUN has concluded that no significant hazards considerations are created by this WOC in that:

1. The WOC does not involve a significant increase in the probability or consequences of OTSG tube rupture. All technically relevant ECT has been performed to identify tubes which may be affected by the HCF mechanism. Thus the probability and consequences of OTSG tube failure are not increased by waiving ECT in non-relevant regions of the OTSG.
2. The WOC does not create the possibility of a new or different kind of accident since OTSG tube ruptures have been evaluated and the WOC does not significantly change their nature, probability, or consequences.
3. The WOC does not involve a reduction in the margin of safety since it in no way reduces the required structural strength of the OTSG tubes or the reactor coolant system.

Environmental Considerations

The WOC has no impact on environmental consideration in that:

1. No changes in effluent limits or types are involved,
2. No changes in accident dose consequences or releases are involved,
3. No routine effluent releases are changed in granting of the WOC, and
4. No increase in power level is involved.

Finally, the Plant Review Group has reviewed this WOC pursuant to TS 6.5 and has concluded that it is acceptable.

High Cycle Fatigue Experience
Comparison Table

Industry Experience

1. Predominantly a "lane wedge" tube phenomenon in OTSGs.
2. Cracks at the secondary face of the upper tube sheet and/or 15th (upper most) tube support plate were secondary side initiated, oriented circumferentially and of ≥ 4 coils circumferential extent (when measured by 8x1 ECT probe).
3. On at least twelve prior occasions, tubes which previously had been tested by ECT and found free of defect indications at the UTS secondary face have subsequently leaked in service following resumption of plant operation.
4. Leaks in the lane wedge tubes due to environmentally assisted HCF have often occurred within 30 days after startup from a refueling or maintenance outage (on 7 occasions in ≤ 10 days after startup).

TMI-1 Experience

Tube A77-1 is a periphery tube immediately adjacent to the open tube lane.

Eddy current examination of A77-1 reports a through wall, circumferentially oriented crack at the secondary face of the upper tube sheet on all 8 coils of an 8x1 probe. Secondary side initiation cannot be established from the ECT data.

A77-1 was inspected on January 31, 1990 and found free of recordable indication of degradations at the UTS secondary face following both standard differential and 8x1 absolute ECT exams. Re-review of the January 1990 data with the knowledge of the failure location confirms this area to have no recordable indications of degradation.

A77-1 tube leak occurred within 3 days of the startup from the 8R Refueling outage. The short time to failure from a known defect free condition is consistent with the HCF failure mechanism. This is the first TMI-1 tube to fail via HCF.