

ATTACHMENT

FINAL

TECHNICAL EVALUATION REPORT ON
RESPONSE FROM
CLEVELAND ELECTRIC ILLUMINATING COMPANY
TO GENERIC LETTER 88-01
PERTAINING TO THE
PERRY NUCLEAR POWER PLANT

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ABSTRACT

This report contains an evaluation of the licensee (Cleveland Electric Illuminating Company) submittal for the Perry Nuclear Power Plant which was submitted in response to the NRC Generic Letter 88-01 in which Cleveland Electric was requested to: (1) Furnish their current plans relating to piping replacement and other measures to mitigate IGSCC, inspection, repair, and leakage detection. (2) Indicate whether they plan to follow the NRC Staff positions, or propose alternative measures. Cleveland Electric's plans are evaluated in Section 2 of this report in terms of compliance to NRC Staff positions. Section 3 contains an evaluation of an alternative position concerning a change to the Technical Specification on ISI and concerning exceptions to the NRC Staff position on leakage detection.

SUMMARY

The Licensee, Cleveland Electric Illuminating Company, submitted a response to the NRC Generic Letter 88-01. Cleveland Electric's response pertaining to the austenitic stainless steel piping in the Perry Nuclear Power Plant (a BWR nuclear power plant) was evaluated in terms of: (1) Their previous and planned actions to mitigate IGSCC to provide assurance of continued long-term service. (2) Their Inservice Inspection (ISI) Program. (3) Their Technical Specifications pertaining to ISI and their plans to ensure that leakage detection will be in conformance with the NRC Staff position. (4) Their plans to notify the NRC of significant flaws identified (or changes in the condition of the welds previously known to be cracked) during inspection.

Cleveland Electric endorse twelve (two with provisions) of the 13 NRC Staff positions which are outlined in Generic Letter 88-01. They proposed alternative positions to portions of the NRC Staff positions on leakage detection.

Most welds at Perry are IGSCC Category A as a result of design and construction practices that followed NRC Staff guidelines; however, welds in nozzle assemblies contain Inconel alloys and are considered nonresistant to IGSCC. SI treatments are being considered for these welds.

The ISI program proposed for Perry conforms with the NRC Staff position except for two provisions. Many welds have special geometrical contours due to corrosion resistant cladding. For these welds, they propose to supplement the recommended inspection procedures with special procedures developed for the CRC contours. The second provision applies to IGSCC Category D welds. They plan to inspect all of these welds every second outage rather than 50% each refueling outage. Also concerning ISI, Cleveland Electric presented an alternative position to the NRC Staff position requesting a change to the TS on ISI.

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1. INTRODUCTION

Intergranular stress corrosion cracking (IGSCC) near weldments in Boiling Water Reactor (BWR) piping has been occurring for almost 20 years. Substantial efforts in research and development have been sponsored by the BWR Owners Group for IGSCC Research, and the results of this program, along with other related work by vendors, consulting firms and confirmatory research sponsored by the NRC, have permitted the development of NRC Staff positions regarding the IGSCC problems. The technical basis for NRC Staff positions is detailed in Reference 1, and further background is provided in Reference 2.

The results of these research and development programs prompted the NRC to issue Generic Letter 88-01 (see Reference 3) requesting all licensees of BWR's and holders of construction permits to:

- (1) Furnish their current plans relating to piping replacement, inspection, repair, and leakage detection.
- (2) Indicate whether they:
 - (a) Plan to follow the staff positions, or
 - (b) Propose alternative measures.

Specifically, Generic Letter 88-01 stated that an acceptable licensee response would include the following items:

- (1) Current plans regarding pipe replacement and/or other measures taken or to be taken to mitigate IGSCC and provide assurance of continued long-term piping integrity and reliability.
- (2) An inservice inspection (ISI) program to be implemented at the next refueling outage for austenitic stainless steel piping.
- (3) A change to the Technical Specifications to include a statement

in the section on ISI that the inservice inspection program for piping will be in conformance with the staff positions on schedule, methods and personnel, and sample expansion.

- (4) Confirmation of plans to ensure that the Technical Specification related to leakage detection will be in conformance with the Staff position on leak detection.
- (5) Plans to notify the NRC, in accordance with 10CFR50.55a(o), of any flaws identified that do not meet IWB-3500 criteria of Section XI of the ASME Code for continued operation without evaluation, or a change found in the condition of the welds previously known to be cracked, and an evaluation of the flaws for continued used operation and/or repair plans.

This report contains a technical evaluation of the response which Cleveland Electric Illuminating Company (called either Cleveland Electric or CEI in this report) submitted in response to the NRC Generic Letter 88-01 pertaining to the Perry Nuclear Power Plant (hereafter called either Perry or PNPP).

2. EVALUATION OF RESPONSE TO GENERIC LETTER 88-01

This evaluation consisted of a review of the response to NRC Generic Letter 88-01 of January 25, 1988 by Cleveland Electric pertaining to Perry to determine if their performance and plans are in conformance with the NRC Staff positions or if proposed alternatives are acceptable. Proposed inspection schedules and amendments to the Technical Specification were included in the review.

2.1 Documents Evaluated

Review was conducted on the information pertaining to Perry provided by the Licensee in the following documents.

- (1) "Response to Generic Letter 88-01, Docket No. 50-440, Perry Nuclear Power Plant," PY-CEI/NRR-0894 L, Cleveland Electric Illuminating Company, P.O. Box 97, 10 Center Road, Perry, Ohio, 44801, July 29, 1988.
- (2) "Perry Nuclear Power Plant, Docket No. 50-440, Generic Letter 88-01, Extension Request and Response Clarification," PY-CEI/NRR-1027 L, Cleveland Electric Illuminating Company, P.O. Box 97, 10 Center Road, Perry, Ohio, 44801, June 15, 1989.
- (3) "Perry Nuclear Power Plant, Docket No. 50-440, (Response to) Request for Additional Information on Generic Letter 88-01 (IGSCC) TAC No. 69152," PY-CEI/NRR-1044 L, Cleveland Electric Illuminating Company, P.O. Box 97, 10 Center Road, Perry, Ohio, 44801, ~~June 2, 1989.~~ July 31, 1989

Hereafter, in this report, these documents will be referred to as the Cleveland Electric Submittals No. 1, No. 2, and No. 3, respectively, and collectively as the Cleveland Electric Submittals.

2.2 Review of Cleveland Electric Illuminating Co.'s Responses to Staff Positions and Implementation of Those Positions.

Generic Letter 88-01 outlines 13 NRC Staff positions pertaining to (1) materials, (2) processes, (3) water chemistry, (4) weld overlay, (5) partial replacement, (6) stress improvement of cracked weldments, (7) clamping devices, (8) crack evaluation and repair

criteria, (9) inspection methods and personnel, (10) inspection schedules, (11) sample expansion, (12) leak detection, and (13) reporting requirements. Generic Letter 88-01 states that the licensee should indicate in their submittal whether they endorse these NRC Staff positions or propose alternative positions. Cleveland Electric Submittal No. 3 contains a table that presents their position on the 13 NRC Staff positions, and Table 1 of this report was constructed using information from that table.

Note that Cleveland Electric indicated acceptance of twelve of the thirteen NRC Staff positions, although they indicated that they have applied provisions to two of those positions (i.e., that pertaining to Inspection Methods and Personnel and that pertaining to Inspection Schedules). As discussed in Section 2.5 of this report those provisions are acceptable.

Concerning inspections, although not indicated in Table 1, Cleveland Electric proposed an alternative to the NRC Staff request to amend the Technical Specification on ISI to include a statement that their ISI program will comply with the NRC Staff position on schedules, methods and personnel, and sample expansion. This alternative position is discussed in Section 3.1 of this report.

It may also be noted from Table 1 that Cleveland Electric proposed alternative positions pertaining to portions of the NRC Staff positions concerning leakage detection. These alternative positions are discussed in Section 3.2 of this report.

Table 1

Summary of Cleveland Electric's Responses to Staff Positions

Staff Position	CEI Accepts NRC Staff Position	CEI Has/Will	
		Applied In Past	Consider for Future Use
1. Materials	yes	yes	yes ^(a)
2. Processes	yes	yes ^(a)	yes
3. Water Chemistry	yes	no	yes
4. Weld Overlay	yes	no	yes
5. Partial Replacement	yes	no	yes
6. Stress Improvement of Cracked Weldments	yes	no	yes
7. Clamping Devices	yes	no	yes
8. Crack Evaluation and Repair Criteria	yes	no	yes
9. Inspection Method and Personnel	yes ^(b)	yes	yes
10. Inspection Schedule	yes ^(b)	no	yes
11. Sample Expansion	yes	no	yes
12. Leak Detection	see (c)	see (c)	see (c)
13. Reporting Requirements	yes	no	yes

(a) Welds in most stainless steel piping is conforms to NRC Staff requirements for resistance to IGSCC, but this was achieved by extensive used of SHT and CRC. Exceptions are 25 Inconel welds between pressure vessel nozzles and safe-ends. Stress improvement is being considered for these welds.

(b) Provisions applied. See text for discussion.

(c) CEI proposed alternatives to some portions of NRC Staff position on leakage detection. See text for discussion.

2.3 Review of Classification of Welds, Previous Mitigating
Actions, and Previous Inspections

2.3.1 Scope of Generic Letter 88-01

Generic Letter 88-01 defines its scope of coverage as follows:

"This Generic Letter applies to all BWR piping made of austenitic stainless steel that is four inches or larger in nominal diameter and contains reactor coolant at a temperature above 200°F regardless of Code classification. It also applies to reactor vessel attachments and appurtenances such as jet pump instrumentation penetration assemblies and head spray and vent components."

In a Request for Information, Cleveland Electric was specifically asked, among other things, whether they had excluded any piping (such as the portion of piping in the RWCU that is outboard of the isolation valves) from their reply to Generic Letter 88-01. Cleveland Electric did not respond to that question in their replies to the RAI (Cleveland Electric Submittals Nos. 2 and 3). Thus, it is assumed that the piping discussed in the following sections constitutes all of the piping within the scope of Generic Letter 88-01.

2.3.2 Materials in Piping Systems

Cleveland Electric Submittal No. 1 states the following:

"... The stainless steel piping at Perry was fabricated, welded, inspected, and controlled as described in Sections 5.2.4 and 5.2.5 of the Perry SER (NUREG) 0887 and its supplements 5 and 7. With the exception of inconel weld

metal, CEI finds no significant difference in material at Perry and the Generic Letter 88-01 requirements for reactor coolant pressure boundary materials."

Cleveland Electric Submittal No. 2, in elaborating on measures that were taken during construction of the piping systems to provide protection from IGSCC, states the following:

"Recirculation piping was made resistant to IGSCC by application of corrosion resistant cladding followed by solution annealing. The recirculation inlet safe-ends and thermal sleeves were replaced with 316L austenitic stainless steel material having a no-crevice design."

"The standby liquid control system piping is fabricated from Type 316L stainless steel."

"Other reactor coolant pressure boundary and engineered safety feature piping, except NSSS-supplied systems and the standby liquid control system, is fabricated from Type 304 stainless steel. Individual pipe lengths and fittings have been procured in the solution-annealed condition under ASME Specifications SA-312, SA-376, and SA-403 and are, therefore, not sensitized. Additionally, the following weld methods are employed for all pipe sizes: (a) Weld heat input is controlled to limit the material heat flux values to avoid the conditions that cause excessive sensitization. (b) Weld interpass temperatures are limited to a maximum of 350°F, and the weld weave pattern is limited to a maximum of four times the core wire diameter to control the heat build-up which contributes to excessive sensitization. (c) Weld procedures also conform to the guidelines of Regulatory

Guide 1.44, 'Control of the Use of Sensitized Stainless Steel.'

2.3.3 Materials in Nozzle to Safe-End Welds

Cleveland Electric Submittal No. 1 states that twenty-five Inconel 182 welds exist at Perry between the reactor vessel nozzles and safe-ends. These welds have been classified by Cleveland Electric as IGSCC Category D (as noted below, the classifications of most of these were subsequently changed to IGSCC Category G). These welds are identified as items B5.10 and B5.20 in the Perry ten year ISI Program Plan (Document No. ISI-GEN-T2004 Rev. 0, dated January 21, 1987, Section 13-A, pages 51-55, submitted by PY-CEI/NRR-0614 on March 31, 1987)

These welds were reclassified to IGSCC Category G in Cleveland Electric Submittal No. 2, which contains the following explanation:

"Generic Letter 88-01 reflected recent industry concerns with certain Inconel materials used in the welding process. In our original response we therefore determined that the 25 reactor vessel nozzle to safe-end welds were fabricated of IGSCC sensitive material due to the use of Inconel 182 in weld preparation ('buttering') of the nozzles and the pipe ends. These 25 welds were classified 'D' (non-resistant material, no stress improvement) in our response to the Generic Letter. In performing our review for the RAI with regard to weld inspection methods and qualifications, we have determined that the categorization of these reactor vessel nozzle to safe end welds should be IGSCC Category G as defined in Sections 5.2.1 and 5.3.1 of NUREG 0313 Revision 2. These

welds are listed in the attached tabulation (a preliminary draft of RAI response)."

The tabulation of welds mentioned in the above paragraph was duplicated in Cleveland Electric Submittal No. 3 and is summarized in the following section.

2.3.4 Summary of IGSCC Classifications, Materials, and Mitigating Treatments

Cleveland Electric Submittal No. 3, which was submitted in response to a Request for Additional Information (RAI), contains a list of welds that are included in the Perry IGSCC program. They listed a total of 302 welds; however, 154 of those are longitudinal seam welds which are not within the scope of Generic Letter 88-01. A summary of the number of welds, excluding the longitudinal seam welds, their IGSCC classifications, and mitigating treatments is contained in Table 2 of this report.

2.3.5 Previous Inspection Programs

Cleveland Electric Submittal No. 1 does not disclose their previous inspection schedule; however, those inspections are discussed in Cleveland Electric Submittal No. 2 and 3.

Cleveland Electric Submittal No. 2 states:

"The Perry Unit 1 Preservice Inspection (PSI) program scope of examinations, procedures, and acceptance criteria was based on the requirements of ASME Code, Section XI, 1977 Edition with Addenda through Summer 1978. The extent of examination was determined by the requirements of

Table 2

Summary of IGSCC Classifications, Materials,
and Mitigating Treatments at Perry

IGSCC Category	No. of Welds	No. of Welds With Conform. Material	No. of Welds With Indicated Treat.	
			CRC	SHT
A	121	6	51	64
B	0	-	-	-
C	0	-	-	-
D	2	-	-	-
E	0	-	-	-
F	0	-	-	-
G	26	0	0	0
Total	148	6	51	64

ASME Code, Section XI, 1974 Edition with Addenda through
Summer 1975."

In addressing the 25 nozzle to safe-end welds, Cleveland
Electric Submittal No. 2 states:

"These welds have been previously inspected per ASME
Code criteria. Of 25 reactor vessel nozzle safe-end
welds, 22 were examined during preservice inspection
using automated ultrasonic equipment. ... The other 3
welds were manually examined. There were no reportable
UT indications."

More specific information concerning previous inspections at Perry is contained in Cleveland Electric Submittal No. 3 which provides a list of inspection dates for all welds. Included are both preservice inspection dates and inspections during Refueling Outage No. 1. This information is summarized in Table 3 and in the following paragraphs.

IGSCC Category A Welds: All 121 of these welds were given preservice inspections. Six of these were conducted in 1983, seven were conducted in 1984, and the remaining 108 were conducted in 1985.

IGSCC Category D Welds: These two welds which are located at the jet pump instrument nozzle safe end to penetration seal were both inspected during Refueling Outage No. 1. Methods and Personnel were in conformance with guidelines provided in NUREG 0313, Revision 2.

IGSCC Category G Welds: All 25 of these welds received preservice inspections in 1984. Cleveland Electric elected to classify these welds as IGSCC Category G despite those inspections because Methods and Personnel utilized in those inspections were not in conformance with guidelines provided in NUREG 0313, Revision 2. As noted later, this action has no effect on the long term examination schedules.

2.3.6 Evaluation of Previous Mitigating Actions and Inspections and Recommendations

Cleveland Electric has followed the guidelines of NUREG 0313, Revision 2 in the construction of the piping systems at Perry with the result that all welds in piping are IGSCC Category A welds. In addition, Cleveland Electric followed previously

Table 3

Summary of Inspection Schedules for Perry

IGSCC Categ	No. in Categ	No. Inspected/Scheduled ^(a) During Indicated Outage									Required by Generic Letter 88-01
		Past			Future						
		83	84	85	RF1	RF2	RF3	RF4	RF5	RF6	
A	121	6	7	108	3	24	7	8	8	7	25% every 10 years (at least 12% in 6 years)
B	0	-	-	-	-	-	-	-	-	-	50% every 10 years (at least 25% in 6 years)
C	0	-	-	-	-	-	-	-	-	-	All within the next 2 refueling cycles, then all every 10 years (at 50 % in 6 years)
D	2 (see note b)				2						All every 2 refueling cycles
E	0	-	-	-	-	-	-	-	-	-	50% next refueling cycle, then all every 2 refueling cycles
F	0	-	-	-	-	-	-	-	-	-	All every refueling outage
G	25	0	0	25	0	25				(see note c)	All next refueling cycle

(a) The 1983, 1984, and 1985 inspections were preservice inspections. Refueling Outage (RF) No. 1 occurred in the Spring, 1989. Perry is on an 18 month fuel cycle, but the actual dates of future refueling outages were not provided.

(b) IGSCC Category D welds may have received preservice inspections, but this was not disclosed in the Cleveland Electric Submittals.

(c) IGSCC Category G welds will be reclassified as IGSCC Category D following inspections during Refueling Outage No. 2 (assuming no flaws are found). SI may be applied to IGSCC Category D and IGSCC Category G welds. Inspection schedules after Refueling Outage No. 2 will follow the NRC Staff guidelines for the IGSCC classification(s) that are applicable at that time.

accepted practices for 27 nozzle welds in the use of Inconel alloys. However, these welds are not considered to be resistant to IGSCC. Cleveland Electric conservatively elected to classify most of these as IGSCC Category G even though they received preservice inspections. Acceptance of Cleveland Electric's classification of the welds at Perry is recommended.

2.4 Current Plans for Mitigating Actions

2.4.1 Summary of Plans

Cleveland Electric has no specific plans for future mitigating actions except for possible application of stress improvement to non-resistant welds as discussed below.

2.4.2 Stress Improvement

Stress improvement treatments of nozzle to safe-end welds are under consideration, concerning which Cleveland Electric Submittal No. 2 states:

"Perry is still evaluating mechanical stress improvement (SI) on these nozzles for the second refueling, which would place the subject welds in Category C (nonresistant materials, stress improvement after 2 years of operation) if satisfactorily completed and inspected."

2.4.3 Evaluation of Conformance to Staff Positions and Recommendation

Stress improvement is being considered for the 25 non-resistant welds (i.e., the nozzle to safe-end welds)

and all other welds within the scope of Generic Letter 88-01 are already IGSCC Category A welds. In addition, as discussed in the Section 2.5 of this report, inspection plans comply with NRC Staff guidelines. Thus, acceptance of Cleveland Electric's plans is recommended.

2.5 Plans for Future Inspections

2.5.1 Summary of Inspection Schedule

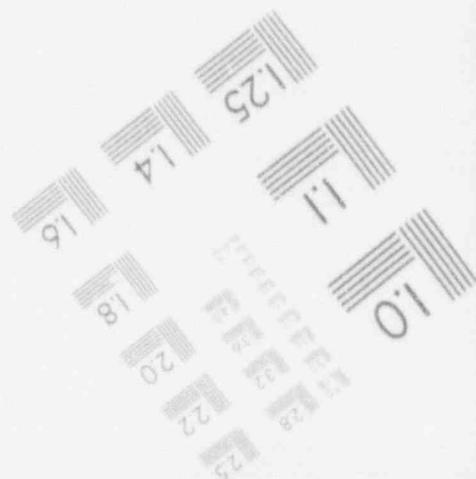
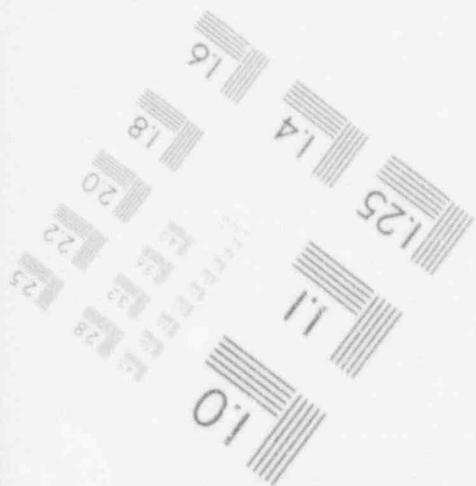
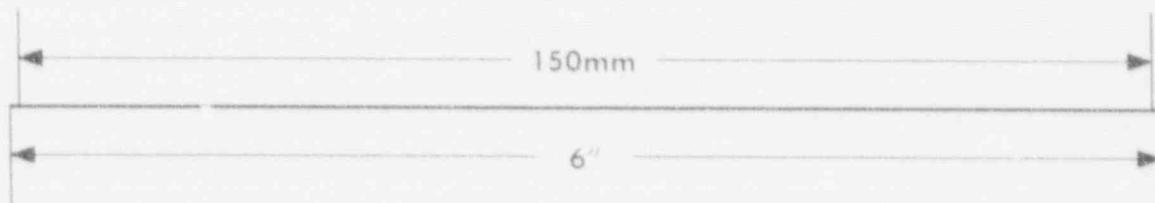
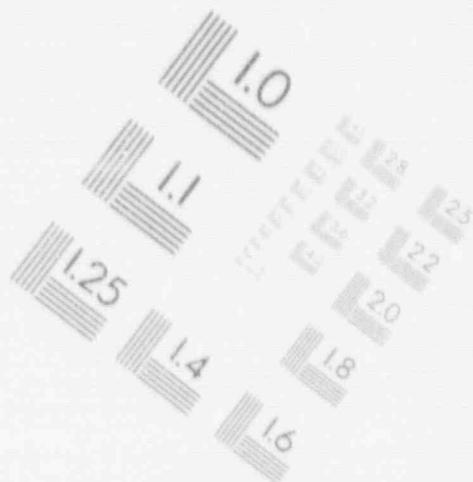
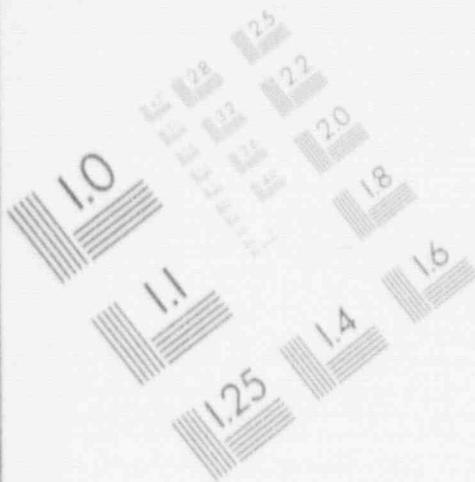
Cleveland Electric Submittal No. 1 states that the requirements for IGSCC Category A welds will be incorporated into the ISI Program plan, and that plan will reflect commitments to Generic Letter 88-01. In addition Cleveland Electric Submittal No. 1 states that an augmented inspection program will be instituted for the 25 nozzle to safe-end welds that will comply with Generic Letter 88-01.

Cleveland Electric Submittal No. 3 contains a detailed list (on a weld-by-weld basis) of inspection plans for welds within the IGSCC program. These plans are summarized in Table 3 (along with the summary of past inspections that were discussed previously) and in the following paragraphs. Table 3 also contains summaries of the inspection requirements for each IGSCC category as delineated in Generic Letter 88-01.

IGSCC Category A Welds: Fifty-seven of the 121 IGSCC Category A welds are scheduled for inspection during the inspection period (Refueling Outage Nos. 1 through 6). This represents 47% of the welds which is considerably in excess of the 25% required by Generic Letter 88-01.

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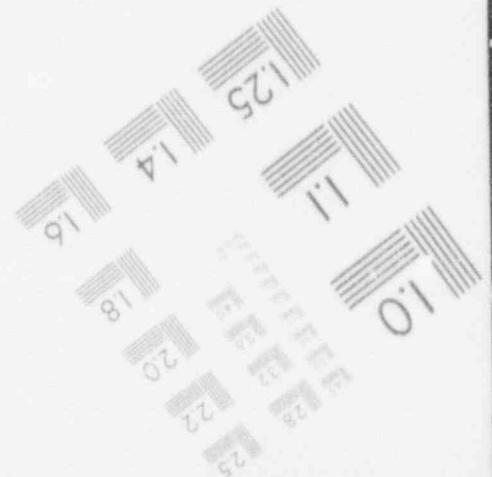
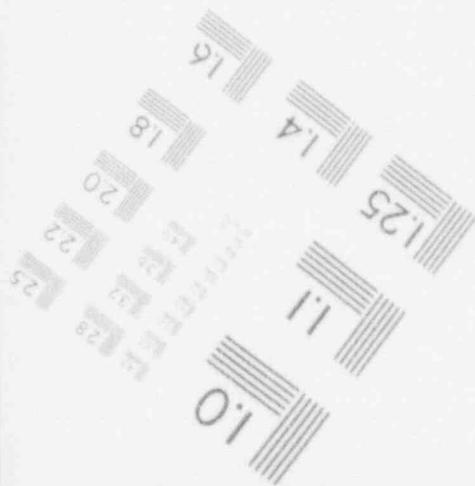
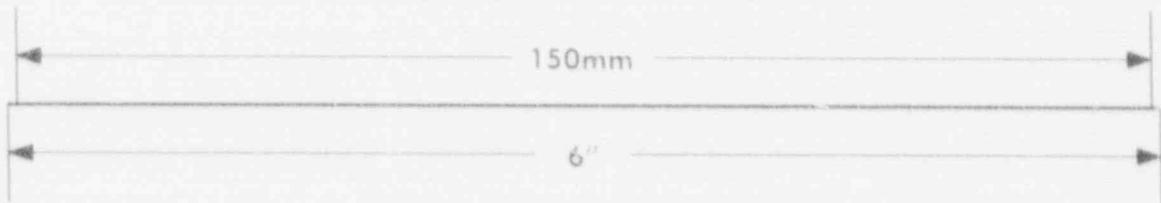
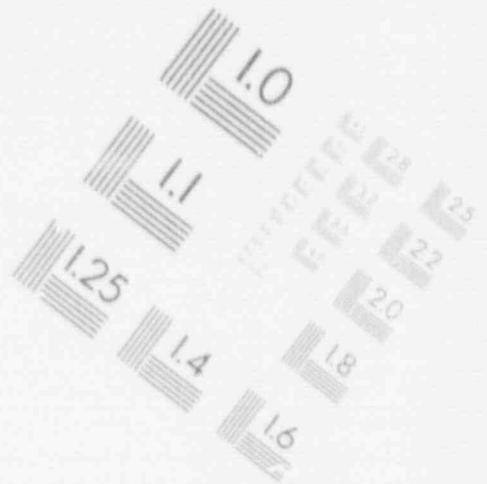
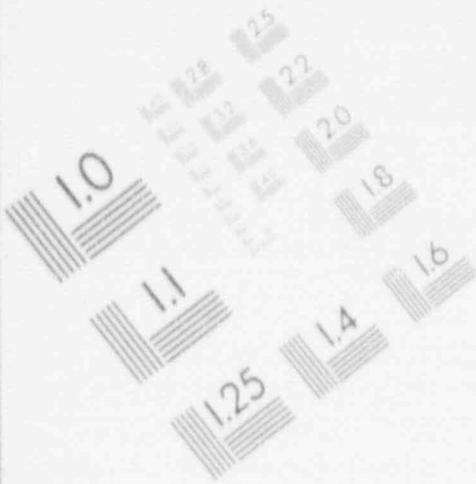
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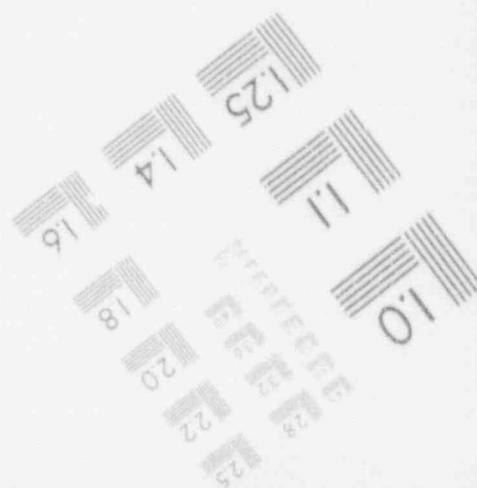
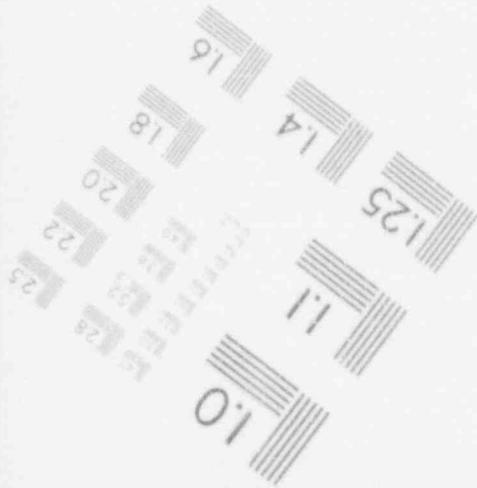
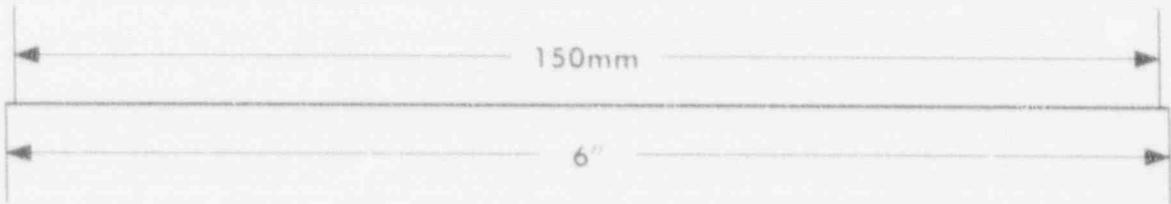
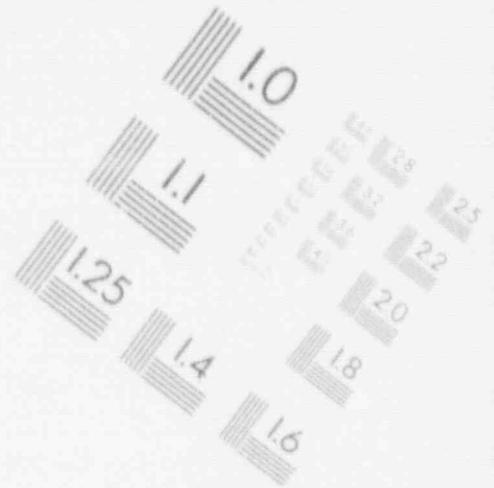
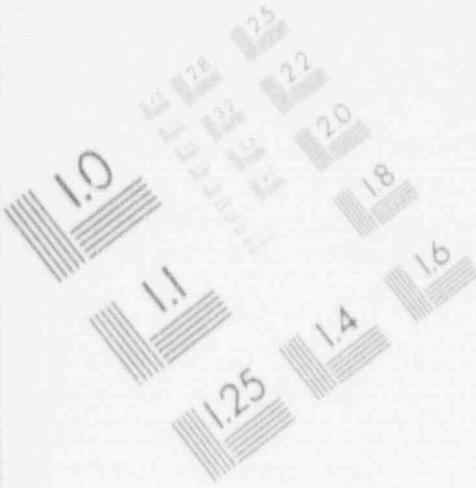
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IMAGE EVALUATION TEST TARGET (MT-3)



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IGSCC Category D and IGSCC Category G Welds: All of these non-resistant welds will be inspected during the second refueling outage. Thereafter, the IGSCC Category G welds will be reclassified as IGSCC Category D, and all IGSCC Category D welds will be reviewed for Stress Improvement (SI) treatments. If SI treatments are not applied, Cleveland Electric plans to inspect all of these welds every second refueling outage. Note that this is a deviation from NRC Staff guidelines as delineated in paragraph 5.3.2.4 of NUREG 0313, Revision 2 which suggests that half of the IGSCC Category D welds should be inspected during each refueling outage. This deviation constitutes the provision applied to inspection schedules that was noted in Section 2.2 and Table 1 of this report.

Cleveland Electric Submittal No. 3 contains the following statement of that provision:

"PNPP has 25 reactor vessel nozzle to safe-end welds which are presently categorized as 'C', and subsequently scheduled for ultrasonic examination during the second refueling outage (tentatively scheduled for the fall of 1990). Following the RF2 scheduled examinations, if IGSCC has not occurred if SI has not been applied, the nozzle safe-end welds will be reclassified as category 'D'. Any Category 'D' welds would be scheduled for in-service inspections in accordance with NUREG 0313 revision 2 with an Exception of the recommendation to perform the examinations on half of the nozzles every refueling outage. PNPP proposes to examine 100% of the category 'D' welds every other refueling outage with no mid-term examinations unless the areas are made accessible due to other work related activities occurring during the refueling outage."

Cleveland Electric Submittal No. 2 contains the following information pertaining to inspection plans of nozzle welds.

"Regarding the inspection interval for non-resistant material without stress improvement, the recommendation is to perform inspections every 2 refueling cycles once a determination is made that no IGSCC indications are present. The Perry Nuclear Power Plant is still a 'young' plant, having finished only one fuel cycle after initial testing. Prior to plant operation, the Perry safe-end welds could not have been subject to IGSCC conditions, and therefore were acceptable from an IGSCC standpoint. Therefore, the first inspection of the subject welds can be scheduled for the second refueling outage, consistent with our original decision to perform these inspections at that time."

"Discussions with our NSSS vendor indicated that IGSCC of Inconel 182 material typically does not occur until after at least six years of operation. Recent experience has shown that the earliest any limited occurrence of IGSCC has been found is after completion of the initial two fuel cycles."

2.5.2 Inaccessible Welds

No inaccessible welds are listed in the Cleveland Electric Submittal No. 1 for Perry.

2.5.3 Methods and Personnel

Recall from Section 2.2 and Table 1 of this report that Cleveland Electric endorses the NRC Staff position pertaining to methods and personnel, although they applied a provision.

Specifically, Cleveland Electric Submittal No. 3 states:

"Each weld will receive a basic Section XI examination. Welds containing corrosion resistant cladding (CRC) will receive an augmented examination developed specifically to examine the unique weld configurations. Welds without CRC will receive an augmented IGSCC examination."

"The exception applies to the examination techniques used on welds which have the CRC application. As noted in the Staff Position on Materials, welds with CRC are considered resistant to IGSCC, and this unique CRC weld configuration makes the application of an IGSCC examination method ineffective. Therefore, a specialized ultrasonic examination technique was developed by the pre-service NDE vendor. The technique was demonstrated at the EPRI NDE Center in Charlotte, North Carolina. The procedure was reviewed and approved by the Site ANII and reviewed by the Region III NDE Inspector prior to utilization."

2.5.4 Sample Expansion

The Cleveland Electric Submittals did not contain descriptions of plans for sample expansion; however, Cleveland Electric did indicate that their endorsement of the NRC Staff position would be incorporated into the Inservice Inspection program for Perry.

2.5.5 Evaluation and Recommendation

Cleveland Electric' position concerning inspection schedules comply with the NRC Staff position with the minor provision that IGSCC Category D welds will all be inspected every two

refueling outages (rather than half each refueling outage). This is an acceptable provision. Their position concerning inspection methods and personnel complies with the NRC Staff position with the provision that improved inspection techniques have been developed and will be applied to the inspection of welds that have been clad (CRC). This is an acceptable provision. Their position pertaining to sample expansion complies with the NRC Staff position. Thus, acceptance of Cleveland Electric's positions pertaining to inspection schedules, methods and personnel, and sample expansion is recommended.

2.6 Changes in the Technical Specification Concerning ISI

Cleveland Electric proposed an alternative position to the NRC Staff position concerning a change to the Technical Specification to include a statement that their ISI program will comply with the NRC Staff position on inspection schedules, methods and personnel, and sample expansion. This alternative position is discussed in Section 3 of this report.

2.7 Confirmation of Leak Detection in the Technical Specification

Table 4 of this report provides a summary of Cleveland Electric's position on requirements for leakage detection that are delineated in Generic Letter 88-01. Note that Cleveland Electric indicates conformance with a portion of the requirements. However, since they also proposed alternative positions on a portion of the leakage requirements, discussion of the entire subject of leakage detection is deferred in this report to Section 3, "Alternative Positions and Exceptions."

Table 4

Licensee Positions on Leakage Detection^(a)

<u>Position</u>	<u>Already Contained in TS</u>	<u>TS will be Changed to Include</u>	<u>Alternate Position Proposed</u>
1. Conforms with Position C of Regulatory Guide 1.45	yes	-	-
2. Plant shutdown should be initiated when:			
(a) within any period of 24 hours or less, an increase is indicated in the rate of unidentified leakage in excess of 2 gpm, or	-	-	yes
(b) the total unidentified leakage attains a rate of 5 gpm.	yes	-	-
3. Leakage monitored at four hour intervals or less.	-	-	yes
4. Unidentified leakage includes all except:	yes	-	-
(a) leakage into closed systems, or			
(b) leakage into the containment atmosphere from sources that are located, do not interfere with monitoring systems, or not from throughwall crack.			
5. Provisions for shutdown within 24 hours due to inoperable measurement instruments in plants with Category D, E, F, or G welds.	-	-	yes

(a) See text for discussions concerning alternate proposals and other comments.

2.8 Plans for Notification of the NRC of Flaws

Generic Letter 88-01 requests the following:

"In accordance with 10CFR50.55(o), your plans to notify the NRC of any flaws identified that do not meet IWB-3500 criteria of Section XI of the Code for continued operation without evaluation, or a change found in condition of the welds previously known to be cracked, and your evaluation of the flaws for continued operation and/or your repair plans."

2.8.1 Cleveland Electric's Position

The Cleveland Electric Submittal No. 1 states:

"CEI confirms that such notification will be provided."

2.8.2 Evaluation and Recommendation

Cleveland Electric's plans for reporting of flaws complies with the NRC Staff position, so it is recommended that the plans for reporting of flaws should be accepted.

3. ALTERNATIVE POSITIONS AND EXCEPTIONS

3.1 Alternative Position Concerning ISI in the Technical Specification

3.1.1 NRC Staff Position

Generic Letter 88-01 requires each licensee to change their Technical Specifications to include a statement in the section on ISI that the Inservice Inspection Program for piping

covered by the scope of that letter will be in conformance with the NRC Staff position on schedule, methods and personnel, and sample expansion.

3.1.2 Cleveland Electric's Position

Cleveland Electric Submittal No. 1 states:

"CEI plans to incorporate these changes in the ISI program."

"The commitment for performing ISI related examination is presently documented in both the PNPP 10-year Inservice Inspection Plan in addition to Sections 3.4.8 and 4.0.5 of the plant Technical Specifications. The examination requirements pertaining to the IGSCC Category A and D material of the Generic Letter will be incorporated into the ISI Program Plan ... rather than adding a generic statement to the Technical Specifications. This alternative method of documenting specific commitments to the Generic Letter recommendations will properly control the activities conducted under the ISI program at PNPP."

3.1.3 Evaluation and Recommendation

Generic Letter 88-01 discloses that the Inservice Inspection and Testing Sections may be removed from the Technical Specifications (TS) and included in the ISI Program in the future. Despite this consideration, the NRC Staff specifically included a requirement in Generic Letter 88-01 to change the TS to include a statement that the ISI program will conform with the NRC Staff position on inspection. Thus rejection of the Cleveland Electric position

is recommended, and the Technical Specification for Perry should be changed to include the required statement on ISI.

3.2 Leakage Detection in the Technical Specification

3.2.1 Conformance with Regulatory Guide 1.45

Generic Letter 88-01 states:

Leakage detection systems should be in conformance with Position C of Regulatory Guide 1.45 'Reactor Coolant Pressure Boundary Leakage detection Systems,' or as otherwise previously approved by the NRC."

Cleveland Electric Submittal No. 3 states that the Perry Technical Specification in conformance with this provision as previously reviewed and approved by the NRC.

3.2.2 Leakage Limits

Generic Letter 88-01 states:

"Plant shutdown should be initiated for inspection and corrective action when, within any period of 24 hours or less, any leakage detection system indicates an increase in rate of unidentified leakage in excess of 2 gpm or its equivalent, or when the total unidentified leakage attains a rate of 5 gpm or equivalent, whichever occurs first."

Note from Table 4 that the Perry Technical Specification contains requirements that conform with the NRC Staff position concerning the 5 gpm total unidentified leakage. However,

Cleveland Electric Submittal No. 3 contains the following statement:

"The Perry Plant is already restricted to 5 gpm leakage from unidentified sources by the Technical Specifications. This limit is shown to be quite conservative by USAR Section 5.2.5.5 which identifies that this 5 gpm leakage rate is a small fraction of the calculated flow from a critical crack in a primary system pipe. Should a leak develop for whatever reason, this current limit is considered sufficient to allow for plant shutdown to investigate. PNPP has just completed its first refueling outage, and the PNPP reactor coolant pressure boundary had no evidence of cracking from either preservice examinations or from inservice examinations performed during the refuel outage. Industry experience has shown that IGSCC cracking is not yet a safety concern for a plant such as PNPP, at least through the end of the second fuel cycle. ... Stress improvement is still under consideration for welds currently not considered resistant to IGSCC. Should CEI elect to apply Stress Improvement techniques to these welds during the second refuel outage, then all welds at PNPP would be considered resistant to IGSCC. If Stress Improvement is not chosen to be performed on the subject welds during upcoming refueling outages, CEI would consider the addition of the NRC recommended Technical Specification requirement associated with service sensitive IGSCC materials that imposes a shutdown if leakage rates increase 2 gpm over a 24-hour period. Again, CEI intends to consider this Technical Specification change in conjunction with evaluation of Stress Improvement. As a minimum, however, this requirement would have to allow for reestablishing background rates of leakage during plant startups."

3.2.3 Frequency of Leakage Monitoring

Generic Letter 88-01 states:

"For sump level monitoring systems with fixed-measurement-interval methods, the level should be monitored at approximately 4-hour intervals or less."

Cleveland Electric Submittal No. 3 states the following:

"This recommendation is not applicable to PNPP. ... Leakage into the drywell floor drain sump (unidentified leakage) at PNPP is continuously monitored by instrumentation which records the rate of fill of the sump and provides an alarm in the control room as leakage approaches Technical Specification limits. This leakage flow rate is also monitored by control room operators every shift (approximately every 8 hours) in order to ensure meeting the Technical Specification 12-hour surveillance requirement. If the alarm is activated/Tech Spec limits are approached, close monitoring of this flow rate is initiated as a result of administrative controls."

3.2.4 Definition of Unidentified Leakage

Generic Letter 88-01 states:

"Unidentified leakage should include all leakage other than: (a) leakage into closed systems, such as pump seal or valve packing leaks that are captured, flow metered, and conducted to a sump or collection tank, or (b) leakage into the containment atmosphere from sources that are both specifically located and known either not to

interfere with the operations of unidentified leakage monitoring systems or not to be from a throughwall crack in the piping within the reactor coolant pressure boundary."

As indicated in Table 4, the Perry Technical Specification conforms with this position.

3.2.5 Operability of Monitoring Instruments

Generic Letter 88-01 states:

"For plants operating with any IGSCC Category D, E, F, or G welds, at least one of the leakage measurement instruments associated with each sump shall be operable, and the outage time for inoperable instruments shall be limited to 24 hours, or immediately initiate an orderly shutdown."

As indicated in Table 4, Cleveland Electric proposed an alternative position on this item. Specifically, Cleveland Electric Submittal No. 3 states:

"As discussed ... above, IGSCC cracking is not yet a safety concern for PNPP at least through the end of the second fuel cycle, and Stress Improvement is still under consideration for implementation on Category D, E, F or G welds. If CEI elects to apply Stress Improvement to these welds, then no Category D, E, F or G welds would exist and this recommendation would clearly not apply. Even if Stress Improvement is not performed on these welds, PNPP's design includes the use of upper drywell cooler condensate flow rate monitors which eliminate the need to implement this recommendation at PNPP. These

condensate flow rate monitors have the capability to identify leaks with an accuracy of 1 gpm within 1 hour and since reactor coolant leakage flashes to steam at the atmospheric pressure in the drywell free space, these drywell cooler condensate flow monitors perform essentially the same function as the floor drain sump flow rate measurements (with a correction for steam condensed on other equipment). PNPP Technical Specifications have always allowed a 30-day out-of-service Action Statement for floor drain sump inoperability based on the assumption that the other leak detection systems would provide adequate indication; this assumption was made a requirement through a recent Technical Specification amendment that required that the drywell cooler condensate flow monitor be operable if the floor drain instrumentation was not. If both systems are inoperable, a 12 hour shutdown is imposed by Technical Specifications. Therefore, a 24 hour out-of-service Action Statement for loss of floor drain instrumentation is not necessary at PNPP."

3.2.6 Evaluation and Recommendations

Cleveland Electric's positions concerning compliance with Regulatory Guide 1.45, limits on the total unidentified leakage of 5 gpm, and description (or definition) of unidentified leakage comply with NRC Staff guidelines. Thus, acceptance of these positions is recommended.

Concerning the requirement for limiting the increase of the unidentified leakage to 2 gpm over a 24 hour period, Cleveland Electric's proposal is not acceptable. The NRC Staff, in the development of this proposal concluded that limiting the total unidentified leakage to 5 gpm (without imposing

a restriction of the rate of increase of unidentified leakage) is not sufficiently conservative. Furthermore, this requirement was included in Generic Letter 88-01 even though the NRC Staff realized that all welds at some plants would be IGSCC Categories A, B, and C. Thus, rejection of Cleveland Electric's position on this item is recommended. It is further recommended that Cleveland Electric should amend the Perry Technical Specification to require a maximum rate of increase of unidentified leakage as delineated in Generic Letter 88-01 and quoted in Section 3.2.2 of this report.

Concerning requirements for frequency of leakage measurement: Even though Perry continuously monitors the unidentified leakage, the recording of this rate by control room operators every eight hours is inadequate. It is recommended, therefore, that the Technical Specification should be amended to require that operators record the unidentified leakage approximately every 4 hours or less, as required by Generic Letter 88-01.

Cleveland Electric's position pertaining to requirements for operability of measurements instruments is not acceptable. The alternative methods of leakage measurement available at Perry provide accuracy of 1 gpm within 1 hour. This is inadequate to measure an increase of unidentified leakage in a 24 hour period of 2 gpm. Thus, Cleveland Electric should either modify the Perry Technical Specification or proceed with actions to apply mitigating actions to eliminate the 27 IGSCC Category D and G welds.

4. CONCLUSIONS AND RECOMMENDATIONS

Concerning the thirteen NRC Staff positions as delineated in Generic Letter 88-01: Cleveland Electric endorses twelve of the thirteen NRC Staff positions (i.e., those pertaining to materials, processes, water chemistry, weld overlay, partial replacement, stress improvement of cracked weldments, clamping devices, crack evaluation and repair criteria, inspection methods and personnel, inspection schedule, sample expansion, and reporting requirements), although they presented provisions to the items on inspection schedules and on methods and personnel. They presented exceptions to one of the positions (i.e., that pertaining to leakage detection).

Design and construction at Perry was patterned after NRC Staff guidelines with the result that most welds (121 out of a total of 148) are IGSCC Category A welds. Fifty one of the IGSCC Category A welds were solution heat treated, sixty-four were clad with corrosion resistant cladding, and six were constructed with corrosion resistant materials. Twenty-seven welds in nozzle assemblies contain non-resistant Inconel alloys. Two of these were inspected during the first refueling outage and are classified as IGSCC Category D. Preservice inspections were performed on the other non-resistant welds, but they are classified as IGSCC Category G welds. Specific plans for future mitigating actions have not been formulated; however, stress improvement treatments are being considered for the 27 welds that are classified as IGSCC Categories D and G.

An inservice inspection program (ISI) has been developed for Perry which complies with the requirements of Generic Letter 88-01 (with certain provisions) pertaining to schedule, methods and personnel, and sample expansion. One provision pertains to inspection schedules for IGSCC Category D and G welds. As required by Generic Letter 88-01, all of the IGSCC Category G welds will be inspected during the next refueling outage (and then reclassified as IGSCC Category D,

assuming no flaws are found). Also following requirements of Generic Letter 88-01, all IGSCC Category D welds will be inspected every two refueling outages, but these inspections are planned for every second outage rather than 50% each refueling outage as suggested by NUREG 0313, Revision 2.

The second provision pertains to IGSCC Category A welds that have been clad with corrosion resistant cladding. Inspections of these welds, as with other welds, will follow NRC Staff guidelines for methods and personnel, but they will be supplemented with special techniques developed for the CRC weld configuration that was demonstrated at the EPRI NDE Center at Charlotte, NC, approved by the Site ANII, and reviewed by the Region III NDE inspector.

Cleveland Electric declined to change the Technical Specification on ISI. Rather they proposed to include such a statement in the Inservice Inspection Program. Such action was specifically rejected in Generic Letter 88-01.

Cleveland Electric proposed alternative positions to portions of the NRC Staff position pertaining to leakage detection. The Perry Technical Specification requires plant shutdown (as required by Generic Letter 88-01) when the unidentified leakage exceeds 5 gpm. They consider this requirement is sufficiently conservative that there is no need to require plant shutdown when the rate of increase reaches 2 gpm in a 24 hour period or less, particularly since they may apply SI treatments to the remaining 27 nonconforming welds. They stated that they will consider instituting such a requirement in the event that SI treatments are not applied. This position is in contrast to the NRC Staff position that imposes the 2 gpm limit on the rate of increase of unidentified leakage on all BWR plants regardless of the IGSCC Classifications of the welds.

Leakage at Perry is continuously monitored rather than monitored with

fixed-measurement-interval methods. They require control room operators to record the leakage rate once per shift (approximately once every eight hours rather than approximately every four hours, or less, as required by Generic Letter 88-01).

Finally, Cleveland Electric proposed that the requirements for operability of monitoring instruments outlined in Generic Letter 88-01 for plants operating with IGSCC Category D, E, F, or G welds should not apply to Perry. Reasons given are: (a) IGSCC is not currently a safety concern and will not be until at least the end of the second fuel cycle, and (b) the 27 welds at Perry that are classified in those categories may be Stress Improved and reclassified to IGSCC Category C during the next refueling outage (Refueling Outage No. 2), and (c) alternative methods for measuring leakage are available which are required by the Technical Specification to be operative in the event of outage of sump monitors. However, the alternative methods for measuring leakage do not have equivalent accuracy.

As a result of this technical evaluation, the following recommendations are made.

- (1) Acceptance of Cleveland Electric's IGSCC classifications of welds and plans for mitigating IGSCC at Perry.
- (2) Acceptance of Cleveland Electric's inspection plans, including the provision concerning inspection schedules and the provision concerning methods and personnel.
- (3) Rejection of Cleveland Electric's position concerning changes to the Technical Specification on ISI. Cleveland Electric should add the required statement to the Technical Specification on ISI.
- (4) Acceptance of Cleveland Electric's positions on the portions

of leakage detection pertaining to conformance with Regulatory Guide 1.45, the limit on the total unidentified leakage, and definition (description) of unidentified leakage.

- (5) Rejection of the exception pertaining to plant shut down due to an increase in the rate of unidentified leakage. Cleveland Electric should amend the Perry Technical Specification to require, as directed in Generic Letter 88-01, that plant shutdown should be initiated for inspection and corrective action when, within any period of 24 hours or less, any leakage detection system indicates an increase in rate of unidentified leakage in excess of 2 gpm or its equivalent.
- (6) Although Perry utilizes continuous monitoring of leakage, Cleveland Electric should amend the Perry Technical Specification to require control room operators to record the leakage rate at approximately 4 hour intervals, or less, rather than the currently required 8 hour interval.
- (7) Rejection of the exception pertaining to plant shut down due to inoperable monitoring instruments. Cleveland Electric should either apply mitigating treatments (per guidelines provided in NUREG 0313, Revision 2 and Generic Letter 88-01) to eliminate non-resistant IGSCC classifications or they should amend the Perry Technical Specification on leakage detection to require operability of monitoring instruments per guidelines provided in Generic Letter 88-01.
- (8) Acceptance of the remaining portions of the Cleveland Electric Submittals pertaining to Perry.

5. REFERENCES

1. "Technical report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," NUREG 0313, Revision 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, January, 1988.
2. "Investigation and Evaluation of Stress-Corrosion Cracking in Piping of Light Water Reactor Plants," NUREG 0531, U. S. Nuclear Regulatory Commission, February, 1979.
3. "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping," Generic Letter 88-01, U.S. Nuclear Regulatory Commission, January 25, 1988.