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SUBJECT: Responds to Generic Ltr 84-11 re cracks in BWR stainless steel piping.Response addresses scope & schedule of planned insp,qualifications of examiners,description of surveillance methods & measures taken when cracks discovered.

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May 30, 1984
G02-84-364

Docket 50-397

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Eisenhut:

Subject: NUCLEAR PROJECT NO. 2
SUPPLY SYSTEM's RESPONSE TO NRC's GENERIC LETTER 84-11

Reference: Letter from D. G. Eisenhut to Licensees, "Inspections of BWR Stainless Steel Piping (Generic Letter 84-11)," dated 4/11/84

This letter responds to Generic Letter 84-11, the latest NRC directive on inspection of BWR stainless steel. The first part of the Generic Letter addresses issues experienced by operating plants which underwent examinations in accordance with IE Bulletins 82-03 and 83-02, and which found actual cracks in the stainless steel piping. WNP-2 is not included among these plants since its Operating License post-dated these bulletins.

The Supply System's response will address the following:

a) Scope and schedule of planned inspections. (Attachment 1) This also specifically addresses the NRC's recommendation.

b) Availability and qualification of examiners. (Attachment 2)

c) Description of any special surveillance measures, in effect or proposed, for primary system leak detection, beyond those measures already required by our Technical Specifications. (Attachment 3)

d) Remedial measures to be taken when cracks are discovered. (Attachment 4)

The requested results of Bulletin inspections not previously submitted to the NRC will obviously not be addressed since WNP-2 was not in

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operation when the Bulletins were issued. Responses to the four items described above are attached. They should clearly demonstrate our overall awareness of the BWR pipe cracking problem and our Corporate dedication toward effectively dealing with the issue.

It is recognized that the subject generic letter only provides guidance for inspection at the next refueling outage. Long-term inspection requirements will be contained in Revision 2 of NUREG-0313. The Supply System's response to NUREG-0313, Revision 1, contains our long-term inspection commitment for IGSCC-susceptible piping. Its revision will be considered when Revision 2 is issued by the NRC. The following statement, excerpted from the WNP-2 Safety Evaluation Report, implies that actions already taken by the Supply System are more than adequate.

> "Although the licensee has taken and will take corrective actions with IGSCC as indicated above, the staff is anticipating that the proposed NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," will be implemented uniformly on all boiling water reactors within 1 year. At that time, WNP-2 and all other BWRs that have not been reviewed in detail will be evaluated. WNP-2 conforms to the staff's technical positions in the proposed NUREG-0313, Revision 2 on materials selection and processing to a greater extent than most other BWRs. In addition, the intergranular stress corrosion cracking for WNP-2 will not occur without detection in future operation. This unit does not present a significant hazard to public health and safety."

As noted above, the Supply System conforms to NRC recommendations to a greater extent than most other BWRs. A summary of the more significant IGSCC mitigation efforts which have taken place over the past several years are:

- Core spray piping material was changed from austenitic stainless steel to carbon steel.
- The ten reactor vessel recirculation inlet nozzle safe ends were replaced with 316L which is not susceptible to IGSCC.
- Welds and piping associated with the safe end changeout were solution annealed and/or corrosion resistant clad to reduce susceptibility to IGSCC.
- Controls were placed on welding to reduce sensitization to IGSCC.
- 113 welds were treated with the IHSI process.

- o CRD recirculation return line was deleted and the nozzle was capped with a carbon steel cap.

- o The recirculation system bypass lines were capped and the capped connections were corrosion resistant clad.

In addition to the above, the Supply System is evaluating further actions to be taken on the few remaining welds which may be susceptible to IGSCC; e.g., material changeout for some lines.

As you can see, the Supply System has and will continue to monitor the IGSCC problem carefully. Our attached response reflects and takes credit for the above mitigating actions already taken.

We trust that this response, including the attached material, satisfies your request.

Very truly yours,

for R B Glasscock

G. C. Sorensen, Manager
Regulatory Programs

RAM/cd

Attachments

cc: R. Auluck - NRC
JB Martin - NRC
NS Reynolds - B&L
A. Schwencer - NRC
A. Toth - NRC (901A)

ATTACHMENT 1

SCOPE AND SCHEDULE OF PLANNED EXAMINATIONS

The scope and schedule of planned augmented inservice inspection examinations are the same as submitted in our response to NUREG-0313, Rev. 1, with the following clarifications:

- All previously non-conforming service sensitive welds have received the IHSI treatment and are now classified as conforming and, therefore, no augmented ISI is planned.
- Many of the previously non-conforming non-service sensitive welds have also received the IHSI process and are now considered conforming. The only remaining welds which are considered non-conforming are listed in Table I.
- Twenty percent of the welds listed in Table I on piping equal to or greater than 4 inches in diameter will be examined during the first refueling outage as recommended in the generic letter.

(As supplemental information, an excerpt from the Supply System's response to NUREG-0313, Rev. 1, is provided at the end of this attachment which contains the WNP-2 commitments for augmented ISI.)

TABLE I

WNP-2 NON-CONFORMING NON-SERVICE SENSITIVE WELDS

System	Size, in.	No. of Welds	Description
RRC	4	21	RWCU intertie to RRC in Loops A and B
RRC	4	2	RWCU intertie to RRC in Loops A and B; safe ends to Valves RWCU-V-106 and RWCU-V-100 (dissimilar metals)
RPV/JP	4	4	Jet pump instrumentation nozzle safe end
RRC	24 x 4	6	RRC main suction and discharge to branch lines, pipe to sweepolet weld.
	24 x 8	2	
	24 x 12	4	
	TOTAL	39	

All stainless steel welds not listed in Table I have been evaluated by the Supply System to not be susceptible to IGSCC. The basis for this determination is the material conforms to the requirements contained in Section II of NUREG-0313, Rev. 1, and the weld and adjacent base material has been treated by IHSI.

NUREG-0313, Rev. 1, addressed long-term augmented inspection of austenitic stainless steel piping subject to IGSCC. Generic Letter 84-11 contains guidelines for followup inspections to inspections performed in accordance with IE Bulletins 82-03 and 83-02 and is primarily aimed at those BWRs already in operation. Each of the augmented ISI recommendations of the NRC Generic Letter have been carefully reviewed and the Supply System responses are as follows:

o NRC Recommendation

A reinspection program of piping susceptible to IGSCC should be undertaken. The reinspection should commence within about two calendar years, adjusted to coincide with the next scheduled outage, from the previous inspection performed under IE Bulletins 82-03, 83-02, or our August 26, 1983 Order.

Supply System Response

Not applicable - WNP-2 was not operational at the time IE Bulletin 82-03 and 83-02 were issued. Therefore, there was no IGSCC environment, and thus no possibility for cracking to occur. The Supply System has followed this problem closely and has taken mitigating steps to ensure that IGSCC will not occur at WNP-2.

o NRC Recommendation

These reinspections should include the following stainless steel welds, susceptible to IGSCC, in piping equal to or greater than 4" in diameter, in systems operating over 200°F, that are part of or connected to the reactor coolant pressure boundary, out to the second isolation valve as follows.

Supply System Response

All welds in stainless steel piping whose diameter is equal to or greater than 4 inches have been carefully reviewed. All piping and safe ends utilizing non-conforming material are listed in Table I. These portions of the systems will receive augmented ISI as described later in this letter.

o NRC Recommendation

Inspection of 20% of the welds in each pipe size of IGSCC sensitive welds not inspected previously (but no less than 4 welds) and reinspection of 20% of the welds in each pipe size inspected previously (but no less than 2 welds) and found not to be cracked. This sample should be selected primarily from weld locations shown by experience to have the highest propensity for cracking.

Supply System Response

As previously mentioned, welds at WNP-2 have not been inspected under IE Bulletins 82-03 or 83-02. Therefore, the first part of the above

recommendation is not applicable. The Supply System will inspect 20% of the welds in piping, whose diameter equals or exceeds 4 inches, during the first refueling outage. Note that none of the welds listed in Table I have a high propensity for cracking. In fact, all service sensitive welds at WNP-2 have been mitigated for IGSCC by changout of material, use of corrosion resistant cladding, application of IHSI, or by proper solution heat treatment.

o NRC Recommendation

All unrepaired cracked welds.

Supply System Response:

Not applicable - There are no unrepaired cracked welds at WNP-2 since the piping has not been exposed to an IGSCC environment.

o NRC Recommendation

Inspection of all weld overlays on welds where circumferential cracks longer than 10% of circumference were measured. Disposition of any findings will be reviewed on a case-by-case basis. Criteria for operation beyond one cycle with overlaid joints are under development.

Supply System Response

Not applicable - No welds on WNP-2 have been repaired as the result of IGSCC or any other cracking.

o NRC Recommendation

Inspection of any weld treated by induction heating stress improvement which has not been post treatment UT acceptance tested.

Supply System Response

The Supply System disagrees with this recommendation. The IHSI process was applied at WNP-2 prior to service. Therefore, no cracking existed on any weld to which this process was applied. The IHSI process does not cause further growth of pre-existing cracks. EPRI Report NP-3375 documents that the material is essentially unaffected by the IHSI process. The Supply System did, however, examine 10% of the welds of various sizes and configurations by ultrasonic (UT) and liquid penetrant (PT) methods. A detailed comparison of the post-IHSI results and the pre-IHSI inservice inspection baseline examinations were made. The results showed that the ISI baseline did not change. This was expected. As mentioned above, the Supply System plans to examine 20% of the welds in previously inspected pipes.

NOTE: NRC was informed of the Supply System's IHSI Program in their September 14, 1983 letter number G02-83-833. NRC informal guidance at that time indicated satisfaction with a 10% UT sample of the welds treated.

o NRC Recommendation

In the event new cracks or significant growth of old cracks are found, the inspection scope should be expanded in accordance with IEB 83-02.

Supply System Response

If IGSCC cracking is found at WNP-2, resampling will be done in accordance with IE Bulletin 83-02 and IWB-2430 of ASME Section XI.

- o All welds at terminal ends of pipe at vessel nozzles
- o All welds having a designed combined primary plus secondary stress range of 2.4 Sm or more
- o All welds having a design cumulative fatigue usage factor of 0.4 or more
- o Sufficient additional welds with high potential for cracking to make the total equal to 25% of the welds in each piping system

(3) In the event the examination described in (1) and (2) above find the piping free of unacceptable indications during the first 80 months, the examination frequency thereafter will revert to 120 months as prescribed in Section XI of the ASME Boiler and Pressure Vessel Code.

(b) Nonconforming Service Sensitive (Table III)

(1) Dissimilar Metal Welds (III, 8.2.b.(2).): Will be examined at each reactor refueling outage for three successive outages. There are no dissimilar metal internal attachment welds at WNP-2.

NOTE: The Supply System will not plan to perform augmented examinations more frequently than every refueling outage, which will take place at approximately one-year intervals.

(2) Class 1 Pipe Welds (III. 8.2.b.(3).): Will be examined at each reactor refueling outage subject to the same conditions in (b)(1) above. The welds to be examined will be determined using the sampling system described in IV 8.2.(a)(2).

(3) In the event the examinations described in (1) and (2) above find the piping free of unacceptable indications for three successive inspections, the time between successive examinations will be extended to each 36-month period (plus or minus as much as 12 months) coinciding with a refueling outage. In the event these 36-month period examinations reveal no unacceptable indications for three successive inspections, the frequency of examinations will revert to 80-month periods.

SUPPLEMENT TO ATTACHMENT 1

B. Augmented Inservice Inspection

1. (a) Class 1

An augmented inservice inspection program will be implemented for all ASME Code Class 1 piping and components which are:

(1) Subject to examination requirements specified in ASME Section XI; and

(2) communicate with reactor coolant; and

(3) fabricated from austenitic stainless steel which does not meet the requirements specified in Part III of NUREG-0313, Rev. 1.

(b) Class 2

There are parts of two systems (identified in Table I) at WNP-2 that are Class 2 and fabricated from austenitic stainless steel. The Class 2 portions of these systems are exempt from volumetric and surface examination by the exemption criteria found in Section XI, paragraph IWC-1220. These systems will be visually examined for evidence of leakage during system pressure and hydrostatic tests per Section XI.

(c) Class 3

In accordance with the guidelines established in Part IV B of NUREG-0313, Rev. 1, no additional inservice inspection beyond the Section XI visual examination will be performed.

2. The following is a description of the criteria which will be used by the Supply System to develop the augmented inservice inspection program. The augmented program developed pursuant to this report will be part of the WNP-2 Inservice Inspection Program Plan.

(a) Nonconforming Nonservice Sensitive (Table IV)

(1) Dissimilar Metal Welds (III, 3.1.b.(1).): Will be examined at least once in no more than 80 months. (There are no dissimilar metal internal attachment welds at WNP-2.)

(2) Code Class 1 Pipe Welds (III, 3.1.b.(2).): The following nonconforming nonservice sensitive welds will be examined at least once in no more than 80 months:

ATTACHMENT 2

AVAILABILITY AND QUALIFICATION
OF EXAMINERS

The Supply System plans to qualify Level II and Level III examiners in accordance with IE Bulletin 83-02 at the EPRI NDE Center in Charlotte, North Carolina. A minimum of four examiners will be qualified before the first refueling outage. The current schedule for qualification of examiners is two by November 1984 and two more by June 1985. Any additional or replacement Level II or Level III personnel required to perform examinations will also be qualified to the requirements of IE Bulletin 83-02.

ATTACHMENT 3

DESCRIPTION OF ANY SPECIAL SURVEILLANCE
MEASURES IN EFFECT OR PROPOSED FOR PRIMARY
SYSTEM LEAK DETECTION, BEYOND THOSE MEASURES
ALREADY REQUIRED BY OUR TECHNICAL SPECIFICATIONS

The Supply System has mitigated all weld joints in "service sensitive" (NUREG-0313, Rev. 1) lines and all weld joints in other lines greater than four (4) inches in diameter, except for 12 welds on the RRC system where the technology did not permit an effective IHSI treatment. Since most of our welds are "conforming", the Supply System feels that leak detection and leakage limits over and above those specified in the WNP-2 Technical Specifications are not warranted. WNP-2 plans on performing visual examination for leakage at each refueling outage in accordance with ASME Section XI requirements.

ATTACHMENT 4

REMEDIAL MEASURES, IF ANY, TO BE
TAKEN WHEN CRACKS ARE DISCOVERED

In the event that IGSCC cracks are detected in WNP-2 piping, greater than four (4) inches in diameter, the Supply System intends to first perform evaluations in accordance with Section XI and supplemental NRC crack evaluation criteria (attached to Generic Letter 84-11). If cracks must be repaired, then the Supply System intends to once again comply with NRC's repair criteria (attached to Generic Letter 84-11), supplemented by input from the EPRI-NDE Center at Charlotte, North Carolina. The following further describes the steps which will be taken:

A. Section XI, Para. IWB-3514.3, Allowable Indication Standards for Austenitic Piping (W83)

This paragraph deals with acceptability of flaws without further evaluation. Generally, flaws less than about 10% of the wall thickness are acceptable for further operation without analysis or repair. If flaw sizes exceed IWB-3514.3 limits, then Para. IWB-3640 must be used.

B. Section XI, Para. IWB-3640, Evaluation Procedures and Acceptance Criteria for Austenitic Piping

This paragraph establishes the acceptability of flaws for continued service that exceed the limits of IWB-3514.3. However, the permissible flaw size is further restricted by NRC's Crack Evaluation Criteria.

C. NRC Crack Evaluation Criteria

Plant operation is permitted with cracked welds only for the time period that the cracks are evaluated to not exceed two-thirds of the limits for depth and length provided in ASME Code Section XI, Para. IWB-3640. If flaw sizes exceed NRC/Section XI limits, then weld repair or pipe replacement is the next step. If repair by overlay is the choice, then comply with the following criteria.

D. Weld Overlay Repair Requirements

Weld overlay repair will be made in accordance with NRC Criteria for Crack Repairs. Welding parameters will be in accordance with those developed and demonstrated at the EPRI-NDE Center (Charlotte, North Carolina). Procedures and welders (or welding operators) will be qualified in accordance with the Supply System's Maintenance Welding Program.