



Consumers
Power
Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • (517) 788-0550

June 30, 1981

Director, Nuclear Reactor Regulation
Att Mr Dennis M Crutchfield, Chief
Operating Reactors Branch No 5
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT - RESPONSE TO
GENERIC LETTER 81-04 - IMPLEMENTATION OF NUREG -0313, Rev 1, "TECHNICAL
REPORT ON MATERIAL SELECTION AND PROCESSING GUIDELINES FOR BWR COOLANT
PRESSURE BOUNDARY PIPING (GENERIC TASK A-42)"

NRC Generic Letter 81-04 dated February 26, 1981 requested Consumers Power Company to review coolant pressure boundary piping at the Big Rock Point Plant (BRP) to determine if material selection, testing and processing guidelines set forth in NUREG-0313, Rev 1, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping (Generic Task A-42)," dated July 1980, are met. It also requested identification of materials that do not meet these guidelines and our basis for actions proposed to conform to the guidelines, including Technical Specifications changes, if necessary.

Consumers Power Company has evaluated the BRP coolant pressure boundary piping in accordance with NUREG-0313, Rev 1 guidelines. The results of this evaluation are provided by Attachment 1 to this letter. This evaluation concluded that intergranular stress corrosion cracking (IGSCC) is not a safety issue for BRP which is in agreement with the NUREG-0531 conclusion. Therefore, Consumers Power Company does not intend to replace BRP coolant pressure boundary piping or make Technical Specification changes. However, commensurate with our desire to enhance reliability and minimize radiation exposure, we are pursuing efforts to confirm our conclusion that BRP does not have the stress threshold levels typically considered necessary for IGSCC occurrence. Also, enhanced leak detection systems are being evaluated in the event an upgraded system is determined necessary.

David P Hoffman
Nuclear Licensing Administrator

CC JGKepler, USNRC
NRC Resident Inspector-Big Rock Point Plant

Attachment - 4 pages
8107060208 810630
PDR ADOCK 05000155
P PDR

*Abel
5/11*

EVALUATION OF BIG ROCK POINT PLANT IN ACCORDANCE WITH
NUREG-0313, REVISION 1 GUIDELINES

Abstract

Consumers Power Company has been and will be continuously reviewing technical developments concerning intergranular stress corrosion cracking (IGSCC) as it applies to our Big Rock Point Plant (BRP). We agree that IGSCC does not pose a safety problem as concluded by NUREG-0531, although there are reliability and personnel exposure considerations. Therefore, we are investigating several alternative plans to confirm our belief that Big Rock Point already has a reduced susceptibility to IGSCC. These plans include, but are not necessarily limited to: (1) a study of an enhanced leak detection system, and (2) a study of plant specific items relating the IGSCC susceptibility of the BRP reactor vessel safe end welds.

The maintenance history relating to IGSCC at BRP is very favorable in support of the argument that BRP has a reduced IGSCC susceptibility. Only one suspected and two documented instances of IGSCC have occurred at BRP. These instances all occurred in small diameter (3/4") Reactor Cleanup System vent or drain lines and all were associated with vibration and oversized welds. Many other welds have been examined during ISI but no evidence exists that any other IGSCC cracking has occurred. We conclude that although the material characteristics and environment necessary for IGSCC do exist in some of the primary coolant pressure boundary piping, the stress levels are probably low enough to prevent the occurrence of IGSCC.

General

NRC Generic Letter 81-04 requested Consumers Power Company to respond to those actions recommended by NUREG-0313, Revision 1, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping." NUREG-0313, Revision 1 is oriented toward the BWR plants still in the design or construction stage rather than the BWR plants now in operation, particularly those plants with a significantly long operating history such as BRP. Safety is concluded to be unaffected by IGSCC and as such will not pose an undue risk to the health and safety of the public. The guidelines established by NUREG-0313 for the treatment of those systems affected by IGSCC include augmented inspections and methods for defining those systems which are most susceptible to IGSCC.

Consumers Power Company has been active in continuously reviewing the technical developments concerning IGSCC and its effect at BRP. We have participated in the EIARI managed BWR Owner's Group on Stainless Steel Pipe Cracking and have been actively involved in various EPRI and GE projects in this area. Several projects have been completed or are under way which provide information for review of the general safety margin at BRP. Information from these projects is currently being evaluated. Included among these projects are the BRP Probabilistic Risk Assessment, the IE Bulletin 79-14 activities and Inservice Inspection. Our position remains that augmented inspection or replacement of nonconforming service sensitive materials per NUREG-0313, Revision 1, is not necessary for BRP because IGSCC is not considered a safety issue.

Maintenance History Relating to IGSCC

The maintenance history relating to IGSCC is very favorable in support of the argument that BRP has a reduced susceptibility to IGSCC. The Inservice Inspection Program has resulted in examinations of portions of those lines purported to be susceptible in accordance with NUREG-0531 and NUREG-0313. The only identified instances of IGSCC occurred in small diameter vent lines of the Reactor Cleanup System. The first of these occurred in 1978 and resulted in a leak. The second and third occurred in 1979 and 1980 and were located by UT examination. Both the first and second instances were confirmed to be IGSCC by metallurgical examination while the third instance was not destructively examined but was similar to the other instances. All of these instances were suspected to be assisted by fatigue in addition to the IGSCC and were associated with an oversized branch connection weld. The remaining three vent lines of the six in the Reactor Cleanup System were also examined but no indications were found.

The majority of the ISI examinations performed have not identified IGSCC which lends additional support to our theory that BRP has a reduced susceptibility to IGSCC. Six reactor vessel steam outlet nozzles have been examined using mechanized UT from the nozzle ID. Nearly all of the reactor nozzles and safe ends were examined visually from the ID using a closed circuit TV (CCTV) system. The core spray sparger was also examined using the CCTV system. We are confident that any serious IGSCC indications would have been identified in the components examined.

Material Variables

The stainless steel material variables which must be considered to determine susceptibility to IGSCC include the carbon content, the chromium and other alloy contents, the manufacturing process, the heat treatment and the ferrite content. The BRP coolant pressure boundary piping consists of 304, 316 and CF-8M austenitic stainless steels.

NUREG-0313 has identified cast austenitic stainless steels with more than 5% ferrite content as being resistant to IGSCC in BWR's. The 17 inch downcomer piping and the 20 and 24 inch main recirculation piping to the reactor vessel have been identified as CF-8M cast austenitic stainless steel piping. Although no data exists to verify the ferrite content, Schaeffler diagram calculations establish the minimum ferrite content to be no less than 5%. We therefore consider the downcomer piping and the main recirculation piping to the reactor vessel as conforming to the guidelines of NUREG-0313.

Records are not readily available which identify the actual chemical composition of much of the remaining austenitic stainless steel piping in the coolant pressure boundary. Available records indicate that most of the wrought austenitic stainless steel piping is Type 304, except the 14 inch risers which are Type 316. The safe ends on the reactor nozzles are Type 304 and have apparently been furnace sensitized. The steam drum safe ends are Type 316 and are also furnace sensitized. In accordance with the guidelines of NUREG-0313, all of this piping would be considered nonconforming or indeterminate.

Environment

The water chemistry at BRP has benefited by the use of deaeration procedures during start-up since approximately 1978. A study has been initiated to examine the effects of hydrogen additions to further reduce the oxygen content of the primary coolant.

Most of the piping and safe ends are relatively free of highly oxygenated stagnant conditions which increases the susceptibility to IGSCC. Some apparent exceptions are the Reactor Cleanup System vent lines (which have an IGSCC failure history as discussed earlier) and the creviced area behind the thermal sleeves on the primary core spray and the liquid poison nozzles.

Stress

The stress conditions of the coolant pressure boundary piping are expected to be the most favorable factor in the theory that BRP has reduced susceptibility to IGSCC. Research has shown that all three contributing factors of material variables, environment and stress must be present in sufficient levels to obtain IGSCC. The history of IGSCC in BWR's has shown that most cracking, where the three factors are present, will start to occur in a relatively short time (ie, a few years). The excellent maintenance history of BRP with regard to IGSCC is very likely due to low stress levels. The IGSCC failures which have occurred have all been associated with oversized welds and vibrational loads which are not representative of the systems in general. Therefore, stress levels are probably below the threshold value of stress necessary for IGSCC initiation in the BRP coolant pressure boundary piping, except as previously noted for portions of the Reactor Cleanup System.

Action Plans

Since IGSCC is not considered a safety issue, our action plans in response to NUREG-0313, Revision 1 will take place on a schedule which depends on accessibility and outage schedules. The following actions are presently being addressed:

- (1) A study of an enhanced leak detection system has been initiated. Particularly, the methods of acoustic emission and moisture sensitive tapes will be studied. This feasibility study probably cannot be completed until specific access conditions are identified during the next refueling outage scheduled to commence in January 1982. If any such methods are determined feasible, they will be considered for implementation at BRP.
- (2) A study of plant specific items relating the IGSCC susceptibility of the BRP reactor safe end welds to that predicted on a generic basis by General Electric has been initiated. This study should be completed in December 1981. We expect that this study will further support our foregoing conclusion that BRP has a reduced susceptibility to IGSCC in the reactor vessel nozzle safe ends and that this is due to low stress levels.

There are other actions which may be initiated pending results of the above actions or if a need is identified. The above actions constitute our program to address the potential IGSCC problem at BRP and in our opinion, meet the intent of the NUREG-0313 guidelines.

Conclusion

Consumers Power Company concludes that IGSCC at the Big Rock Point Plant poses no safety hazard to the public. Stainless steel is an inherently tough material and the piping systems at BRP have adequate structural integrity to eliminate safety problems should IGSCC occur. This is the same conclusion reached by NUREG-0531. However, we do not postulate IGSCC occurring in most of the stainless steel coolant pressure boundary systems at BRP. Our basis for arriving at this conclusion is that BRP has an extensive operating history where both susceptible material variables and an enabling environment exist. In spite of this, our experience with IGSCC remains excellent. We have concluded and are attempting to confirm by analysis that the stress levels in the reactor vessel safe ends are below threshold values necessary for IGSCC initiation.

Other programs and continuing efforts to remain up-to-date on IGSCC technology remain in effect. For instance, a program to examine the feasibility of an enhanced leak detection system has been initiated.

In summary, IGSCC is not considered a safety issue for BRP. However, commensurate with our desire to enhance reliability and minimize radiation exposure, we are pursuing efforts to confirm our conclusions. Our basic conclusion is that BRP does not have the stress threshold levels typically considered necessary for IGSCC initiation.