

December 7, 2000

Mr. Carl Terry, BWRVIP Chairman
Niagara Mohawk Power Company
Post Office Box 63
Lycoming, NY 13093

SUBJECT: ACCEPTANCE FOR REFERENCING OF BWR VESSEL AND INTERNALS
PROJECT, BWR CORE SPRAY INTERNALS INSPECTION AND FLAW
EVALUATION GUIDELINES (BWRVIP-18) REPORT FOR COMPLIANCE WITH
THE LICENSE RENEWAL RULE (10 CFR PART 54)

Dear Mr. Terry:

By letter dated July 26, 1996, as supplemented by letters dated October 8, 1997, and January 11, 1999, the Boiling Water Reactor Vessel and Internals Project (BWRVIP) submitted the Electric Power Research Institute (EPRI) proprietary report TR-106740, "BWR Vessel and Internals Project, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (BWRVIP-18)," dated July 1996, for U.S. Nuclear Regulatory Commission (NRC) staff review. By letter dated December 20, 1996, the BWRVIP submitted "Appendix C, BWR Core Spray Internals Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)." The BWRVIP submitted an initial non-proprietary version of this document, TR-107286NP, on August 12, 1996, and an expanded non-proprietary version by letter dated April 8, 1999. On June 8, 1998, the NRC staff issued its initial safety evaluation (SE) of the BWRVIP-18 report, which found the BWRVIP-18 report to be acceptable for inspection and assessment of the subject safety-related core spray internal components, except where the staff's conclusions differed from the BWRVIP's, as discussed in the SE. The BWRVIP was requested to resolve the open issues raised in the staff's initial SE. By letter dated January 11, 1999, the BWRVIP provided a response which proposed guidance to resolve the issues identified in the staff's initial SE. By letter dated December 2, 1999, the NRC staff issued a final safety evaluation report (FSER), in which the staff found the revised BWRVIP-18 report acceptable for the current operating period of BWRs.

As documented in the attached license renewal (LR) SE, the NRC staff has completed its review of the proprietary version of the BWRVIP-18 report. As indicated in the LR SE, the staff found the BWRVIP-18 report acceptable for licensees participating in the BWRVIP to reference in a license renewal application to the extent specified and under the limitations delineated in the LR SE. In order for licensees participating in the BWRVIP to rely on the report, they must commit to the accepted aging management programs (AMPs) defined therein, and complete

the action items described in the LR SE. By referencing the BWRVIP-18 report and the AMPs in it, and completing the action items, an applicant can provide sufficient information for the staff to make a finding that there is reasonable assurance that the applicant will adequately manage the effects of aging so that the intended functions of the reactor vessel within the scope of the report will be maintained consistent with the current licensing basis during the period of extended operation.

The staff does not intend to repeat its review of the matters described in the report and found acceptable in the LR SE when the report is incorporated by reference in a LR application, except to ensure that the report's conclusions apply to the specified plant.

In accordance with the procedures established in NUREG-0390, "Topical Report Review Status," the staff requests that the BWRVIP publish the accepted version of BWRVIP-18 within 90 days after receiving this letter. In addition, the published version will incorporate this letter and the enclosed LR SE between the title page and the abstract.

To identify the version of the report that was accepted by the staff, the BWRVIP requests that "A" follow the topical report number (e.g., BWRVIP-18-A).

Sincerely,

/RA/

Christopher I. Grimes, Branch Chief
License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Project No. 704

Enclosure: Final Safety Evaluation Report

cc w/encl: See next page

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Christopher I. Grimes, Branch Chief
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Enclosure: Final Safety Evaluation Report
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Enclosed SER provided by memorandum from W. Bateman, EMCB, to C. Grimes, RLSB, dated September 6, 2000, Accession number ML003748040.

DOCUMENT NAME: C:\bwrvip-18.wpd

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FINAL LICENSE RENEWAL SAFETY EVALUATION REPORT
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
FOR
"BWR VESSEL AND INTERNALS PROJECT, BWR CORE SPRAY
INTERNALS INSPECTION AND FLAW EVALUATION GUIDELINES (BWRVIP-18)"
FOR COMPLIANCE WITH THE LICENSE RENEWAL RULE (10 CFR PART 54)

1.0 INTRODUCTION

1.1 Background

By letter dated July 26, 1996, as supplemented by letters dated October 8, 1997, and January 11, 1999, the Boiling Water Reactor Vessel and Internals Project (BWRVIP) submitted the Electric Power Research Institute (EPRI) proprietary report TR-106740, "BWR Vessel and Internals Project, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (BWRVIP-18)," dated July 1996, for U.S. Nuclear Regulatory Commission (NRC) staff review. The BWRVIP submitted an initial non-proprietary version of this document, TR-107286NP, on August 12, 1996, and an expanded non-proprietary version by letter dated April 8, 1999.

The BWRVIP-18 report, as supplemented, contains generic guidelines for the inspection and reinspection of the core spray piping and spargers. It describes piping and sparger locations, categories of plants for which inspection needs would differ, and flaw evaluation procedures to determine allowable flaw sizes. The intent of the subject document was, when approved by the NRC, to replace the inspection guidance contained in the NRC's Bulletin 80-13, "Cracking in Core Spray Spargers," dated May 12, 1980, which requested licensees to inspect their core spray spargers and the segment of piping between the inlet nozzle and the vessel shroud during each refueling outage in order to provide adequate assurance of core spray integrity. To date, these inspections have been successful in identifying cracking and flaws in the core spray piping and spargers.

On June 8, 1998, the NRC staff issued its initial safety evaluation (SE) of the BWRVIP-18 report, which found the BWRVIP-18 report to be acceptable for inspection and assessment of the subject safety-related core spray internal components, except where the staff's conclusions differed from the BWRVIP's, as discussed in the SE. The BWRVIP was requested to resolve the open issues raised in the staff's initial SE. By letter dated January 11, 1999, the BWRVIP provided a response which proposed guidance to resolve the issues identified in the staff's initial SE. By letter dated December 2, 1999, the NRC staff issued a final safety evaluation report (FSER), in which the staff found the revised BWRVIP-18 report acceptable for the current operating period of BWRs.

By letter dated December 20, 1996, the BWRVIP submitted a separate document, "Appendix C, BWR Core Spray Internals Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)," for NRC staff review in accordance with the License Renewal Rule (10 CFR Part 54).

ATTACHMENT

Section 54.21 of the LR Rule requires, in part, that each application for license renewal contain an integrated plant assessment (IPA) and an evaluation of time-limited aging analyses (TLAA). The IPA must identify and list those structures and components subject to an aging management review and demonstrate that the effects of aging will be adequately managed so that their intended functions will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. In addition, 10 CFR 54.22 requires that each application include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application.

If an LR applicant participating in the BWRVIP confirms that the BWRVIP-18 report applies to its facility and that the results of the Appendix C IPA and TLAA evaluation are in effect at its plant, then no further review by the NRC staff of the issues described in the documents is necessary, except as specifically identified by the staff below. With this exception, such an applicant may rely on the BWRVIP-18 report for the demonstration required by 10 CFR 54.21(a)(3) with respect to the components and structures within the scope of the report. Under such circumstances, the NRC staff intends to rely on the evaluation in this LR SE to make the findings required by 10 CFR 54.29 with respect to a particular application.

1.2 Purpose

The staff reviewed the BWRVIP-18 report and its Appendix C to determine whether its guidance will provide acceptable levels of quality for inspection and flaw evaluation of the subject safety-related RPV internal components within the scope of the report during the period of extended operation. The staff also considered compliance with the LR Rule in order to allow applicants for renewal the option of incorporating the BWRVIP-18 guidelines by reference in a plant-specific IPA and associated TLAA.

1.3 Organization of this Report

Because the BWRVIP-18 report, as supplemented and modified, is proprietary, this SE was written so as not to repeat information contained in the proprietary portions of the report. The staff does not discuss in any detail the proprietary provisions of the guidelines nor the parts of those guidelines it finds acceptable. A brief summary of the contents of the BWRVIP-18 report is given in Section 2.0 of this SE, with the NRC staff's evaluation presented in Section 3.0. The conclusions are summarized in Section 4.0. The presentation of the evaluation is structured according to the organization of the BWRVIP-18 report.

2.0 SUMMARY OF BWRVIP-18 REPORT

The BWRVIP-18 report and its Appendix C contain a generic evaluation of the management of the effects of aging on the subject RPV internal components so that their intended functions will be maintained consistent with the CLB for the period of extended operation. This evaluation applies to BWR applicants who have committed to implementing the BWRVIP-18 report and want to incorporate the report and Appendix C by reference into a plant-specific IPA and associated TLAA's.

2.1 BWRVIP-18 Topics

The BWRVIP-18 report addresses the following topics:

- Core Spray Piping Design and Susceptibility Information - The various susceptibility factors and the design of typical core spray assemblies are discussed in detail.
- Inspection Strategy - The examination methods are described. The BWRVIP's "baseline" inspection and reinspection strategies are discussed, including the various plant categories, the piping locations and sparger locations of concern, a discussion of other locations of concern, and the reporting of inspection results.
- Loading - Describes the significant loads for core spray line and sparger piping, the load combinations, considerations for loading resulting from core shroud tie rod repairs, and the stress analysis methodology.
- Evaluation Methodologies - Discusses the methodologies used for the various piping, sparger and bracket locations.

The BWRVIP-18 report also contains appendices on (A) Core Spray Piping and Sparger Flaw Evaluation Example and (B) Seismic Inertia Analysis Considerations.

Appendix C discusses the following topics:

2.2 Identification of Structures and Components Subject to an Aging Management Review

10 CFR 54.21(a)(1) requires that an IPA identify and list those structures and components within the scope of license renewal that are subject to an aging management review. Structures and components subject to an aging management review are those structures and components that (1) perform an intended function, as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties and (2) are not subject to replacement based on a qualified life or specified time period. These structures and components are also referred to as "passive" and "long-lived" structures and components.

Section 2.0 of the BWRVIP-18 report describes the intended function of the core spray internals. Their function is to (1) provide a flow path for core cooling water from the vessel nozzle, through the shroud to the sparger, (2) provide a uniform distribution of spray to assure core cooling when the core cannot be fully reflooded, and (3) in some newer BWRs, provide the flow path for the injection of boron from the standby liquid control (SLC) system.

The BWRVIP-18 report's Appendix C identifies the passive and long-lived components as required by 10 CFR 54.21(a)(1). The BWRVIP-18 report states that the core spray internal components subject to aging management review are the:

- Junction or tee box connections at the vessel nozzle or shroud penetration;
- Piping and fittings between the vessel nozzle and sparger;
- Spargers and nozzles; and
- Attachment bracket supports.

2.3 Effects of Aging

The BWRVIP identified the aging mechanisms and aging effects for the core spray internals using the guidance from NUMARC 90-02, "BWR Reactor Pressure Vessel License Renewal Industry Report," Revision 1, dated August 1992. The BWRVIP also used NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal," dated October 1996, to correlate the aging effects and their associated aging mechanisms. Using these reports, the BWRVIP determined that crack initiation and growth is the only aging effect that requires aging management review for the core spray internals.

In Section 2.0 of the BWRVIP-18 report, the BWRVIP discussed the causes of crack initiation and growth and provided a susceptibility assessment, and also discussed the susceptibility factors of environment, materials, and stress state. The BWRVIP's review of the contributing factors has determined that (1) grinding or mechanical straining and/or (2) the presence of a crevice aggravates crack initiation at weld locations, all of which have residual stresses and an aggressive environment. It also appears that sensitization is an important factor. Cracking has occurred predominantly in Type 304 materials to date.

2.3 Aging Management Programs

10 CFR 54.21(a)(3) requires that the applicant demonstrate, for each component identified, that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation.

In Section 3.0 of the BWRVIP-18 report, the BWRVIP discussed the inspection strategy to be used for ensuring that cracks that might occur in the core spray internals are detected in a timely manner. The program specifies implementation of a baseline inspection followed by focused reinspections of the core spray piping and sparger consisting of ultrasonic (UT) and visual (VT) examination methods. The BWRVIP concluded that both its inspection program and plant-specific considerations will result in verification of the structural integrity, consistent with the CLB, for the subject RPV internal components.

2.4 Time-Limited Aging Analyses

10 CFR 54.21(1)(c) requires that each application for license renewal contain an evaluation of TLAA as defined in 10 CFR 54.3. TLAAs considered in the BWRVIP-18 report are those licensee calculations and analyses that:

- (1) involve the core spray internal components within the scope of license renewal;
- (2) consider the effects of aging;
- (3) involve time-limited assumptions defined by the current operating term;
- (4) were determined to be relevant by the licensee in making a safety determination;
- (5) involve conclusions or provide the basis for conclusions related to the capability of the core spray internals to perform their intended function; and
- (6) are contained or incorporated by reference in the CLB.

With respect to the BWRVIP-18 report, if a plant-specific analysis, as identified by an applicant, meets all six of the above criteria, the analysis will be considered a TLAA for license renewal and evaluated by the applicant.

High cycle fatigue from flow induced vibrations, which potentially could be subject to TLAA, has been found to not be a concern through pre-operational testing. Additionally, low cycle fatigue from thermal cycling has been found to be insignificant.

The BWRVIP did not find any generic TLAAs applicable to the core spray internals, as defined by the six criteria above. However, if a plant-specific analysis identified by an applicant satisfies all six criteria above, then this analysis will be considered a TLAA issue for license renewal and evaluated by the applicant.

3.0 STAFF EVALUATION

The staff's FSER of the BWRVIP-18 report for the current operating term was transmitted by letter dated December 2, 1999, to Carl Terry, BWRVIP Chairman. The NRC staff determined that the contents and recommendations in the BWRVIP-18 report, when coupled with the BWRVIP's responses to the specific information requests in the staff's January 22, 1997, RAI, provides a sufficient and acceptable basis for performing examinations and evaluating postulated flaw indications for the core spray internals. The NRC staff concluded that licensee implementation of the guidelines in the BWRVIP-18 report will provide an acceptable level of quality for inspection and flaw evaluation of the components addressed for the current operating term.

The staff has further reviewed the BWRVIP-18 report and its Appendix C to determine if it demonstrates that the effects of aging on the reactor vessel components within the scope of the report will be adequately managed so that the components' intended functions will be maintained consistent with the CLB for the period of extended operation, in accordance with 10 CFR 54.21(a)(3). This is the last step in the IPA described in 10 CFR 54.21(a).

Besides the IPA, 10 CFR Part 54 requires an evaluation of TLAAs in accordance with 10 CFR 54.21(c). The staff reviewed the BWRVIP-18 report to determine if the TLAAs covered by the report were evaluated for license renewal in accordance with 10 CFR 54.21(c)(1).

3.1 Structures and Components Subject to Aging Management Review (AMR)

The staff agrees that the core spray internals are subject to an AMR because they perform intended functions without moving parts or without a change in configuration or properties, and are not subject to replacement based on a qualified life or specified time period. The staff concludes that BWR applicants for license renewal must identify the appropriate subject RPV internal components as subject to aging management to meet the applicable requirements of 10 CFR 54.21(a)(1).

3.2 Intended Functions

The staff agrees that the intended functions of the core spray internals are as stated. Their function is to (1) provide a flow path for core cooling water from the vessel nozzle, through the

shroud to the sparger, (2) provide a uniform distribution of spray to assure core cooling when the core cannot be fully reflooded, and (3) in some newer BWRs, provide the flow path for the injection of boron from the standby liquid control (SLC) system.

3.3 Effects of Aging

The information necessary to demonstrate compliance with the requirements of the license renewal rule, 10 CFR 54.21, is provided in Appendix C of the BWRVIP-18 report. The BWR Reactor Pressure Vessel Industry Report NUMARC 90-02, Revision 1, August 1992, and the resolution to the NRC's questions on that industry report were used to identify the aging mechanisms for the core spray internals. If the industry report concluded that the aging mechanism is significant then the aging mechanism was included in the aging management review. Using this methodology, it was determined that crack initiation and growth are the only aging effects that required aging management review.

Accordingly, NUREG-1557 states that crack initiation and growth are the aging effects that need to be considered. For the reasons stated in NUREG-1557, the staff agrees that this mechanism is the only one applicable to the internal components.

3.4 Aging Management Programs (AMP)

The staff evaluated the BWRVIP's AMP to determine if it contains the following 10 elements constituting an adequate AMP for license renewal. Each of the ten elements is listed below followed by a brief discussion as to how the AMP addresses the element.

- (1) Scope of Program: The program is focused on managing the effects of crack initiation and growth due to stress corrosion cracking (SCC). The program contains preventative measures to mitigate SCC, inservice inspection (ISI) to monitor the effects of SCC on the intended function of the components, and repair and/or replacement as needed to maintain the ability to perform the intended function
- (2) Preventative Actions: Coolant water chemistry is monitored and maintained in accordance with EPRI guidelines. Maintaining high water purity reduces susceptibility to SCC. For those plants using hydrogen water chemistry (HWC) or noble metal chemical addition (NMCA), hydrogen additions are effective in reducing electrochemical (corrosion) potentials in the recirculation piping system, but are less effective in the core region. Noble metal additions, through a catalytic action, appear to increase the effectiveness of hydrogen additions in the core region.
- (3) Parameters Monitored or Inspected: The AMP monitors the effects of SCC on the intended function by detection and sizing of cracks by inservice inspection. Inspection and flaw evaluation are performed in accordance with BWRVIP guidelines, as approved by the NRC.
- (4) Detection of Aging Effects: Inspection in accordance with BWRVIP guidelines assures that degradation due to SCC is detected before any loss of the intended function of the core plate components.
- (5) Monitoring and Trending: The inspection schedule is in accordance with applicable approved BWRVIP guidelines and is adequate for timely detection of cracks. Scope of

examination expansion and re-inspection beyond the baseline inspection are required if flaws are detected.

- (6) Acceptance Criteria: Any degradation is evaluated in accordance with the applicable approved BWRVIP guidelines.
- (7) Corrective Actions: The corrective actions proposed by the BWRVIP have been reviewed and approved in the staff's SE for the BWRVIP-16 and -19 reports, dated August 10, 2000.
- (8) & (9) Confirmation Process and Administrative Controls: Site QA procedures, review and approval processes and administrative controls are implemented in accordance with the requirements of Appendix B to 10 CFR 50 and will continue to be adequate for the license renewal period.
- (10) Operating Experience: NRC Inspection & Examination (IE) Bulletin 80-13, "Cracking in Core Spray Spargers," required visual inspections. BWR utilities have been routinely performing examinations and, over time, additional cracking has been observed. General Electric (GE) has issued Rapid Information Communication Services Information Letters (RICSILs) which recommended specific inspection guidelines based on instances of cracking found in operating plants. IE Bulletin 80-13 reviews instances of cracking in core spray spargers. Further cracking history is given in Table 3-1 of the BWRVIP-18 report.

The staff's FSER of the BWRVIP-18 report for the current operating term was transmitted by letter dated December 2, 1999, to Carl Terry, BWRVIP Chairman. For the reasons set forth in the FSER, the staff concluded that the inspection strategy and evaluation methodologies discussed in the BWRVIP-18 report are acceptable. Implementation of the above inspection program provides reasonable assurance that crack initiation and growth will be adequately managed such that the intended functions of the subject safety-related RPV internal components will be maintained consistent with the CLB in the period of extended operation.

3.5 Time Limited Aging Analyses (TLAA)

The BWRVIP did not find any of the six TLAA criteria listed in Section 2.4 applicable for license renewal for the core spray piping system. Therefore, the staff concludes that the BWRVIP-18 document does not contain any generic TLAA issues pertinent for the core spray internals. However, if a plant-specific analysis performed by an applicant satisfies each of the TLAA criteria, then the plant specific analysis will be considered a TLAA for license renewal and be evaluated by the applicant.

4.0 CONCLUSIONS

The staff has reviewed the subject BWRVIP-18 report submitted by the BWRVIP. On the basis of its review, as set forth above, the staff concludes that the BWRVIP-18 report provides an acceptable demonstration that the BWRVIP member utilities referencing this topical report will adequately manage the aging effects of reactor vessel components within the scope of the report, with the exception of the noted renewal applicant action items set forth in Section 4.1 below, so that there is reasonable assurance that the core spray internals will perform their intended functions in accordance with the CLB during the period of extended operation. The

BWRVIP-18 report does not contain any generic TLAA issues pertinent for the core spray internals. See Applicant Action Item 4.1(4), below.

Any BWR utility may reference this report in a license renewal application to satisfy the requirements of 10 CFR 54.21(a)(3) for demonstrating that the effects of aging on the reactor vessel components within the scope of this report will be adequately managed. The staff concludes that, upon completion of the renewal applicant action items set forth in Section 4.1 below, referencing the BWRVIP-18 report and its Appendix C in a license renewal application and summarizing in an FSAR supplement the aging management programs and the TLAA evaluations contained in this report will provide the staff with sufficient information to make the findings required by Sections 54.29(a)(1) and (a)(2) for components within the scope of this report.

4.1 Renewal Applicant Action Items

The following are license renewal applicant action items to be addressed in the plant-specific license renewal application when incorporating the BWRVIP-18 report in a renewal application:

- (1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-18 report to manage the effects of aging on the functionality of the core spray internals during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within the BWRVIP-18 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).
- (2) 10 CFR 54.21(d) requires that an FSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the programs and activities specified as necessary in the BWRVIP-18 report are summarily described in the FSAR supplement.
- (3) 10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix C to the BWRVIP-18 report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the core spray internals as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the BWRVIP-18 report for the core spray internals shall ensure that the inspection strategy described in the BWRVIP-18 report does not conflict with or result in any changes to their technical specifications. If technical specification

changes do result, then the applicant must ensure that those changes are included in its application for license renewal.

- (4) Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components. This is discussed in more detail in Section 2.4 of this SE.

5.0 REFERENCES

1. NUREG-1557, Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal, October 1996.
2. Carl Terry, BWRVIP, to USNRC, "BWR Vessel and Internals Project, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (BWRVIP-18)," EPRI Report TR-106740, dated July 1996.
3. C. E. Carpenter, USNRC, to Carl Terry, BWRVIP, "Propriety Request for Additional Information - Review of BWR Vessel and Internals Project Report, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (BWRVIP-18)," dated January 22, 1997.
4. Carl Terry, BWRVIP, to USNRC, "BWRVIP Response to NRC Request for Additional Information on BWRVIP-18," dated October 8, 1997.
5. J. R. Strosnider, USNRC, to Carl Terry, BWRVIP, "Safety Evaluation of BWR Vessel and Internals Project Report, BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines (BWRVIP-18)," dated December 2, 1999.

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