NRC FORM 8C
(7-94)
NRCMD 3.57

COVER SHEET FOR CORRESPONDENCE

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NRC Request for Additional Information Set 7 MATL

NRC RAI Set 7 Number 1 MATL

Stress Corrosion Cracking of Reactor Internals

Operating experience has identified stress corrosion cracking as a mechanism active in both domestic and foreign BWR plants. As a result, the BWR executives established the BWR Vessel and Internals Project (BWRVIP), which developed an augmented inspection program. The BWRVIP program has been reviewed and approved by the staff as being adequate to control and manage degradation of BWR safety-related reactor internals. Compliance with the provisions included in the staff approved BWRVIP inspection program should ensure that degradation of reactor internals is promptly identified and corrected so that the safety-related reactor internals will continue to perform in service as designed. The staff requests that GE address this issue for future power uprates by specifying in its topical report that each applicant applying for power uprate implements the BWRVIP at its facility. Please revise the topical report to include such requirement.

GE Response

Because inspection programs may evolve and plant specific requirements are subject to changes, inspection program details are not included in the CLTR. In response to the staff request and to provide a more consistent guidance for the preparation of additional guidance will be added to the CPPU Power Uprate Safety Analysis Report (PUSAR) shell. This document is used as the starting point in the preparation of plant specific CPPU PUSAR documents and reflects the expected level of details for each section, including lessons learned based on past NRC RAIs.

The CPPU PUSAR shell will be updated

NRC RAI Set 7 Number 2 MATL

Flow Assisted Cracking (FAC)

The GE Licensing Topical Report generically addresses the issue of component degradation by flow-accelerated corrosion (FAC) and concludes that the existing plant program is adequate for managing any potential changes in the effects of FAC caused by the constant pressure power uprate (CCPU). Since the effects of FAC on degradation of carbon steel components are plant specific, in addition to referencing the GE Licensing Topical Report, the licensee needs to provide the results of its plant specific evaluations of the potential changes in FAC. The topical report should specify that future power uprate applicants include in their applications a predictive analysis methodology which must include the values of the parameters affecting FAC, such as velocity, and temperature before and after CCPU and the corresponding changes in component wear rates due to FAC.

GE Response

In response to the staff request and to provide a more consistent guidance for the preparation of additional guidance will be added to the CPPU Power Uprate Safety Analysis Report (PUSAR) shell. This document is used as the starting point in the preparation of plant specific CPPU PUSAR documents and reflects the expected level of details for each section, including lessons learned based on past NRC RAIs.

The CPPU PUSAR shell will be updated

NRC Request for Additional Information Set 8 EMEB

NRC RAI Set 8 Number 1 EMEB

The original design of the control rod drive (CRD) mechanism accounted for scrams due to increased pressure. In the section discussing control rod drive integrity assessment, you indicated that other mechanical loads are expected to remain within the CRD component original design basis, and are dispositioned in the section discussing the reactor internals structural evaluation. Further explanation is needed to substantiate the statement regarding the disposition of the CRD mechanical loads in the CPPU topical report. Describe the design basis mechanical loads and discuss how these loads will be bounding for CPPU.

GE Response

The "other mechanical loads" described in the CLTR are a result of reactor vessel motion due to the loads that are applicable to the CRD mechanism. An evaluation of the CRD mechanism will be performed

NRC RAI Set 8 Number 2 EMEB

The section discussing reactor internal pressure difference indicated that the process used for calculating the reactor internal pressure differences (RIPDs) is described in Section 5.5.1.1 of Reference 1 (ELTR1). However, Section 5.5.1.1 of ELTR1 does not provide the process for calculating the RIPDs. Please provide a summary describing the analysis, methodology, assumptions and computer codes used to calculate RIPDs for normal steady-state operation, upset, and faulted conditions relating to CPPU. Confirm whether the calculation of RIPDs is treated on a plant-specific or generic basis.

GE Response

The analysis methods, assumptions, processes, and computer codes used to calculate the reactor internal pressure differences (RIPD) for major reactor vessel internal components, are the same as those in use for plants without a power uprate.

The method reviewed and approved (Reference 1) for calculation of steady state pressure drops through the core, or Normal conditions, remains the method in the ISCOR computer program. This method has been applied to GE BWR/2 through BWR/6 plants (and ABWR) to calculate the Normal conditions RIPD information.

The pressure drops resulting from Anticipated Operational Occurrences, or Upset conditions, are calculated

For Accidents, or Faulted conditions, the pressure differences across the reactor internal components

For minor components (jet pump sensing lines, dryer/separator guide rods, and in-core guide tube braces), the pressure drops during Normal, Upset, Faulted and Emergency conditions are

References

1. "GESTAR II: General Electric Standard Application for Reactor Fuel," Licensing Topical Report, General Electric, (NEDE-24011-P).

NRC RAI Set 8 Number 3 EMEB

The section discussing reactor internal pressure difference states that

To support CPPU for Dresden and Quad Cities, the jet pump sensing lines required modification. Provide the technical basis of the conclusion in the CPPU topical report and discuss the effects of flow induced vibration on these components due to increased steam flow, recirculation drive flow, and pump van passing frequency. Confirm whether these components will be dispositioned on a plant-specific or generic basis.

GE Response

Components in other regions that are affected by FIV due to the increase in feedwater flow, recirculation drive flow (including vane passing frequency) and steam flow will be evaluated . Components such as jet pump assemblies, jet pump sensing lines, feedwater sparger and steam separator/shroud are evaluated

NRC RAI Set 8 Number 4 EMEB

The section discussing FIV influence on reactor internal components stated whether components in regions that are affected by FIV due to increased feedwater, recirculation drive, and steam flow will be evaluated on a plant-specific or generic basis. These components are jet pump assemblies, jet pump sensing lines, feedwater sparger and steam separators

Confirm whether the vibration data are available for these components affected by CPPU, especially for the steam dryers in their evaluation due to FIV.

GE Response

In accordance with Regulatory Guide 1.20, the first plant of a given type is designated as the prototype for that product line, and is extensively instrumented and tested for vibration of safety related components. In addition some components were tested after startup at certain plants and were also tested at GE testing facilities. Hence, vibration data from plants or test facilities is available for jet pump assemblies, jet pump sensing lines, feedwater sparger, and steam separator/shroud.

The steam dryer has no safety function. The sole function of the steam dryer is to remove moisture from the steam in order to minimize erosion of the piping and turbine and to improve the turbine efficiency. BWRVIP-06, which was endorsed by the NRC, also states that the dryer is non-safety related and failure of a dryer component may cause an operability concern but has no safety impact. Hence the dryer was not instrumented during startup testing and no measured vibration data is available for the prototype plant during startup.

The design criteria for the steam dryer is that the structural integrity of the dryer is maintained when subjected to a steam line break occurring beyond the main steam isolation valves.

The steam dryer meets the design basis criteria for faulted conditions, which is more severe than normal operational loads.

NRC RAI Set 8 Number 5 EMEB

The section discussing the reactor vessel states that the reactor vessel components affected by the CPPU due to increased flow, temperature, RIPDs and other mechanical loads should be evaluated for both stress capacity and cumulative fatigue usage (CUF).

GE Response

NRC RAI Set 8 Number 6 EMEB

The section discussing containment system performance states that air-operated-valves and other safety related valves should also be included in the evaluation for CPPU. Evaluation of CPPU effects should also address the provision in Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," concerning the potential for thermal binding or pressure locking (such as that caused by temperature increases) on the scope of power-operated valves under GL 95-07 or the performance of those valves.

GE Response

A bulleted item will be added to the CPPU Basis noting that the assessment will include consideration of Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves."

NRC RAI Set 8 Number 7 EMEB

In the section discussing FIV influence on piping . Provide descriptions of the startup vibration tests that are required during the initial implementation of CPPU, including the procedure, screening criteria, and acceptance criteria for both the carbon and stainless steel piping.

GE Response

For the piping startup vibration tests, the vibration sensor locations and directions are selected A analysis is performed over the piping sections of interest. The analysis identifies locations and directions where the piping is most likely to respond. Once the sensor locations are selected, then the analysis can be used to establish appropriate acceptance criteria .

Test procedures are part of the implementation plan and are plant specific. The licensee will develop test procedures in accordance with plant procedures, which should follow 10CFR50 Appendix B.

Sometimes a velocity screening criteria is used with the startup piping vibration test. Typically a velocity screening criteria of 0.5 inches per second is used. Additional details on this velocity screening criteria are provided in the appendix of Reference 1.

For piping vibration testing, the acceptance criteria are associated with the allowable design alternating (vibration) stress levels. The steady state flow induced vibration (FIV) maximum stress levels of the piping must remain below the endurance limit of the piping material. This is because many cycles of vibration will be encountered over the remaining design life of the plant. The design fatigue endurance limit for steady state alternating stresses from vibration is for carbon steel piping materials. The ASME design fatigue endurance limit for steady state alternating stresses from

vibration is for austenitic (stainless) steel piping materials.

(See References 1 and 2).

References:

1. American National Standard, ANSI/ASME OM-S/G-1997, "Requirements for Preoperational and Initial Startup Vibration Testing of Nuclear Power Plant Piping.

2. ASME Pressure Vessel and Piping Code, Section III, Division 1 – Appendix I, Figure I-9.2.2, 1989.

NRC Request for Additional Information Set 9 RXSB

Generic Assessments versus Plant Specific Evaluation

NRC RAI Set 9 Number 1 RXSB

Provide the justification for the CPPU generic disposition classifications.

GE Response

There are three general types of generic dispositions identified in Section 1.1.1 of the CLTR. These are:

1. Bounding analysis for the limiting conditions
2. Negligible effect due to CPPU
3. Cycle specific reload analyses are sufficient and appropriate for establishing the CPPU core operating limits

For each generic disposition in the CLTR, the CPPU effect is described and the basis for the generic disposition is provided. Table 1 identifies the sections where each of these three types of generic dispositions and plant specific dispositions are applied in the CLTR. The evaluations in the CLTR demonstrate that the generic dispositions are appropriate. In general, the generic disposition for each general type is consistent with one of the following:

1. Bounding analyses are based on a demonstration that previous generic pressure increase power uprate assessments are bounding or upon specific generic studies provided for the CPPU. For bounding analyses, the current CPPU experience is provided along with the basis and results of the assessment.
2. Assessments having a negligible effect are based on current CPPU analysis experience. For these generic dispositions the CPPU effect is provided with a phenomenological discussion of the basis for the assessment. Any plant system design or analysis that falls outside of the current experience base for a generic analysis is addressed in the plant specific submittal.
3. Cycle specific reload analyses are provided for the first and subsequent reload core designs that implement CPPU. Many of the safety evaluations potentially affected by CPPU are reload dependent and are required as part of the standard reload analysis. Application of the NRC approved standard reload analysis process is considered a generic disposition for the purposes of the CPPU process.

The reload analysis is required to demonstrate that the core design for CPPU meets the

applicable NRC evaluation criteria and limits for these analyses. Therefore, on that basis, these analyses are generically dispositioned.

However, the reload fuel design and core loading pattern dependent plant evaluations for CPPU operation is required to be performed as part of the standard reload licensing process and is therefore considered adequate.

Each of the generic dispositions for a specific plant application is evaluated to confirm its applicability. The plant specific submittal will either document the successful confirmation of the generic assessment or provide a plant specific evaluation, consistent with Section 1.1.2 of the CLTR, if the applicability assessment is unsuccessful.

NRC RAI Set 9 Number 2 RXSB

Provide the process (or procedures) that will be used by a licensee to verify that a CPPU generic disposition is applicable to the specific plant/unit uprate.

GE Response

The licensee verification of the CPPU generic disposition is based on the plant specific CPPU Power Uprate Safety Analysis Report (PUSAR), which is prepared to document the disposition of all CLTR topics and submitted to the NRC. As stated in Section 1.1.1 of the CLTR,

> "The applicability of the generic assessments for a specific plant application will be evaluated. The plant specific submittal will either document the successful confirmation of the generic assessment or provide a plant specific evaluation, consistent with Section 1.1.2, if the applicability assessment is unsuccessful."

The basic process for confirming the applicability of a generic disposition begins with the generic disposition of each item in the CLTR. Based on the CLTR, GENE has developed a CPPU PUSAR shell that is used as the starting point in the preparation of the plant specific CPPU PUSAR documents and reflects the expected level of details for each CLTR topic. The CPPU PUSAR shell provides the applicable basis from the CLTR for the generically dispositioned topics and identifies the plant specific confirmation required for each generic disposition. Therefore, a plant specific confirmation for each generic disposition in the CLTR is included in the plant specific PUSAR. The licensee is responsible for reviewing and approving the plant specific PUSAR consistent with the licensee's standard review process for license amendments, including the confirmation of all generic dispositions.

NRC RAI Set 9 Number 3 RXSB

Provide the process to be used by the licensee for CPPU evaluations with both generic and plant specific dispositions indicated.

GE Response

The CLTR will be revised so that there are no combined generic and plant specific dispositions. This approach will require separating the current combined evaluations into a generic component and a plant specific component. By implementing this change, the treatment of the generic dispositions and plant specific dispositions will be consistent with their unique process.

Specifically, the following CLTR existing topic disposition:

Will be changed to:

NRC RAI Set 9 Number 4 RXSB

Discuss the process for vendor (GENE/GNF) coordination and oversight from the initiation of a licensee request for an EPU through the design and safety analyses phases, including follow-up until successful plant EPU operation is achieved.

GE Response

For CPPU, the GENE/GNF interface is effectively the same as for the standard reload process.

Consistent with the standard reload safety analysis, GNF is responsible for the reload fuel thermal-mechanical and core design, and GENE is responsible for all CPPU and reload safety analyses. As a result, the reload interface is treated in same manner as the standard reload. Each organization is controlled by their specific procedures and quality assurance programs.

Any items that require coordination during the performance of the CPPU project are handled through the GENE Project Manager for the EPU.

<u>CPPU Effects</u>

NRC RAI Set 9 Number 5 RXSB

Discuss the process to be followed if the licensee requesting EPU has not previously implemented MELLLA/ARTS.

GE Response

NRC RAI Set 9 Number 6 RXSB

Discuss the process if the licensee has not previously used GE14 (or GE12) reload fuel and will be loading a mixed fuel type core for EPU operation.

GE Response

GE12 and GE14 are approved fuel designs. These fuel types were generically licensed for operation through the GESTAR II Amendment 22 process.

CPPU is intended to be implemented with any GE approved fuel design through GE14. The standard reload process for new fuel introduction (mixed fuel type core) is followed, if the fuel design for the initial cycle of CPPU was not previously utilized. The reload analysis is required to demonstrate that the core design for CPPU meets the applicable NRC evaluation criteria and limits.

NRC RAI Set 9 Number 7 RXSB

Discuss the oversight process to be used to coordinate the EPU effort if the licensee is concurrently implementing other significant changes (e.g., improved TS).

GE Response

NRC RAI Set 9 Number 8 RXSB

What documentation will exist to explain the CPPU process, in addition to the normal reload core design and safety analyses DRFs, project Task Reports, SRLR and COLR? Will a licensee's EPU submittal under the CPPU approach provide a checklist or references to the documentation that will exist?

GE Response

The CPPU process is described in the CLTR. This document describes all evaluations that are performed for CPPU and identifies the potential Technical Specification changes. In addition, the CLTR provides generic disposition for many of the evaluations.

The license amendment request for the increase in OLTP is submitted by the licensee consistent with the requirements of 10CFR50.90. A key part of the license amendment request is the plant specific PUSAR. The plant specific PUSAR provides the results of the plant specific evaluations

and a confirmation of the applicability of the generic dispositions identified as required by the CLTR. Plant specific evaluations are performed for any generic dispositions that were not confirmed for a specific plant. Other GE internal documentation in support of the CPPU evaluation such as DRFs and task reports are generated as required and are not considered part of the license amendment request. This process is the same as the EPU process.

NRC RAI Set 9 Number 9 RXSB

Since "representative equilibrium" reload core designs are not being performed, are specific GENE/GNF oversight procedures required to ensure that the initial (and continuing) transition reload core evaluations satisfy all safety analyses acceptance criteria?

GE Response

NRC Request for Additional Information Set 2

NRC RAI Set 2 Number 5 PRA - December 12, 2001 Conference Call

GE Response

Per the subject conference call the response to RAI Set 2 Number 5 has been modified. The CLTR Section will be revised

General Electric Company

AFFIDAVIT

I, George B. Stramback, being duly sworn, depose and state as follows:

(1) I am Project Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Attachments 1 through 4 to letter MFN 01-072, JF Klapproth to NRC, *Responses to Draft Request for Additional Information (RAI) to Licensing Topical Report NEDC-33004P, Revision 1, (TAC NO. MB2510)*, dated December 18, 2001. The proprietary information in Attachments 1 through 4 (GE Company Proprietary), is identified by double underlining of the specific material.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), 2.790(a)(4), and 2.790(d)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals cost or price information, production capacities, budget levels, or commercial strategies of General Electric, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, of potential commercial value to General Electric;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in both paragraphs (4)a. and (4)b., above.

(5) The information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains further details regarding the GE proprietary report NEDC-33004P, *Constant Pressure Power Uprate,* Revision 1, Class III (GE Proprietary Information), dated July 2001, which contains detailed results of analytical models, methods and processes, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR").

The development and approval of these system, component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF CALIFORNIA)
) ss:
COUNTY OF SANTA CLARA)

George B. Stramback, being duly sworn, deposes and says:

That he has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 18th day of December 2001.

George B. Stramback
General Electric Company

Subscribed and sworn before me this 18TH day of DECEMBER 2001.

Notary Public, State of California

ANNA HANLIN
Commission # 1184507
Notary Public - California
Santa Clara County
My Comm. Expires Jun 19, 2002

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