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Date: 6/1/04 2:30PM
Subject: Proposed Generic Communication; Potential Impact of Debris Blockageon Emergency Recirculation During Design Basis Accidents at PressurizedWater Reactors (69 Fed. Reg. 16980)

Mr. Michael T. Lesar, Chief

Rules and Directives Branch
U.S. Nuclear Regulatory Commission

Mail Stop T6-D59
Washington, DC 20555-0001

3/31/04

69 FR 16980

(4)

SUBJECT: Proposed Generic Communication; Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors (69 Fed. Reg. 16980)

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Rules and Directives Branch

Dear Mr. Lesar:

Enclosed are comments submitted on behalf of the nuclear power industry by the Nuclear Energy Institute (NEI)[1] <outbind://9/#_ftn1> . These comments are in response to the March 31, 2004 Federal Register "Notice of opportunity for public comment" concerning the subject proposed generic letter.

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NUCLEAR ENERGY INSTITUTE

Anthony R. Pietrangelo
SENIOR DIRECTOR, RISK REGULATION
NUCLEAR GENERATION

June 1, 2004

Mr. Michael T. Lesar, Chief
Rules and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, DC 20555-0001

SUBJECT: Proposed Generic Communication; Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized Water Reactors (69 *Fed. Reg.* 16980)

Dear Mr. Lesar:

Enclosed are comments submitted on behalf of the nuclear power industry by the Nuclear Energy Institute (NEI)[1]. These comments are in response to the March 31, 2004 *Federal Register* "Notice of opportunity for public comment" concerning the subject proposed generic letter.

We appreciate the opportunity to comment on this proposed generic letter. Please direct any questions on our comments to John Butler at (202) 739-8108.

Sincerely,

Anthony R. Pietrangelo

Enclosure
c: Mr. David C. Cullison, U.S. Nuclear Regulatory Commission
Mr. David L. Solorio, U. S. Nuclear Regulatory Commission
Mr. Ralph E. Architzel, U. S. Nuclear Regulatory Commission
Mr. Michael L. Marshall, Jr., U.S. Nuclear Regulatory Commission
Mr. John G. Lamb, U. S. Nuclear Regulatory Commission
Public Document Room (Project No. 689)

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory aspects of generic operational and technical issues. NEI members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

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Industry Comments on Draft NRC Generic Letter 2003-XX: Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors

I. Introduction

The draft Generic Letter (GL) references new research information that identifies the "potential susceptibility of pressurized-water reactor (PWR) recirculation sump screens to debris blockage during design basis accidents requiring recirculation operation of the emergency core cooling system (ECCS) or containment spray system (CSS) and the potential for additional adverse effects due to debris blockage of flowpaths necessary for ECCS and CSS recirculation and containment drainage." The research has led to a generic regulatory concern about the adequacy of long-term cooling following a design basis event (DBE). Post-DBE long-term cooling is a general requirement of 10 CFR 50.46(b)(5). The new information may also lead to other plant-specific concerns, the natures of which are further discussed in the draft GL.

The research is documented by NRC Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on PWR Sump Performance." The objective of GSI-191 is to ensure that post-accident debris blockage will not impede or prevent the operation of the ECCS and CSS in recirculation mode at PWRs during loss-of-coolant accidents (LOCAs) or other high-energy line break (HELB) accidents for which sump recirculation is required.

The nuclear industry has always recognized the importance of ensuring that Emergency Core Cooling and Containment Spray Systems are capable of meeting their design requirements. The nuclear industry also recognizes and acknowledges the need to reevaluate the capability of current PWR designs using a robust mechanistic analysis that takes into account a large body of research that has generated, and continues to generate, new information about the effect of debris generated by DBEs. Plant-specific reevaluations, when completed, will likely result in revisions to the licensing bases for affected plants and may lead some PWR owners to modify their plant's design and operation. New licensing bases would take effect after the completion of plant and license modifications.

Our comments on the draft GL recommend changes to support the PWR industry's intent to expeditiously resolve GSI-191 concerns and ensure that PWR emergency recirculation designs are robust and provide a more than adequate level of safety.

II. A Licensing Framework for GSI-191 Resolution

The draft GL is written as a request for information about the status of each licensee's compliance with the general requirement for post-DBE long-term cooling codified in 10 CFR 50.46(b)(5). However, any compliance determination using the robust, highly conservative methodology that is being prepared by the NEI PWR Sump Performance Task Force would be indeterminate. It could confirm compliance, but could not confirm non-compliance because the methodology is not designed to be a "minimum compliance" methodology. Thus, failure to satisfy the acceptance criteria of the new methodology would not necessarily imply non-compliance with 10 CFR 50.46(b)(5). Furthermore, verification of minimum compliance would require extensive fine-tuning of the methodology, which would lengthen the time needed to resolve GSI-191.

Rather than approach the issue from a compliance standpoint, NEI recommends that NRC approach it from a design basis standpoint. This is the approach that was used successfully by NRC in the early 1990s to resolve concerns with the environmental qualification of electrical equipment and in the late 1990s to resolve sump blockage concerns at BWRs. It would be based on date-certain commitments from licensees to:

- apply the NRC-approved methodology,
- evaluate the results to determine the need for plant modifications and license amendments,
- prepare a modification package in accordance with 10 CFR 50.59(c)(2)(viii) and plant procedures,
- if necessary, prepare a License Amendment Request (LAR) in accordance with plant procedures,
- procure material and schedule plant modifications,
- install and test plant modifications, and
- incorporate the revised design basis in the licensing basis (FSAR, Technical Specifications, or other docketed correspondence).

This approach has the advantage of resolving GSI-191 in a well-defined manner and in a well-understood time frame. The robust methodology being developed by industry also supports expeditious resolution of GSI-191 through the use of large built-in conservatisms to accommodate the complex phenomenological nature of the processes, uncertainties associated with translation and application of small-scale tests and experiments, variability in expected plant conditions, and difficulties associated with modeling chaotic flow processes.

III. Specific Comments

Comment 1

The generic letter should be modified to support industry action to expeditiously resolve GSI-191 concerns. Specifically, the GL should request PWR licensees to take appropriate action, utilizing the latest approved methods, to provide a high degree of assurance that PWR recirculation systems address the effects of debris generation.

If the resulting evaluation confirms a "potential susceptibility" (not the same as non-compliance) of PWR recirculation sump screens to post-LOCA debris blockage, licensees should be permitted to take action to eliminate susceptibility by incorporating the revised evaluation into the plant licensing basis. A licensee should also be permitted to develop and implement any resulting corrective actions in a time frame that allows for the design of plant modifications, the procurement of materials, the preparation of procedures, training, implementation, testing, and (if necessary) operating license amendments.

Discussion

The draft GL directs PWR licensees to confirm compliance with applicable regulatory requirements. In the absence of a specific request to revise a plant's licensing basis, this compliance is confirmed by demonstrating that a plant's design, construction, maintenance, and operation are in full conformance with the licensing basis for the plant.

As noted in the draft GL, most PWRs use the guidance contained in Regulatory Guide 1.82, Revision 0, to support the design and licensing of systems supporting ECCS and CSS recirculation operation. Thus, confirmation that a plant is in compliance with applicable regulatory requirements will, for many plants, involve confirmation that their design continues to meet their licensing basis, based on RG 1.82, R0 guidance.

Absent a specific regulatory requirement for PWR licensees to modify their licensing bases to incorporate the new information identified in the draft GL, the "confirmation of compliance with regulatory requirements" can be demonstrated without performing a mechanistic analysis that explicitly accounts for debris generation and transport.

Many of the recirculation concerns identified in the draft GL for PWRs were previously addressed for BWRs in response to Bulletin 96-03. This Bulletin took a more direct approach in addressing recirculation concerns by requesting BWR

licensees to take appropriate action[2], utilizing the latest available information from testing and experimentation, to provide a high degree of assurance that BWR ECCS systems addressed the effects of debris generation on strainer performance.

This direct request of BWR plant licensees enabled activities and resources to be properly focused on a determination of the appropriate procedural measures and plant modifications necessary to meet the Bulletin request, using analytical methods that mechanistically account for debris generation and transport. Each BWR licensee performed the necessary mechanistically based analyses, implemented appropriate procedural measures and plant modifications and revised the plant licensing basis in accordance with accepted regulatory processes in response to the Bulletin request.

As noted in the *Discussion* section of the draft GL, industry is developing guidance for use by PWR licensees to address GSI-191 concerns. The intent of this guidance is to provide PWR licensees with the tools, methods and guidance necessary to evaluate the impact of debris generation on containment sump performance and to guide the decision process toward ensuring that plants have a robust design that is capable of addressing the full range of uncertainties endemic to any analysis of debris generation, transport and resultant flow blockage.

The industry evaluation process calls for the performance of an initial baseline analysis that utilizes simplified and conservative methods. The results of this baseline analysis will help guide the decision process for individual plants and permit the direct incorporation of planned design modifications as part of the baseline analysis. This will enable plants to expeditiously resolve GSI-191 in a manner that is similar to that accomplished by BWR plants in response to Bulletin 96-03.

We believe the intent of the draft GL and Bulletin 96-03 are the same, as each is intended to direct those actions necessary to provide a high level of assurance that recirculation systems supporting ECCS and CSS operation are capable of completing their safety functions under design basis accident assumptions. This intent was met by Bulletin 96-03 for the BWRs through a very direct and focused generic communication.

We believe the draft GL purpose, requested information and required information should be modified to direct actions that are more in line with Bulletin 96-03.

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[2] Bulletin 96-03 Purpose
"Request addresses to implement appropriate procedural measures and plant modifications to minimize the potential for clogging of emergency core cooling system (ECCS) suppression pool suction strainers by debris generated during a loss-of-coolant accident (LOCA)"

Comment 2

As discussed in a separate letter from the Nuclear Utility Backfitting and Reform Group (NUBARG)[3], the NRC purpose for this generic letter is not clear in that, on one hand, it is requested that a licensee confirm compliance with its licensing basis. However, on the other hand, the NRC appears to request that licensees perform evaluations based on guidance that arguably may be outside of their licensing basis. Unless the NRC justifies requiring the use of this guidance as a "compliance backfit," such an action should not be required pursuant to 10 C.F.R. § 50.54(f). Furthermore, should the NRC claim that this issuance is a justified backfit pursuant to 10 C.F.R. § 50.109, a regulatory analysis consistent with 10 C.F.R. § 50.109(a)(6) would still be required.

Comment 3

In the *Background* section of the draft GL it states,

> *During the process of resolving the potential concerns identified in this generic letter, the revised analysis of sump performance may affect addressees' understanding of their facilities' ECCS and CSS recirculation capabilities. In accordance with GL 91-18, Revision 1, ...addressees may find it necessary to reevaluate the adequacy of their compensatory measures in light of the new information and take further action as appropriate and necessary.*

Use of GL 91-18, Revision 1 is appropriate should a licensee determine that its plant fails to conform to its licensing basis. However, for an evaluation of sump performance using guidance, assumptions, and analyses that have not been approved by the NRC on a plant specific basis, use of GL 91-18 is not appropriate.

As discussed at the May 19 public meeting on the draft GL, the changes in analytical techniques and assumptions, as well as some of the physical modifications that may be introduced as part of the resolution process can lead to a need for NRC approval before such changes can be implemented[4]. When the new analyses are approved and the modifications installed, they become the new licensing basis and then fall under the provisions of Generic Letter 91-18. The Background section should be revised reflect this clarification on the use of GL 91-18.

Comment 4

The schedule for actions and information that are requested or required by the draft GL do not appear to take into account the effect of related activities that will impact the conduct and outcome of industry actions in response to the GL and do not appropriately account for the time and effort necessary to perform requested

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[3] NUBARG is a consortium of nuclear utilities which was initially established to participate actively in the NRC's adoption and implementation of the backfit rule at 10 C.F.R. 50.109. NUBARG continues to oversee NRC regulatory actions and initiatives from a backfit perspective.

[4] 10CFR50.59(c)(2)(viii), "A licensee shall obtain a license amendment pursuant to Sec. 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would...result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses."

mechanistic evaluations and implement any actions and modifications that may be deemed necessary following completion of these evaluations.

Within 15 days of the issuance date of the GL, addressees are required to determine their ability to provide the full scope of information identified in the GL by the requested dates. A key source of information necessary to support this required assessment is an approved evaluation methodology, by which licensees will perform a mechanistic evaluation of ECCS and CSS recirculation functions. As noted in the draft GL, NRC is currently reviewing generic industry guidance and will issue a safety evaluation report endorsing portions or all of the generic industry guidance. The NRC's current schedule for actions related to GSI-191[5] call for issuance of the GL in August 2004. This schedule also calls for completion of the technical review of industry guidance in September 2004. Per this schedule, licensees will be required to assess their capability to respond to the GL by early to mid September, without having an approved methodology available for use in performing this assessment.

Within 60 days of the issuance date of the GL, addressees are requested to provide information regarding their planned actions and schedule to confirm their compliance with applicable regulations. The requested information includes:

- A description of the methodology used or that will be used
- Completion date of any analysis that will be performed
- Plans, schedule and methodology for performance of containment walkdown surveillance

As noted above, the current schedule calls for completion of NRC review and endorsement of an evaluation methodology approximately 1 month following the planned issuance of the GL. Assuming these two activities occur per the schedule and there is no delay in issuing the evaluation methodology endorsement, licensees would have approximately 30 days to review the methodology, decide if the methodology is appropriate for their plant(s) and identify necessary resources and schedule to support the evaluation. Because the schedule for responding to the GL and NRC approval of evaluation methodologies are not tied together, the time available for review of approved methodologies could easily be less than the estimated 30 days.

The mechanistic evaluation of ECCS and CSS recirculation performance called for by the draft GL requires a comprehensive and detailed evaluation of system performance and operation. This will likely require addressees to contract portions of the evaluation to qualified contractors. We do not believe the resources of qualified contractors are sufficient to support initial evaluations of up to 69 PWRs within the limited time period provided by the draft GL.

[5] NRC schedule for resolution of GSI-191 provided at http://www.nrc.gov/reactors/operating/ops-experience/pwr-sump-performance/res-schedule.html

By April 1, 2005, addressees are requested to provide the results of a comprehensive mechanistic evaluation of ECCS and CSS recirculation functions, including a description and implementation schedule for any planned plant modifications and programmatic controls. The calendar date by which this information is to be provided is not tied to the GL issuance date. As such, any delays in issuance of the GL will directly impact the time available to complete necessary analyses and respond to the GL.

The above discussion identifies a number of concerns related to the time frames for completion of necessary actions and submittal of required and requested information. These time frames should be revised so that they are consistent with the intent of the GL, as identified in the *Discussion* section[6].

In order for licensees to adequately complete their walkdowns, determine the status of their sumps and containments, perform the required analysis and calculations and develop, procure and complete any necessary modifications; the response dates of the draft GL should be extended and should begin following the availability of accepted evaluation guidance.

The *Requested Information* response of the draft GL should be one year after the date of issuance of approved evaluation guidance instead of April 1, 2005. This schedule would take into account the time constraints identified above and would allow time for resolution of the concerns regarding chemical effects (see Comment 6) and would accommodate the development and implementation of a risk-informed resolution option (see Comment 5).

The following time line is proposed:

A. NRC endorsement of evaluation guidance	-	~September 2004
B. Generic Letter Issued	-	~September 2004
C. Licensee response containing plans and Schedule	B+180 days	~March 2005
D. Licensee response containing results of evaluation	B+1 yr	~September 2005
E. All required modifications complete		~December 31, 2007

[6] Draft GL, final paragraph of *Discussion* section –
"The time frames for addressee responses in this generic letter were selected to 1) allow adequate time for addresses to perform an analysis, if they opt to do so, 2) allow addressees to properly design and install any identified modifications, 3) allow addresses adequate time to obtain NRC approval, as necessary, for any licensing basis changes, and 4) allow for the closure of the generic issue in accordance with the published schedule. These time frames are appropriate since all addresses have responded to Bulletin 2003-01 and will, if necessary, implement compensatory measures until the issues identified in this generic letter are resolved".

Comment 5
In a March 4, 2004 letter to NEI, NRC opened the possibility for risk-informing portions of the evaluation process for addressing GSI-191 concerns.

> "...the NRC staff plans to discuss, in public meetings, the use of current or planned work to risk-inform Title 10, *Code of Federal Regulations* Section 50.46, "Acceptance criteria for emergency core cooling system for light-water nuclear power reactors," as a suitable technical basis for defining a spectrum of break sizes for debris generation and containment sump strainer performance."

The development of a risk-informed GSI-191 resolution option is important to industry in that it would enable risk information to be utilized in a technical area that is traditionally treated in a manner that unrealistically compounds known conservatisms.

We believe that the GL issuance schedule should be modified to reasonably accommodate the time necessary to complete discussions between NRC and industry on a risk-informed GSI-191 resolution option. In addition, the GL schedule for industry responses to the GL should address the time needed to implement a risk-informed GSI-191 resolution option.

Comment 6
As part of the mechanistic evaluation, the results of which are requested by April 1, 2005, addressees are asked to address any debris which might result from the containment environment (thermal and chemical). The GL identifies chemical precipitants caused by chemical reactions in the pool as an example of the type of chemical reaction to be considered. While the potential for chemical precipitants is worthy of further study to identify if it is a valid concern for PWR containment environments, there have been no studies, evaluations or experiments that demonstrate that chemical precipitants can form under the conditions that will be present in a PWR containment. The necessary experiments to determine whether chemical precipitants can form under prototypic PWR containment conditions are planned to be performed under the joint sponsorship of EPRI, WOG and NRC Research. Results from these tests are not expected until late 2004.

Under the current schedule for responses to the GL, results from planned testing will not be available before licensees have to begin the mechanistic evaluations called for by the GL. Licensees will thus be placed in a position where they are called upon to address a potential concern with no technical foundation upon which to base their evaluation.

Other than providing some reasonable design margin for the uncertainty associated with these effects, it is not clear how licensees are to address chemical effects under the proposed response schedule. As noted in Comment 4, the response timeline should provide sufficient time for completion of necessary confirmatory research or the GL should cite, with supporting justification, the appropriate standards or requirements to be applied.

Comment 7

In the *Background* section of the draft GL it states,

> *In response to Bulletin 2003-01, PWR licensees that were unable to confirm regulatory compliance implemented or plan to implement compensatory measures to reduce risk or otherwise enhance the capability of the ECCS and CSS recirculation functions.* (Emphasis added)

Similarly, in the *Reasons for Information Request* section of the draft GL it states,

> *Bulletin 2003-01 requested information to verify addressees' compliance with NRC regulations and to ensure that any interim risks associated with post-accident debris blockage are minimized while evaluations to determine compliance proceed....(Emphasis added)*

These statements are incorrect. The Bulletin requested information and provided two options by which to respond. Option 1 requested a statement that mechanistic analyses have been performed that take into account recent research findings described in the Bulletin. Option 2 requested a description of compensatory measures that have been or will be implemented to reduce the risk associated with potentially degraded or nonconforming ECCS or CSS recirculation functions.

Because reviewed and accepted guidance necessary to perform the mechanistic analyses cited in Option 1 is not currently available, most PWR licensees chose Option 2 and implemented compensatory measures. Confirmation of compliance with a plant's licensing basis was not requested and would not have served the intent of the Bulletin since the licensing bases for most plants do not include mechanistic analyses that take into account recent research findings.

The draft GL statements cited above should be revised to accurately reflect the Bulletin 2003-01 information request.

Comment 8

In the *Paperwork Reduction Act Statement* section of the draft GL a burden estimate of *1000 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the necessary data, and completing and reviewing the information collections* is provided.

This estimate is low and does not adequately capture the effort necessary to respond to the information requested by the draft GL. We estimate between 5000 and 10000 man-hours to accomplish the work necessary to collect and analyze necessary plant information (including containment walkdowns), perform mechanistic analyses, documentation and review. This estimate does not include the cost and time necessary to implement any plant changes resulting from the analysis, such as procedural changes, plant modifications and revision to the plant licensing basis.

The burden estimate should be revised to better reflect the estimated impact of the generic letter requests.

Comment 9

The *Requested Information* section of the draft GL (section 1b) requests as part of the 60-day response, the results of any completed containment surveillance walkdowns. This request for results should be a) modified to identify the specific results or derived conclusions that are to be addressed in the response and b) moved to be incorporated as part of the detailed information request following completion of the evaluation (section 2 of *Requested Information*).