POLICY ISSUE
INFORMATION

July 28, 2008 SECY-08-0108

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: SUMMARY OF ACTIVITIES RELATED TO GENERIC ISSUES PROGRAM

PURPOSE:

This paper provides the annual summary of the Generic Issues Program (GIP) activities including improvements to ensure timely and effective resolution of generic issues (GIs). This paper does not address any new commitments.

BACKGROUND:

In the staff requirements memorandum (SRM) related to SECY-05-0126, "Summary of Activities Related to Generic Safety Issues," dated August 31, 2005 (Agencywide Document and Management System (ADAMS) Accession No. ML052430101), the Commission directed the staff to develop a plan to focus renewed attention to the GIP to resolve the older GIs, and ensure that future GIs are resolved in a timely manner. In its response to that SRM, "Response to Staff Requirements Memorandum on SECY-05-0126, 'Summary of Activities Related to Generic Safety Issues,'" dated March 29, 2006 (ADAMS Accession No. ML053570259), the staff provided a plan to ensure timely resolution of GIs. The staff provided to the Commission updates and progress reports on this plan in SECY-06-0161, "Summary of Activities Related to Generic Safety Issues," dated July 20, 2006 (ADAMS Accession No. ML061860078), and SECY-07-0110, "Summary of Activities Related to Generic Safety Issues," dated July 6, 2007 (ADAMS Accession No. ML071620042). In SECY-07-0022, "Status Report on Proposed Improvements to the Generic Issues Program," dated January 30, 2007, (ADAMS Accession

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No. ML063460239) the staff discussed GIP improvement elements it will implement through a revision of Management Directive (MD) 6.4, “Generic Issues Program.”

DISCUSSION:

Status of Generic Issues

Since the latest annual report to the Commission (SECY-07-0110), the staff closed two GIs. Three reactor GIs exited the GIP when responsibility for their implementation and verification was transferred to NRR in accordance with SECY-07-0022. These GIs in “regulatory office implementation” are proceeding under other established programs and processes, and continue to be tracked in GIMCS. Three reactor GIs remain open in the GIP. Additional details are provided below.

Closed Generic Issues

During this reporting period, the staff closed GI-156.6.1, “Pipe Break Effects on Systems and Components,” after completing the technical assessment. The staff closed this issue with no additional actions. The decision was based primarily on examinations of the layout of applicable operating plants, and no instance was found where a pipe break would directly disable both channels of any safety-significant system.

During this reporting period, the staff closed GI-NMSS-0007, “Criticality Benchmarks Greater Than 5% Enrichment,” after issuing Fuel Cycle Safety and Safeguards (FCSS) Interim Staff Guidance (ISG)-10, “Justification of Minimum Margin of Subcriticality for Safety.”

During this reporting period, the staff transferred the following three reactor GIs from the GIP to NRR for regulatory office implementation: GI-163, ”Multiple Steam Generator Tube Leakage”; GI-189, “Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident”; and GI-191, “Assessment of Debris Accumulation on PWR Sump Performance.” Their status will continue to be tracked and reported in GIMCS until completion by the program office.

Open Generic Issues

The following three reactor GIs are open in the GIP: GI-186, “Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants”; GI-193, “BWR ECCS Suction Concerns”; and GI-199, “Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States for Existing Plants.” There are no open nonreactor GIs.

The enclosure provides the status of GIs being tracked in GIMCS.

Update on GIP Improvements

In SECY-07-0022 and SECY-07-0110, the staff discussed implementing actions to ensure comprehensive and timely resolution of future GIs. The staff implemented the improvements and is finalizing revisions to MD 6.4, “Generic Issues Program,” and its companion RES office instruction (OI), TEC-002, “Procedures for Processing Generic Issues.” The staff is incorporating experience and lessons learned from the implementation of the new GIP process

into the revised MD and RES OI documents. For example, based on experience with GI-199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants," all issues that screen into the GIP will have an issue-specific communication plan prepared prior to release of the screening memorandum. The communication plan ensures consistent information on the specific GIs is clearly communicated and accessible to all interested parties. The staff plans to issue the revised MD 6.4 by October 2008.

Communication of GIP Improvements

In September 2007, the staff contacted key stakeholders and held an open public meeting to discuss GIP improvement initiatives. The revised MD and RES OI documents will incorporate feedback, as appropriate, from the stakeholders. Other staff activities include the following: (1) papers and presentations on the revised GIP at the 16th International Conference on Nuclear Engineering and the 2008 International Conference on Advances in Nuclear Power Plants, (2) ongoing improvements to make the GIP internal and external Web pages more useful by expanding the available information and improving its accessibility, (3) inter-office coordination on the MD 6.4 revision. Staff plans to provide agency wide training after issuing the revised MD 6.4.

Lessons Learned from Implementation of the Revised GIP

As previously discussed, the staff learned several important lessons during the implementation of the enhanced GIP and is including them in the revised guidance documents. These lessons include the following:

(1) need for issue-specific communication plans to clearly and consistently provide the information on the issue;

(2) clear documentation of GIP transitions whenever an issue enters the program, completes a stage, or responsibility is transferred to another program or office;

(3) a mechanism to defer the acceptance review stage for a proposed issue, when detailed information is not available, but a scoping study to better characterize the issue can be completed within one year; and

(4) a renewed focus on the importance of identifying and engaging all internal stakeholders during the screening stage for each GI.

International Efforts

In December 2007, the staff gave presentations at the Technical Meeting on Global Cooperation on Generic Safety Issues for Nuclear Power Plants and Measures for Their Resolution, in Bonn, Germany. Subsequent to that meeting, the staff concluded it was important for the NRC to be aware of any generic issues being assessed in other countries. To accomplish this, the staff conducted followup discussions with representatives from the International Atomic Energy Agency and the Nuclear Energy Agency of the Organization for Economic Co-operation and Development. The purpose of these discussions was to organize a meeting of experts from countries with programs similar to the GIP. The meeting is scheduled for September 2008, in

Vienna, Austria. At the proposed meeting, the participants will review and compare recent, relevant GIs from each country to share any technical results and development. In addition, the participants will discuss mechanisms for future information exchange and cooperation on GIs.

RESOURCES:

For Fiscal Year (FY) 2008, the staff estimates that the resources needed for these activities will total $1,150K and 7.6 full-time equivalents (FTE). These resources are included in the FY 2008 budget as follows:

- RES: $1,150K and 6.8 FTE
- NRR: 0.4 FTE
- NMSS: 0.1 FTE
- FSME: 0.2 FTE, and
- NRO: 0.1 FTE

For FY 2009 the staff has streamlined the GIP process and has reduced the total budget resources. However, the FTE has increased because there is an increase in the workload assisting with the resolution of existing issues during the regulatory assessment process. Thus, for FY 2009, the staff estimates that the resources needed for these activities will total $850K and 8.7 FTE. The staff has budgeted the following resources for FY 2009:

- RES: $850K and 7.5 FTE
- NRR: 0.8 FTE
- NMSS: 0.1 FTE
- FSME: 0.2 FTE, and
- NRO: 0.1 FTE

COORDINATION:

The Office of the General Counsel reviewed this package and has no legal objection. The Chief Financial Officer reviewed this package and determined that it has no financial impact.

/RA Martin Virgilio acting for/

R. W. Borchardt
Executive Director
for Operations

Enclosure:
Generic Issue Management Control
System Report, June 30, 2008

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM (GIMCS) REPORT
June 30, 2008

Office of Nuclear Regulatory Research

Enclosure

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Description

The Generic Issue Management Control System (GIMCS) provides information necessary to manage the resolution of generic issues (GIs). The resolution of any GI has the potential for safety enhancements and the promulgation of new or revised requirements or guidance.

GIMCS is part of an integrated system of reports and procedures that is designed to manage GIs from issue identification through resolution (development of new criteria, management review and approval, public comments, and incorporation into the regulations, as appropriate). The priority evaluation of generic issues (i.e., listed as HIGH- or MEDIUM) is primarily of historical significance only as issue prioritization was discontinued in 1999 with issuance of MD 6.4. Issue priority in this report and in NUREG-0933, "A Prioritization of Generic Safety Issues," is retained, where applicable, for historical purposes.

For reactor issues, the "Procedures for Processing Generic Issues" are outlined in the Office of Nuclear Regulatory Research (RES) Office Instruction TEC-002, dated September 29, 2005, and is currently undergoing revision. The procedures for processing non-reactor issues are documented in the Office of Nuclear Material Safety and Safeguards (NMSS) Policy and Procedures Letter 1-57, Revision 1, "NMSS Generic Issues Program," dated October 1997. In 1999, Management Directive (MD) 6.4, “Generic Issues Program,” was initiated for the processing of all new GIs; MD 6.4 was revised on July 29, 2005; and is currently under revision again with scheduled completion by October 2008.

The data fields (or elements) documented in GIMCS include 31 items as described below. Some of these data fields (e.g., priority) are not used for new GIs, but have historical value for tracking legacy GIs.

Legend

ACRS - Advisory Committee on Reactor Safeguards
ASME - American Society of Mechanical Engineers
BNL - Brookhaven National Laboratory
BWR - Boiling Water Reactor
BWROG - Boiling Water Reactor Owners Group
DCH - Direct Containment Heat
CEUS - Central and Eastern United States
CRGR - Committee to Review Generic Requirements
DE - Division of Engineering
DSA - Division of Systems Analysis
ECCS - Emergency Core Cooling System
EPRI - Electric Power Research Institute
FIN - Financial Identification Number
FRN - Federal Register Notice
GI - Generic Issue (same meaning as GSI)
GIMCS - Generic Issue Management Control System
GL - Generic letter
GSI - Generic Safety Issue
H - HIGH-priority GSI
IN - Information Notice
IPEEE - Individual Plant Examination of External Events
M - MEDIUM-priority GSI
MD - Management Directive
NEI - Nuclear Energy Institute
NMSS - Office of Nuclear Material Safety and Safeguards
PRA - Probabilistic Risk Assessment
PWR - Pressurized Water Reactor
PWROG - Pressurized Water Reactor Owners Group
RES - Office of Nuclear Regulatory Research
RG - Regulatory Guide
RI - Regulatory Impact
S - Subsumed in Another Issue (No.)
SOW - Statement of Work
SRP - Standard Review Plan
SSE - Safe Shutdown Earthquake
STS - Standard Technical Specification
TAC - Task Action Control
T/A - Technical Assistance
TAP - Task Action Plan
TBD - To Be Determined
TI - Temporary Instruction
TS - Technical Specification
USI - Unresolved Safety Issue

Data Elements

Management and control indicators used in GIMCS are defined as follows:

1.	Issue Number	Generic Issue Number
2.	Title	Generic Issue Title
3.	Type	Generic Issue (GI)
4.	Office/Division /Branch	The Office, Division, and Branch of the Task Manager who has lead responsibility for resolving the issue
5.	Priority	High (H), Medium (M), or Continue (Priority designations of H and M have historical value only for issues identified before 1999)
6.	Task Manager	Name of assigned individual responsible for resolution
7.	Action Level	Active Technical assistance funds appropriated for resolution and/or Task Manager actively pursuing resolution Inactive No technical assistance funds appropriated for resolution, Task Manager assigned to more important work, or no Task Manager assigned Resolved All necessary work has been completed and no additional resources will be expended Regulatory Office Implementation The GI has exited the formal GIP but actions outside the GIP remain, RES actions of safety / risk assessment or regulatory assessment are complete, and remaining actions reside with program offices
8.	TAC Number	Task Action Control (TAC) number assigned to the issue
9.	Resolution Status	Coded summary as follows: 3A - (Resolved with requirements) 3B - (Resolved with No requirements) Cn - Continue
10.	Identification	Date the issue was identified
11.	Identification Status	Describes status of identification

Data Elements (continued)

12.	Prioritization/Screen	The date that the prioritization evaluation was approved by the RES Director (historical value only for issues identified before 1999)
13.	Priority/Screen Status	Describes the status of the prioritization evaluation
14.	Technical Assessment	The date the technical assessment was completed. This is provided for historical purposes only.
15.	Technical Assessment Status	Describes the status of the technical assessment
16.	Regulation and Guidance Development	The date the regulation and guidance was developed
17.	Regulation and Guidance Development Status	The status of regulation and guidance development
18.	Regulation and Guidance Issuance Status	The date the regulation and guidance was issued
19.	Implementation	Date of GI implementation
20.	Implementation Status	The status of GI implementation
21.	Verification	Date of GI verification
22.	Verification Status	The status of GI verification
23.	Closure	Date of GI closure
24.	Closure Status	The status of GI closure
25.	Work Authorization	Who or what authorized work to be done on the issue
26.	Work Scope	Describes briefly the problem and the work necessary to technically resolve and complete the generic issue
27.	Status	Describes current status of work while also retaining an accurate running narrative discussion of major activities, milestones, and decision points.

Data Elements (continued)

28.	Affected Documents	Identifies documents into which the technical resolution will be incorporated
29.	Problem/Resolution	Identifies current problem areas and describes what actions are necessary to resolve them. Note: Discussions of previous problems and resolutions are incorporated into the status narrative, as appropriate.
30.	Reasons for Schedule Changes	Describes reasons for and explain current changes in milestones (additions, deletions, and delays).
31.	Milestones	Selected significant milestones: Original Scheduled dates reflected in the original Task Action Plan, plus additional milestone dates added during resolution of the GI Current Expected date of completion, or changes in the original scheduled dates Actual The date the milestone was completed

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0156.6.1 **Type:** GSI **Office/Division/Branch:** RES/DRA/OEGIB

Title: PIPE BREAK EFFECTS ON SYSTEMS AND COMPONENTS

Priority H **Action Level** ACTIVE **Resolution Status:** 3B

Task Manager: H. Vandermolen **TAC Number:**

Identification: 02/1991 **Prioritization/Screen:** 07/1999 **Technical Assessment:** 12/2007

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** C

Regulation and Guidance Development: **Regulation and Guidance Issuance Status:**

Regulation and Guidance Development Status: TBD **Regulation and Guidance Development Status:** TBD

Implementation: **Verification:** **Closure:** 12/2007

Implementation Status: TBD **Verification Status:** TBD **Closure Status:** C

Work Authorization: Memo from A. Thadani to E. Rossi dated July 16, 1999.

WORK SCOPE:

Description

GDC 4 is the primary regulatory requirement of concern. It requires, in part, that structures, systems and components important to safety be appropriately protected against the environmental and dynamic effects that may result from equipment failures, including the effects of pipe whipping and discharging fluids. Several possible scenarios for plants that do not have adequate protection against pipe whip were identified as a result of research.

Work Scope

The objective of the GI-156.6.1 TAP is to determine through analysis if: (1) a high energy pipe break inside a BWR Mark I containment has the potential to perforate the drywell shell and possibly disable accident mitigation systems; and (2) a high energy pipe break inside a BWR Mark I or Mark II containment can disable the control rod drive (CRD) scram system. The TAP is a follow-on to NUREG/CR-6395, "Enhanced Prioritization of Generic Safety Issue 156.6.1 Pipe Break Effects on Systems and Components Inside Containment," which was performed by the Idaho National Engineering and Environmental Laboratory (INEEL) and issued in November 1999, and the screening evaluation, "A Screening Evaluation of GSI-80 Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywell of BWR Mark I and II Containments" attached to the February 14, 2003 memorandum from Thadani to Collins concerning GSI-80. Individual TAP section reports will be issued when analysis information is obtained. All TAP sections are not required to be completed if a bounding analysis finds the associated risk to be inconsequential.

STATUS:

A letter was sent from F. Eltawila (NRC) to W. Glenn Warren (BWROG) expressing concerns related to the GSI. The BWROG responded on 01-10-2001 that a committee was formed to coordinate the response to the ACRS. There are a total of 16 SEP III BWRs. A Task Action Plan for resolving the issue was

approved in May 2001.

Task 4 of Contract Y6406 (NRC-04-01-67) was issued to Information Systems Laboratories (ISL). ISL issued a draft report in September addressing many of the BWOG peer review comments on the prioritization done by INEEL (issued in 1999). The ISL report has been reviewed and comments have been made. In December 2002, ISL completed its review of technical comments made by the BWROG on the INEEL 's "Enhanced Prioritization of Generic Safety Issue 156.6.1 Pipe Break Effects on Systems and Components Inside Containment." ISL concluded that, in general, INEEL's analysis was overly conservative in its risk estimates, and simplistic in accident sequence development. A followup meeting was held on 1/15/03 to discuss potential options for resolution of differences. A meeting to discuss options was held on March 19, 2003. The ongoing reevaluation of 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Plants," will be considered in the technical assessment of this GSI.

The Task Action Plan for the partial resolution of GSI 156.6.1, "Pipe Break Effects on Systems and Components Inside Containment," and GSI-80, "Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments," was approved on February 3, 2004 (ML040340549). Prior to his departure from the NRC, Task Manager Ron Lloyd completed a technical evaluation of the effects of postulated pipe breaks inside BWR Mark I and Mark II containments in July 2004. The ANSYS finite element code was used to perform nonlinear transient analysis to determine the impact of impulsive loads due to pipe breaks in feedwater, main steam, and recirculation system piping on drywell steel shell and control rod drive (CRD) bundles. The results of the analysis indicated that the structural integrity and leak-tightness of the drywell steel shell will not be compromised due to pipe impact. The calculations indicate that: (1) the drywell steel shell will yield locally at the point of impact but will not perforate and cause an over-pressure in the annular space between the steel shell and concrete shield wall; (2) the CRD bundles will not be impacted by breaks in recirculation, steam, and feedwater system piping after a postulated break. This resolved the issue for BWR plants.

For PWRs, in October 2005, DSARE conducted a review of 37 operating plants as part of its selection of certain plants for plant walkdowns. In November 2005, DSARE identified 16 plants (23 reactors) that needed to be reviewed. In April 2006, DRASP requested NRR assistance in gathering detailed plant layout information. A survey of the layout of those plants affected by the issue was completed by the Office of Nuclear Reactor Regulation (NRR) in September 2006. The GIP review of piping configurations to identify the most vulnerable plants is complete. One site for which there was insufficient information to form a conclusion may have a vulnerability. This condition appears to be site specific. Staff from RES and NRR met on 06/01/2007 and decided NRR would interface with the licensee for this site to help identify and assess options for further assessment of this potential vulnerability. Based on information provided by the licensee on June 29, 2007, the issue was resolved for this plant site.

A technical assessment report was prepared and transmitted to the ACRS on July 18, 2007. The ACRS was then briefed at its meeting on September 6, 2007. On September 26, 2007, the ACRS issued a memorandum to the NRC Executive Director for Operations stating the ACRS concurs with the staff recommendation that GI-156.6.1 be closed and that no further actions by the NRC staff of licensees with respect to this issue are necessary (ADAMS ML072530615). The issue was closed in December 21, 2007, (ADAMS ML073170185).

AFFECTED DOCUMENTS:

None identified.

Milestone	Original Date	Current Date	Actual Date
Task Action Plan Approved	05/01/2001		05/30/2001
Task Manager Reassigned to Other Duties	07/01/2001		07/01/2001
New Task Manager Assigned	01/01/2002		01/01/2002

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Draft Contractor Report	09/01/2002		12/31/2002
Meeting to Discuss Options	03/19/2003		03/19/2003
Complete Draft Task Action Plan	11/01/2002		07/31/2003
Decision to Integrate GSI-80 into Technical Assessment of GSI-156.6.1	10/02/2003		10/02/2003
Approval of Task Action Plan	11/30/2003		02/03/2004
High Energy Piping Interactions with BWR Mark I Drywell Shells	03/31/2004		03/31/2004
Analysis and Documentation of Calculation Results	06/30/2004		07/31/2004
Identify Plants to be Visited	11/30/2005		11/30/2005
Select PWRs for Site Visits	09/30/2005		06/08/2006
Complete NRR PMs Survey of Affected Plants	03/31/2006		09/30/2006
Complete GIP Review of Piping Configurations at PWR Plants	09/30/2005	12/31/2006	10/17/2006
Perform Assessment of Plants Based on Specific Piping Configurations	04/30/2007	04/30/2007	03/30/2007
Draft Recommendations	08/31/2004	06/30/2007	06/27/2007
Meet with ACRS	02/28/2006	09/30/2007	09/06/2007
Close Out Issue with Memo to the EDO	06/30/2006	12/31/2007	12/21/2007

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0163 **Type:** GSI **Office/Division/Branch:** NRR/DCI/CSG

Title: MULTIPLE STEAM GENERATOR TUBE LEAKAGE

Priority H **Action Level** REGULATORY OFFICE IMPLEMENTATION **Resolution Status:** Cn

Task Manager: E. Murphy **TAC Number:** MB7216, MA7147

Identification: 06/1992 **Prioritization/Screen:** 01/1997 **Technical Assessment:**

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:**

Regulation and Guidance Development: **Regulation and Guidance Issuance Status:**

Regulation and Guidance Development Status: TBD **Regulation and Guidance Development Status:** TBD

Implementation: **Verification:** **Closure:**

Implementation Status: TBD **Verification Status:** TBD **Closure Status:**

Work Authorization: January 17, 1997, Memorandum from H. Thompson to D. Morrison

WORK SCOPE:

Description

This issue addresses the safety concern associated with multiple steam generator tube leaks during a main steam line break that cannot be isolated. This sequence could lead to core damage that could result from the loss of all primary system coolant and safety injection fluid in the refueling water storage tank. The issue was opened in response to a DPV filed in late 1991. The DPV (and later DPO) was initially prompted by widespread outer diameter stress corrosion cracking (ODSCC) at the steam generator (SG) tube support plates at Trojan (which the author claimed could not be reliably detected) and also by the staff's approval of alternate repair criteria which would allow many tubes known to contain such cracks to remain in service.

Work Scope

The staff has considered the DPO concerns as part of its development of a new regulatory framework governing SG tube integrity. The NRC originally planned to develop a rule involving a more flexible and more effective regulatory framework for SG tube surveillance and maintenance activities (compared to existing technical specification requirements) that allows a degradation-specific management approach. The staff discontinued this effort in 1997 after a regulatory analysis indicated that rule making was unnecessary. With Commission approval, the staff undertook an effort to develop a generic letter requesting that all PWR licensees submit proposed changes to their plant technical specifications that would ensure SG tube integrity is maintained. (This generic letter initiative included a draft regulatory guide and sample technical specifications incorporating a programmatic, performance based strategy for ensuring SG tube integrity.)

On December 1, 1997, the industry informed the staff of an industry initiative, NEI 97-06, "Steam Generator Tube Integrity Guidelines," which paralleled the above draft regulatory guide and which all PWR licensees had committed (among themselves) to implement. NEI 97-06 provides a programmatic, performance based approach to ensuring SG tube integrity. With commission approval, the staff put the above generic letter initiative on hold and worked

with the industry to identify revised technical specifications which would be aligned with the NEI 97-06 initiative and which would ensure that all PWR licensee's are implementing programs which ensure that SG tube integrity will be maintained. This effort was completed in May 2005 with the staff's approval of the TSTF-449, Rev 4 which includes a new standard technical specification template governing SG tube integrity.

Regarding the DPO, its nature evolved considerably in the years subsequent to 1991, adding additional concerns relating to alternate tube repair criteria, iodine spiking assumptions for radiological analysis, severe accidents, and many other concerns. The staff prepared a DPO consideration document which it provided to the EDO on September 1, 1999. At the EDO's request, the ACRS served as an equivalent ad hoc panel to review the DPO issues. The ACRS met with the DPO author and other members of the NRC staff and reviewed the documentation related to the DPO issues. The ACRS issued NUREG-1740 on February 1, 2001 documenting its conclusions and recommendations. By memorandum dated May 11, 2001, NRR and RES developed a joint action plan to address the conclusions and recommendations in the ACRS report. This action plan and resolution of GSI 163 was later incorporated into the NRC Steam Generator Action Plan, the status of which was presented to the Commission in SECY-03-0080 and discussed at a Commission meeting on May 19, 2003. (A copy of the NRC SG Action Plan, milestones, schedule, and current status can be found on the NRC public web page.)

The scope of the DPO issues and followup SG Action Plan tasks relevant to GSI 163 are those which could potentially impact needed SG tube inspection, maintenance and repair activities. In contrast, any needed actions to address containment bypass scenarios due to tube failure during severe accidents would likely involve changes to accident management procedures and perhaps hardware modifications not involving the steam generators and, therefore, are outside the scope of GSI-163. Similarly, iodine spiking and radiological assessment issues are outside the scope of GSI-163. DPO issues outside the scope of GSI-163 will continue to be managed under the SG Action Plan umbrella.

STATUS:

As of September 30, 2007, all PWR licensees have modified their technical specifications in response to NRC Generic Letter 2006-01, "Steam Generator Tube Integrity and Associated Technical Specifications," and in accordance with TSTF-449.

SG Action Plan tasks relevant to resolution of GSI-163 have been completed with the exception of task 3.1.k. This task involves evaluation of the conditional probabilities of multiple tube failures for risk assessment pertaining to SG alternate repair criteria. To support the needs of the GSI, the staff is actually performing this task from the broad standpoint of the integrity of the overall tube rather than being narrowly focused on tube locations with alternate repair criteria.

The staff is targeting July 30, 2009, for issuing memorandum to the EDO documenting the resolution of GSI-163 and the supporting technical bases.

AFFECTED DOCUMENTS:

NUREGs 1430 - 1432 regarding Standard Technical Specifications
NRC Generic Letter 2006-01
Plant-specific technical specifications for PWRs

PROBLEM/RESOLUTION:

Lessons learned from work completed so far have necessitated several modifications and additions to tasks. These are being formalized in the RES Operating Plan and the SG Action Plan.

Completion of Steam Generator Action Plan Item 3.1.k (currently scheduled for January 31, 2008) has been delayed due to the sudden retirement of the lead investigator for this item (Steve Long, DRA/APLA). DRA/APLA is currently seeking resources to carry on this item. In the meantime, the estimated completion date for this item is TBD. This item is critical path for completing GSI 163 work.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

REASONS FOR SCHEDULE CHANGES:

As approved by the Commission in an SRM dated December 21, 1998, development of new technical specifications for ensuring SG tube integrity involved a cooperative effort between the NRC staff and the industry. That it took seven years to reach agreement with the industry is attributable to the complexity of the issues involved and that consensus building within the industry itself proved to be a time consuming process.

The target dates for completing ACRS briefing on GSI resolution and closeout memorandum to EDO were slipped by 4-months (as indicated in the milestones) due to the need for the staff to review plant specific licensing actions during the 1st and 2nd quarters of 2008 related to inspections of steam generator tubes in the tubesheet region which were needed to support the Spring 2008 outages for four plants.

Milestone	Original Date	Current Date	Actual Date
Regulatory Analysis	05/01/1997		05/01/1997
Proposed GL Package	06/01/1997		10/01/1997
ACRS Endorsement	06/01/1997		10/01/1997
GL Package Placed in Concurrence	10/01/1997		10/01/1997
NEI 97-06 Submitted	12/01/1997		12/01/1997
GL Package Sent to CRGR by NRR	07/01/1997		04/01/1998
CRGR Meeting on GL Package	06/01/1998		06/01/1998
CRGR Meeting on Proposed GL	07/01/1998		07/01/1998
NRR Memo to EDO Putting GL on Hold	09/01/1998		09/01/1998
Commission Paper Recommending Hold on Issuance of GL	11/01/1998		10/01/1998
SRM on SECY-98-248	12/01/1998		12/01/1998
DPO Consideration Document to the EDO	09/01/1999		09/01/1999
EDO Establishes an Independent Panel to Review the DPO	02/01/2000		05/01/2000
ACRS to Perform DPO Review Panel Function	10/01/2000		10/01/2000
ACRS to Provide Conclusions and Recommendations	12/01/2000		02/01/2001
NRR & RES Issue Joint Action Plan	05/31/2001		05/31/2001
Approve TSTF-449	05/31/2005		05/31/2005
Issue Generic Letter 2006-01	01/20/2006		01/20/2006
Issue Revised Technical Specifications - All PWRs	12/31/2007		09/30/2007

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Brief ACRS on Proposed GSI Resolution	02/28/2009		
Close Out Issue with Memo to the EDO	02/28/2001	07/30/2009	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0186 **Type:** GSI **Office/Division/Branch:** NRR/DSS/SBP

Title: POTENTIAL RISK AND CONSEQUENCES OF HEAVY LOAD DROPS IN NUCLEAR POWER

Priority **Action Level** ACTIVE **Resolution Status:** Cn

Task Manager: S. Jones **TAC Number:**

Identification: 04/1999 **Prioritization/Screen:** 07/2003 **Technical Assessment:** 11/2003

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** C

Regulation and Guidance Development: 04/2007 **Regulation and Guidance Issuance Status:** 04/2007

Regulation and Guidance Development Status: **Regulation and Guidance Development Status:**

Implementation: **Verification:** **Closure:** 12/2008

Implementation Status: N **Verification Status:** N **Closure Status:**

Work Authorization: Memo from A. Thadani to S. Collins, "Initial Screening of Candidate Generic Issue #186, 'Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants," dated June 28, 2000.

WORK SCOPE:

Description

In 1985, the staff declared, through GL 85-11, "Completion of Phase II of Control of Heavy Loads at Nuclear Power Plants, NUREG-0612," that licensees need not analyze the potential consequences of a heavy load drop. In 1986, the staff reported that USI A-36 was resolved based on the implementation of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants - Resolution of Generic Technical Activity A-36." Subsequent review of licensees' programs for the handling of heavy loads revealed that there is a substantially greater potential for severe consequences to result from the drop of a heavy load, than previously envisioned.

Work Scope

The technical assessment of GI-186 resulted in the following four recommendations that were documented in NUREG-1774, "A Survey of Crane Operating Experience at U.S. Nuclear Power Plants from 1968 Through 2002": (1) Evaluate the capability of various rigging components and materials to withstand rigging errors (e.g., absence of corner softening material, acute angle lifts, shock from load shifts, and postulated human errors). As appropriate, issue necessary guidelines for rigging applications. (2) Endorse ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" for Type I cranes as an acceptable method of qualifying new or upgraded cranes as single-failure-proof. As appropriate, issue guidance endorsing the standard. (3) Reemphasize the need to follow NUREG-0612 Phase I guidelines involving good practices for crane operations and load movements. Continue to assess implementation of heavy load controls in safety-significant applications through the Reactor Oversight Process. (4) Evaluate the need to establish standardized load drop calculation methodologies for heavy load drops.

STATUS:

The report on the potential risk and consequences of heavy load drops in nuclear power plants was completed in June 2003, after NRR comments were addressed by RES. The publication of the report, NUREG-1774, in July 2003 completed the initial screening stage of the issue. The proposed recommendations resulting from the technical assessment of the issue were discussed with the ACRS Full Committee on September 11, 2003. Three of the RES recommendations on regulation and guidance development were sent to NRR on November 12, 2003. By letter dated February 4, 2004, NRR informed RES that these three recommendations would be implemented through issuance of a Regulatory Issue Summary that clarifies and reemphasizes existing regulatory guidance for control of heavy loads. The remaining recommendation was resolved by DET/RES on May 4, 2004, with the conclusion that existing industry standards were adequate for application to load drop analyses.

The staff has been participating with the American Society of Mechanical Engineers (ASME) Cranes for Nuclear Facilities Committee in comparing the provisions of the industry crane standard, ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes," with the NRC guidelines contained in NUREG-0554, "Single Failure-Proof Cranes for Nuclear Power Plants," in support of future endorsement of the industry standard. In September 2004, NRR reported that the Committee action in support of NRC endorsement was delayed. In April 2005, the staff identified an emergent concern with the adequacy of evaluations of heavy load drops. NRR issued Regulatory Issue Summary (RIS) 2005-25 on October 31, 2005, to clarify and reemphasize existing regulatory guidance for the control of heavy loads.

Though its work with the Committee, the NRR staff has concluded that the industry standard, ASME NOG-1, provides improved guidance for construction of new single-failureproof cranes. Therefore, the staff elected to endorse the ASME NOG-1, 2004, through the Standard Review Plan Update Program in March 2007. The NRC staff understands that the committee will provide the comparison as an appendix to a future revision of ASME NOG-1. The staff also modified the guidelines for slings used with single-failure-proof handling systems in the Standard Review Plan (NUREG-0800), Section 9.1.5, "Overhead Heavy Load Handling Systems," based on a review of operating experience issues. The staff issued Supplement 1 to RIS 2005-25 to notify industry of the changes to SRP Section 9.1.5 and further clarify existing regulatory expectations associated with 10 CFR 50.59 and 50.71(e), as these requirements relate to the safe handling of heavy loads and load drop analyses.

On September 14, 2007, the Nuclear Energy Institute (NEI) notified the NRC that the nuclear industry approved a formal initiative that specifies actions each plant will take to ensure that heavy load lifts continue to be conducted safely and that plant licensing bases accurately reflect plant practices. The initiative is expected to clarify the licensing basis with respect to handling of heavy loads, and the NRC staff is modifying guidance documents to accommodate the initiative. The initiative includes development of guidelines for realistic load drop analyses and for establishing single failure proof crane equivalence for reactor vessel head lifts. On December 13, 2007, February 1, 2008, and April 8, 2008, the NRC staff participated in public meetings with NEI to discuss implementation of the initiative and criteria for acceptable reactor vessel head load drop analyses. On April 17, 2008, the NRC staff participated in a public meeting with NEI to discuss draft guidelines for establishing single failure proof crane equivalence for reactor vessel head lifts.

By letters dated April 17, 2008, and April 22, 2008, NEI submitted the guidelines for reactor vessel head drop analyses and the guidelines for establishing single failure proof crane equivalence for reactor vessel head lifts, respectively. On May 16, 2008, the NRC staff issued a letter providing preliminary endorsement of these guidelines with exceptions regarding the load drop analysis acceptance criteria, By letter dated May 27, 2008, the NRC clarified criteria for acceptable interim analyses where more detailed analyses or crane upgrades cannot be completed prior to the next refueling outage and requested a schedule for completion of a complete guideline document.

AFFECTED DOCUMENTS:

NUREG-1774
Standard Review Plan (NUREG-0800), Section 9.1.5

PROBLEM/RESOLUTION:

None

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

REASONS FOR SCHEDULE CHANGES:

The NRC staff is modifying guidance documents to allow time for implementation of the initiative and to be consistent with the expected end state following implementation. The ACRS brief is rescheduled to conform with the additional time necessary to modify guidance documents.

Milestone	Original Date	Current Date	Actual Date
Publish NUREG-1774	06/30/2003		06/30/2003
Meet with ACRS Full Committee	09/01/2003		09/11/2003
ACRS Memo to the EDO on Staff Recommendations	09/24/2003		09/24/2003
Complete Technical Assessment and Transfer Issue to NRR for Regulation and Guidance Development	10/31/2003		11/12/2003
DSARE/RES Memo to DET/RES Requesting Industry Code Committee Evaluation	11/21/2003		11/21/2003
DET/RES Memo to DSARE/RES Concluding Existing Industry Code Adequate for Load Drop Analysis	05/04/2004		05/04/2004
Issue RIS 2005-25 to Clarify and Reemphasize Existing Regulatory Guidance for Control of Heavy Loads	12/31/2004		10/31/2005
Issue RIS 2005-25, Supplement 1 to Address Endorsement of Industry Standard	02/28/2006	04/30/2007	05/29/2007
Enhance Inspection Procedures for Heavy Loads	09/30/2007	08/28/2008	
Brief ACRS on Implementation of Recommendations	11/30/2004	10/31/2008	
Issue Closeout Memo to the EDO	08/31/2005	12/31/2008	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0189 **Type:** GSI **Office/Division/Branch:** NRR/DSS/SBP

Title: SUSCEPTIBILITY OF ICE CONDENSER AND MARK III CONTAINMENTS TO EARLY FAILURE FROM HYDROGEN COMBUSTION DURING A SE

Priority **Action Level** REGULATORY OFFICE IMPLEMENTATION **Resolution Status:** Cn

Task Manager: S. JONES **TAC Number:** MB7245

Identification: 05/2001 **Prioritization/Screen:** 02/2002 **Technical Assessment:** 12/2002

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** C

Regulation and Guidance Development: 04/2007 **Regulation and Guidance Issuance Status:** 04/2007

Regulation and Guidance Development Status: TBD **Regulation and Guidance Development Status:**

Implementation: 06/2008 **Verification:** 06/2009 **Closure:** 09/2010

Implementation Status: TBD **Verification Status:** TBD **Closure Status:**

Work Authorization: Memo from J. Zwolinski to F. Eltawila, "Resolution Process for Generic Safety Issue 189: "Post-Accident Combustible Gas Control in Pressure Suppression Containments"

WORK SCOPE:

Description

NUREG/CR-6427, "Assessment of the Direct Containment Heat (DCH) Issue for Plants with Ice Condenser Containments," showed that the early containment failure probability of ice condensers is dominated by non-DCH hydrogen combustion events. The staff subsequently extended the issue to include BWR MARK III containments because their relatively low free volume and strength are comparable to PWR ice condensers.

Work Scope

The staff conducted studies to determine whether providing an independent power supply for the igniter systems provides a substantial increase in the overall protection of the public health and safety with implementation costs that are justified in view of the increased protection. The staff continued work on this issue following an initial screening in accordance with MD 6.4.

The staff briefed the ACRS on June 6, 2002, and again on November 13, 2002. The ACRS recommended that the form of regulatory action should be through the plant-specific severe accident management guidelines. RES provided its technical assessment for resolving GI-189 to NRR in a memorandum dated December 17, 2002. RES concluded that further action to provide back-up to one train of igniters is warranted for both ice condenser and MARK III plants.

On January 30, 2003, NRR prepared a reply memorandum that outlined the next steps in the resolution of this GI. NRR prepared a Task Action Plan to complete MD 6.4, Stage 4, Regulation and Guidance Development, based on a preliminary decision to issue an Order. The staff reviewed the proposed regulatory actions and associated draft documents with senior management and OGC, and senior management decided to pursue Rulemaking rather than an Order. The staff held a public meeting on June 18, 2003, to receive feedback from licensees and other stakeholders regarding the need to provide a backup

power supply to the hydrogen igniters and NRR's consideration of rulemaking for the resolution of GI-189. NRR staff briefed the ACRS on November 6, 2003, and recommended providing a backup power supply to the hydrogen igniters. On November 17, 2003, the ACRS Chairman wrote the NRC Chairman recommending the NRC proceed with rulemaking to require a backup power supply to the hydrogen igniters for PWR ice-condenser and BWR MARK III plants. The ACRS recommended that rulemaking include a small pre-staged generator with installed cables, conduit, panels, and breakers, or an equivalent diverse power supply. The ACRS also recommended that the rulemaking be accompanied by guidance that specifies the design requirements.

NRR developed design criteria for the backup power supply, and administered a contract to merge and enhance the existing technical assessment into a regulatory analysis. NRR held a public meeting with the public and industry on September 21, 2004, to get external stakeholders' input on the draft design criteria. The BWR owners indicated a willingness to make modifications to supply power from the existing HPCS diesel generator, and agreed to provide additional information regarding implementation cost for the prestaged generator and relative risk contribution of SBO events at each of the four Mark III plants. Duke power, representing two PWR ice condenser sites, Catawba 1 & 2, McGuire 1 & 2, indicated a willingness to make modifications to an existing safe shutdown diesel generator that could manually connect to provide backup power source as needed. American Electric Power representatives indicated a willingness to provide backup power source for D. C. Cook 1 & 2 from the large diesel generators intended to support an increased allowed outage time for the emergency diesel generators. TVA, representing two PWR ice condenser sites, Sequoyah 1 & 2, Watts Bar 1, also indicated a willingness to provide a backup power source from a supplemental diesel generator. In November 2004, the staff reached a consensus to evaluate the proposed voluntary initiatives and pursue that path as a preferential solution.

In February and early March 2005, the NRR staff met with representatives of RES, NSIR, and OEDO to develop an understanding of newly identified safety/security interface issues and actions initiated in the security arena that could impact the solution of the issue. On March 30, 2005, the staff met with senior representatives of the six affected utilities to present security-related insights.

On June 14, 2005, the EDO issued a memorandum to the Commissioners to inform the Commission of the regulatory analysis results and recent staff activities on GSI-189. The regulatory analysis indicated that the backup power modification may provide a substantial safety benefit at a justifiable cost for the PWRs with an ice-condenser containment, and the proposed voluntary actions provide the majority of the benefit. The costs exceed the benefits for all BWR regulatory options, and none of the options for the BWRs provides a substantial increase in the overall protection of public health and safety. However, external events and security insights were not fully evaluated in the regulatory analysis, and defense-in-depth considerations in improving the balance among accident prevention and mitigation provide an additional un-quantified benefit for both containment types.

STATUS:

Based on an understanding that many of the voluntary physical modifications had been completed, the staff elected to delay seeking specific commitments while security-related reviews of the facilities were ongoing. On March 1, 2006, the EDO issued a memo informing the Commission of the staff's intent to delay the request for commitments until after the security-related reviews were completed in September 2006. Because this issue was not incorporated in the scope of security-related modifications, the staff held closed meetings in December 2006 and January 2007 to further explore the proper consideration of security insights in the design of the modifications. The staff received industry proposals for modifications that incorporate security insights in late February and early March 2007. The staff reviewed the industry proposals and concluded that the proposed modifications would resolve GSI-189 and provide benefit for some security scenarios. On April 23, 2007, the EDO issued a memo informing the Commission of the staffs intent to accept the commitments and perform verification inspections at the affected sites. On June 15, 2007, the NRC staff issued letters to affected licensees accepting the commitments. The NRC staff also notified licensees of the intent to perform verification inspections at the affected sites and clarified the scope of the inspection relative to the commitments. Based on industry proposals, the staff expects full implementation of the modifications to be completed by June 2008 at nearly all affected units, with two units delayed as late as early 2010 for more complex modifications.

AFFECTED DOCUMENTS:

10 CFR 50.44
10 CFR 50.34

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

PROBLEM/RESOLUTION:

The costs exceed the benefits for all BWR regulatory options, and none of the options for the BWRs provides a substantial increase in the overall protection of public health and safety. However, external events and security insights were not fully evaluated in the regulatory analysis, and defense-in-depth considerations in improving the balance among accident prevention and mitigation provide an additional un-quantified benefit for both containment types. With consideration of security insights, all affected licensees have proposed modifications that adequately address the identified safety issue.

REASONS FOR SCHEDULE CHANGES:

The staff received initial industry proposals for modifications that incorporate security insights in late February and early March 2007. The staff reviewed the industry proposals and concluded that the proposed modifications would resolve GSI-189 and provide benefit for some security scenarios. On April 23, 2007, the EDO issued a memo informing the Commission of the staffs intent to accept the commitments and perform verification inspections at the affected sites. On June 15, 2007, the NRC staff issued letters to affected licensees accepting the commitments. The NRC staff also notified licensees of the intent to perform verification inspections at the affected sites and clarified the scope of the inspection relative to the commitments. Based on industry proposals, the staff expects full implementation of the modifications to be completed by June 2008 at nearly all affected units, with two units delayed as late as early 2010 for more complex modifications.

Milestone	Original Date	Current Date	Actual Date
Draft Technical Assessment	05/01/2002		05/01/2002
Meet with ACRS	06/01/2002		06/06/2002
Second Meeting on Technical Assessment with ACRS Sub-Committee	10/01/2002		11/05/2002
Final Technical Assessment	11/01/2002		11/10/2002
Meet with ACRS Full Committee	11/01/2002		11/13/2002
Transfer GSI to NRR	12/01/2002		12/17/2002
Review RES Technical Assessment	02/28/2003		02/28/2003
Determine Best Course of Action	02/28/2003		02/28/2003
Public Meeting with Stakeholders	02/28/2003		02/28/2003
Finalize CRGR Package	03/26/2003		03/26/2003
Distribute Draft Order and SECY Paper	03/26/2003		03/26/2003
Prepare Guidance and Provide Results to NRR Management	03/26/2003		03/26/2003
Provide Draft Order to OGC and Draft SECY to EDO	03/28/2003		03/28/2003
Meet with Rulemaking Committee	05/05/2003		05/05/2003

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Conduct Public Meeting	06/18/2003		06/18/2003
Meet with OPA to Develop Communication Plan	06/24/2003		06/24/2003
Complete Communication Plan	07/10/2003		07/10/2003
Public Meeting to Address Design Criteria	11/06/2003		11/06/2003
NRR Meeting with ACRS	11/06/2003		11/06/2003
Public Meeting with Stakeholders	02/03/2004		02/03/2004
Brief Commissioner Merrifield	03/04/2004		03/04/2004
Public Meeting with Stakeholders	03/31/2004		03/31/2004
Issue Draft Design Criteria for Comment	08/13/2004		08/13/2004
Public Meeting with Stakeholders	09/21/2004		09/21/2004
Internal Meeting to Discuss Pursuit of Rulemaking	11/02/2004		11/02/2004
Perform Sensitivity Analysis to Determine Whether 2-Hour Startup Time for BWRs is Acceptable	11/30/2004		11/30/2004
Finalize Design Criteria	11/30/2004		11/30/2004
Decision on Voluntary Licensee Initiatives as Alternative to Rulemaking	11/30/2004		11/30/2004
Evaluate Safety/Security Interface	03/31/2005		03/30/2005
Issue Status Paper to Commission	05/31/2005		06/14/2005
Brief Commissioner Jaczko on Regulatory Analysis Results and Safety Significance	07/18/2005		07/18/2005
Meet with Owners to Discuss Safety-Security Interface Issues	08/03/2005		08/03/2005
Update Commission Regarding Licensee Plans for Voluntary Measures	03/01/2006		03/01/2006
Seek Commitment for Implementation of Voluntary Initiatives	08/31/2005		03/09/2007
Request Information from Owners on Voluntary Actions Implemented	12/31/2005		03/09/2007
Complete Regulation and Guidance Development	06/30/2006	04/30/2007	04/23/2007
Clarify Commitments to Resolve Any Remaining Issues	12/31/2007	12/31/2007	06/15/2007
Complete Implementation	06/30/2008	01/31/2010	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Complete Verification	06/30/2009	08/31/2010	
Close Out Issue with Memo to the EDO	06/30/2010	09/30/2010	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0191 **Type:** GI **Office/Division/Branch:** NRR/DSS/SSI

Title: ASSESSMENT OF DEBRIS ACCUMULATION ON PWR SUMP PERFORMANCE

Priority H **Action Level** REGULATORY OFFICE IMPLEMENTATION **Resolution Status:** Cn

Task Manager: M. Scott **TAC Number:** MA6454, MB4864

Identification:	09/1996	**Prioritization/Screen:**	09/1996	**Technical Assessment:**	09/2001
Identification Status:	Complete	**Priority/Screen Status:**	Complete	**Technical Assessment Status:**	C

Regulation and Guidance Development:	09/2004	**Regulation and Guidance Issuance Status:**	09/2004
Regulation and Guidance Development Status:	C	**Regulation and Guidance Development Status:**	C

Implementation:	12/2007	**Verification:**	06/2009	**Closure:**	06/2009
Implementation Status:		**Verification Status:**	TBD	**Closure Status:**	

Work Authorization: Memo to D. Morrison from W. Russell, "Third Supplemental User Need Request...Accident Generated Debris," 12/07/95

WORK SCOPE:

Description

This issue concerns the possibility that debris accumulating on the ECCS sump screen in PWRs may result in a loss of the net positive suction head (NPSH) margin. Loss of NPSH margin could impede or prevent the flow of water from the sump, which is necessary to meet the criteria of 10 CFR 50.46.

Work Scope

The goals of the NRC's reassessment are to: (1) determine if the transport and accumulation of debris in containment following a LOCA will impede the operation of the ECCS in operating PWRs; (2) if it is shown that debris accumulation will impede ECCS operation, develop the technical basis for revising NRC's regulations, or guidance to ensure that debris accumulation in containment will not prevent ECCS operation; (3) if it is shown that debris accumulation will impede ECCS operation, provide NRC technical reviewers with sufficient information on phenomena involved in debris accumulation and how it affects ECCS operation to facilitate the review of any changes to plants that may be warranted; and (4) issue Generic Communication and work with the industry plan to evaluate and resolve GSI-191 for all PWRs.

Preliminary parametric calculations were completed in July 2001 indicating the potential for debris accumulation for 69 cases. These 69 cases were representative of, but not identical to, the operating PWR population. The staff's Technical Assessment concluded that GSI-191 was a credible concern for the population of domestic PWRs, and that detailed plant-specific evaluations were needed to determine the susceptibility of each U.S.-licensed PWR to ECCS sump blockage. Following the ACRS agreement with the staff's Technical Assessment of the issue in 09/2001, the issue was forwarded to NRR in a memorandum dated September 28, 2001. Consistent with Management Directive 6.4, NRR has the lead for Stages 4 through 6 of the Generic Issues Process for GSI-191. NRR has evaluated the technical assessment, and prepared a Task Action Plan for developing appropriate regulatory guidance and resolution of GSI-191.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

STATUS:

Following meetings with stakeholders on March 5 and April 29, 2003, the NRC issued Bulletin 2003-01 to PWR licensees on June 9, 2003 to: (1) confirm their compliance with 10 CFR 50.46 (b)(5) and other existing applicable regulatory requirements, or (2) describe any compensatory measures that have been implemented to reduce the potential risk due to post-accident debris blockage, as evaluations to determine compliance proceed. All PWR licensees provided a response to the Bulletin, indicating interim compensatory measures and candidate operator actions that would be implemented. The Safety Issues Resolution Branch (SSIB) reviewed and evaluated the information provided and determined that the licensee's actions were responsive, and consistent with the guidance of Bulletin 2003-01. The Division of Reactor Licensing (DORL) issued close-out letters to the PWR licensees as these reviews were completed. Generic close-out of Bulletin 2003-01 was completed in December 2005.

Generic Letter (GL) 2004-02 was issued in September 2004 requesting licensees to perform plant-specific mechanistic evaluations of sump performance following LOCA and HELB events, and to implement corrective actions as required to ensure compliance with regulatory requirements. The Nuclear Energy Institute (NEI) provided a guidance report (GR) to the staff in May 2004 containing the industry's proposed evaluation methodology for performing the plant specific evaluations. The staff reviewed the GR and issued a draft Safety Evaluation (SE), which supplemented the GR. The staff presented the SE to CRGR, and to the ACRS Subcommittee and Full Committee in September and October 2004, respectively. The final SE was issued in December 2004, resulting in an NRC-approved evaluation methodology. In January and April 2005, the staff held public meetings with NEI and owners to discuss the GL and SE, and to address questions as the evaluations were performed using the SE and GR.

Generic Letter 2004-02 required licensees to respond within 90 days to document the actions planned by the licensees to perform the sump evaluation, and the proposed schedule for completion. All PWR licensees responded to the GL on schedule in September 2005. All PWR licensees committed to modify their containment sump strainer, except for three plants who had modified their containment sump strainers within the previous five years. The staff evaluated all 90-day responses to Generic Letter 2004-02 and in early 2006 issued comments to licensees to be addressed in their final response submittals.

To address concerns regarding the potential for chemical precipitates and corrosion products to significantly block a fiber bed and increase the head loss across an ECCS sump screen, a joint NRC/Industry Integrated Chemical Effects Testing program was started in 2004 and completed in August 2005. Chemical precipitation products were identified during the test program, and follow-up testing and analyses will be needed to address the effect on head loss. IN 2005-26, "Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment," was issued on September 16, 2005.

The NRC conducted additional research in certain areas to support evaluation efforts and provide confirmatory information. These areas include research on chemical effects to determine if the pressurized-water reactor sump pool environment generates byproducts which contribute to sump clogging, research on pump head losses caused by accumulation of containment materials and chemical byproducts, and research to predict the chemical species that may form in these environments. The staff completed reports on the chemical effects on ice condenser containments on 01/13/2006 (ML053550433), and on other PWR containments on 01/20/2006 (ML060190713). Supplement 1 to IN 2005-26 was issued on January 26, 2006 to specifically provide additional information regarding test results related to chemical effects in environments containing dissolved phosphate (e.g., from trisodium phosphate) and dissolved calcium.

NRR expected that recipients would review the information for applicability to their facilities and consider taking actions, as appropriate, to avoid similar issues. Research was also conducted and documented on the transportability of coating chips in containment pool environments, and on the effect of ingested debris on downstream valve performance.

Between July and September 2006, the staff completed research on: (1) the thermodynamic simulation of containment sump pool chemical constituents, to predict the chemical reactions/byproducts in the pools; (2) the pressure loss across containment sump screens due to fiber insulation, chemical precipitates, and coating debris; and (3) a literature survey to summarize the knowledge base to date on the potential contribution of material leached from containment coatings to the chemical products formed in the containment sump pool, after a loss-of-coolant accident. Additional research activities included development of a revised head-loss correlation and completion of a peer review of the NRC's chemical effects research program. All planned NRC-sponsored research activities for GI-191 are now complete and documented, though some follow-up work regarding questions identified by a chemical effects peer review is

ongoing. Information obtained as the staff reviews industry activities to support issue closure may indicate the need for additional NRC-sponsored research.

Planned strainer modifications are now complete at all PWRs. These modifications typically increased strainer size by one to two orders of magnitude. The NRC believes these modifications have significantly reduced the risk of strainer clogging.

As part of the plan to confirm adequate implementation and resolution of GI-191, the NRC conducted detailed plant audits examining the analyses and design changes used to address the technical issues. Visits to strainer vendor test facilities are also part of this audit process. Two pilot audits were performed in 2005 (Crystal River Unit 3 and Fort Calhoun) to provide opportunities to exercise and improve the NRC evaluation process. Nine full-scope plant audits have been performed; no additional full-scope audits are planned. Audit reports are posted on the NRC's ADAMS document control system as they become available. To support the audits, the NRC staff also made some visits to sump strainer vendor facilities to observe ongoing head loss and chemical effects testing, and the staff is reviewing vendor head loss testing protocols. Several additional limited-scope audits are planned for 2008 to address chemical effects. The NRC staff is also systematically evaluating remaining technical questions related to GI-191 to support a decision on whether additional confirmatory research is needed and if so, on what time frame.

In addition to the plant audits identified above, the staff is using inputs from review of licensee responses to GL 2004-02 (received in February 2008) and items identified from Regional inspections using Temporary Instruction TI-2515/166 to support closure of GI-191. Review of licensee GL responses is in progress. Inspections by regional staff will verify proper implementation of planned modifications.

Plant-specific issues led to many licensees identifying a need to request an extension beyond the NRC-identified date of December 31, 2007 for completion of certain corrective actions for GL 2004-02. In particular, some licensees requested additional time to complete one or more specific modifications, such as removal of problem insulation. Others requested additional time to complete strainer testing. Licensees have been challenged to develop and implement a conservative test for showing that their strainers will not experience excessive head loss in the presence of debris and chemical effects. Because they are plant-specific, these extension requests have been evaluated on a case-by-case basis. Extension requests have been approved for most PWR units based on, for example, strong sets of interim compensatory measures, significant interim or final sump screen area, fibrous insulation removal or lack of fibrous insulation issues, installation of debris interceptors, and short periods of extension. Most extensions have been granted for relatively short periods (i.e., less than six months). However, several licensees received longer extensions. The NRC has indicated to such licensees that they must show the plant can be operated safely for the extension period and that the extension is necessary (i.e., actions cannot reasonably be performed sooner). Very recently, testing results have led some licensees to conclude that additional modifications are needed to fully address GI-191. The NRC expects these licensees to commit to near-term comprehensive testing of a complete suite of modifications that can be shown to fully resolve the issue. Further, the NRC expects the licensees to install any necessary additional modifications a soon as practicable.

To provide open communication on NRC activities associated with GI-191 resolution, public meetings and/or conference calls with NEI and industry representatives continue to be held regularly, as schedules allow and developments regarding issue resolution indicate the need for an interaction. Briefings of ACRS have been scheduled periodically to provide opportunities for communication on technical issues and additional public involvement.

AFFECTED DOCUMENTS:

(1) Regulatory Guide 1.82, Rev. 3
(2) NUREG-0800
(3) Generic Letter 85-22
(4) Bulletin 2003-01
(5) Generic Letter 2004-02

PROBLEM/RESOLUTION:

Activities will occur in 2008 that are needed to support issue closure. Licensees submitted supplemental responses to GL 2004-02 in February 2008. The

staff's review of GL responses is expected to be complete in early 2009. The staff is also verifying, using Temporary Inspection Procedure TI-2515/166, that licensees have accomplished the activities related to GL 2004-02 to which they have committed. Completion reports for the TI will be due in summer 2008.

REASONS FOR SCHEDULE CHANGES:

All full scope audits are complete. Reports for the last two audits were completed in June 2008.

RES changed the status of GI-191 to Regulatory Office Implementation (see ML071630094). This change is part of improvements to the Generic Issues Program (GIP) described in SECY-07-0022, "Status Report on Proposed Improvements to the Generic Issues Program," (ML063460239). This improvement obviates the need for milestones specifically associated with the Generic Issue Program after the implementation phase begins. Issue closure will occur in accordance with applicable NRR Office programs as indicated in the remaining milestones.

Milestone	Original Date	Current Date	Actual Date
NRR User Need Request Sent to RES	12/01/1995		12/01/1995
User Need Request Assigned to GSIB/RES	01/01/1996		01/01/1996
Reassessment Declared a New GSI	09/01/1996		09/01/1996
Issue SOW for Evaluation of GSI A-43	11/01/1996		11/01/1996
Complete Evaluation of GSI A-43	04/01/1997		03/01/1997
Issue SOW for Reassessment of Debris Blockages in PWR Containments Impact on ECCS Performance	09/01/1998		09/01/1998
Complete Collection and Review of PWR Containment and Sump Design and Operation Data	12/01/1999		12/01/1999
Complete All Debris Transport Tests	09/01/2000		08/01/2000
Complete Parametric Evaluation	07/01/2001		07/31/2001
Proposed Recommendations to the ACRS	08/31/2001		08/31/2001
ACRS Review Completed	09/30/2001		09/14/2001
Issue Transferred from RES to NRR	09/28/2001		09/28/2001
Complete Reassessment of Debris Blockages in PWR Containments Impact on ECCS Performance	09/30/2001		09/28/2001
Complete Estimate of Average CDF Reduction, Benefits, and Costs	04/01/2002		09/28/2001
Prepare Memo Discussing Proposed Recommendations (End of Technical Assessment Stage of Generic Issue Process)	04/01/2002		09/28/2001

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Issue Bulletin 2003-01	05/01/2003		06/01/2003
Complete Development of Models and Methods for Analyzing Impact of Debris Blockages in PWR Containments on ECCS Performance	04/01/2001		06/09/2003
Discuss Reg. Guide 1.82, Rev. 3 with ACRS SubCommittee on Thermal-Hydraulic Phenomena	08/20/2003		08/20/2003
Present Final Version of Reg. Guide 1.82, Rev. 3 to ACRS Full Committee	09/11/2003		09/11/2003
ACRS Letter on Final Version of Reg. Guide 1.82, Rev. 3	09/30/2003		09/30/2003
Draft Industry Guidance for Plant-Specific Analyses	10/30/2003		10/31/2003
Issue Reg. Guide 1.82, Rev.3	09/30/2003		11/30/2003
NRC Meeting with Stakeholders	03/23/2004		03/23/2004
NRC Meeting with Stakeholders	05/25/2004		05/25/2004
Receive Industry Guidance for Plant-Specific Analyses	09/30/2003		05/28/2004
NRC Meeting with Stakeholders	06/17/2004		06/17/2004
Brief ACRS SubCommittee on Proposed Generic Letter	06/22/2004		06/22/2004
NRC Meeting with Stakeholders	06/29/2004		06/29/2004
Brief Full ACRS Committee on Proposed Generic Letter	07/07/2004		07/07/2004
Develop Generic Letter for Resolution of GSI	07/07/2004		07/07/2004
Meet with CRGR on Proposed Generic Letter	08/10/2004		08/10/2004
Issue Generic Letter 2004-02	09/13/2004		09/13/2004
Meet with ACRS on Safety Evaluation of NEI 04-07	10/07/2004		10/07/2004
ACRS Response on Safety Evaluation of NEI 04-07	10/18/2004		10/18/2004
Brief Commissioners Jaczko and Lyons on Status	07/18/2005		07/18/2005
EDO Briefing of ACRS on Status	09/09/2005		09/09/2005
Receive All GL Responses Addressing Plant-Specific Analyses	05/31/2005		09/15/2005
Issue Information Notice 2005-26	09/16/2005		09/16/2005
Issue Supplement 1 to IN 2005-26	01/20/2006		01/20/2006

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Complete Review of Licensee Responses to GL 2004-02	01/20/2006		01/20/2006
Complete Research Programs Evaluating Coating Transportability and Surrogate Throttle Valve Debris Ingestion	02/28/2006		02/28/2006
Brief ACRS on Staff Evaluation of Licensee Responses to GL 2004-02 and Results of Chemical Effects Tests	03/09/2006		03/09/2006
Complete Testing and Analysis Associated with Initial Phase of Chemical Effects Research	05/30/2006		05/30/2006
Complete Containment Material Head Loss Testing	06/15/2006		06/15/2006
Complete Thermodynamic Simulation of Containment Sump Pool Chemical Constituents	09/30/2006		09/30/2006
Complete Last Audit Report	05/23/2008	06/20/2008	06/19/2008
Regions Complete TI Inspections	06/30/2008		
Receive Last TI Verifications From Regions	08/11/2008		
Complete Review of TI Verifications	08/25/2008		
Complete Review of Licensee GL 2004-02 Responses for Adequacy	12/31/2007	04/30/2009	
Prepare Closure Memo for GL-04-02 Responses and TI Verifications	11/23/2008	05/15/2009	
Complete NRR Review and Approval of GL Closure Memo	12/28/2008	06/30/2009	
Licensees Complete GL-2004-02 Activities	01/31/2007	12/31/2009	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0193 **Type:** GSI **Office/Division/Branch:** RES/DRA/OEGIB

Title: BWR ECCS SUCTION CONCERNS

Priority **Action Level** ACTIVE **Resolution Status:** Cn

Task Manager: J. Lane **TAC Number:**

Identification: 05/2002 **Prioritization/Screen:** 10/2003 **Technical Assessment:**

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** TBD

Regulation and Guidance Development: **Regulation and Guidance Issuance Status:**

Regulation and Guidance Development Status: TBD **Regulation and Guidance Development Status:** TBD

Implementation: **Verification:** **Closure:**

Implementation Status: TBD **Verification Status:** TBD **Closure Status:**

Work Authorization: Memorandum to A. Thadani from F. Eltawila, "Results of Initial Screening of Generic Safety Issue 193, 'BWR ECCS Suction Concerns,'" October 16, 2003

WORK SCOPE:

Description

The Generic Safety Issue (GSI) - 193, "BWR ECCS Suction Concerns" (initiated in 2002) evaluates possible failure of the emergency core cooling systems (ECCS) pumps (or degraded performance) due to unanticipated, large quantities of entrained gas in the suction piping from suppression pools in BWR Mark I, II, and III containments during LOCA conditions that could cause gas binding, vapor locking, or cavitation.

Work Scope

As a result of the initial screening (ML0329407080) completed in October 2003, a Task Action Plan (TAP) for the technical assessment of this issue was approved in May 2004 (ML0414502080). Staff completed a literature search for information on ECCS pump performance during intake conditions at high voiding in March 2005. Staff also found experimental evidence that gas may reach the ECCS pumps during a loss-of-coolant accident. Although it appears the pumps can recover given a limited amount of void fraction, the impact of voiding on the continued operation of the pumps is a concern.

The TAP to resolve this GSI involves an evaluation of suppression pool designs, the dynamics of air entrainment in the suppression pool, and the impact on ECCS pump performance. A review of wetwell and suppression pool designs was made to establish bounding parameters. Relevant experiments on pool dynamics were reviewed to identify pre-existing sources of data.

The next phase will involve:

• estimating the void fraction at the suction strainers as a function of the time after accident initiation

• assessing the plausibility of air ingress and entrainment into ECCS strainers and intake piping,

• predicting the potential impact on the ECCS pumps' ability to fulfill their design function, and

• re-quantifying risk metrics to assess the need for further action.

STATUS:

In 2005, a detailed literature search was completed as part of the initial phase of the TAP. It was documented in a status report issued in November 2005 (ML0531901950).

In 2006, discussions were initiated with NRR regarding commonality of concerns between GI-193 and those being addressed in a proposed Generic Letter (later issued as GL 08-01) addressing gas accumulation in ECCS suction piping covering all reactors. It was decided initially that the resolution of GI-193 would be pursued by RES independently, but with appropriate coordination with the NRR activities on gas management issues. After consideration of a research project to model the central issue in GI-193 (i.e., ability of BWR ECCS pumps to tolerate short periods of high void fraction operation), RES reached a decision in favor of working with NRR to issue an appropriate generic communication to affected licensees and revised milestones accordingly. Discussions with NRR ensued on the specifics of the generic communication and the schedule for its issuance.

By March 2007, the continuing discussions between RES and NRR resulted in agreement not to include this GI in the GL. Inclusion was deemed impractical because the proposed GI was sufficiently different and, in addition, the proposed GL was developed to that point that including an additional information request for this GI would have resulted in too much rework and schedule delay. Also in 2007, RES and NRR (the Generic Communication and Power Uprate Branch) agreed to request BWR Owners Group cooperation to support the ongoing assessment of this GI. This approach is consistent with the principles described in SECY-07-022, "Status Report on proposed Improvements to the Generic Issues Program." A conference call was held on June 6, 2007 (ML071640257). The BWROG informed the staff that no plant specific studies have been done relative to this GI. They did not have any information regarding operability of ECCS pumps when air ingress might lead to void fractions greater than 20 percent. They reported that within the first 30 seconds following onset of a LOCA, no information was available on the period of time over which blow-down gas clears the suppression pool. The BWROG provided references to two research reports from a the Lappeenranta University of Technology laboratory in Finland (ML071640273 and ML071640280). The information from Finland has been evaluated and, although somewhat relevant, it has been deemed not entirely applicable to domestic BWRs.

In 2008, contractor support is envisioned for the ongoing evaluation phase of this GI along with a request for plant configuration details from the BWROG. Since the initial screening evaluation was performed approximately 5 years ago, it may be deemed appropriate to re-examine and "rebaseline" it in light of the literature searches conducted and new understanding obtained from that and other sources. This appears warranted especially in light of the effort and schedule anticipated to address the interdisciplinary, state-of-art issues raised by this GI. This includes application of computational fluid dynamics, consultation with pump experts and application of PRA capability.

AFFECTED DOCUMENTS:

To be determined.

PROBLEM/RESOLUTION:

As described above, some elements of the original TAP were deferred in favor of attempts made by the staff to pursue other avenues of resolution. For example, the staff attempted to incorporate a request for licensee input via inclusion in GL 08-01. Ultimately, this approach was not chosen. Similarly, the staff attempted to consider international research from Finland as supportive of a resolution. This also did not meet with the success originally envisioned. Finally, the BWR Owners' Group has not provided significant supporting information that might otherwise have reduced staff efforts.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

REASONS FOR SCHEDULE CHANGES:

The initial intent to include this issue in the scope of the GL on the topic of gas accumulation in suction piping of ECCS pumps being developed by NRR proved to be impractical due to fundamental differences and the development status of the GL in relation to the GI. Later developments that placed information from Finland on the resolution path extended the time needed to review potential BWROG data but both those avenues ultimately proved not supportive of resolution. The schedule has also been negatively impacted by numerous changes of project managers owing to retirement and personnel transfers out of the RES.

Milestone	Original Date	Current Date	Actual Date
Complete Task Action Plan for a Technical Assessment	03/31/2004		05/24/2004
ECCS Pump Performance Literature Search	03/31/2005		03/31/2005
Issue RFP to BNL for Technical Assistance	04/26/2005		04/26/2005
Receive Proposal for Technical Assistance from BNL	06/03/2005		06/03/2005
Request Information from Technical Research Center of Finland	09/12/2005		09/12/2005
Complete Literature Search for Two Specific Thermal-Hydraulic Phenomena	09/30/2005		09/30/2005
Evaluate Experimental Results on Thermal-Hydraulic Phenomena	09/30/2005		09/30/2005
Assign New Task Manager	05/15/2006		05/15/2006
RES Decision to Work with NRR on Generic Communication	08/31/2006		08/31/2006
Arrange Meeting With BWROG and Obtain Their Input	06/30/2007		06/06/2007
Review BWROG Data and Determine Regulatory Action	09/30/2007	12/31/2007	12/31/2007
Assign New Task Manager	04/15/2008		04/15/2008
Obtain Contractor Support and Re-Assess Initial Screening Evaluation in light of current knowledge	11/30/2008	11/30/2008	
Assess BWRs, industry-wide, to determine candidate plants for detailed modeling (using BWROG and/or contractor support, if available)	05/31/2009	05/31/2009	
Model & Evaluate void fraction and feasibility of air ingress using computational fluid dynamics (CFD)	11/30/2009	11/30/2009	
Evaluate ECCS pump performance in light of CFD results	03/30/2010	03/30/2010	
Update pump failure rates	05/30/2010	05/30/2010	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Re-quantify CDF with revised failure rates	09/30/2010	09/30/2010	
Perform detailed PRA estimating change in CDF, LERF, and public risk include determining the number of BWRs located in high seismicity areas	12/31/2010	12/31/2010	
Complete Safety & Risk Assessment Phase; assess follow-on activities, e.g., back-fit analysis, if appropriate	03/30/2011	03/30/2011	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0199 **Type:** GSI **Office/Division/Branch:** RES/DRA/OEGIB

Title: IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN U.S. FOR EXISTING PLANTS

Priority **Action Level** ACTIVE **Resolution Status:** Cn

Task Manager: L. Killian **TAC Number:** KC0030

Identification: 05/2005 **Prioritization/Screen:** 12/2006 **Technical Assessment:**

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** TBD

Regulation and Guidance Development: **Regulation and Guidance Issuance Status:**

Regulation and Guidance Development Status: TBD **Regulation and Guidance Development Status:** TBD

Implementation: **Verification:** **Closure:**

Implementation Status: TBD **Verification Status:** TBD **Closure Status:**

Work Authorization:

WORK SCOPE:

Description

Recent data and models indicate that estimates of the potential for earthquake hazards for some nuclear power plants in the Central and Eastern United States (CEUS) may be larger than previous estimates. While it has been determined that currently operating plants remain safe, the recent seismic data and models warrant further study and analysis. This further analysis will allow the NRC to better understand the current margins at operating plants for earthquakes.

Work Scope

The following paragraph reflects background information in the Generic Issue request memo dated May 26, 2005. Regulatory Guide 1.165, developed in the early 1990s, specifies a reference probability for exceedance of a safe shutdown earthquake (SSE) ground motion, i.e., seismic hazard, at a median annual value of 1E-5. This reference probability value is based on the annual probability of exceeding the SSEs for 29 CEUS nuclear power sites and is used to establish the SSEs for future nuclear facilities. Based on preliminary results from work performed by the United States Geological Survey (USGS) in 2004, it appears the reference probability for the 29 CEUS has increased to about 6 to 7E-5. The increase in the reference probability value is primarily due to recent developments in the modeling of earthquake ground motion in the CEUS. When the staff first identified this issue, no new plants had applied for a Construction Permit or Early Site Permit (ESP) since 10 CFR Part 100 was revised and Regulatory Guide 1.165 was issued in 1997. When the staff began review of the ESP applications, the staff realized the impact of the revised regulation and the regulatory guide as they relate to future plants and operating reactors.

From the staff's review of the ESP applications with support from the 2004 USGS draft report, it appeared that the perception of seismic hazard for operating plants in the CEUS region had possibly increased for some sites. Based on the evaluations of the Individual Plant Examination of External Events (IPEEE)

Program, the staff had determined that seismic designs of operating plants in the CEUS provided an adequate level of protection. However, in light of the preliminary results from the review of the USGS work of 2004 and ESP applications, the staff also recognized that the probability of exceeding the SSE at some of the currently operating sites in the CEUS maybe higher than previously understood. Therefore, the staff initiated this GI to assess the impact of increased estimates of seismic hazards on selected current nuclear power plants in the CEUS region that might be impacted by the updated seismic research, information, and models.

STATUS:

In August 2005, the NRC Office of Research (RES) issued a task order for a contractor to develop a probabilistic screening analysis for the increased probabilities of exceedance of the safe-shutdown earthquake ground motion on current nuclear power plants in the CEUS. The contractor was to use information provided by the NRC to perform this task in accordance with guidelines of Section 3.3 and Appendix B.3.2 of NUREG-1489, "A Review of NRC Staff Uses of Probabilistic Risk Assessment." The information to be provided by the NRC included Electric Power Research Institute (EPRI) Report NP-6395-D, "Probabilistic Seismic Hazard Evaluations at Nuclear Power Plant Sites in the Central and Eastern United States: Resolution of the Charleston Earthquake Issue," April 1989. In May 2007, the NRC and the contractor agreed to stop work on this task order because the NRC and EPRI had not resolved issues with releasing the copyrighted EPRI Report NP-6395-D to the NRC contractor for performing this task.

The NRC Office of RES had decided, in April 2007, to complete the USGS update of seismic hazard assessment of CEUS plants and then use this information to perform the screening analysis for this GI. In May 2007, the staff developed a plan to complete the screening analysis for GI-199 by February 2008, and began work on initial tasks described in this plan. In June 2007, the staff decided to focus the screening analysis efforts on using existing USGS seismic hazard information to address the seven criteria for screening GIs described in SECY-07-0022, "Status Report on Proposed Improvements to the Generic Issues Program," dated January 30, 2007 (ML063460239). In July 2007, the staff completed their preliminary screening analysis and in August 2007, provided it to the screening analysis review panel.

In October 2007, the staff determined that the screening analysis should consider seismic hazard data and models besides those available from the USGS. This determination was based on the staff's ongoing interactions with stakeholders to develop a new performance-based approach for assessing seismic hazards for new reactors as described in a memorandum to the Commission, "A Performance-Based Approach to Define the Safe Shutdown Earthquake Ground Motion," dated July 26, 2006 (ADAMS Accession No. ML052360044).

The staff completed the screening analysis using guidance contained in MD 6.4 and SECY-07-0022 in December 2007, and reconvened the screening panel in January 2008. On February 1, 2008, the Director of the Office of Research approved the screening panel recommendation (ML073400477) to begin the Safety / Risk Assessment Stage of the Generic Issue Process. On February 6, 2008, the staff met with the public and stakeholders to discuss the results of the Screening Stage of Generic Issue 199. The meeting took place at NRC headquarters located in Rockville, MD.

RES staff is currently collecting and analyzing seismic hazard information from USGS and other sources, and seismic risk information from IPEEE analyses. EPRI reported that they had calculated mean seismic spectra for the 28 sites using Reg. Guide 1.165, and that results for the remaining sites would be calculated. With these results, EPRI would have an up-to-date understanding of the seismic spectra at each site. The staff plans to review this information and, if it is acceptable, use this information in the Safety / Risk Assessment of the GI.

This GI is in the Safety / Risk Assessment Stage of the Generic Issue Process.

AFFECTED DOCUMENTS:

None Identified.

PROBLEM/RESOLUTION:

Progress on performing the screening analysis was delayed due to issues with releasing the copyrighted EPRI Report NP-6395-D to the NRC contractor. To overcome this issue, RES re-assessed alternatives for proceeding with the screening assessment of GI-199 in accordance with MD 6.4 and SECY-07-0022. From April 2007 through September 2007, staff performed the initial screening analysis of GI-199 using currently available seismic hazard information from the USGS. Then, in October 2007, the staff determined that the screening analysis should consider seismic hazard data and models besides those available from the USGS. The RES staff has worked with technical experts from NRR and NRO to complete an acceptable screening analysis and to develop an approach for the Safety / Risk Assessment Stage. We consider the previous problems to be resolved. The timely success of the Safety / Risk Assessment Stage depends upon the timely submittal of plant specific data by EPRI, and the acceptability of this data.

REASONS FOR SCHEDULE CHANGES:

Schedule delays involving the initial screening analysis were caused by not identifying an amenable solution for EPRI release of NP-6395-D to the NRC contractor for performing the screening analysis task. Based on discussions with the USGS, the staff determined the time frame for obtaining current seismic hazard update information for CEUS plant sites would be mid-2008 as opposed to October 2007. Accordingly, the staff changed the date for the milestone: "Receive Seismic Hazard Update Results for Selected CEUS Plants from USGS," from 10/30/2007 to 6/30/2008. In support of completing the screening analysis, consistent with timeliness targets described in SECY-07-0022, the staff decided to base the screening analysis on currently available seismic hazard information from the USGS. Following this approach, the staff completed the milestone: "Generate Screening Analysis," on July 27, 2007, and then completed the milestone: "Screening Panel Meeting," on September 12, 2007.

Then in October 2007, the staff determined that the screening analysis should consider seismic hazard data and models besides those available from the USGS. This determination is based on the staff's ongoing interactions with stakeholders to develop a new performance-based approach for assessing seismic hazards for new reactors as described in a memorandum to the Commission, "A Performance-Based Approach to Define the Safe Shutdown Earthquake Ground Motion," dated July 26, 2006 (ADAMS Accession No. ML052360044). The staff's ongoing work on this performance-based approach resulted in issuance of NRC Regulatory Guide 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," dated March 2007 that endorses the performance-based approach. After the Director of RES approved the Screening Panel's recommendation (ML073400477) to conduct a Safety / Risk Assessment Stage, a milestone was added for completion of this stage.

Milestone	Original Date	Current Date	Actual Date
Issue RFP to ISL for Technical Assistance	07/07/2005		07/07/2005
Receive Proposal from ISL	08/11/2005		08/11/2005
Generate Screening Analysis	10/31/2006	12/31/2007	07/27/2007
Screening Panel Meeting	11/30/2006	01/31/2008	09/12/2007
Prepare Screening Analysis Applying Criteria from MD 6.4 and SECY-07-0022	12/15/2007	12/31/2007	12/31/2007
Reconvene Screening Panel	12/15/2007	01/13/2008	01/11/2008
Provide Screening Panel Recommendation Memo for RES Director Approval"	01/31/2007	02/15/2008	01/25/2008
Issue RES Director Approved Screening Analysis and Panel Recommendation	12/31/2006	02/28/2008	02/01/2008
Receive Seismic Hazard Update Results for Selected CEUS Plants from USGS	10/30/2007	08/01/2008	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Receive Analyses from EPRI	05/30/2008	11/01/2008	
Schedule and Conduct Safety/Risk Assessment Panel	09/30/2008	01/15/2009	
Brief ACRS	03/31/2009		
Proceed to Regulatory Assessment Stage or close	06/30/2009		

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number NMSS-0007 **Type:** GSI **Office/Division/Branch:** NMSS/FCSS/SPTS

Title: CRITICALITY BENCHMARKS GREATER THAN 5% ENRICHMENT

Priority H **Action Level** RESOLVED **Resolution Status:** 3B

Task Manager: C. Hrabal **TAC Number:**

Identification: 05/1998 **Prioritization/Screen:** 05/1998 **Technical Assessment:** 05/1998

Identification Status: Complete **Priority/Screen Status:** Complete **Technical Assessment Status:** C

Regulation and Guidance Development: 03/2007 **Regulation and Guidance Issuance Status:** 03/2007

Regulation and Guidance Development Status: C **Regulation and Guidance Development Status:**

Implementation: **Verification:** **Closure:** 08/2007

Implementation Status: TBD **Verification Status:** TBD **Closure Status:** C

Work Authorization:

WORK SCOPE:

Description

The importance of software (methods and data) in establishing the criticality safety of systems with fissile material is increasing as licensees work to optimize facilities and storage/transport packages at the same time that access to experimental data is decreasing. Available experimental data are insufficient to validate nuclear criticality safety evaluations for all required configurations at U-235 enrichments in the range of 5-20%.

Work Scope

The purpose of this project is to develop and confirm the adequacy of methods, analytical tools, and guidance for criticality safety software to be used in licensing nuclear facilities. The contractor will develop and test methods to estimate trends in calculational bias and uncertainty (thus extending the range of applicability) using sensitivity analysis techniques that: relate the importance of the system parameters to the calculated neutron multiplication factor; provide expert guidance on assessing the adequacy of the parameter phase space used in the validation process and the resulting bias and uncertainty; and illustrate use of the guidance by application to a regime of experimental phase space (such as 5-10% U-235 and degree of moderation) that has limited measured data but extensive interest in terms of current and planned safety evaluations.

STATUS:

The final reports for the sensitivity/uncertainty (S/U) methods were published in November 1999 as Volumes 1 and 2 of NUREG/CR-6655. The reports covered the following subjects: (1) methodology for defining range of applicability including extensions of enrichments from 5% to 11%; (2) test applications and results of the method; (3) test application for higher enrichments using foreign experiments; (4) feasibility study for extending the method to multidimensional analyses, such as transport casks and reactor fuel.

Results of the test applications of the ORNL methods showed that, for simple geometries with neutron spectra that are well moderated (high H/X), benchmark experiments at 5% enrichment are applicable to calculations up to 11% enrichment. On the other hand, these test applications also showed that benchmark experiments at intermediate and higher H/X values are not applicable to calculations at very low H/X. There are relatively few benchmarks at these very low H/X values for many compositions of interest to LEU licensees.

Although the ORNL method must be applied by licensees to each individual process to determine an acceptable subcritical margin, the preliminary results indicated that there may be situations where there are no applicable benchmarks. In these cases, the method does provide sensitivity and uncertainty information to aid designers in allowing adequately large margins to cover the lack of benchmark validation.

Based on the ORNL work, it was recognized that a new statement of work was needed to make the computer codes for S/U methods readily available for use by the industry. It was decided that this could best be handled by incorporating the S/U methods into the release of SCALE 5.0. A User Need Memo to RES dated 04/17/2001 requested assistance for that work.

The 04/17/2001 User Need Memo from NMSS to RES was canceled by NMSS by memo dated 06/24/2004, because RES had not been able to fund the contract due to higher priority work. However, independent of RES, NMSS used an existing contract with ORNL to complete most of the work, which involved providing the NRC with a pre-release of the S/U computer codes in SCALE 5.0 (via the TSUNAMI computer code), along with training. SCALE 5.0 was released to the industry in June 2004. Training was also completed in June 2004 by non-NRC funded ORNL tutorials at the 2004 Annual American Nuclear Society Meeting and NMSS funded training for NRC. Additional training on interpreting the results of TSUNAMI was provided in August 2005 and September 2006.

To communicate the acceptability of using TSUNAMI as one method for determining subcriticality margins, the NRC prepared Interim Staff Guidance (ISG)-10, "Justification for Minimum Margin of Subcriticality for Safety," which was finalized in June 2006. The TSUNAMI code in SCALE 5.0 is one such method for systematically quantifying the degree of similarity between a set of critical experiments and applications. For those applications where few benchmarks exist, as described previously for low H/X values, the TSUNAMI code can be used to apply adequately large margins to ensure the application is properly validated by SCALE 5.0. However, if lower margins are wanted for certain applications, further benchmarks will be needed. The development and funding of additional benchmarks are not in the scope of this GSI.

This issue was closed out as described in memorandum from Director, Office of NMSS to the EDO, dated August 28, 2007 (ML072340091).

AFFECTED DOCUMENTS:

ISG-10

PROBLEM/RESOLUTION:

There has been some question as to whether benchmark experiments from 5 to 10 enrichment should be part of this GSI. These experiments are not required for validation, unless an applicant wants reduced margins, and thus should be part of a different GSI or other vehicle for development of the requisite benchmarks.

REASONS FOR SCHEDULE CHANGES:

Milestone, "Close Out Issue," has been changed to 8/31/07 to ensure a plan for closing out the GSI is in place. The milestones below are assuming only a closeout memorandum is needed and no further work needs to be performed (i.e., changing the scope of the GSI to include benchmark experiments). The milestone, “Determine If User Needs Have Been Met,” has been deleted, since it is not required to close out this GSI.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Date	Actual Date
Development of Generalized Sensitivity Methods	12/01/1997		12/01/1997
Acquisition and Documentation of Russian Data	05/01/1998		05/01/1998
Development of Guidance for Defining Ranges of Applicability	07/01/1998		11/01/1998
Application of Guidance to Extend Low Enrichment Range	09/30/1998		11/30/1998
Technical Assistance and Project Planning	03/01/1999		03/01/1999
Receive Final ORNL Contract Reports	03/01/1999		10/01/1999
Publish Final ORNL Contract Reports	10/01/1999		11/01/1999
User Need Request Memo to RES	12/01/2000		06/01/2001
Make New Computer Codes Available Through Scale 5.0 Release	03/01/2001		06/30/2004
Training to NRC Staff and Licensees on S/U Methods in SCALE 5.0	09/01/2002		06/30/2004
Cancel User Need Request Memo to RES	06/30/2004		06/30/2004
Issue Staff Guidance (ISG-10)	10/01/2000	10/31/2006	06/15/2006
Close Out Issue	03/31/2003	08/31/2007	08/28/2007