GENERIC ISSUE MANAGEMENT CONTROL SYSTEM REPORT
FOR FISCAL YEAR 2011 4th QUARTER

OFFICE OF NUCLEAR REGULATORY RESEARCH

Enclosure

TABLE OF CONTENTS

Description ….. iii

Legend …...iv-v

Data Elements...vi-vii

4th Quarter FY 2011 GIMCS Report for Active GIs.. 1-21

- ❖ GI-186, "Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants" 1-3
- ❖ GI-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident".............. 4-7
- ❖ GI-191, "Assessment of Debris Accumulation on PWR Sump Performance"... 8-13
- ❖ GI-193, "BWR ECCS Suction Concerns".. 14-17
- ❖ GI-199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern U.S. on Existing Plants" 18-21

Generic Issue Management Control System

Description

The Generic Issue Management Control System (GIMCS) provides information relevant to the management and resolution of generic issues (GIs). The resolution of any GI may lead to safety enhancements and the promulgation of new or revised requirements or guidance. The GIMCS 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 procedures for processing non-reactor issues were 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 new GIs. For reactor issues, the Office of Nuclear Regulatory Research (RES), Office Instruction TEC-002, "Procedures for Processing Generic Issues," provides guidance to the RES staff.

NRC policy document SECY-07-0022, dated January 30, 2007, describes a revised GI process. A recent update of MD 6.4 (issued November 2009) reflects the revised GI process. While GI-193 and GI-199 are being conducted under the new process, the remaining older GIs will continue to use the previously established procedures in accordance with their original task action plans. MD 6.4 also provides acceptance criteria for proposed issues being processed by the GI program. Since the establishment of SECY-07-0022, six proposed GIs have not been accepted into the program because they did not meet the criteria.

In accordance with 10 CFR 52.47(a)(21), applications for design certification must contain "Proposed technical resolutions of those Unresolved Safety Issues and medium- and high-priority generic safety issues which are identified in the version of NUREG-0933 current on the date up to 6 months before the docket date of the application and which are technically relevant to the design." Similarly, in accordance with 10 CFR 52.79(a)(20), applications for combined licenses must contain "Proposed technical resolutions of those Unresolved Safety Issues and medium- and high-priority generic safety issues which are identified in the version of NUREG-0933 current on the date up to 6 months before the docket date of the application and which are technically relevant to the design." As indicated in Pilot MD 6.4, dated July 21, 1999, prioritization of GIs was replaced by the screening process, in which a determination is made to either establish the proposed issue as a bona fide GI or reject the issue from the program. For the purposes of 10 CFR 52.47(a)(21) and 10 CFR 52.79(a)(20), any GI established by the MD 6.4 screening process is considered equivalent to a HIGH-Priority GI.

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
CDF	- Core Damage Frequency
DCH	- Direct Containment Heat
DE	- Division of Engineering
DRA	- Division of Risk Analysis
DSA	- Division of Systems Analysis
DSS	- Division of Safety Systems
CEUS	- Central and Eastern United States
CRGR	- Committee to Review Generic Requirements
ECCS	- Emergency Core Cooling System
EDO	- Executive Director of Operations
EPRI	- Electric Power Research Institute
ESP	- Early Site Permit
GI	- Generic Issue (same meaning as GSI)
GIMCS	- Generic Issue Management Control System
GL	- Generic Letter
GR	- Guidance Report
GSI	- Generic Safety Issue
HPCS	- High Pressure Core Spray
IN	- Information Notice
IPEEE	- Individual Plant Examination of External Events
LOCA	- Loss of Coolant Accident
MD	- Management Directive
MPVF	- Maximum Potential Void Fraction
NEI	- Nuclear Energy Institute
NPSH	- Net Positive Suction Head
NRC	- U.S. Nuclear Regulatory Commission
NRO	- Office of New Reactors
NRR	- Office of Nuclear Reactor Regulation
NSIR	- Office of Nuclear Security and Incident Response
OEGIB	- Operating Experience and Generic Issues Branch
OGC	- Office of General Counsel
PUMA	- Purdue University Multi-dimensional Integral Test Assembly
PWR	- Pressurized-Water Reactor
RES	- Office of Nuclear Regulatory Research
RIS	- Regulatory Issue Summary
SBO	- Station Blackout
SBPB	- Balance-of-Plant Branch
SE	- Safety Evaluation
SOW	- Statement of Work
SRM	- Staff Requirements Memorandum
SRP	- Standard Review Plan
SSE	- Safe Shutdown Earthquake
SSIB	- Safety Issue Resolution Branch
TAC	- Task Action Control

Legend (continued)

TAP	- Task Action Plan
TBD	- To Be Determined
TI	- Temporary Instruction
TVA	- Tennessee Valley Authority
USI	- Unresolved Safety Issue

Generic Issue Management Control System

Data Elements

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

1.	Issue Number	A unique number assigned to each generic issue
2.	Title	Generic issue title
3.	Type	Type designation (generic issue, unresolved safety issue, etc.)
4.	Office/Division /Branch	The Office, Division, and Branch of the task manager who has lead responsibility for resolving the issue
5.	Task Manager	Name of assigned individual responsible for resolution
6.	Action Level	Active – The GI involves actions under the Generic Issues Program Inactive – No technical assistance funds appropriated for resolution, no task manager assigned, or task manager assigned to other work Transferred – Issue has been transferred out of the Generic Issues Program for additional research or scoping study Completed – All necessary work associated with the GI has been completed by the agency 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
7.	TAC Number	Task Action Control (TAC) number assigned to the issue
8.	Resolution Status	In progress, resolved with requirements, or resolved with no requirements
9.	Identification Date	Date the issue was identified
10.	Generic Issue Acceptance Date	Date the issue was designated as a generic issue
11.	Technical Assessment	The date and status associated with completion of the technical assessment activity (when applicable)
12.	Regulation and Guidance Development	The date and status associated with completion of the regulation and guidance development activity (when applicable)

Data Elements (continued)

13.	Regulation and Guidance Issuance	The date and status associated with completion of the regulation and guidance issuance activity (when applicable)
14.	Safety Risk Assessment	The date and status associated with completion of the safety risk assessment activity (when applicable)
15.	Regulatory Assessment	The date and status associated with completion of the regulatory assessment activity (when applicable)
16.	Transfer to Regulatory Office for Action	The date and status associated with transfer of the issue to a regulatory office for action
17.	Completion of Verification	The date and status associated with completion of verification activities
18.	Closure	The date and status associated with agency closure of the GI
19.	Work Authorization	Who or what authorized work to be done on the issue
20.	Work Scope	Describes the problem and the technical work necessary to address or resolve the generic issue
21.	Status	Describes current status of work while also retaining an accurate running narrative discussion of major activities, milestones, and decision points
22.	Affected Documents	Identifies documents into which the technical resolution will be incorporated
23.	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.
24.	Reasons for Schedule Changes	Narrative discussion associated with schedule changes
25.	Milestones	Selected significant dates Original – Scheduled dates reflected in the original Task Action Plan, plus additional original milestone dates added During resolution of the GI Current – Revised expected date of completion if the original date has changed Actual – The actual date the milestone was completed

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Issue Number 0186 **Type:** GI **Office/Division/Branch:** NRR/DSS/SBPB

Title: Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants

Resolution Status: In progress **Identification Date:** 4/1/1999 **Generic Issue Acceptance Date:**

Action Level: Regulatory Office Implementation **Task Manager:** Steve Jones **TAC Number:**

Technical Assessment: 11/12/2003 (Actual/Complete) **Regulation and Guidance Development:** 9/18/2008 (Actual/Complete)

Regulation and Guidance Issuance: 12/1/2008 (Actual/Complete) **Transfer to Regulatory Office for Action:**

Completion of Verification: **Closure:** 12/31/2011 (Planned/Projected)

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, "A Survey of Crane Operating Experience at U.S. Nuclear Power Plants from 1968 through 2002," 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 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 postulated reactor vessel head load drops. NRR issued 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-failure proof 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, 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.

By letter dated July 28, 2008, NEI submitted the guidance document NEI 08-05, "Industry Initiative on Control of Heavy Loads," which provides industry-developed guidelines for: (1) managing the risk associated with maintenance involving movement of heavy loads, (2) performing consequence analyses for postulated reactor vessel head drops, (3) establishing single-failure-proof equivalence for handling systems when used for reactor vessel head lifts, and (4) updating the description of heavy load handling programs in the safety analysis report. The staff issued its safety evaluation of NEI 08-05 on September 5, 2008. Through the safety evaluation, the NRC staff endorsed the methods in NEI 08-05 for the specified applications, with certain exceptions and clarifications. The NRC staff issued supplementary inspection guidance addressing implementation of the industry initiative as Revision 2 to Operating Experience Smart Sample FY2007-03, which provides supplementary guidance for refueling inspection activities related to cranes and heavy lifts. This inspection guidance was posted for inspector use and public review on September 18, 2008. The NRC issued RIS 2008-28, "Endorsement of Nuclear Energy Institute Guidance for Reactor Vessel Head Heavy Load Lifts," to notify stakeholders of NRC endorsement of the guidelines in NEI 08-05. The NRC staff is continuing to conduct sampling inspections to validate initial implementation of the guidelines.

AFFECTED DOCUMENTS:

NUREG-1774, "A Survey of Crane Operating Experience at U.S. Nuclear Power Plants from 1968 through 2002"

Standard Review Plan (NUREG-0800), Section 9.1.5

NEI 08-05, "Industry Initiative on Control of Heavy Loads" Revision 0 (ADAMS Accession Number ML082180684)

Safety Evaluation by the Office of Nuclear Reactor Regulation Related to NEI 08-05, Revision 0, "Industry Initiative on Control of Heavy Loads" (ADAMS Accession Number ML082410532)

PROBLEM/RESOLUTION:

None

REASONS FOR SCHEDULE CHANGES:

Discussions with ACRS Staff indicated that the ACRS was unlikely to require a brief on the implementation of recommendations related to GI-186. The staff has been assessing the proper closeout method given the revision of Management Directive 6.4, "Generic Issues Program." The completion dates for closeout memoranda to the ACRS and the Executive Director for Operations have been extended to address certain inspection issues arising during initial implementation of the industry initiative on heavy loads and to compensate for resource limitations.

Milestone	Original Date	Current Date	Actual Date
Publish NUREG-1774	6/30/2003		6/30/2003
Meet with ACRS Full Committee	9/1/2003		9/11/2003
ACRS Memo to the EDO on Staff Recommendations	9/24/2003		9/24/2003
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	5/4/2004		5/4/2004
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	2/28/2006		5/29/2007
Enhance Inspection Procedures for Heavy Loads	9/30/2007		9/18/2008
Closeout Memo to ACRS on Implementation of Recommendations	11/30/2004	11/15/2011	
Issue Closeout Memo to the EDO	8/31/2005	12/31/2011	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Issue Number 0189 **Type:** GI **Office/Division/Branch:** NRR/DSS/SBPB

Title: Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident

Resolution Status: In progress **Identification Date:** 5/17/2001 **Generic Issue Acceptance Date:**

Action Level: Regulatory Office Implementation **Task Manager:** Steve Jones **TAC Number:** MB7245

Technical Assessment: 12/15/2002 (Actual/Complete) **Regulation and Guidance Development:** 4/23/2007 (Actual/Complete)

Regulation and Guidance Issuance: 4/30/2007 (Actual/Complete) **Transfer to Regulatory Office for Action:**

Completion of Verification: 12/15/2009 (Actual/Complete) **Closure:** (To Be Determined)

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 condenser containments 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 GI-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.

Based on an understanding that many 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.

STATUS:

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 GI-189 and provide benefit for some security scenarios. On April 23, 2007, the EDO issued a memo informing the Commission of the staff's 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. Licensee implementation and NRC verification inspections performed pursuant to NRC TI 2515/174, "Hydrogen Igniter Backup Power Verification," have been completed at all 9 affected sites. In November 2010, the staff received a commitment from the Tennessee Valley Authority to implement measures at Watts Bar Unit 2 equivalent to those measures verified to have been implemented at Watts Bar Unit 1.

The reactor events in Japan are relevant to this issue because the events involved a station blackout condition and core damage leading to hydrogen detonations. Therefore, the staff intends to suspend closeout activities pending outcome of the Near Term Task-Force recommendations review regarding the Japan events.

AFFECTED DOCUMENTS:

10 CFR 50.44
10 CFR 50.34

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 GI-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. Licensee implementation and NRC verification inspections have been completed as of December 2009. Final closeout will be extended due to resource limitations and to assess the impact of the reactor events in Japan.

Milestone	**Original Date**	**Current Date**	**Actual Date**
Draft Technical Assessment	5/1/2002		5/1/2002
Meet with ACRS	6/1/2002		6/6/2002
Second Meeting on Technical Assessment with ACRS Sub-Committee	10/1/2002		11/5/2002
Final Technical Assessment	11/1/2002		11/10/2002
Meet with ACRS Full Committee	11/1/2002		11/13/2002
Transfer GI to NRR	12/1/2002		12/17/2002
Public Meeting with Stakeholders	2/28/2003		2/28/2003
Determine Best Course of Action	2/28/2003		2/28/2003
Review RES Technical Assessment	2/28/2003		2/28/2003
Prepare Guidance and Provide Results to NRR Management	3/26/2003		3/26/2003
Finalize CRGR Package	3/26/2003		3/26/2003
Distribute Draft Order and SECY Paper	3/26/2003		3/26/2003
Provide Draft Order to OGC and Draft SECY to EDO	3/28/2003		3/28/2003
Meet with Rulemaking Committee	5/5/2003		5/5/2003
Conduct Public Meeting	6/18/2003		6/18/2003
Meet with OPA to Develop Communication Plan	6/24/2003		6/24/2003
Complete Communication Plan	7/10/2003		7/10/2003
NRR Meeting with ACRS	11/6/2003		11/6/2003

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
Public Meeting to Address Design Criteria	11/6/2003		11/6/2003
Public Meeting with Stakeholders	2/3/2004		2/3/2004
Brief Commissioner Merrifield	3/4/2004		3/4/2004
Public Meeting with Stakeholders	3/31/2004		3/31/2004
Issue Draft Design Criteria for Comment	8/13/2004		8/13/2004
Public Meeting with Stakeholders	9/21/2004		9/21/2004
Internal Meeting to Discuss Pursuit of Rulemaking	11/2/2004		11/2/2004
Perform Sensitivity Analysis to Determine Whether 2-Hour Startup Time for BWRs is Acceptable	11/30/2004		11/30/2004
Decision on Voluntary Licensee Initiatives as Alternative to Rulemaking	11/30/2004		11/30/2004
Finalize Design Criteria	11/30/2004		11/30/2004
Evaluate Safety/Security Interface	3/31/2005		3/30/2005
Issue Status Paper to Commission	5/31/2005		6/14/2005
Brief Commissioner Jaczko on Regulatory Analysis Results and Safety Significance	7/18/2005		7/18/2005
Meet with Owners to Discuss Safety-Security Interface Issues	8/3/2005		8/3/2005
Update Commission Regarding Licensee Plans for Voluntary Measures	3/1/2006		3/1/2006
Seek Commitment for Implementation of Voluntary Initiatives	8/31/2005		3/9/2007
Request Information from Owners on Voluntary Actions Implemented	12/31/2005		3/9/2007
Complete Regulation and Guidance Development	6/30/2006		4/23/2007
Clarify Commitments to Resolve Any Remaining Issues	12/31/2007		6/15/2007
Complete Implementation	6/30/2008		12/15/2009
Complete Verification	6/30/2009		12/15/2009
Close Out Issue with Memo to the EDO (TBD)	6/30/2010		

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

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

Title: Assessment of Debris Accumulation on PWR Sump Performance

Resolution Status: In progress **Identification Date:** 9/1/1996 **Generic Issue Acceptance Date:**

Action Level: Regulatory Office Implementation **Task Manager:** Stewart Bailey **TAC Number:** MA6454, MB4864

Technical Assessment: 9/15/2001 (Actual/Complete) **Regulation and Guidance Development:** 9/24/2004 (Actual/Complete)

Regulation and Guidance Issuance: 9/30/2004 (Actual/Complete) **Transfer to Regulatory Office for Action:** 12/31/2007 (Actual/Complete)

Completion of Verification: **Closure:** 12/31/2018 (Estimated)

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 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 GI-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 GI-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 GI-191. NRR has evaluated the technical assessment, and prepared a Task Action Plan for developing appropriate regulatory guidance and resolution of GI-191.

STATUS:

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. 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 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.

GL 2004-02 was issued in September 2004, requesting licensees to perform plant-specific mechanistic evaluations of sump performance following LOCA and high-energy line break events, and to implement corrective actions as required to ensure compliance with regulatory requirements. NEI provided a 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 SE, which supplemented the GR. The final SE was issued in December 2004, resulting in an NRC-approved evaluation methodology.

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 were conducted 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.

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.

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. 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. 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. Additional limited-scope audits were conducted in 2008 and 2009 to address chemical effects.

In addition to the plant audits identified above, the staff is using inputs from review of licensee responses to GL 2004-02 (received in 2008 and 2009) and items identified from Regional inspections using Temporary Instruction TI-2515/166 to support closure of GI-191. Initial review of licensee GL responses is complete. These reviews identified the need for additional information from most licensees in order for the NRC to conclude that the licensees have fully addressed the sump issues. Licensee responses to these requests for additional information and subsequent NRC staff reviews of the responses are ongoing.

An additional issue that needs to be resolved to close GI-191 regards in-vessel downstream effects, the potential for debris to bypass the sump strainers and enter the core. The NRC staff determined in 2008 that additional industry-sponsored testing was necessary to support resolution of this issue. The testing resulted in submittal of a topical report to the NRC in April 2009. Although the topical report is under NRC staff review, the staff determined that additional testing is still needed. The PWR Owners Group expected to complete the testing by the end of 2009. However, the NRC staff requested additional testing and some of the testing yielding unexpected results. Therefore, further evaluation and testing are in progress. The NRC expects to issue a safety evaluation on the topical report in 2011. The safety evaluation will provide guidance to licensees regarding use of the industry-developed test results and topical report. Licensees will be expected to evaluate the potential for in-vessel effects on a plant-specific basis within 90 days of issuance of the final NRC safety evaluation for the topical report. The expected issuance date of this safety evaluation has been delayed until late 2011 because of the incomplete industry testing; additional delays are possible.

Another emergent regulatory issue involves some licensees taking credit for certain vendor testing as a basis for assuming reduced generation of debris following a LOCA. The NRC staff reviewed the report of this testing and developed a number of questions regarding it. Despite numerous interactions with the industry on these questions, the NRC staff has been unable to conclude that the reduced generation assumptions are valid. The NRC staff informed the industry in March 2010 that the staff does not accept the testing. The industry responded that it plans a new testing campaign to address the staff's issues, with the intent of still crediting reduced debris generation. The industry expects to complete this testing in 2011.

In April 2010, the staff and industry briefed the Commission regarding the current status of the resolution of GI-191. Representatives from industry summarized their actions to address the issue and suggested that these actions have resolved the safety implications of this GI. The industry representatives further recommended resolution and closure via the application of 10 CFR 50, Appendix A, General Design Criterion 4 (GDC-4). This criterion allows credit for certain purposes for the high likelihood that a reactor coolant leak would be detected before a major piping rupture would occur; the NRC staff has not heretofore allowed this credit for resolving sump performance issues. The staff acknowledged the industry's actions to address this issue. However, the staff stated its position that the issue remains of concern for plants with relatively high fibrous insulation loading that have not demonstrated adequate sump performance using methods acceptable to the NRC. Based on the information presented, the Commission directed the staff to provide information on potential approaches for bringing GI-191 to closure. The staff paper was presented to the Commission in September 2010. The Commission issued its SRM in December 2010. The Commission determined that it was prudent to allow the nuclear industry to complete testing on in-vessel effects and zone of influence in 2011, and to develop a path forward by mid 2012. The SRM directed the staff to evaluate alternative approaches, including risk-informed approaches, for resolving GSI-191 and to present them to the Commission by mid 2012. The Commission further agreed that modifications should be completed within two operating cycles for smaller LOCAs and three operating cycles for larger LOCAs after development of the path forward.

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:

Licensees have submitted supplemental responses to GL 2004-02 in 2008 and 2009. The staff's initial review of GL responses is complete. However, reviews completed to date have identified the need for more information from some licensees. Staff reviews of the additional information will continue. An innovative new issue resolution process has to date resulted in resolution of sump performance issues for approximately 2/3 of the 69 PWRs (with the exception of in-vessel effects). Progress continues to resolve issues for the remaining PWRs.

REASONS FOR SCHEDULE CHANGES:

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

The need to evaluate the path forward to resolution of GSI-191, based on the issues identified in the April 15, 2010 and September 29, 2010 Commission briefs, has resulted in a delay in the projected closure of GI-191, as outlined in this document. The currently expected closure date of December 31, 2012, with modifications completed by December 31, 2018, could change depending on Commission direction. Another condition that could affect the issue closure date is further delays in the ongoing testing and evaluation for in-vessel effects. In addition, the issue regarding credit for reduced debris generation may mean affected licensees need to make additional modifications. Such modifications would likely require two operating cycles to design and install and some modifications may take three operating cycles. While the identity of licensees in this situation is not yet known, the completion date for additional modifications is assumed to be the end of 2018. The NRC plans to close GI-191 when all PWRs have completed testing and evaluation of sump performance using NRC-accepted methods. After issue closure, the NRC staff will track all committed modifications to completion.

RES changed the status of GI-191 to Regulatory Office Implementation (see ML071630094). This change is part of improvements to the GI Program 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 GI 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	12/1/1995		12/1/1995
User Need Request Assigned to GSIB/RES	1/1/1996		1/1/1996
Reassessment Declared a New GSI	9/1/1996		9/1/1996
Issue SOW for Evaluation of GSI A-43	11/1/1996		11/1/1996
Complete Evaluation of GSI A-43	4/1/1997		3/1/1997
Issue SOW for Reassessment of Debris Blockages in PWR Containments Impact on ECCS Performance	9/1/1998		9/1/1998
Complete Collection and Review of PWR Containment and Sump Design and Operation Data	12/1/1999		12/1/1999
Complete All Debris Transport Tests	9/1/2000		8/1/2000
Complete Parametric Evaluation	7/1/2001		7/31/2001
Proposed Recommendations to the ACRS	8/31/2001		8/31/2001
ACRS Review Completed	9/30/2001		9/14/2001
Issue Transferred from RES to NRR	9/28/2001		9/28/2001
Complete Reassessment of Debris Blockages in PWR Containments Impact on ECCS Performance	9/30/2001		9/28/2001
Complete Estimate of Average CDF Reduction, Benefits, and Costs	4/1/2002		9/28/2001
Prepare Memo Discussing Proposed Recommendations (End of Technical Assessment Stage of Generic Issue Process)	4/1/2002		9/28/2001

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
Issue Bulletin 2003-01	5/1/2003		6/1/2003
Complete Development of Models and Methods for Analyzing Impact of Debris Blockages in PWR Containments on ECCS Performance	4/1/2001		6/9/2003
Discuss Reg. Guide 1.82, Rev. 3 with ACRS SubCommittee on Thermal-Hydraulic Phenomena	8/20/2003		8/20/2003
Present Final Version of Reg. Guide 1.82, Rev. 3 to ACRS Full Committee	9/11/2003		9/11/2003
ACRS Letter on Final Version of Reg. Guide 1.82, Rev. 3	9/30/2003		9/30/2003
Draft Industry Guidance for Plant-Specific Analyses	10/30/2003		10/31/2003
Issue Reg. Guide 1.82, Rev.3	9/30/2003		11/30/2003
NRC Meeting with Stakeholders	3/23/2004		3/23/2004
NRC Meeting with Stakeholders	5/25/2004		5/25/2004
Receive Industry Guidance for Plant-Specific Analyses	9/30/2003		5/28/2004
NRC Meeting with Stakeholders	6/17/2004		6/17/2004
Brief ACRS SubCommittee on Proposed Generic Letter	6/22/2004		6/22/2004
NRC Meeting with Stakeholders	6/29/2004		6/29/2004
Develop Generic Letter for Resolution of GI	7/7/2004		7/7/2004
Brief Full ACRS Committee on Proposed Generic Letter	7/7/2004		7/7/2004
Meet with CRGR on Proposed Generic Letter	8/10/2004		8/10/2004
Issue Generic Letter 2004-02	9/13/2004		9/13/2004
Meet with ACRS on Safety Evaluation of NEI 04-07	10/7/2004		10/7/2004
ACRS Response on Safety Evaluation of NEI 04-07	10/18/2004		10/18/2004
Brief Commissioners Jaczko and Lyons on Status	7/18/2005		7/18/2005
EDO Briefing of ACRS on Status	9/9/2005		9/9/2005
Receive All GL Responses Addressing Plant-Specific Analyses	5/31/2005		9/15/2005
Issue Information Notice 2005-26	9/16/2005		9/16/2005
Complete Review of Licensee Responses to GL 2004-02	1/20/2006		1/20/2006
Issue Supplement 1 to IN 2005-26	1/20/2006		1/20/2006

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
Complete Research Programs Evaluating Coating Transportability and Surrogate Throttle Valve Debris Ingestion	2/28/2006		2/28/2006
Brief ACRS on Staff Evaluation of Licensee Responses to GL 2004-02 and Results of Chemical Effects Tests	3/9/2006		3/9/2006
Complete Testing and Analysis Associated with Initial Phase of Chemical Effects Research	5/30/2006		5/30/2006
Complete Containment Material Head Loss Testing	6/15/2006		6/15/2006
Complete Thermodynamic Simulation of Containment Sump Pool Chemical Constituents	9/30/2006		9/30/2006
Complete Last Audit Report	5/23/2008		6/19/2008
Regions Complete TI Inspections	6/30/2008		6/30/2008
Receive Last TI Verifications From Regions	8/11/2008		8/11/2008
Complete Review of TI Verifications	8/25/2008		6/30/2009
Licensees Complete GL-2004-02 Activities (TBD)	1/31/2007		
Complete Review of Licensee GL 2004-02 Responses for Adequacy (except in-vessel downstream effects)(TBD)	12/31/2007		
Prepare Closure Memo for GL-2004-02 Responses(TBD)	11/23/2008		
Complete NRR Review and Approval of GL Closure Memo(TBD)	12/28/2008		
Complete Review of Licensee GL 2004-02 Responses for in-vessel downstream effects(TBD)	3/31/2010		
Issue final safety evaluation for in-vessel downstream effects	6/30/2009	3/30/2012	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

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

Title: BWR ECCS Suction Concerns

Resolution Status: In progress **Identification Date:** 5/10/2002 **Generic Issue Acceptance Date:** 10/16/2003

Action Level: Active **Task Manager:** John C. Lane **TAC Number:** KC0140

Safety Risk Assessment: 8/31/2012 (Planned/Projected) **Regulatory Assessment:** 1/31/2013 (Planned/Projected)

Transfer to Regulatory Office for Action: (To Be Determined) **Completion of Verification:**

Closure Date: (To Be Determined)

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

GI-193, "BWR ECCS Suction Concerns" evaluates possible failure of the 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.

As a result of the initial screening (ML032940708) completed in October 2003, a TAP for the technical assessment of this issue was approved in May 2004 (ML041450208). Staff completed a literature search for information on ECCS pump performance during intake conditions at high voiding in March 2005 (ML050910465). 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 GI 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.

Completed portions of the TAP resulted in a basic understanding of the overall phenomena and a preliminary assessment that continued work on the GI is warranted. The next phase will involve a multi-step estimation of the MPVF occurring at different stages of a Large and Medium LOCA. The MPVF appears to be influenced by a number of phenomena many of which overlap in time, such as the gas/liquid jet coming from the downcomer and non-condensable gas injection from the drywell. It is an attempt to quantify an upper bound for voids present at the ECCS pump suction strainer in the wetwell. An estimate of the MPVF based on a simplified, worst-case scenario for a generic containment will be made. Ultimately, it is expected that this may provide licensees with guidance of how to calculate the MPVF based on their plant specific geometrical and operational characteristics. Initial emphasis will be placed on the calculations for the Mark I containment.

STATUS:

A detailed literature search and issue evaluation was completed as part of the initial phase of the TAP. It was documented in status reports issued in November 2005 (ML101410640 and ML102460492).

Discussions were initiated in NRC 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.

RES and NRR agreed not to include this activity in the upcoming GL 08-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." Also in 2007, RES and NRR 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." The BWROG provided references to two research reports from the Lappeenranta University of Technology laboratory in Finland (ML071640273 and ML071640280).

Based upon a staff request (ML092920376 and ML092920023), the BWROG agreed to provide voluntary input which would provide insights into the characteristics of LOCA phenomena at the earliest stages of the postulated accidents plus general information about wetwell geometries in relation to ECCS suction strainers. This proprietary input was received on October 29, 2009.

Staff efforts are under way to estimate the MPVF. An experimental testing program, underway during 2010, has been completed at Purdue University to promote understanding of complex void transport phenomena (ML092920025). The results of the experimental program are expected to shed light on the behavior of voids in the BWR Mark I wetwell design in regards to the potential transport of bubbles resulting from the LOCA blowdown. This information will be valuable in assessing the capability of bubbles to be transported to the suction strainer of ECCS pumps. Additional calculations will be made to provide boundary conditions for the tests and to compare to the experimental results.

AFFECTED DOCUMENTS:

GE Topical Report NEDO-33526, "Assessment of NRC Generic Issues, GI-193," October 29, 2009.

PROBLEM/RESOLUTION:

As described above, some elements of the original TAP were deferred in favor of staff attempts to pursue other avenues of resolution. For example, the staff attempted to incorporate a request for licensee input via inclusion in GL 08-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." Ultimately, this approach was not chosen due to dissimilarities in the phenomenology involved. Similarly, the staff attempted to consider test results from Finland as supportive of a resolution. This approach also did not meet with the success originally envisioned as the test results were not conclusive of pump survival and performance. Due to the complexity of bubble formation, transport and its impact on pump performance the staff plans to supplement the analytical resolution with a focused, experimental program. The purpose of the program, scheduled to begin in early 2010 at the PUMA test facility, is to provide clarification as to the potential for bubbles formed from simulated LOCA blowdown to be transported in the wetwell to the ECCS pump inlets and, consequently, to be ingested into ECCS pump impellers.

REASONS FOR SCHEDULE CHANGES:

An experimental testing program was proposed in 2009 to help assess the complex phenomenology involved with bubble creation, injection, and transport into the containment wetwell. Modifications to the experimental facility at Purdue University began in the fall of 2009 in order to simulate the creation and behavior of voids following their injection into a BWR Mark I suppression pool. The simulated blowdown tests will attempt to demonstrate representative flows through Mark I wetwell downcomers of the steam and drywell inert gases resulting from postulated medium and large loss of coolant accidents. Bubbles formed and transported as a result of these flows will be tracked to determine the extent to which they might be available to be ingested into ECCS suction lines. The staff expects that these tests will help in determining the extent to which these bubbles could potentially challenge ECCS performance ultimately by causing air binding in the ECCS pumps. In 2009, the staff used calculational tools to determine acceptable estimates of the key input parameters related to blowdown steam and inert gas flow resulting from LOCAs. The draft test plan is contained in an attachment (ML100750236) to a letter sent to the BWROG (ML100750232) which also contained a description of the PUMA test facility (ML100750240). Steady state tests began in mid-June 2010 and transient tests were completed by December 2010. The final report was received in March 2011. The staff is in the process of evaluating the test results.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
Complete Task Action Plan for a Technical Assessment	3/31/2004		5/24/2004
ECCS Pump Performance Literature Search	3/31/2005		3/31/2005
Issue Request for Proposal to BNL for Technical Assistance	4/26/2005		4/26/2005
Receive Proposal for Technical Assistance from BNL	6/3/2005		6/3/2005
Request Information from Technical Research Center of Finland	9/12/2005		9/12/2005
Evaluate Experimental Results on Thermal-Hydraulic Phenomena	9/30/2005		9/30/2005
Complete Literature Search for Two Specific Thermal-Hydraulic Phenomena	9/30/2005		9/30/2005
Assign New Task Manager	5/15/2006		5/15/2006
RES Decision to Work with NRR on Generic Communication	8/31/2006		8/31/2006
Arrange Meeting With BWROG and Obtain Their Input	6/30/2007		6/6/2007
Review BWROG Data and Determine Regulatory Action	9/30/2007		12/31/2007
Assign New Task Manager	4/15/2008		4/15/2008
Query BWROG for background information	9/4/2008		9/4/2008
Query Finnish researchers to share current information	11/30/2008		1/30/2009
Establish workscope for experimental program at Purdue University to study void transport phenomena	5/1/2009		9/1/2009
Receive BWROG response to staff information request	12/31/2008		10/29/2009
Propose and Develop Draft Experimental Test Plan	2/1/2010		3/1/2010
Finalize Experimental Test Plan	4/1/2010		6/1/2010
Begin steady state and transient tests	11/1/2009		6/15/2010
Receive Draft Report from University Contractor	12/30/2009		12/15/2010
Conclude Steady State and Transient Tests	12/31/2010		12/31/2010
Receive Final Report from University Contractor	3/31/2011	3/31/2011	3/31/2011
Staff Evaluation of Test Findings	7/31/2011	12/31/2011	
Complete Safety/Risk Assessment	9/30/2010	8/31/2012	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
Complete Regulatory Assessment	7/30/2012	1/31/2013	
Develop Plan for Potential Follow-on Actions or Proceed to Issue Closure	10/31/2012	5/30/2013	
Begin Follow-On Actions Commensurate with Risk-Significance, if Required	12/31/2012	8/31/2013	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Issue Number 0199 **Type:** GI **Office/Division/Branch:** NRR/DE/

Title: Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern U.S. on Existing Plants

Resolution Status: In progress **Identification Date:** 5/25/2005 **Generic Issue Acceptance Date:** 2/1/2008

Action Level: Regulatory Office Implementation **Task Manager:** Kamal Manoly **TAC Number:**

Safety Risk Assessment: 9/2/2010 (Actual/Complete) **Regulatory Assessment:**

Transfer to Regulatory Office for Action: 9/2/2010 (Actual/Complete) **Completion of Verification:**

Closure Date: 9/2/2010 (Actual/Complete)

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 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 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 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 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 may have increased for some sites. Based on the evaluations of the 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 may be 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, 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 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 RES Director 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 collected and analyzed seismic hazard information from USGS and other sources, and seismic risk information from IPEEE analyses. EPRI reported that they calculated mean seismic hazard results for all nuclear power plant sites in the CEUS. With these results, EPRI performed an independent evaluation of the implications of changes in seismic hazard estimates. The staff interacted with EPRI under a Memorandum of Understanding to discuss data, methodology, and outcomes from the methodology. In June 2009, the staff completed the review and analysis of seismic data in support of the Safety/Risk Assessment. Several Safety/Risk Assessment Panel meetings were held in July and August 2009. From November 2009 through March 2010, RES staff held internal briefings with NRR, NRO, and NRC regional offices. The Safety/Risk Assessment Panel reconvened in March 2010 and in June 2010 to review their recommendations. The Safety/Risk Assessment Panel Report was issued on September 2, 2010. The panel recommended transferring lead responsibility for subsequent GI-199 actions to NRR for regulatory office implementation, and that further actions be taken to address GI-199 outside the GI Program (i.e. obtain information and develop methods, as needed, to complete plant-specific value impact analyses of potential backfits to reduce seismic risk). The issue was transferred to NRR on September 2, 2010 for Regulatory Office Implementation.

Information Notices were issued to inform stakeholders of the GI-199 Safety/Risk Assessment report and results. Information Notice IN 2010-18 was issued on September 2, 2010, to nuclear power plants and independent fuel storage installations. Information Notice IN 2010-19 was issued September 16, 2010 to fuel cycle facilities. A public meeting was held on October 6, 2010, and a presentation to the ACRS Siting Subcommittee was held November 30, 2010. NRR developed a draft Generic Letter GL-2011-XX "Seismic Risk Evaluation For Operating Reactors" that was issued on September 1, 2011 for public comments. The Generic Letter will request needed data from power reactor licensees.

This GI is in Regulatory Office Implementation.

AFFECTED DOCUMENTS:

IN 2010-18
IN 2010-19

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 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.

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.

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.

The Safety/Risk Assessment panel meeting was extended because of the complexity of additional evaluations and the desire for internal and external stakeholder agreement. The RES Director approved the Safety/Risk Assessment and panel recommendation September 2, 2010.

Milestone	Original Date	Current Date	Actual Date
Issue Request for Proposal to contractor (ISL) for Technical Assistance	7/7/2005		7/7/2005
Receive Proposal from ISL	8/11/2005		8/11/2005
Generate Screening Analysis	10/31/2006		7/27/2007
Screening Panel Meeting	11/30/2006		9/12/2007
Prepare Screening Analysis Applying Criteria from MD 6.4 and SECY-07-0022	12/15/2007		12/31/2007
Reconvene Screening Panel	12/15/2007		1/11/2008
Provide Screening Panel Recommendation Memo for RES Director Approval	1/31/2007		1/25/2008
Issue RES Director Approved Screening Analysis and Panel Recommendation	12/31/2006		2/1/2008
Receive Seismic Hazard Update Results for Selected CEUS Plants from USGS	10/30/2007		10/15/2008
Receive Information from EPRI	5/30/2008		12/3/2008
Schedule and Conduct Safety/Risk Assessment Panel	9/30/2008		8/31/2009

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

Milestone	Original Date	Current Date	Actual Date
GI-199 transferred to NRR for Regulatory Office Implementation	6/30/2009		9/2/2010
Issue RES Director Approved Safety/Risk Assessment and Panel Recommendation	1/31/2010		9/2/2010
Information Notice IN 2010-18 issued	9/2/2010		9/2/2010
Information Notice IN 2010-19 issued	9/16/2010		9/16/2010
Conduct Public Meeting	6/30/2009		10/6/2010
Presentation to ACRS Subcommittee	11/5/2009		11/30/2010
Presentation to CRGR	6/30/2011		8/2/2011
Issue draft Generic Letter for public comment	7/31/2011		9/1/2011
Incorporate public comments into final draft of the GL	11/18/2011		
Presentation to ACRS Subcommittee	10/31/2011	12/9/2011	
Presentation to ACRS Full Committee	10/31/2011	12/16/2011	
Issue Generic Letter	12/31/2011	1/13/2012	
1st response deadline	3/30/2012		
2nd response deadline	6/30/2012		
Response from licensees performing Seismic Margin Assessment	12/30/2012		
Response from licensees performing Seismic PRA	12/30/2013		