GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

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

Title: PIPE BREAK EFFECTS ON SYSTEMS AND COMPONENTS

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

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:**

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:**

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

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
Y6406	ISL		$195.00
		Total Resources Expended (K):	**$195.00**

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 attached 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.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

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. The previous Task Manager (Stuart Rubin) was reassigned to the Advanced Reactors Group in REAHFB/DSARE/RES in July 2001. New Task Manager (Ron Lloyd) was assigned in January 2002.

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. The next step is to confirm the staff's findings with inspections at a minimum of 3 PWR plants.

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 will interface with the licensee for this site to help identify and assess options for further assessment of this potential vulnerability.

Staff Resources Expended: 760 hours

AFFECTED DOCUMENTS:

To be determined.

PROBLEM/RESOLUTION:

The entire list of plants has been examined. One site may have a vulnerability. However, if this applies to a single site, then this issue is not generically applicable.

REASONS FOR SCHEDULE CHANGES:

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Arrangement for plant visits was delayed to pursue design drawings that would preclude walkdowns.

Milestone	Original Date	Current Dat	Actual Date
Task Action Plan Approved	5/1/2001		5/30/2001
Task Manager Reassigned to Other Duties	7/1/2001		7/1/2001
New Task Manager Assigned	1/1/2002		1/1/2002
Draft Contractor Report	9/1/2002		12/31/2002
Meeting to Discuss Options	3/19/2003		3/19/2003
Complete Draft Task Action Plan	11/1/2002		7/31/2003
Decision to Integrate GSI-80 into Technical Assessment of GSI-156.6.1	10/2/2003		10/2/2003
Approval of Task Action Plan	11/30/2003		2/3/2004
High Energy Piping Interactions with BWR Mark I Drywell Shells	3/31/2004		3/31/2004
Analysis and Documentation of Calculation Results	6/30/2004		7/31/2004
Identify Plants to be Visited	11/30/2005		11/30/2005
Select PWRs for Site Visits	9/30/2005		6/8/2006
Complete NRR PMs Survey of Affected Plants	3/31/2006		9/30/2006
Complete GIP Review of Piping Configurations at PWR Plants	9/30/2005	12/31/2006	10/17/2006
Perform Assessment of Plants Based on Specific Piping Configurations	4/30/2007	4/30/2007	3/30/2007
Draft Recommendations	8/31/2004	6/30/2007	
Meet with ACRS	2/28/2006	9/30/2007	
Close Out Issue with Memo to the EDO	6/30/2006	12/31/2007	

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:**

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

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
	None		$0.00
		Total Resources Expended (K):	**$0.00**

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:

In response to NRC Generic Letter 2006-01, “Steam Generator Tube Integrity and Associated Technical Specifications,” all PWR licensees have submitted license amendment applications to change their technical specifications in accordance with TSTF-449. The staff has approved and issued amendments for 48 PWRs. The staff has targeted December 31, 2007 for issuing amendments for the remaining PWRs.

SG Action Plan tasks relevant to resolution of GSI-163 have been completed with the exception of task 3.1.k. SG Action Plan task 3.1.k 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 has targeted January 31, 2008 for completing this task.

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

Staff Resources Expended: 1800 hours

AFFECTED DOCUMENTS:

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

PROBLEM/RESOLUTION:

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

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.

REASONS FOR SCHEDULE CHANGES:

1. 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.

2. ACRS findings in NUREG-1740 necessitated followup tasks relating to GSI-163, the last of which is not scheduled for completion until January 2008.

Milestone	Original Date	Current Dat	Actual Date
Regulatory Analysis	5/1/1997		5/1/1997
Proposed GL Package	6/1/1997		10/1/1997
ACRS Endorsement	6/1/1997		10/1/1997
GL Package Placed in Concurrence	10/1/1997		10/1/1997
NEI 97-06 Submitted	12/1/1997		12/1/1997
GL Package Sent to CRGR by NRR	7/1/1997		4/1/1998
CRGR Meeting on GL Package	6/1/1998		6/1/1998
CRGR Meeting on Proposed GL	7/1/1998		7/1/1998
NRR Memo to EDO Putting GL on Hold	9/1/1998		9/1/1998
Commission Paper Recommending Hold on Issuance of GL	11/1/1998		10/1/1998
SRM on SECY-98-248	12/1/1998		12/1/1998
DPO Consideration Document to the EDO	9/1/1999		9/1/1999
EDO Establishes an Independent Panel to Review the DPO	2/1/2000		5/1/2000
ACRS to Perform DPO Review Panel Function	10/1/2000		10/1/2000
ACRS to Provide Conclusions and Recommendations	12/1/2000		2/1/2001
NRR & RES Issue Joint Action Plan	5/31/2001		5/31/2001
Approve TSTF-449	5/31/2005		5/31/2005

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
Issue Generic Letter 2006-01	1/20/2006		1/20/2006
Issue Revised Technical Specifications - All PWRs	12/31/2007		
Completion of GSI-Related Joint Action Plan Issues	3/31/2005	1/31/2008	
Brief ACRS on Proposed GSI Resolution	11/30/2008		
Close Out Issue with Memo to the EDO	2/28/2001	4/30/2009	

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:** 10/2007

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.

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
None			
		Total Resources Expended (K):	

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: (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 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.

Staff Resources Expended: 3,000 hours

AFFECTED DOCUMENTS:

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

PROBLEM/RESOLUTION:

Recent operating experience suggests continuing issues related to load drop analyses. The staff communicated 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 through issuance of Regulator Issue Summary 2005-25, Supplement 1, on May 29, 2007.

REASONS FOR SCHEDULE CHANGES:

The issuance of Supplement 1 to RIS 2005-025 was delayed to notify industry of changes to regulatory positions included in a revision to SRP Section 9.1.5

and to communicate 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. The ACRS brief is rescheduled for October 2007 to accommodate the ACRS meeting schedule and allow time for enhancements to heavy load handling inspection procedures.

Milestone	Original Date	Current Dat	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	4/30/2007	5/29/2007
Enhance Inspection Procedures for Heavy Loads	9/30/2007	9/30/2007	
Issue Closeout Memo to the EDO	8/31/2005	10/31/2007	
Brief ACRS on Implementation of Recommendations	11/30/2004	10/31/2007	

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:** 06/2010

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"

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
			$685.00
		Total Resources Expended (K):	**$685.00**

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 staffs 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 has 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.

Staff Resources Expended: 8,000 hours

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 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 Dat	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 GSI 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

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
Distribute Draft Order and SECY Paper	3/26/2003		3/26/2003
Finalize CRGR Package	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
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

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
Request Information from Owners on Voluntary Actions Implemented	12/31/2005		3/9/2007
Complete Regulation and Guidance Development	6/30/2006	4/30/2007	4/23/2007
Clarify Commitments to Resolve Any Remaining Issues	12/31/2007	12/31/2007	6/15/2007
Complete Implementation	6/30/2008	1/31/2010	
Complete Verification	6/30/2009	6/30/2010	
Close Out Issue with Memo to the EDO	6/30/2010	6/30/2010	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

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

Title: ASSESSMENT OF DEBRIS ACCUMULATION ON PWR SUMP PERFORMANCE

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

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:** 10/2008 **Closure:** 10/2008

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

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
W6650	SEA	Technical Assistance in Resolving Generic Safety Issues	$20.00
Y6041	LANL	Assessment of Debris Accumulation on Pressurized Water Reactors Sump Performance	$4,517.30
J3213	ISL	Technical Support of GSI-191 Review Activities	$835.90
J2978	LANL	Technical Assistance for the Resolution of the PWR Sump Clogging Issue	$835.90
J3130	LANL	Technical Assistance in Support of the Plant Systems Branch	$835.90
		Total Resources Expended (K):	**$7,045.00**

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.

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 met the requirements 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 licensee 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 last five years. The staff evaluated all 90-day responses to Generic Letter 2004-02 and in January 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 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 anticipates that recipients will review the information for applicability to their facilities and consider taking actions, as appropriate, to avoid similar issues. Research was also conducted on the transportability of coating chips in containment pool environments, and on the effect of ingested debris on downstream valve performance. Draft test reports have been issued for these items; final issuance is expected in FY07.

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 GSI-191 are now complete and documented, though information obtained as the staff reviews industry activities to support issue closure may indicate the need for additional NRC-sponsored research.

As part of the plan to confirm adequate implementation and resolution of GSI-191, the NRC is conducting detailed plant audits examining the analyses and design changes used to address the technical issues. Visits to strainer vendor test facilities will also be included as 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. Currently, 10 plant audits are planned. Audit reports will be posted on the NRC's ADAMS document control system as they become available. Audit activity in the 3rd Quarter of FY-2007 included completion of the San Onofre and Prairie Island audits, continuation of the Millstone and Oconee audits, and a visit to Waterford to initiate an audit. 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. The NRC staff is also systematically evaluating remaining technical questions related to GSI-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 will use inputs from review of licensee responses to GL 2004-02 and items identified from Regional inspections using Temporary Instruction TI-2515/166 to support closure of GSI-191. Review of final licensee GL responses will begin after they are submitted, which is expected to occur by the December 31, 2007 due date specified in the GL. Inspections by regional staff will verify proper implementation of planned modifications.

Some plant-specific issues (e.g., outage schedule availability, steam generator replacement scheduled) have led to some 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. Because they are plant-specific, these extension requests must be evaluated on a case-by-case basis. As of June 2007, 15 extension requests have been approved based on, for example, strong sets of interim compensatory measures, significant interim or final sump screen areas, fibrous insulation removal or lack of fibrous insulation issues, installation of debris interceptors, and short periods of extension.

To provide open communication on NRC activities associated with GSI-191 resolution, public meetings with NEI and industry representatives continue to be held regularly, as schedules allow. Briefings of ACRS have been scheduled periodically to provide opportunities for communication on technical issues and additional public involvement. The going forward project schedule for resolution of GSI-191 includes public meetings with industry on a regular basis (approximately 2 per quarter) and briefings for the ACRS (approximately 2 per year). Experience has shown that flexibility in meeting/briefing scheduling is beneficial to allow milestones to be complete prior to meeting/briefing occurrence.

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

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

PROBLEM/RESOLUTION:

Complexities associated with chemical effects are making it difficult for licensees to design modified sump screens, and for the NRC to evaluate the adequacy of the modified screens. Data are being generated both by the industry and RES to address this issue.

REASONS FOR SCHEDULE CHANGES:

Although licensees GL submittals are still due by December 31, 2007, activities will occur in 2008 that are needed to support issue closure. The final staff audit will be complete in spring 2008. The staff's review of GL responses is expected to be complete in July 2008. Completion reports for TI-2515/166 will also be due in summer 2008. Integrating these activities to support final issue closure, including ACRS and management reviews, results in planned closure of the GSI in October 2008.

Complexities associated with the impact of chemical effects on sump strainer performance continue to be challenging. With chemical effects testing ongoing, there is the possibility that additional time may be needed to fully address this aspect of the GSI. The likelihood of such an outcome should be clearer in about three months.

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 Dat	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

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
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
Prepare Memo Discussing Proposed Recommendations (End of Technical Assessment Stage of Generic Issue Process)	4/1/2002		9/28/2001
Complete Estimate of Average CDF Reduction, Benefits, and Costs	4/1/2002		9/28/2001
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 GSI	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

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
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
Issue Supplement 1 to IN 2005-26	1/20/2006		1/20/2006
Complete Review of Licensee Responses to GL 2004-02	1/20/2006		1/20/2006
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
Licensees Complete GL-2004-02 Activities, Including All Modifications	1/31/2007	12/31/2007	
Complete Last Audit Report	5/23/2008		
Regions Complete TI Inspections	6/30/2008		
Complete Review of Licensee GL 2004-02 Responses for Adequacy	12/31/2007	7/24/2008	
Receive Last TI Verifications From Regions	8/11/2008		
Complete Review of TI Verifications	8/25/2008		
Prepare Closure Memo for GL-04-02 Responses and TI Verifications	9/23/2008		
Complete NRR Review and Approval of GL Closure Memo	10/28/2008		

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0193 **Type:** GSI **Office/Division/Branch:** RES/DRASP/NRCA

Title: BWR ECCS SUCTION CONCERNS

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

Task Manager: P. Kadambi **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

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
	None		
		Total Resources Expended (K):	

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

Screening analysis narrowed the safety concerns to Mark I containments. A Task Action Plan (TAP) for the Technical Assessment of the issue was approved in May 2004. Staff completed a literature search for information on ECCS pump performance during intake conditions at high voiding in March 2005. Staff continued the literature search, in accordance with Phase I of the Task Action Plan, and found experimental evidence that gas could reach the ECCS pumps during a loss-of-coolant accident. Staff also found that the pumps can recover with as much as 20 percent void fraction; however, the impact of voiding on the continued operation of the pumps remained an item of concern. The staff's plans were to pursue additional information from NRR, Region I, and foreign sources.

The TAP to resolve this GSI involves a three part evaluation of suppression pool designs, dynamics of air entrainment in the suppression pool, and the impact on ECCS pump performance. Part A reviewed wetwell and suppression pool designs to establish bounding parameters and values. Part B reviewed relevant experiments on pool dynamics to identify available data. Part C originally intended to use information from Parts A and B to estimate the void fraction at the suction strainers as a function of the time after accident initiation, to assess the plausibility of air ingress into the ECCS strainers and intake piping, and to forecast the potential impact on the ECCS pumps' ability to fulfill their design function. Part C has been modified to involve industry in assessing this issue, as appropriate. This applies the approach to resolving generic safety issues described in SECY-07-022, "STATUS REPORT ON PROPOSED IMPROVEMENTS TO THE GENERIC ISSUES PROGRAM."

STATUS:

Staff completed parts A and B of the work scope and continues to work on part C of the work scope as described below.

A proposal for performing technical analyses was received from BNL in June 2005, in response to an RFP issued by the NRC in April 2005. In September 2005, information on suppression pool experiments was requested from the Technical Research Center of Finland and experimental results on thermal hydraulic phenomena from one plant were evaluated. A literature search was completed for two specific thermal-hydraulic phenomena: liquid gas jet; and bubble breakup.

During the 4th Quarter of FY-2006, discussions were initiated with NRR regarding commonality of concerns between GI-193 and those being addressed in a proposed Generic Letter 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 Mark-1 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 about including this GI in the scope of the NRR proposed Generic Letter (GL) resulted in agreement not to include this GI in the GL. Inclusion was deemed impractical because the proposed the GI was sufficiently different and the proposed GL was substantially developed such that including the GI would have resulted in substantial rework. Accordingly, in March 2007, RES and NRR (the Generic Communication and Power Uprate Branch) decided to collaborate on obtaining 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."

NRR made preliminary contact with the BWROG in March 2007 and requested information to support this GI. The plan is to hold a meeting with BWROG by June 2007 to discuss their input and identify alternatives for completing part C of the work scope. Any resulting decisions on regulatory actions, implementation, and verification depend on the outcome of part C.

Instead of a meeting with the BWROG, 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 GI-193 issues. They did not have any information regarding operability of ECCS pumps when air ingress might lead to void fractions greater than 20 percent. Within the first 30 seconds, no information was available on the period of time over which blow-down gas clears the suppression pool. However, they did provide references to two research reports from the Nordic Regulatory Authority in Europe (ML071640273 and ML 071640280). The significance of the information provided by the BWROG will be evaluated.

Staff Resources Expended: Estimated at 2,000 hours.

AFFECTED DOCUMENTS:

To be determined.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

PROBLEM/RESOLUTION:

Engage the BWROG through the Generic Communication and Power Uprate Branch of NRR to participate in further evaluation of this GI for completing part C of the proposed work scope. (See ADAMS ML070920154 for e-mail between NRR and BWROG representatives on this collaborative effort.) Any resulting decisions on regulatory actions, implementation, and verification depend on the outcome of part C.

REASONS FOR SCHEDULE CHANGES:

The previous Task Manager left the NRC in December 2005. The new Task Manager was assigned in May 2006.

REASONS FOR SCHEDULE CHANGES:

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 based on the differences and development status of this GL.

Milestone	Original Date	Current Dat	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 RFP 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
Complete Literature Search for Two Specific Thermal-Hydraulic Phenomena	9/30/2005		9/30/2005
Evaluate Experimental Results on 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		
Initiate Appropriate Action Commensurate With Risk-Significance	12/31/2007		
Close Out Issue with Memo to the EDO	3/31/2007	3/31/2008	

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Issue Number 0199 **Type:** GSI **Office/Division/Branch:** RES/DRASP/OERA

Title: IMPLICATIONS OF UPDATED PROBABILISTIC SEISMIC HAZARD ESTIMATES IN CENTRAL AND EASTERN UNITED STATES FOR EXISTING

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

Task Manager: T. Mitts **TAC Number:** K81095

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

Identification Status: Complete **Priority/Screen Status:** Incomplete **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:

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
Y6912	ISL	Assistance for Screening Analysis of Generic Issue 199	$25.00
		Total Resources Expended (K):	**$25.00**

WORK SCOPE:

Description

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 10E-5. This reference probability value is based on the annual probability of exceeding the SSEs for 29 Central and Eastern United States nuclear power sites and is used to establish the SSEs for future nuclear facilities. Preliminary results from a 2004 USGS report indicated that the reference probability for the 29 CEUS is now about 6 to 7 x 10E-5. The increase in the reference probability value is primarily due to recent developments in the modeling of earthquake ground motion in the CEUS. No new plants have applied for a construction permit or ESP since 10 CFR Part 100 was revised and Regulatory Guide 1.165 was issued in 1997. Therefore, the impact of the revised regulation and the regulatory guide as they relate to future plants and operating reactors was not realized until the staff began its review of the ESP applications.

It is apparent from staff's review of the ESP applications with support from the USGS letter report that the perception of seismic hazard for operating plants in the CEUS region has increased. The staff has determined, based on the evaluations of the IPEEE Program, that seismic designs of operating plants in the CEUS still provide an adequate level of protection. At the same time, the staff also recognizes that the probability of exceeding the SSE at some of the currently operating sites in the CEUS is higher than previously understood. Therefore, this GI is to assess the impact of higher seismic hazard on current nuclear power plants in the CEUS region.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Work Scope

This GI is in Stage 2 (Screening) of the MD 6.4 process.

STATUS:

In August 2005, the NRC Office of RES awarded a contract task to ISL 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 Central and Eastern United States (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. The contract term for this task expired in December 2006, before the NRC and EPRI resolved issues with releasing the copyrighted EPRI Report NP-6395-D to the NRC contractor ISL for performing this task.

In April 2007, RES decided to complete the United States Geologic Survey (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 NRC developed a plan to complete the screening analysis for GI-199 by February 2008, and began work on initial tasks described in this plan.

Staff Resources Expended: 160 staff-hours

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 reassessed alternatives for proceeding with the screening assessment of GI-199 in accordance with MD 6.4 and SECY-07-0022, "Status Report on Proposed Improvements to the Generic Issues Program," dated January 30, 2007 (ML063460239). The office of RES decided to complete the update of USGS probabilities of exceedance of the safe shutdown earthquake ground motion for the CEUS sites and then use this information to perform the screening analysis.

REASONS FOR SCHEDULE CHANGES:

Schedule delays are caused by not identifying an amenable solution for EPRI release of NP-6395-D to ISL for performing the screening analysis task, and also not identifying or pursuing any possible workable alternate solutions for proceeding with screening assessment of GI-199.

Milestone	Original Date	Current Dat	Actual Date
Issue RFP to ISL for Technical Assistance	7/7/2005		7/7/2005
Receive Proposal from ISL	8/11/2005		8/11/2005
Receive Seismic Hazard Update Results for Selected CEUS Plants From USGS	10/30/2007		

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

Milestone	Original Date	Current Dat	Actual Date
Generate Screening Analysis	10/31/2006	12/31/2007	
Screening Panel Meeting	11/30/2006	1/31/2008	
Complete Screening	1/31/2007	2/15/2008	
Issue Panel Report to RES Director	12/31/2006	2/28/2008	

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** ACTIVE **Resolution Status:**

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: **Regulation and Guidance Development Status:**

Implementation: **Verification:** **Closure:** 05/2007

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

Work Authorization:

FIN NUMBER	CONTRACTOR	CONTRACT TITLE	EXPENDED ($k)
	ORNL		$600.00
		Total Resources Expended (K):	**$600.00**

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.

Staff Resources Expended: 2,200 hours

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:

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

All Action Levels: Selected Issue(s)

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.

Milestone	Original Date	Current Dat	Actual Date
Development of Generalized Sensitivity Methods	12/1/1997		12/1/1997
Acquisition and Documentation of Russian Data	5/1/1998		5/1/1998
Development of Guidance for Defining Ranges of Applicability	7/1/1998		11/1/1998
Application of Guidance to Extend Low Enrichment Range	9/30/1998		11/30/1998
Technical Assistance and Project Planning	3/1/1999		3/1/1999
Receive Final ORNL Contract Reports	3/1/1999		10/1/1999
Publish Final ORNL Contract Reports	10/1/1999		11/1/1999
User Need Request Memo to RES	12/1/2000		6/1/2001
Make New Computer Codes Available Through Scale 5.0 Release	3/1/2001		6/30/2004
Training to NRC Staff and Licensees on S/U Methods in SCALE 5.0	9/1/2002		6/30/2004
Cancel User Need Request Memo to RES	6/30/2004		6/30/2004
Issue Staff Guidance (ISG-10)	10/1/2000	10/31/2006	6/15/2006
Close Out Issue	3/31/2003	8/31/2007	