GSI-191, "ASSESSMENT OF DEBRIS ACCUMULATION ON PWR SUMP PERFORMANCE"

STATUS OF NRC ACTIVITIES

Ralph Architzel
May 30, 2002

ATTACHMENT 3

SUMMARY FROM MARCH 28 NEI/OG MEETING

- The GSI-191 parametric study has demonstrated that sump blockage is credible concern, even for smaller breaks.
- Risk numbers suggest that issue requires a regulatory response.
- Plant-specific analyses are necessary to determine susceptibility to sump clogging and best resolution.
- NRR has initiated its GL process, but will provide an opportunity for an industry developed solution.

TOPICS PROPOSED IN MARCH NEI/OG MEETING

- Industry initiatives to employ interim measures for operator action to compensate for potential screen blockage until plant-specific corrective actions implemented

- Industry development of a JCO/schedular supplement to the JCO developed by the NRC

- Address the means for NRC review of the Industry Evaluation Guide which is intended to be used for plant specific assessments

NRC PLAN FOR RESOLUTION/CURRENT STATUS

- **RESOLUTION PROCESS** for GSI-191 will be industry-led and NRC-monitored.
  - NEI described 2-step sump evaluation program in 3/28/02 public meeting
    - performing inventory of potential debris sources (4/02)
    - debris generation, transport and head-loss methodology (9/03)
  - NRC involvement necessary because:
    - NEI's program does not comprehensively address regulatory needs
    - NEI's program is voluntary in both scope and schedule
    - NRC oversight is commensurate with safety significance

NRC PLAN FOR RESOLUTION/CURRENT STATUS (cont)

- NRC plans to issue a GL to request that licensees:
  - commit to NEI's program or alternative
  - take interim compensatory actions
  - submit key information to the NRC

- NRC also plans to develop TIs to inspect licensees' actions, including:
  - containment debris source inventories
  - plant modifications

- NRC plans to use sample audits to perform detailed verification of licensees' sump-clogging evaluations

REQUIRED SUPPORT

- NRR SPLB Lead
- NRR Projects - Generic Letter Review
- Region Inspection Activities Planned
- LANL Contracted for Technical Support
  - Analysis tools CASINOVA/BLOCKAGE available
- RES Support:
  - revise RG 1.82 for PWRs
  - publish a NUREG/CR summarizing sump-clogging information
  - advise NRR in interactions with industry

GSI-191 Resolution Schedule		
Date (mm/yy)	Task	Responsible Organization
08/02	Publication of guidance for performing inventory of containment debris sources	NEI
08/02 - 09/04	Performance of an inventory to characterize potential debris sources during next refueling outage	Licensees
09/02 - 09/04	Inspection of licensees' containment walkdowns and interim compensatory measures with a Temporary Instruction	NRC
01/03	Issuance of GL concerning GSI-191	NRC
04/03	Submission of interim GL response (response to include a description of interim compensatory measures, a justification for the planned resolution schedule, and a commitment to the NEI program or alternative)	Licensees
10/03	Publication of guidance for licensees' evaluations of sump clogging susceptibility	NEI
10/03 - 02/05	Performance of an evaluation to determine sump clogging susceptibility	Licensees
02/04 - 06/05	Submission of final GL response (response to include evaluation results, a summary of actions taken, any plans for modifications, and a JCO, if any necessary modifications will not be performed immediately)	Licensees
02/04 - 12/06	Performance of plant modifications during next refueling outage, as necessary	Licensees

GSI-191 Resolution Schedule		
Date (mm/yy)	Task	Responsible Organization
02/04 - 01/07	Inspection of licensees' modifications and other evaluation activities with a Temporary Instruction	NRC
02/04 - 01/07	Verification of licensees' evaluations of sump clogging susceptibility through sample audits	NRC
2007	Resolution and closure of GSI-191	NRC

PWR Industry Program to Address GSI 191 Issues: Project Plan Update

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PWR Industry Program to Address GSI-191 Issues: Update

Presentation Overview

- Review
  - Industry Action
  - Program Objectives
  - Key Features of PWR Industry Program
  - Program Overview
  - Schedule
- Status of Activities
- NRC Concerns from March 28, 2002 Meeting
- Summary

PWR Industry Program to Address GSI-191 Issues: Update

Industry Action

- Industry response to NRC RES recommendation
  - PWR's should evaluate their sumps and take corrective actions as necessary
  - Take lead on issue resolution
- Benefits recognized to a coordinated effort among WOG, CEOG, BWOG, and NEI
- Desire to coordinate with anticipated NRC generic communication

PWR Industry Program to Address GSI-191 Issues: Update

Program Objectives

- Quantify impact of potential PWR containment debris sources on ECCS performance (10CFR50.46)
- Develop tool set and resolution framework for industry to use in resolution of GSI 191 at plant level
  - Consistent evaluation approach and close-out will expedite issue resolution
- Maintain open communication with NRC and industry during program implementation
- To develop comprehensive and structured program
  - Relative safety significance allows for this objective

PWR Industry Program to Address GSI-191 Issues: Update

Key Features of the PWR Industry Program

- Addresses GSI-191 issues directly
- Organized, logical structure of tasks and products
- Commitment by all three PWR Owners Groups
  - To the program
  - To the plan to accomplish the program
  - To active participation in NEI PWR Sump Performance Task Force
- Actions are proceeding per schedule

PWR Industry Program to Address GSI-191 Issues: Update

Program Overview

Program Step 1	Program Coordination and Solicitation of Industry Comment
Program Step 2	Utility Configuration Assessment
Program Step 3	Industry Development of PWR Industry Evaluation Guide Methodology and Corrective Action
Program Step 4	Plant Specific IEG Application
Program Step 5	Plant Specific Corrective Actions
Program Step 6	Plant Specific Issue Resolution / Close Out

PWR Industry Program to Address GSI 191 Issues: Update

Schedule

Work Product	NRC Meeting	Finish Date
Issue NEI-02-01, Condition Assessment Guidance	N/A	4/2002
Data Evaluation and Needs Identification	8/15/2002	9/20/2002
Document methodology, guidance on use of data, selection of break locations, use of probabilities, etc.	9/27/2002	10/31/2002
Develop Sump Performance Evaluation Tools	11/31/2002	1/17/2003
Sensitivity Studies	1/31/2003	2/21/2003
Draft Sump Performance Evaluation Guidance	3/28/2003	4/25/2003
Sump Pe formance Evaluation Sensitivities	5/16/2003	6/27/2003
Decision Analysis Tools / Final Program Documents	8/22/2003	9/26/2003

Notes: Finish Date is date documentation is released
Overall industry implementation of program guidance follows 9/26/2003

PWR Industry Program to Address GSI-191 Issues: Update

Status of Activities

- NEI-02-01, Condition Assessment Guidelines
  - Issued April 5, 2002 to NEI Administrative Points of Contact
  - Copy provided to NRC
  - Implemented at several plants during 2002 Spring Outages
  - NEI workshop planned for July 2002
- Data Evaluation and Needs Identification
  - Currently being performed
  - Activity on schedule

NRC STAFF COMMENTS ON NEI 02-01, "CONDITION ASSESSMENT GUIDELINES: DEBRIS SOURCES INSIDE PWR CONTAINMENTS"

Presented by: John Lehning, NRR/DSSA/SPLB
May 30, 2002

GENERAL COMMENTS

- Generally, the NRC staff finds NEI 02-01 to be reasonable and thorough
- However, the NRC staff has identified several areas where guidance should be improved
  - Additional scoping considerations
  - Certain guidance may be overly flexible or possibly contrary to NRC staff expectations

NECESSITY OF CONTAINMENT WALKDOWNS

- NEI guidance suggests that licensees with adequate records may not need to perform containment walkdowns

- The NRC staff believes containment walkdowns are essential, though depth of investigation be reduced by good record-keeping

CONSIDERATION OF RETURN FLOWPATHS

- NEI guidance lacks specific direction on walkdowns of containment flowpaths

- The NRC staff believes that insufficient information may be collected on flowpaths from upper elevations of containment to the sump
  - Debris accumulation at "choke-points" in return flow paths can divert water from sump & reduce expected NPSH margin
  - If interdicting structures (e.g. floor grating) will be credited with stopping large debris, there must be a documented basis

PRIMARY PIPE BREAK LOCATIONS

- NEI guidance does not provide specific direction on the locations of pipe breaks to be considered

- The NRC staff believes that PWR licensees should approach break locations similar to BWRs
  - Staff position documented in SER on URG and RG 1.82
  - Analysis should consider break locations which are most limiting for NPSH requirements
  - For compliance with 10 CFR 50.46, it is not sufficient to consider only high-stress locations

SECONDARY PIPE BREAK LOCATIONS

- NEI guidance does not emphasize secondary system high-energy line breaks

- Secondary pipe breaks such as a MSLB may require containment sprays to maintain peak containment pressure below design value
  - If spray recirculation is necessary for successful mitigation of a secondary break, sump evaluation must consider expected debris loads
  - Otherwise, secondary pipe break analysis must demonstrate that spray recirculation is unnecessary

ZONE OF INFLUENCE

- NEI guidance recommends using line-of-sight considerations for determining scope of walkdown

- The NRC staff believes that the guidance concerning the "direct line-of-sight" criterion is not precisely defined
  - Guidance does not adequately consider the reflection of jet impingement and pressure waves to zones beyond direct line-of-sight
  - Guidance does not include the caution that credit to intervening structures should be applied only to qualified, robust, and large structures

ZONE OF INFLUENCE

- NEI guidance suggests the use of a 12-D sphere for walkdown purposes, which may be truncated due to line-of-sight considerations

- The NRC staff does not have assurance that this truncated spherical approach appropriately models the volume over which energy dissipation from the pipe break would actually occur
  - 12-D sphere is based on an approximation
  - Any new modeling approach should have a realistic technical basis

COMMENTS ON INSULATION TYPES

- NEI guidance suggests that a 12-D sphere is sufficient for surveying all insulation materials
- Debris can be generated from unjacketed calcium-silicate insulation (and similar insulation types) due to erosion caused by the impingement of hot spray water

- NEI guidance does not emphasize the distinction between different types of reflective metallic insulation (RMI)
- RMI behaves quite differently based upon its material composition (e.g., stainless steel, aluminum) and construction (e.g., spot-welded, reinforced)

TREATMENT OF COATINGS

- NEI guidance suggests that coatings addressed under GL 98-04 programs may be considered to have a negligible contribution to sump clogging

- The NRC staff believes that it is unrealistic not to include all coatings within the scope of plant-specific evaluations
  - Unqualified coatings would be an expected debris source
  - NRC's acceptance of GL 98-04 responses does not imply that coatings are an insignificant factor in an integrated evaluation of recirculation sump performance

DETAILS OF SUMP DESIGN

- NEI guidance does not emphasize the collection of sump design details through a walkdown or a review of sump screen structural capability

- The NRC staff believes that sump design details have a significant effect upon sump clogging and that a physical inspection of sump would add value
  - As-constructed details of sump may have minor, yet significant differences from design
  - Structural design of sump screens may not account for loadings due to currently expected debris accumulation

CONDITION OF INSULATION

- NEI guidance emphasizes determining the type of insulation and its fastening and jacketing, but not the condition of these items

- The NRC staff believes that walkdowns should describe the general condition of insulation and fastening and jacketing materials
  - Destruction pressure of degraded materials may be less than experimental values
  - Degraded insulation materials may already be handled in a licensee's corrective action program

REACTOR VESSEL INSULATION

- NEI guidance does not specifically recommend surveying all insulation on the reactor vessel (though "vessel heads" is specified as a potential target area)

- Reactor vessel could potentially be a target for debris generation as a result of postulated breaks