
AGENDA

| <u>TOPIC</u> | <u>PRESENTER</u> | <u>TIME</u> |
|---|-------------------------|--------------------|
| Opening Remarks, Introductions | Hannon, NRC | 1:00 |
| Description and Status of Ongoing NRC Activities to Support Resolution of GSI-191 | Elliott, NRC | 1:10 |
| Description and Status of Planned Industry Activities to Support Resolution of GSI-191 | NEI, Owners Groups | 1:30 |
| Discussion on Potential Resolution Paths (i.e., actions or activities needed to achieve resolution) | NRC, NEI, et. al | 2:00 |
| Break | | 2:30 |
| Continue Discussion | NRC, NEI, et. al | 2:45 |
| Summary of Action Items/Planned Next Meetings | NRC, NEI, et. al | 3:45 |
| Adjourn | | 4:00 |

MEETING PURPOSE

- **To discuss NRC and industry planned activities for the resolution of GSI-191.**

MEETING SUCCESS

- **Mutual understanding of issues to be addressed and how the issues will be addressed in upcoming months.**
- **Identification of potential problem areas along with an associated potential resolution path for each problem identified.**
- **Agree on a plan of action and milestones for resolution.**
 - **Analysis Methods**
 - **Verification**
 - **Schedule**

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

STATUS OF NRC ACTIVITIES



Rob Elliott
March 28, 2002

RESEARCH STUDY BOTTOM LINE

- 69 Parametric cases were evaluated. Each parametric case attempted to represent actual plant parameters for one plant.
 - Each parametric case was classified as one of four categories for loss of NPSH margin: Very likely, Likely, Possible, or Unlikely.

| | SLOCA | MLOCA | LLOCA |
|-------------|-------|-------|-------|
| Very Likely | 25 | 31 | 53 |
| Likely | 7 | 6 | 7 |
| Possible | 4 | 6 | 1 |
| Unlikely | 33 | 26 | 8 |

- *Sump blockage is a credible concern; however, parametric study is inadequate to draw conclusions about the susceptibility of specific plants to sump clogging.*

- LANL risk assessment results:
 - CDF without considering debris blockage = $3.3\text{E-}06/\text{year}$. CDF with consideration of debris blockage = $1.5\text{E-}04/\text{year}$.
 - Increase in CDF by a factor of 45. SLOCA is dominant due to higher initiating event frequency. No operator action considered.
 - Operator action could reduce CDF by an order of magnitude.

NRC CONCLUSION

Plant specific analyses should be conducted to determine whether debris accumulation in PWR containments will impede or prevent ECCS operation during recirculation. Appropriate corrective action, as necessary, should be implemented on the basis of these plant-specific analyses.

NRC PLAN FOR RESOLUTION/CURRENT STATUS

- **Office of Nuclear Regulatory Research Activities**
 - **Complete documentation of GSI-191 Parametric Study.**
 - **Revise Regulatory Guide (RG) 1.82 to update the RG to current level of knowledge.**
 - **Provide NUREG/CR that describes the current level of knowledge.**
 - **Completion of ongoing headloss and chemical interaction testing.**

- **Office of Nuclear Reactor Regulation Activities**
 - **Initiated Generic Communication process**
 - **Issue Generic Letter (GL) by end of 2002.**
 - **Action Plan updated to include GL.**
 - **RG 1.82 update issued at approximately the same time.**
 - **Update Standard Review Plan to include review guidance related to sump design.**
 - **Could change to Regulatory Information Summary if industry resolves issue.**

POTENTIAL ISSUES FROM THE NRC PERSPECTIVE

- **Analysis methodology**
 - **How does a plant evaluate its susceptibility to ECCS clogging?**
 - **Prefer a consistent industry approach to ensure that potential susceptibility is appropriately identified.**
 - **Methodology should address adequacy of plant modifications (both in response to this issue, and future unrelated plant mods).**
 - **NRC review of methodology.**
- **Verification of implementation**
 - **The staff will need to verify adequate implementation of the resolution of GSI-191 consistent with our Management Directive 6.4, "Generic Issue Program."**
 - **If industry approach is uniform, then verification can be done by sampling.**

SUMMARY

- **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.**

NEI / PWR Owners Groups GSI-191 Action Plan: An Introduction

March 28, 2002

March 28, 2002

GSI-191_Introduction.ppt

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NEI / PWR Owners Groups GSI-191 Action Plan

Purpose of Today's Meeting

- To identify PWR Industry actions to address GSI-191 issues
- To share with NRC
 - PWR Industry plan to address GSI-191 issues
 - Recent actions taken by the PWR Industry with respect to GSI-191 issues
- To invite NRC interaction and comment
 - On the PWR Industry plan
 - Throughout the execution of the plan

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GSI-191_Introduction.ppt

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NEI / PWR Owners Groups GSI-191 Action Plan

Today's Presentations and Presenters

- **Introduction** Alex Marion
Nuclear Energy Institute
- **Program Overview** Jeffrey Brown
Arizona Public Service
- **PWR Industry Program Plan** Timothy S. Andreychek
Westinghouse Electric Co.
- **Industry Communication Plan** John Butler
Nuclear Energy Institute

Industry Program to Address GSI 191

Industry/NRC Communication Plan

John Butler
Nuclear Energy Institute
jcb@nei.org



Industry Communication

- GSI-191 activities thus far have resulted in a significant body of information
 - research data,
 - PIRT reports,
 - findings and
 - recommendations
- Industry communication of this and future information (e.g., guidance, generic communications) is an important focus of the NEI task force



Industry Communication

- Multiple methods of industry communication are being used:
 - Written correspondence to plant operators
 - *PWR Sump Performance Information Forum* website
 - Industry Workshops



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Industry Communication

- Written correspondence to plant operators
 - Utilizes identified points of contact for each NEI member company
 - Used primarily to:
 - ◆ Provide updates on ongoing task force and regulatory activities
 - ◆ Distribute draft documents for comment and review
 - ◆ Issue finalized guidance along with recommendations for use



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Industry Communication

- *PWR Sump Performance Information Forum* website
 - Internet based website used to augment more traditional communication tools
 - Provides benefit of easy access by all staff levels within a company
 - Facilitates distribution of GSI-191 research reports and NEI PWR Sump Performance Task Force guidance materials
 - Provides a forum for discussion among PWR plant operators



Industry Communication

- Industry Workshops
 - Industry workshops will be conducted following completion of guidance documents to provide additional instruction on use and implementation
 - First workshop tentatively scheduled for July 30-31 in Baltimore
 - ◆ Will address NEI 02-01



NRC Communication

- The PWR industry has benefited from the open manner in which the NRC has conducted GSI-191 research
- Industry needs will be similarly benefited by continuing the open dialogue



NRC Communication

- Possible means for task force/NRC interaction
 - Meetings
 - Conference calls
 - Correspondence (letters, emails)
- Recommend establishing a clear set of meeting/correspondence milestones tied to project schedule
- Communication needs between meetings can be met using combination of conference calls and emails



PWR Industry Program to Address GSI 191 Issues: Project Plan

Timothy S. Andreychek
Westinghouse Electric Co., LLC
andreyts@westinghouse.com

March 28, 2002

March 28, 2002

PWR_Industry_GSI-191_Program

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PWR Industry Program to Address GSI-191 Issues

Presentation Overview

- Key Features of PWR Industry Program
- Description of PWR Industry Program Steps
- Status of Activities
- Use of Data Sources
- Schedule
- Interaction with NRC
- Summary

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PWR Industry Program to Address GSI-191 Issues

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
 - Through active participation in NEI PWR Sump Performance Task Force
- Actions already initiated
 - To prepare guidance for information collection
 - To develop evaluation methodology
- Planned interaction with NRC at key points

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PWR Industry Program to Address GSI 191 Issues

Step 1

- Program Development, Coordination and Industry Comment
 - Initial program plan development facilitated by NEI PWR Sump Performance Task Force
 - Focus on assessment of sump performance
 - Directed at development of data and methodology
 - Program introduced to PWR industry
 - Comments received and addressed
 - Consensus agreement reached
 - Final documentation being developed

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PWR Industry Program to Address GSI 191 Issues

Step 2

- Utility Configuration Assessment
 - Developed NEI 02-01, Condition Assessment Guidelines
 - Guidance to assist quantifying potential debris sources inside containment
 - Locate, collect and document information to support plant-specific sump performance assessments
 - Guidelines undergoing final comment resolution
 - Issue guidance in April 2002
 - Will be implemented at several sites for Spring 2002 outages
 - Invitation to share in initial application issued
 - Workshop to share initial application experience planned

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PWR Industry Program to Address GSI 191 Issues

Step 2 (continued)

- NEI 02-01 addresses the following:
 - Approach to gather information on
 - Sources,
 - Types, and,
 - Locationof potential debris that may be transported to containment sump screen following a LOCA
 - Collecting and compiling facility design documentation pertinent to sump performance
 - Documentation, including descriptions of ongoing configuration management programs

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PWR Industry Program to Address GSI 191 Issues

Step 2 (continued)

- Overview of NEI 02-01
 - Data Collection and Preparation
 - Design Considerations
 - Construction and Maintenance Records
 - Materials to Support the Walkdown
 - Timing of the Walkdown
 - Containment Walkdown
 - Insulation
 - Coatings
 - Foreign Materials
 - Records Retention

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PWR Industry Program to Address GSI 191 Issues

Step 2 (continued)

- NEI 02-01 Documentation Examples
 - Design Considerations
 - Containment sump design
 - Licensing basis for the sump
 - Historical debris sources
 - Transport calculations
 - Sump blockage considerations
 - Construction and Maintenance Records
 - Records of insulation installation
 - Records of coatings used inside containment
 - Foreign materials exclusion program

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PWR Industry Program to Address GSI 191 Issues

Step 3

- Development of PWR Industry Evaluation Guide, Methodology and Corrective Action
 - Develop and justify applicable assumptions and bounds
 - These form “ground rules” for development of screening and evaluation methodology to assess containment sump performance under ECCS recirculation conditions
 - Work has been initiated

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PWR Industry Program to Address GSI 191 Issues

Step 3 (continued)

- Establish methodology and application guidance
 - Collect, review, evaluate, and extract data from available sources
 - Develop guidance to apply and use the data
 - Develop guidance on selection of break locations using pipe break rules consistent with licensing basis
- Methodology will be written for high level application
 - Possible detailed analyses (i.e., CFD calculations) identified but are beyond the general methodology

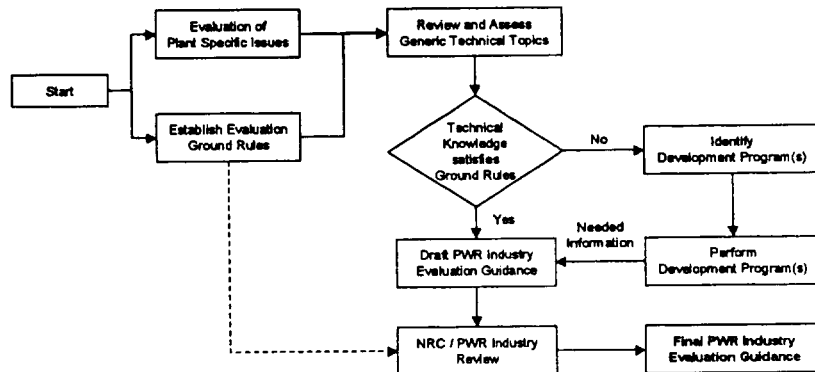
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PWR Industry Program to Address GSI 191 Issues

Development of PWR Industry Evaluation Guidance



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PWR Industry Program to Address GSI 191 Issues

Step 3 (continued)

- Develop and document common analytical tools
 - Sump performance
 - Debris generation
 - Debris transport
 - Debris accumulation
 - Pressure drop across the sump screen

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PWR Industry Program to Address GSI 191 Issues

Step 3 (continued)

- Perform sensitivity analysis
 - Use analytical tools developed in previous task
 - Assess order or magnitude effects on results
 - Values used in the sensitivity calculations will be chosen so as to bound the expected range of a plant-specific values

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PWR Industry Program to Address GSI 191 Issues

Step 3 (continued)

- Corrective action document
 - Develop a decision analysis tool
 - Define and develop set of structured decisions to support identification of cost-effective actions for both industry and plants.
 - Tools developed on both a general industry basis and a plant specific basis, as applicable

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PWR Industry Program to Address GSI 191 Issues

Program Step 4

- Plant Specific Application
 - Utility uses recommend guidance and evaluation methods developed by PWR Industry program, or,
 - Develop their own guidance
 - Using guidance and plant specific information, assess:
 - Debris generation
 - Transport
 - Accumulation
 - Head loss using plant specific information
 - Available NPSH margins

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PWR Industry Program to Address GSI 191 Issues

Program Step 5

- Evaluate need for plant specific Corrective Action
 - Demonstrate sump operation is acceptable (no corrective action needed), or,
 - Identify, plan and implement corrective action
- Corrective Action(s) options include:
 - Design modifications to insulation systems
 - Design modifications to sump configuration
 - Post-accident operational changes
 - Others, to be determined

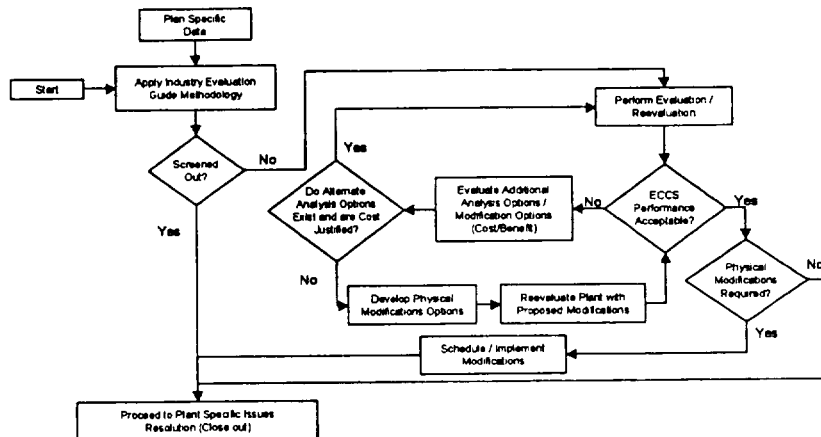
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PWR Industry Program to Address GSI 191 Issues

Application of PWR Industry Evaluation Guidance



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PWR Industry Program to Address GSI 191 Issues

Program Step 6

- Plant specific issue resolution
 - Develop generic template to summarize plant specific efforts and results
 - Promotes consistent issue closure documentation
- Plants prepare and document the following:
 - Plant specific evaluations, and,
 - Corrective action plans, as appropriate

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PWR Industry Program to Address GSI 191 Issues

Use of Data Sources

- Will use NRC Research data
 - Will use data from GSI-191 and USI A-43 research
 - Test facility descriptions documented
 - Designs
 - Instrumentation
 - Test procedures and conditions documented
 - Data documented
- Will evaluate use of other applicable industry data (BWR sump strainer data), as considered appropriate

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PWR Industry Program to Address GSI 191 Issues

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 Performance 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

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PWR Industry Program to Address GSI 191 Issues

Summary

- All three PWR Owners Groups have agreed and committed to:
 - An overall plan to address GSI-191 Issues
 - Specific generic tasks to support completion of the plan
- Tasks have been initiated
 - Guidance on performing a condition assessment, collection of data to support plant specific evaluations drafted
 - Tasks to support development of generic guidance initiated
 - Schedule for completion of generic tasks identified
- Interaction with NRC an integral part of the plan

Industry Program to Address NRC GSI 191

Program Overview

Jeffrey Brown
Arizona Public Service

NRC / NEI Meeting on Generic Safety Issue 191

March 28, 2002

GSI 191 Program Overview

- Background
- Industry Action
- Program Objectives
- Approach
- Program Overview
- Key Points

NRC / NEI Meeting on Generic Safety Issue 191

March 28, 2002

GSI 191 Program Overview

- **Background**

- NRC RES program results (LA-UR-01-4083) identify potential for degraded ECCS performance
 - Results establish a credible technical basis in the determination that sump blockage is a generic concern for PWRs
 - Suggests plant specific evaluation now warranted
 - NRC/Industry recognize that GSI 191 parametric assessments lack plant specific detail
 - » Next step is needed to quantify plant specific impact
 - NRC NRR has determined safety significance "low"
 - » Plant specific analyses may be needed to verify

NRC / NEI Meeting on Generic Safety Issue 191

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GSI 191 Program Overview

- **Industry Action**

- Industry response to NRC RES recommendation
 - PWRs 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

NRC / NEI Meeting on Generic Safety Issue 191

March 28, 2002

GSI 191 Program Overview

- 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 closeout 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

NRC / NEI Meeting on Generic Safety Issue 191

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GSI 191 Program Overview

- Industry Program Approach
 - Program to be developed to support PWR plant specific resolution
 - Industry effort to coordinate generic program
 - Coordinate PWR industry
 - Develop guidance tools and close out documentation
 - Plant specific resolution
 - Perform as-built plant configuration assessments
 - Plant specific application of Industry Evaluation Guide
 - Implement corrective actions as required
 - Final issue resolution and closure

NRC / NEI Meeting on Generic Safety Issue 191

March 28, 2002

GSI 191 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 |

NRC / NEI Meeting on Generic Safety Issue 191

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GSI 191 Program Overview

- Program Key Points
 - Industry acting to take lead to address PWR sump performance issues
 - Program coordinated and developed by NEI PWR Sump Performance Task Force with full support of PWROGs
 - Draft NEI PWR Sump Performance Program plan presented to PWR utilities
 - PWR utilities expressed support for plan
 - Program development allows for NRC comments
 - Provides for NRC interaction with industry

NRC / NEI Meeting on Generic Safety Issue 191

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List of GSI-191 Technical Reports Available to the Public

| Title | Accession Number |
|---|------------------|
| GSI-191: Parametric Evaluations for Pressurized Water Reactor Recirculation Sump Performance | ML020300349 |
| GSI-191: Summary and Analysis of US Pressurized Water Reactor Industry Survey Responses and Responses to GL 97-04 | ML020280288 |
| GSI-191: Thermal-Hydraulic Response of PWR Reactor Coolant System and Containments to Selected Accident Sequences | ML020310161 |
| Development of Debris Generation Quantities in Support of the Parametric Evaluation | ML020290554 |
| Jet Impact Tests - Preliminary Results and Their Application | ML020290085 |
| GSI-191: Development of Debris Transport Fractions in Support of the Parametric Evaluation | ML020290128 |
| GSI-191: Separate-Effects Characterization of Debris Transport in Water | ML020300279 |
| Pressurized Water Reactor Debris Transport in Dry Ambient Containments Phenomena Identification and Ranking Tables | ML003698506 |
| Pressurized Water Reactor Debris Transport in Ice Condensor Containments Phenomena Identification and Ranking Tables | ML003698509 |

List of Additional GSI-191 Technical Reports to Be Released to Public

| Title | Target Date |
|---|----------------|
| GSI-191: The Impact of Debris-Induced Loss of ECCS Recirculation on PWR Core Damage Frequency | April 2002 |
| GSI-191: Integrated Debris Transport Tests in Water Using Simulated Containment Floor Geometries | April/May 2002 |

Information on how to access these documents electronically via the internet is available at the following website: <http://www.nrc.gov/reading-rm/adams.html>