



## GSI-191 Status and Lessons Learned

Presented by:  
Donnie Harrison  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission

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## Sump/Strainer History

- Addressing Post-Accident Long-Term Cooling Issues Has Covered Three Decades
  - Unresolved Safety Issue A-43 (1979 – 1985)
  - Boiling Water Reactor ECCS Strainer Blockage Issue (1992 – 2001)
  - Generic Safety Issue 191, Pressurized-Water Reactor Sump Performance (1996 – Present)
  - Revisit Boiling Water Reactor Resolution (Future)

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## GSI-191 History

- Generic Safety Issue 191 was initiated in late 1990s to address pressurized water reactor (PWR) sump performance issues
  - Water spilling onto the containment floor during a loss-of-coolant accident (LOCA) may need to be pumped back through the core (recirculated) to keep the core cool
  - This water may entrain debris that could clog the inlet strainer to the emergency core cooling system (ECCS) or the inlet to the core itself
- Generic Letter (GL) 2004-02 requested that operators of PWRs
  - Perform a plant-specific analysis of the emergency core cooling system and containment spray system in recirculation mode when mechanically considering post-LOCA debris
  - Based on the results of the analysis, implement any corrective actions necessary to ensure compliance with regulatory requirements
    - NRC did not identify specific plant modifications to be made
- GL 2004-02 requested completion of corrective actions by December 31, 2007

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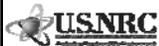
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## PWR Modifications

- All U.S. PWRs have installed significantly larger (10 to 100 times larger) ECCS sump strainers in response to GL 2004-02
- Licensees have also performed, or will perform, other modifications, for example:
  - Insulation modifications to reduce problematic debris
  - Sump buffer replacement to reduce precipitate formation
  - Installation of debris interceptors upstream of strainers
  - Installation of trash racks over refueling canal drains
  - Increasing minimum required refueling water tank level
  - Modification of gates in bioshield wall to prevent debris blockage and water hold up

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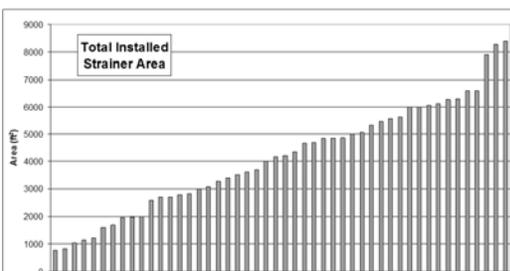
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## New Total Installed Strainer Area



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## GSI-191 Status

- Initial NRC staff review of licensees' 2008 supplemental responses to GL 2004-02 is complete
  - Some licensees submitted additional supplements while the staff review was being performed and the staff is revisiting these additional supplements prior to engaging these licensees
- NRC needs additional information from most plants to conclude sump performance issue has been resolved

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## Going Forward

- NRC staff will review licensee responses to the plant-specific RAIs
- NRC goal is to complete all reviews by end of 2009
  - In-vessel downstream effects by early 2010
- Licensees may not be able to make some modifications needed to achieve the “as tested” configuration until after 2009

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## Lessons Learned

- Evolving Knowledge
  - Complexity of issue and plant-specific features resulted in more reliance on “proof” testing versus an analytical solution
  - Knowledge and approaches evolved as testing and analyses were performed and reviewed
    - Intent of early testing/analyses was to pursue prompt issue resolution
    - Resulted in changes in testing protocols, analyses, etc.
    - Continuing debate on specific technical issues
  - Identified effects (e.g., downstream, chemical, thin bed) were incorporated into the resolution strategy for GSI-191
    - Intent was to have an integrated resolution
    - Sought to have margins to offset uncertainties
    - Hard to ensure fully accounting for phenomenon uncertainty in a mechanical fix
  - Created potential for cycling through analyses, testing, modifications, and reviews as new insights were gained

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## Lessons Learned

- Holistic Review/Acceptance
  - Harder than expected to make decisions that rely on weighing uncertainties and conservatisms to demonstrate regulatory compliance
  - Differences regarding what constitutes licensing basis versus what various staff relied upon to find licensee's response acceptable
  - Need for licensees to make holistic argument that staff can evaluate to come to a regulatory decision

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## Lessons Learned

- Licensing Basis/FSAR Content
  - Level of detail regarding description of sump and related programs varies among current licensees
  
  - Licensees need to establish clear licensing bases
    - FSAR needs to contain the key parameters and describe relied upon control programs
  
  - Maintenance of licensing basis in the future

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## Conclusion

- GSI-191 is headed toward resolution
  
- Lessons have been learned in pursuing GSI-191 resolution
  - Technical/phenomena and process
  
- New Reactors should address these issues upfront and build off the lessons learned during GSI-191 resolution

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