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# **Status and Path Forward for Generic Safety Issue (GSI)-191**



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# Background

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- Emergency core cooling systems for light water reactors recirculate water from the containment sump through the reactor after a loss of coolant accident
- Strainers are provided to limit amount and size of debris that enters reactor coolant system



# Background (Continued)

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- Strainer clogging identified as an issue for pressurized water reactors (PWRs) in late 70s – considered resolved in mid 80s
- Events at boiling water reactors in 1990s involved fibrous materials (strainer clogging or collapse under debris loading)
- NRC initiated GSI-191 to address PWR sump strainer clogging in 1996



# Important Documents

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- Bulletin 2003-01: State compliance with 10 CFR 50.46 requirements for long-term cooling or describe interim compensatory measures
- Generic Letter 2004-02: Make changes as necessary to show compliance by 12/31/2007 given mechanistic evaluation of debris load
- Guidance documents (Nuclear Energy Institute Document 04-07 and accompanying NRC safety evaluation)



# Potentially Problematic Materials

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- Insulation (fibrous or particulate)
- Coatings
- “Latent” debris (tags, labels, trash, etc.)
- pH buffers (e.g., sodium hydroxide) and other materials that support chemical reactions in the sump water (e.g., aluminum)



# Subissues

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- Chemical effects
  - Potentially most problematic
  - Concerned mainly about chemical precipitates
- Downstream effects (in- and ex-vessel)
  - Clogging of valves and orifices
  - Potential for pump damage
  - Debris ingestion into the core



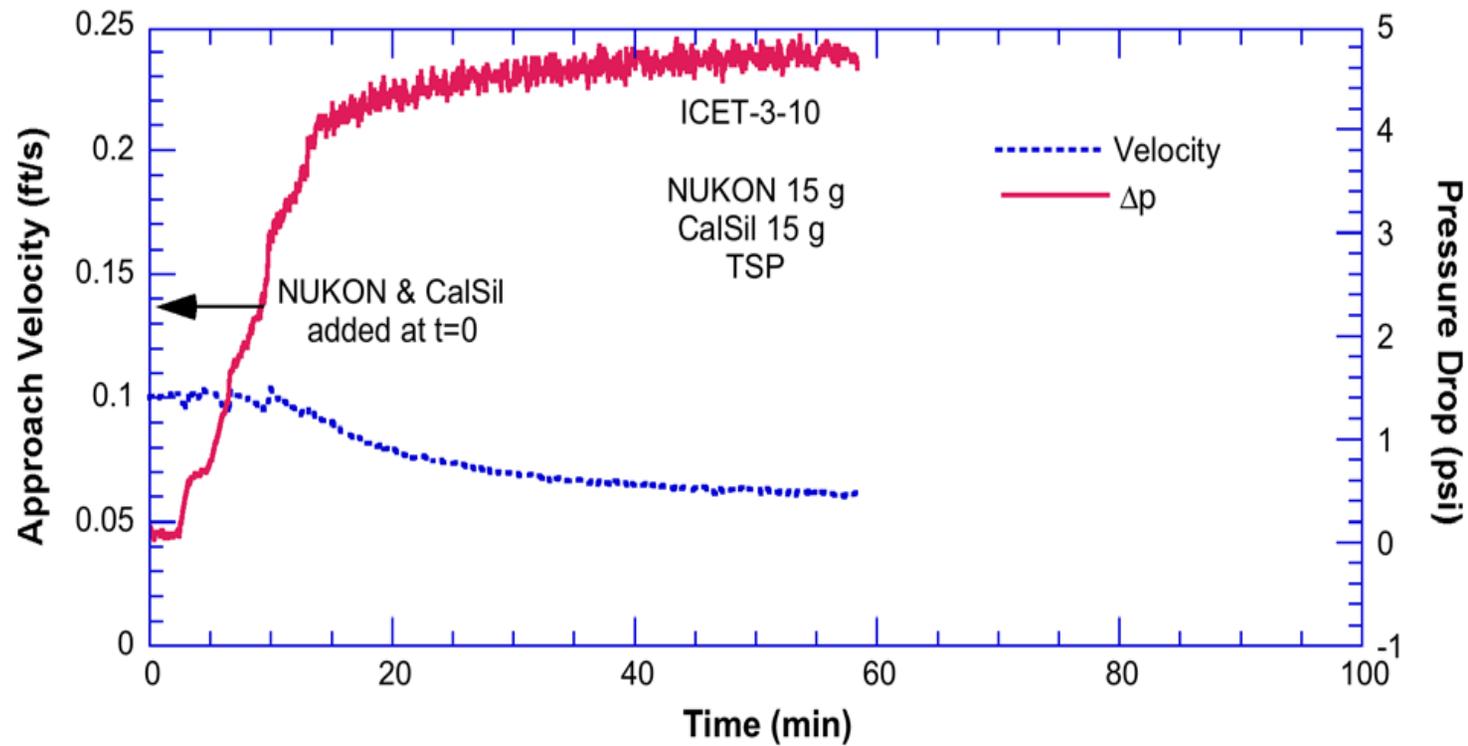
# Subissues (Continued)

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- Coatings debris generation and transport
  - Chips mostly will not transport
  - Particulates assumed to transport
  - Key issue is condition assessment
- “Near field” effect
  - Some debris settles in front of screen during testing, so does not influence test head loss
  - Representative of actual plant conditions?



# Chemical Effects Example



# Current Status

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- Licensees are making significant changes to address GSI-191
  - Much larger sump strainers (~ 1-2 orders of magnitude)
  - pH additive changes (some plants)
  - Valve modifications to reduce vulnerability
  - Insulation changeout
  - Water management initiatives



# Current Status (Continued)

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- Some licensees experiencing challenges meeting 12/07 deadline for Generic Letter 2004-02
  - Mostly plants installing strainers in fall 2006, who need additional time to complete some portion of planned modifications
- NRC has approved several extensions to spring 2008 - all for plants with relatively large strainers in place in or before fall 2006
- Regardless of extensions, NRC expects Generic Letter 2004-02 responses to be essentially complete by 12/07



# Audits

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- NRC currently auditing licensee responses to Generic Letter 2004-02
- Plan about 12 audits across sample of licensees and vendors – 3 complete to date
- Results can be useful to other licensees with same vendor
- Not feasible to verify overall adequacy of actions because of chemical effects - rather, reviewing adequacy of actions in each specific area against criteria in industry guidance document (Nuclear Energy Institute Document 04-07) and accompanying NRC safety evaluation (SE)
- Licensees may use other methods if appropriately justified



# Path Forward

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- State of knowledge continues to evolve, making path and timeline to closure challenging to finalize
- Chemical effects most challenging; precipitates form in certain combinations of pH buffers and containment materials
- Path forward clearer for downstream effects, but awaiting industry topical report on incore effects
- Coatings resolution depends on suitable coatings condition assessment method



# Path Forward (Continued)

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- Criteria and methods in NEI 04-07 and NRC SE for evaluation of aspects of the issue (e.g., debris generation and transport) are believed to be conservative
- Given chemical effects issues, may be advantageous to licensees to reduce excessive conservatism
- NRC working with NEI to attempt to identify areas for which reduction in excessive conservatism could be fruitful in near term
- No intent that every aspect of GSI-191 evaluation must be shown to be conservative



## Path Forward (Continued)

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- GSI-191 will be resolved for each licensee when it demonstrates reasonable assurance that long-term cooling will be provided in accordance with 10 CFR 50.46 in presence of debris - licensee's challenge is making that case
- Staff receptive to innovative approaches to reach reasonable assurance
- For some plants, the best solution may be removal or replacement of problematic materials (insulation, buffer, aluminum, etc.)

