# GSI-191 Chemical Effects Update

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**Public Meeting on GSI-191**
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# Outline

- Review Status: WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids To Support GSI-191"
- Staff Comments: WCAP-16785-NP "Evaluation of Additional Inputs to the WCAP-16530-NP."
- Additional NRC sponsored tests

# WCAP-16530-NP Status

- NRC staff review in progress
- NRC- PWR Owners Group have been interacting, PWROG performed testing to support technical issue resolution:
  - Chemical precipitate filterability model/testing
  - Surrogate precipitate settlement acceptance criteria
  - Potential effects from release of reactor coolant system oxides
  - Aluminum release rates
- As indicated during 8/20/07 call with PWROG, NRC staff has sufficient information for a safety evaluation
- NRC staff safety evaluation projected for November

# WCAP-16785-NP: NRC Staff Comments

- Evaluates and proposes to reduce certain conservative assumptions in the WCAP-16530-NP chemical model
- Submitted to the NRC for information
- NRC staff providing some initial feedback since licensee chemical effect evaluations are in progress:
  - Phosphate Inhibition of Aluminum Corrosion
  - Silicate Inhibition of Aluminum Corrosion
  - Solubility of Aluminum and Calcium
  - Overall Impression

# WCAP-16785-NP: NRC Staff Comments

- Phosphate Inhibition of Aluminum Corrosion
  - Plants with TSP buffer have a known quantity of phosphate
  - Given tests were performed with immersed coupons, staff has questions about inhibition of non-submerged aluminum, e.g., timing of TSP dissolution relative to containment spray (CS) termination, efficiency and timing of aluminum inhibition by spray
- Silicate Inhibition of Aluminum Corrosion
  - Silicate source term is break specific and determining the break that results in overall maximum head loss will be an iterative process
  - Staff has questions about inhibition of atmospheric aluminum, e.g., timing of silicate pool concentration relative to containment spray (CS) termination, efficiency and timing of aluminum inhibition by spray
  - Presence of dissolved aluminum inhibits Si leaching from fiberglass (ICET). WCAP-16530 model, based on single effects, over predicts Si released in these conditions

# WCAP-16785-NP
# NRC Staff Comments

- Solubility of aluminum and calcium
  - WCAP-16530-NP model assumes all dissolved calcium (in the presence of phosphate) and all dissolved aluminum precipitates
  - The degree of conservatism associated with the assumption of precipitation of all dissolved aluminum is a strong function of temperature and pH
  - WCAP-16530-NP chemical model predictions of the relative amounts of sodium aluminum silicate and aluminum oxyhydroxide are based on thermodynamic predictions that may not be accurate
  - Staff thinks it will be difficult to determine the applicability of the WCAP-16785-NP test results to plant-specific conditions to justify solubility limits

- <u>Overall Staff Comment:</u>
  - Conservative assumptions in the WCAP-16530-NP model were intended to balance chemical effects uncertainties. Staff review of WCAP-16530-NP indicates that some aspects of the model are non-conservative, however, these are offset by conservative assumptions. Licensees that are implementing "refinements" to the base chemical model should ensure their plant specific chemical effects evaluations remain conservative

# Additional NRC Sponsored Tests

- Objective: support an independent assessment of licensee chemical effects evaluations

- Work Scope:
  - Vertical head loss loop tests to compare head loss properties of chemical precipitate prepared using the WCAP-16530-NP protocol and precipitate formed by chemical injection
  - Evaluation of settlement properties for various precipitates
  - Limited evaluations of aluminum solubility

# Path Forward – Chemical Effects

- RES and NRR working on disposition of RES peer review panel member comments contained in NUREG-1861 (peer review) and identified by the phenomena identification ranking table
- NRC staff continues to visit vendor facilities and assess ongoing industry chemical effects testing
- Complete staff review of WCAP-16530-NP and issue SE
- NRC staff developing draft guidance for review of licensee chemical effects evaluations to be provided in Generic Letter 2004-02 supplemental responses (Fall 2007)
- NRC sponsoring some additional testing at Argonne National Laboratory
- Targeted chemical effects and downstream audits in 2008