PMSTPCOL PEmails

From: Joseph, Stacy
Sent: Tuesday, August 11, 2009 2:23 PM
To: STPCOL
Subject: FW: Slides from June NRC Strainer Audit
Attachments: TSBDownstream Effects.pdf; TSBStrainer Audit_GSI-191 Issues.pdf; TSBStrainer Audit_Overview.pdf

Presentations converted to PDF from powerpoint for ADAMS processing.

From: Schlaseman, Caroline [mailto:cschlaseman@mpr.com]
Sent: Tuesday, August 11, 2009 12:30 PM
To: Joseph, Stacy; Tomkins, James
Cc: Fumihiko Ishibashi; Koichi Kondo
Subject: Slides from June NRC Strainer Audit

Stacy/Jim--

As Jim requested this morning, attached are the 3 slide presentations we used during the June NRC ECCS Strainer Audit for STP 3&4.

Please note that there is a statement on page 5 of the second presentation (on GSI-191 issues) that an action for chemical effects bench-top testing would be completed during the 3rd quarter. At the time the slides were prepared, I didn't realize that Toshiba had completed this commitment in June and that the hardcopy material Iwata-san shared with Greg and Eduardo contained the results from this testing. I understand from Jim that the NRC would like us to make that presentation available on the E-Reading Room. We will try to get that presentation uploaded next week.

--Caroline

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Caroline S. Schlaseman, P.E.

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Files	**Size**	**Date & Time**
MESSAGE	1334	8/11/2009 2:22:42 PM
TSBDownstream Effects.pdf	51745	
TSBStrainer Audit_GSI-191 Issues.pdf	58147	
TSBStrainer Audit_Overview.pdf	49646	

Options
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Downstream Effects

STP 3&4 ECCS Strainer Audit

Debris Types Evaluated for Downstream Effects

PWRs have to consider the following debris for downstream effects:

1. Fibrous Debris
2. Paint Chips
3. Concrete Dust
4. RMI Shards

Debris Types Evaluated for Downstream Effects—Fiber

1. Fibrous Debris—fiber insulation is not allowed in the STP 3&4 Primary Containment; therefore, this does not need to be considered

Debris Types Evaluated for Downstream Effects

2. Paint Chips:
   - Only Qualified Coatings are allowed in the STP 3&4 Primary Containment
   - BWRs have much smaller ZOI than PWRs and therefore much less coated surface area would be exposed to fluid escaping from the postulated break
   - The URG-specified value of 85 lbs. paint chips was used for Japanese ABWR and planned for STP 3&4

Debris Types Evaluated for Downstream Effects—Concrete Dust

3. Concrete Dust:

- For STP 3&4, the primary containment is steel-lined, except for the floor of the upper drywell
- Concrete particles were considered as part of the latent dust/dirt quantity (150 lbs.) for BWRs in the URG

Debris Types Evaluated for Downstream Effects—RMI Shards

4.RMI shards:

- The H5 CCI strainer has circular openings with maximum diameter 1/12-inch (HPCF) or 1/16-inch (RHR); STP 3&4 will have 1/16-inch openings
- Figure 3-7 of NUREG/CR-6808 provides data from RMI steam-jet destruction testing; about 1% of transported RMI could pass through strainer holes (~0.01m^3 for Japanese ABWR)

Approach for Components

- ECCS system components will be evaluated for downstream effects of debris using methodology based on WCAP-16406
- Components include:
  - Pumps
  - Heat Exchangers
  - Valves
  - Orifices
  - Sparger nozzles

Approach for Fuel

- Describe debris characterization in COLA:
  - Small amounts of RMI, concrete and coating particles
  - Minimal risk of impact on fuel
- License Condition to verify acceptable impact (if any) on fuel prior to fuel load

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12 Issues from GSI-191

STP 3&4 ECCS Strainer Audit

RAI Response

- In April, STPNOC provided a two-part response to RAI 06.02.02-1 including:
  - Discussion of baseline/bounding evaluation for Japanese ABWR, consistent with U.S. BWR guidance in Utility Resolution Guidance (URG) prepared in 1998
  - STP 3&4 approach to 12 recent issues identified for PWRs during resolution of GSI-191

Items 1&2: Downstream Effects

- See separate presentation

Item 3: Debris Bed Head Loss Prediction

- RAI Response (shortened):
  - Toshiba confirmed head loss characteristic parameter for H5 insulation design, which includes some Cal-Sil. CCI strainer testing confirmed acceptance criteria met. H5 evaluation will be available for NRC audit.
- Subsequent to RAI Response, Toshiba decided to eliminate all fiber insulation from STP 3&4 primary containment, so RAI Response will be revised.

Item 4: Chemical Effects

- RAI Response (shortened):
  - Only RMI on large bore piping and nuclear grade fiberglass on small bore piping allowed; aluminum and zinc are prohibited. [Needs revision because fiber is not allowed, but zinc in coatings is allowed.]
  - No chemical reactions with normal suppression pool water chemistry—confirmed with bench-top testing
  - Post-LOCA SLC-actuation water has higher pH, but since no aluminum or phosphates in containment, unlikely to have reactions—bench-top testing to confirm is scheduled for third quarter

Item 5: Assessment of Coatings

- RAI Response (shortened):
  - Coatings [URG-mandated 85 lbs. paint chips] are included in existing CCI head loss tests for H5, which bound STP 3&4. H5 evaluation will be available for NRC audit.
  - Additionally, when detailed design is completed for STP 3&4, Toshiba will conduct confirmatory small-scale tests with predicted mix of debris, including coatings.

Item 6: Latent Debris (and Suppression Pool Cleanliness)

- RAI Response:
  - The SPCU (Suppression Pool Clean Up System) will minimize the amount of corrosion products which could accumulate on the bottom of the suppression pool.
  - Other debris will be minimized by the adoption of INPO and EPRI guidance for cleanliness and Foreign Materials Exclusion (FME).
  - Therefore, the latent debris defined in the URG (which was used for the Hamaoka 5 testing) is considered bounding for STP 3&4.

Item 7: Zone of Influence (ZOI) adjustment for air jet testing

- RAI Response:
  - The current debris generation evaluation uses the URG methodology, and there is no indication in GSI-191 guidance documents (e.g., NEI 04-07) that this methodology is unconservative, other than for Cal-Sil, which will not be used at STP 3&4 (see Item 3 above).

Item 8: ZOI for Protective Coatings

- RAI Response:
  - See discussion on Items 5 and 7 above. There is no indication that the quantity of coatings assumed for the Hamaoka 5 strainer testing (which is based on URG guidance) is unconservative.

Item 9—Debris Transport - Erosion

- RAI Response:
  - The Hamaoka 5 debris transport evaluation uses the URG transport factors for Mark III and Mark I containments. The URG transport factors were based on testing.

Item 10—Debris Characteristics – Calcium Silicate Insulation

- RAI Response:
  - See Item 3 above, “Debris Bed Head Loss” (Cal-Sil will not be used in the primary containment at STP 3&4.)

Item 11—Near Field Effect/Scaling

- RAI Response:
  - The summary report of the CCI strainer testing performed for Hamaoka 5 will be available for NRC audit by May 31, 2009.
  - Additionally, Toshiba will confirm that the CCI strainer testing ensured adequate mixing of all debris such that test results are valid by conducting confirmatory small-scale testing of detailed design debris loading (see Item 5, above).

Item 12—Spherical ZOI Approach

- RAI Response:
  - The current debris generation calculation for Hamaoka 5 considers breaks representing adverse combinations of insulation and other materials of concern.

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ECCS Strainer Agenda and Overview of Bounding Evaluation

STP 3&4 ECCS Strainer Audit

Agenda

A. Baseline Evaluation—in accordance with URG

- H5 ECCS Strainer Evaluation Report (prepared for Japanese Regulator)—Report 1
  - Large Break LOCA Debris Generation
  - Debris Transport
  - Latent Debris Assumptions
  - Strainer Head Loss—Analysis and Testing
  - NPSH Calculation & Strainer Sizing
- Supplemental Report for H5 Strainers—Report 2
  - Other Break Locations Considered
  - Debris Testing Summaries
- Supplemental Report for flow difference between H5 and STP 3&4 approach—Report 3

Agenda (continued)

B. Additional 12 Issues Identified from GSI-191

- Overview of 12 Issues—RAI Response
- Downstream Effects
  - Debris predicted to pass through STP 3&4 strainers
  - Proposed approach for components (consistent with WCAP-16406)
  - Proposed approach for fuel

Agenda (continued)

C. Potential COLA Additional Information

- Identify information/level of detail NRC would like to have in COLA

Overview of Baseline/Bounding Evaluation

- The STP 3&4 detailed design is in process
- The reports/calculations for the Japanese ABWR (Hamaoka 5) establish the bounding size for STP 3&4 RHR and HPCF strainers, and methodology for RCIC strainers
  - Original H5 RCIC strainer was acceptably sized due to short duration of operation

Overview of Baseline/Bounding Evaluation (continued)

- STP 3&4 is bounded by H5 evaluations because:
  - H5 has some fiber and calcium silicate insulation; STP 3&4 will not—thermal insulation will be all stainless steel RMI
  - Although H5 evaluation was performed using pump design flows (for head loss and required NPSH) vs. pump runout for STP 3&4, still have more available NPSH than required NPSH for ECCS