

BWROG ECCS Suction Strainers – NRC Public Meeting ML14232A312

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BWR Expertise – Proven Solutions

Topics



Introduction

- Meeting Objectives
- Discussion Overview

ECCS Suction Strainers Deterministic Project

- Project Update Since Last Public Meeting (April 30, 2014)
- Downstream Effects (DSE) – Fuels Subcommittee Update
- Head Loss Subcommittee Update
- Debris Source Term Subcommittee Update
- Downstream Effects (DSE) – Components Subcommittee Update

Fuels Testing Program Update Presentation and Facilitated Discussion

- Benchtop Testing Program
- Full Scale Testing Program

Introduction



Meeting Objectives

- BWROG ECCS Suction Strainers business update
 - New risk-informed committee formation
 - Subcommittee business updates (submittals, Benchtop Testing)
- NRC review status
 - Status of NEDC-33608-P review
 - Status of review for other submittals on the BWROG Prioritization Matrix
- Integration with 50.46c related industry efforts

Discussion Overview

- Coordination / scope allocation with new BWROG risk-informed committee
- NRC technical questions / commentary on BWROG submittals

ECCS Suction Strainers Deterministic Project



Project Update Since Last Public Meeting (April 30, 2014)

- 2Q 2014 Submittals
 - BWROG-14030: 2014 BWROG Submittal Intentions Update and Summary of the April 30, 2014 NRC-BWROG Public Meeting (ML14090A352) (June 5, 2014)
 - BWROG-14032: Submittal of BWROG Responses to NRC Questions Associated with BWROG Report – “BWR Material Dissolution Test Plan,” BWROG-ECCS-WP-4-1 R4” (BWROG-14003 originally submitted on January 23, 2014)

ECCS Suction Strainers Deterministic Project (cont.)



Project Update Since Last Public Meeting (April 30, 2014)
(cont.)

- 2Q 2014 Submittals (cont.)
 - BWROG-14033: Submittal of Non-Proprietary BWROG Technical Product, BWROG-TP-11-006 – “ECCS Containment Walkdown Procedure, Rev 1 (January 2011),” as Formally Requested During the Public Meeting Held on April 30, 2014
 - Two referenced products (BWROG-TP-08-035 & BWROG-TP-09-001) requested for review
 - BWROG-14035: Submittal of BWROG Report – “BWROG ECCS Suction Strainer Thin Bed Head Loss Test Plan,” BWROG-ECCS-TP-3-2 R0, for NRC Information and Commentary

ECCS Suction Strainers Deterministic Project (cont.)



Project Update Since Last Public Meeting (April 30, 2014) (cont.)

- Adjustments to Benchtop Testing program
 - Re-ordering tests from BT4, BT2, BT1, BT3 to BT2, BT1, BT4, BT3
 - Creation of fuels LTR RAI resolution roadmap
- Preview of 3Q BWROG submittals
 - BWROG-TP-08-035: Drywell & Wetwell Walkdown Guidance Document (January 2009)
 - BWROG-TP-09-001: Containment Walkdown Procedure for Potential Strainer Debris Sources at BWR Nuclear Power Plants (March 2009)

ECCS Suction Strainers Deterministic Project (cont.)



Project Update Since Last Public Meeting (April 30, 2014) (cont.)

- Preview of 3Q BWROG submittals (cont.)
 - BWROG-ECCS-TP-2-X: Benchtop Testing Plan – BT2
- Preview of 4Q BWROG submittals
 - BWROG-ECCS-WP-3-1-1: Responses to NRC Questions - Summary of Member Responses to BWROG Survey on Strainer Head Loss and Near-Field Effects
 - BWROG-ECCS-TP-10-1: Debris Characteristics
 - BWROG-ECCS-TP-13-5: Fuel Debris Specification

ECCS Suction Strainers Deterministic Project (cont.)



Project Update Since Last Public Meeting (April 30, 2014) (cont.)

- Preview of 4Q BWROG submittals (cont.)
 - BWROG-ECCS-TP-13-0: Debris Source Term Specification
 - BWROG-ECCS-TP-2-X: Benchtop Testing Plan – BT4
- Submittal status update to be included in agenda for expected public meeting on November 12, 2014
 - As requested in BWROG-14030 (June 5, 2014)

New Risk-Informed Committee Formation



Objective

- To establish a risk-analysis resolution strategy and to obtain NRC feedback associated with the proposed alternate resolution path for BWR ECCS SS issues
 - Public meeting ML14232A307 held on September 9, 2014 to introduce approach

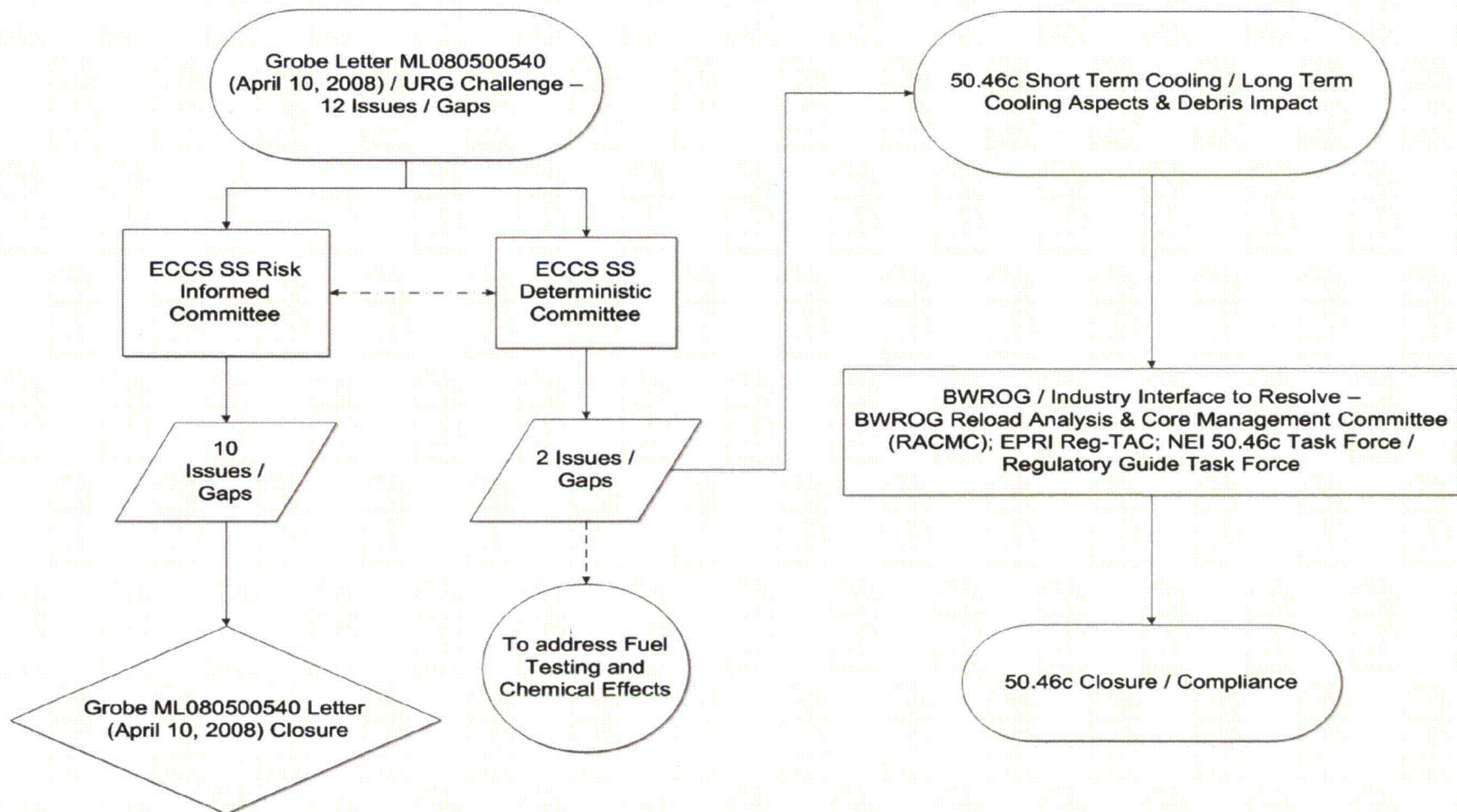
New Risk-Informed Committee Formation (cont.)



Disposition plan to address / close NRC Letter from John A. Grobe, Associate Director for Engineering and Safety Systems, Office of Nuclear Reactor Regulation to Richard Anderson, BWROG Executive Chairman, April 10, 2008, ML080500540)

- 12 Issues of Concern
 - 10 Issues via ECCS SS R-I project
 - 2 Issues via ECCS SS Deterministic project (requiring coordination with industry / 50.46c effort)
 - Fuels Testing
 - Chemical Effects (In-vessel)

New Risk-Informed Committee Formation (cont.)



ECCS Suction Strainers Deterministic Project (cont.)



Downstream Effects (DSE) – Fuels Subcommittee Update

- May 15, 2014 teleconference with NRC
 - Discussion of NRC Response to Benchtop Test Program Description Submitted with BWROG-13032 (June 2013)
 - Many new issues raised by reviewers
 - Drove reordering and separation of Benchtop Tests
 - BWROG and NRC Staff developed a prioritization matrix for review of backlog submittals (including NEDC-33608P)

ECSS Suction Strainers Deterministic Project (cont.)



Downstream Effects (DSE) – Fuels Subcommittee Update (cont.)

- Challenges
 - 50.46c Intersection
 - Implementation plans not aligned with ECSS SS Deterministic project scope
 - BWR/4 & /6: 24 months after rule (~2018)
 - BWR/2: 48 months after rule (~2020)
 - BWR/3: 60 months after rule (~2021)

ECCS Suction Strainers Deterministic Project (cont.)



Downstream Effects (DSE) – Fuels Subcommittee Update (cont.)

- Challenges (cont.)
 - Industry Coordination
 - BWROG ECCS SS / Reload Analysis & Core Management (RACMC) / EPRI Reg-TAC / NEI
 - Rule commenting period
 - Implementation
 - Participation in 50.46c risk-informed Reg Guide development

ECCS Suction Strainers Deterministic Project (cont.)



Head Loss Subcommittee Update

- Recent submittals
 - BWROG-13058: Summary of Member Responses to BWROG Survey on Strainer Head Loss and Near-Field Effects,” BWROG-ECCS-WP-3-1 (October 31, 2013)
 - BWROG-14035: BWROG ECCS Suction Strainer Thin Bed Head Loss Test Plan, BWROG-ECCS-TP-3-2 R0 (June 26, 2014)
- Opportunity for BWROG-14035 discussion
 - Debris preparation

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update

- DST-related issues
 - Issue 4: Chemical Effects
 - Issue 5: Coatings Assessments
 - Issue 6: Latent Debris
 - Issue 7: ZOI Adjust for Air Jet Testing (AJT)
 - Issue 8: Coatings ZOI
 - Issue 9: Debris Transport / Erosion
 - Issue 10: Debris Characteristics
 - Issue 11: Near Field Effects & Scaling
 - Issue 12: Spherical ZOI
- Debris
Source
Term

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 4: Chemical Effects
 - Submitted BWROG-14003: BWR Material Dissolution Test Plan, BWROG-ECCS-WP-4-1 R4 (January 23, 2014)
 - Chemical Effects testing in progress; through 2015
 - Coordinated project elements
 - Chemical Effects / Debris Source Term / Head Loss

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 5: Coatings Assessments
 - 2015 draft submittal in progress
 - BWROG-ECCS-TP-5-1: Assessment of Coatings

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 6: Latent Debris; Issue 7: ZOI Adjust for Air Jet Testing (AJT); Issue 12: Spherical ZOI
 - Submitted BWROG-14006: BWROG Request for Closure of ECCS Suction Strainer Issues: Latent Debris Issue #6; Zone of Influence (ZOI) Adjustment for Air Jet Testing (AJT) Issue #7; and Spherical Zone of Influence (ZOI) Issue #12WR Material Dissolution Test Plan, BWROG-ECCS-WP-4-1 R4 (February 14, 2014)

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 8: Coatings ZOI
 - 2015 draft submittal in progress
 - BWROG-ECCS-TP-8-3: Coatings Zone of Influence Calculation and Closure Letter

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 9: Debris Transport / Erosion
 - 4Q 2014 draft submittal in progress
 - BWROG-ECCS-TP-9-X: Debris Transport and Erosion Position Paper

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 10: Debris Characteristics
 - 4Q 2014 draft submittal in progress
 - BWROG-ECCS-TP-10-1: Debris Characteristics

ECCS Suction Strainers Deterministic Project (cont.)



Debris Source Term (DST) Subcommittee Update (cont.)

- DST-related issues (cont.)
 - Issue 11: Near Field Effects & Scaling
 - Evaluation of 1990's Head Loss testing observations and references
 - Utility surveys completed
 - Initial analysis performed

ECCS Suction Strainers Deterministic Project (cont.)



Downstream Effects (DSE) – Components Subcommittee Update

- Objectives
 - To determine the mass, size characteristics and timing of fibrous debris that can pass through the suction strainer after a LOCA for input into the fuels testing program
 - To determine impact of fibrous debris that can pass through the suction strainer after a LOCA on the downstream components (ex. pump impellers, pump seals, valves)
 - Obtain results to be applied to the BWR fleet

ECCS Suction Strainers Deterministic Project (cont.)



Downstream Effects (DSE) – Components Subcommittee Update (cont.)

- Current activities
 - Primary subcommittee scope related to Components to begin ~2017
 - Currently supporting the Debris Source Term subcommittee

Fuels Testing Program Update Presentation



Benchtop Testing Program

- Moving forward with following BT order:
 - BT 2: surface roughness effects
 - BT 1: debris concentration effects
 - BT 4: non-uniform debris bed
 - BT 3: thermal adhesion
- BT2 test plan has been finalized
- BT1 test plan nearly identical except test conditions
- BT4 test plan is next

Fuels Testing Program Update Presentation (cont.)



Benchtop Testing Program (cont.)

- RAI Resolution Roadmap:
 - Motivated by May NRC discussion on BT testing
 - Provides clarity and context for BT testing
 - Lays out anticipated resolution of each RAI involving Benchtop Testing
 - Documents other information that will also aid in resolution. BT tests are rarely the sole source of resolving an RAI

Fuels Testing Program Update Presentation and Facilitated Discussion



Benchtop Testing Program (cont.)

- RAI Resolution Roadmap Example – RAI 4:
 - Addressed primarily using BT1
 - Also using information from:
 - Conducted LTR analysis (boil-off rates)
 - Ongoing chemical effects program (precipitation)

Fuels Testing Program Update Presentation (cont.)



Benchtop Testing Program – BT2

Goal: Understand roughness effects near spacer grid in bed formation and resilience to removal

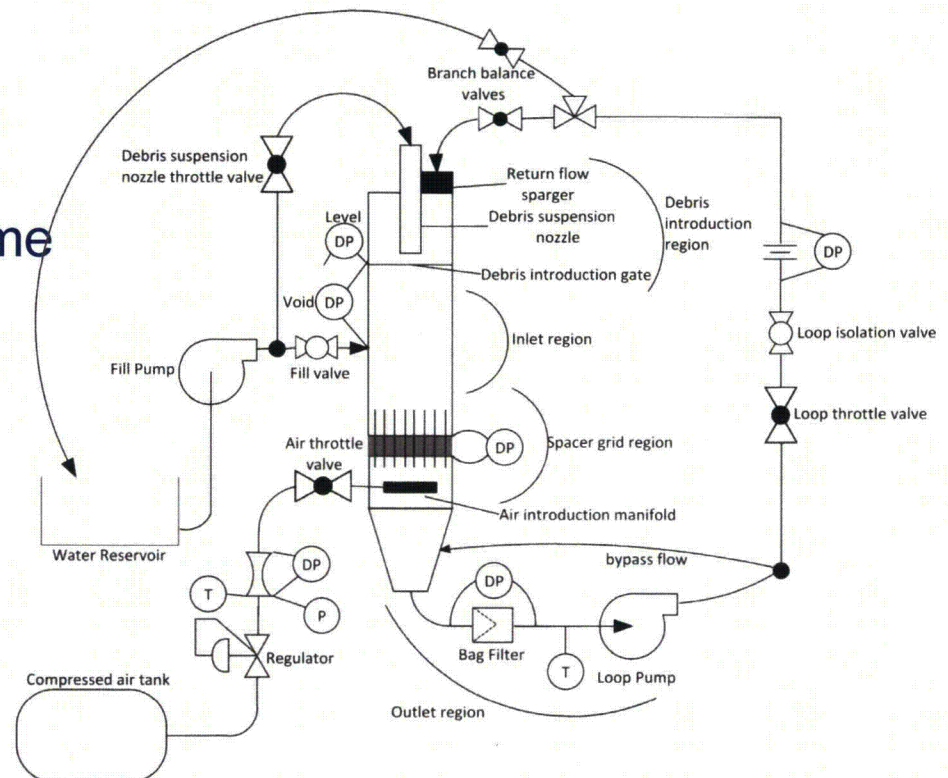
- Rod stubs in spacer grid
- Baseline stainless steel pipe
- Roughened surface
 - Grit paint, simple paint, bead blasted...
 - Likely starting point is grit paint
- Steps:
 - Develop fiber quantity needed to form debris bed at 3 particulate to fiber ratios (P/F) (1:1, 3:1 and 10:1)
 - Bed formation achieved when spacer grid D/P is 2" H₂O
 - Run tests with determined fiber quantity, varying (P/F, debris concentration, rod roughness)

Fuels Testing Program Update Presentation (cont.)



Benchtop Testing Program – BT2 (cont.)

- Test setup with recirculation
 - Aligned to reservoir or loop
 - Allows larger debris slurry volume
 - Bounding initial concentration:
 - 1 g/gallon
- Debris collection downstream
 - Measure retention at grid
- Implement resilience test to steam
 - Simulate using air
 - Allow bed to develop (no air)
 - Measure air required to reduce loss



Fuels Testing Program Update Presentation (cont.)



Benchtop Testing Program – BT1

- Will use the same facility
- Altered debris preparation to increase concentration above prototypical inlet conditions
 - Simulating effects of boil-off
- Considering the possibility of testing with roughened rods
 - Combine effects of roughness and debris concentration

Fuels Testing Program Update Presentation (cont.)



Fuels Testing Program – Current Activities

- Test 3 operational inspection in clean water
 - In progress
- Debris laden facility qualification
 - Use test standard with preliminary versions of Test 3 and 4 procedures
 - Debris to be based on available information from ongoing specification activities
- Test plan for Tests 3 and 4
- Benchtop testing, starting with BT2 (start in 2014)

Facilitated Discussion



- Coordination / scope allocation with new BWROG risk-informed committee
 - Benefits
- NRC technical questions regarding BWROG submittals
- BWROG submittals pending review
 - Prioritization matrix input / revision
 - Reviewer resources update / NEDC-33608-P Safety Evaluation (SE) forecast
- 50.46c coordination
 - Implementation schedule alignment with fuels / chemical effects testing programs
- Issues 6, 7 and 12 closure request response

Summary



- BWROG ECCS Suction Strainers business update provided
- Status of NEDC-33608-P review
- Status of NRC reviewer resources to support BWROG ECCS SS scope
- NRC input into the BWROG Submittal Prioritization Matrix
- Integration with 50.46c related industry efforts
- Integration with new ECCS SS Risk-Informed Solutions committee scope