BWROG Plans to Address ECCS Suction Strainer Issues

Steve Scammon, Energy Northwest

BWROG ECCS Suction Strainers Committee Chairman

NRC-BWROG Meeting
July 30, 2009

Meeting Agenda

Introductions and meeting purpose

Committee Overview - Scammon

Source Term - Borger

Downstream Effects – Fuel (DSE-F) - Emerson

Status of WCAP-16793-NP - NRC

Downstream Effects – Components (DSE-C) - Davenport

Strainer Head Loss - Holcomb

BWR/PWR Treatment Disparities Review - NRC

Public Comment and Closing

Committee Overview

Steve Scammon, Energy Northwest

Chairman

Committee Overview

The BWROG is currently updating the Program Plan to reflect the current activity status

- Target for completion is August 10
- Provide to NRC when completed

The BWROG will seek NRC approval for significant portions of its resolution plans, prior to implementation

- Licensing Topical Report process to be used

Committee Overview

Reviewing PWR experience

Prior to BWROG commitment of significant funds for test programs and other initiatives, issue resolution to consider

- NRC responses to BWROG LTRs
- NRC review of similar PWR topical reports

Committee Overview

BWROG proposes status meetings with NRC be held semiannually

- Periodic intermediate meetings or telephone conferences held as necessary to provide significant updates in plans and schedules

Committee Overview

Committee Meeting June 23-25

- Walkdowns
  - Several plants have conducted preliminary walkdowns
    - Target completion Spring 2011
  - An operability communiqué has been issued and a guidance document for determining operability is in preparation

Committee Overview

Committee meeting June 23-25

- Source Term Subcommittee
  - This subcommittee will provide input to the DSE-C and DSE-F Subcommittees
  - Additional BWROG work on latent debris, air jet testing, and ZOI is planned
  - PWR resolution of source term issues will be considered in the BWROG resolution plan

Committee Overview

Committee meeting June 23-25

- DSE-F Subcommittee – developing LTR to summarize analysis results and test plans
- DSE-C Subcommittee
  - Reviewing a proposal for the WCAP 16406 adaptation
  - LTR is to be developed
  - Developing recommendation on how the bypass fraction is to be determined
- Head Loss Subcommittee - proposing either an LTR or a position paper

Committee Overview

URG – NEI 04-07 Gap Analysis

- Report prepared by subcontractor and reviewed by Committee
- Comments being addressed
- BWROG would like to review NRC gap analysis before finalizing BWROG gap analysis report

Committee Overview

Program Plan Elements

- Includes issue history, completed actions, and issue resolution
- Reflects activity of 4 subcommittees
- Means for tracking plans and schedules going forward
- Living document

Preliminary Schedule (Committee Overview)

Activity	Status	Current Schedule
Track PWROG interactions with NRC	Participating in most NEI meetings and calls related to GSI-191	Ongoing
Program plan	Developing Revision D	August 10, 2009
NRC briefings	Plan to conduct these semiannually in the future, with telecons or meetings as required to update status	July 23, 2009 (DSE-Fuels) July 30, 2009 (General)

Preliminary Schedule (General)

Activity	Status	Current Schedule
Analysis of gaps between URG and NEI 04-07	1. Draft BWROG report being reviewed 2. Assessment of NRC gap report 3. Final report 4. Additional actions to close gaps beyond those previously identified.	1. Complete 2. 1 month from receipt of NRC report 3. TBD 4. TBD

Source Term

Tony Borger, PPL

Vice-Chairman

Debris Source Terms

Topics

- Overview of source term development
  - Survey summary (debris source term and reactive materials)
  - Zone of Influence (ZOI) methodology
  - Walkdown plan
  - Planned submittals

Debris Source Term

Source Term Survey Summary

- 84% of units surveyed have responded
- Wide range of ECCS flows and strainer sizes
- Four principal strainer vendors (GEH, PCI, Enercon, ABB)
- Several plants have common ECCS suction headers
- Debris quantities vary considerably (e.g. fiber, sludge & coatings)
- Spectrum of debris types not as wide as PWRs
  - Very few BWRs now have large amounts of CalSil / Microporous
- Most plants used URG for misc. debris (dirt/dust, rust, coatings)
- Walkdowns to confirm survey results
- Several source terms may be necessary to accommodate fleet variations

Debris Source Term

Reactive Materials Survey Summary

- 81% of units surveyed have responded
- Results to include plant-specific quantities of potentially reactive materials
- Plants to perform walkdowns to confirm reactive materials

Debris Source Term

ZOI methodology

- BWROG performed considerable testing during the development of the URG analysis
  - Air-jet testing performed to conservatively determine ZOI size, pursuant to debris source term inspections and inventories at each plant
- PWR testing performed at subcooled water conditions
- In addition to the URG, additional reports have documented the conservatism of using air-jet testing
- Relative to steam and two-phase jets, the BWROG plans to confirm the conservatism of the air-jet testing documented in the URG and present the BWR position to the NRC

Debris Source Term

Walkdown Plan

- All plants planning walkdowns
- Walkdown results will consider GSI-191 lessons learned
- Decision tree developed to determine plant-specific walkdown scope
  - Criteria will consider each element of BWROG TP-09-001 “Containment Walkdown Procedure for Potential Strainer Debris Sources at BWR Nuclear Power Plants”

Debris Source Term

Walkdown Decision Tree

- Proposed decision tree elements to determine extent of walkdowns
  - Previous walkdown: performed thoroughly and well documented
  - Conservatism in DST: URG Methods 1-3, testing, and strainer design or modifications
  - Strong programs: to control additional fiber/debris introduced in containment

Debris Source Term

Source Term Development

- Initial source term(s) to be developed from survey results of existing design bases
  - Will be used as inputs for DSE-F, DSE-C, and Strainer Head Loss activities
- Source terms to be reviewed further and modified as necessary based on walkdown results

Debris Source Term

Planned Submittals

- Position paper to address chemical effects with regard to AST plants' design basis
- Position paper on conservatism of air-jet testing
- TP-09-001 with decision criteria for plant-specific walkdown scope
- Discussion point: What is the appropriate method for obtaining NRC concurrence?

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Determine debris source term	1. Review PWR results 2. Complete surveys at BWR plants 3. Review surveys 4. Develop source term(s)	1. Ongoing 2. August 10, 2009 3. August 31, 2009 4. TBD

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Chemical effects	1. Collect survey results related to reactive materials 2. Develop a position paper to address chemical effects with regard to AST plants' design basis	1. August 10, 2009 2. September 30, 2009

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Chemical effects	3. Develop a Chemical Dissolution test protocol and submit to NRC for comment prior to performing bench tests	3. September 30, 2009
	4. Incorporate NRC comments into test protocol and send out for competitive bid by vendors	4. October 30, 2009

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Chemical effects	5. Select a vendor to perform chemical dissolution bench tests	5. December 15, 2009
	6. Perform bench tests	6. April 30, 2010
	7. Select a vendor and develop a template for application to individual BWR plants	7. August 31, 2010

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Zone of Influence	1. Develop a BWROG position regarding conservatism of air jet testing versus steam and two-phase flow tests	1. Complete
	2. Select a vendor to independently review BWROG position to be presented to NRC	2. August 31, 2009

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Conduct containment walkdowns to confirm source terms	1. Guidance and checklist provided for utility use	1. Complete
	2. Template for sharing walkdown results	2. September 15, 2009
	3. Guidance for addressing operability issues	3. Draft complete; final August 31, 2009

Preliminary Schedule (Debris Source Term)

Activity	Status	Current Schedule
Conduct containment walkdowns to confirm source terms	4. Summary of walkdown schedules 5. Walkdowns being conducted	4. August 15, 2009 5. Refueling outages between Spring 2009 and Spring 2011

Downstream Effects - Fuel

Fred Emerson, GEH

Project Manager

Downstream Effects – Fuel (DSE-F)

The BWROG proposes up to four LTR submittals for NRC review/approval of BWROG plans.

- First LTR prepared by GE-Hitachi (GEH) that generically analyzes blockage effects for determination of limiting conditions and applies those conditions to the GNF fuel bundle design. This LTR includes the bundle testing design. Actual test results will be provided in later revisions to this LTR
- Second LTR prepared by third party to compare the results of the GEH analysis with fuel bundle designs provided by the other two BWR fuel vendors (AREVA, and Westinghouse) to determine need for additional testing
- Third and fourth LTRs to report the actual test results for AREVA and Westinghouse BWR fuel as necessary

Before committing significant funds to test design and implementation, the BWROG will await completion of NRC review of the LTR(s).

Preliminary Schedule (DSE-F)

Activity	Status	Current Schedule
Perform thermal-hydraulic analysis of potential fuel bundle blockage scenarios to develop limiting conditions for generic BWR fuel bundle	1. Reflood scenario (lower tie plate) 2. Remaining scenarios (core spray, natural circulation, bypass region)	1. Complete 2. August 31, 2009
Address BWR product line differences		Begin September 2009 Complete December 2009

Preliminary Schedule (DSE-F)

Activity	Status	Current Schedule
Integrate GNF fuel bundle information with analysis results		August 31, 2009
Evaluate analysis results for GNF fuel bundle		August 31, 2009
Proposed: Status/results review meeting with NRC		September 2009
Develop test recommendations for GNF fuel		October 31, 2009

Preliminary Schedule (DSE-F)

Activity	Status	Current Schedule
Early assessment of need for testing AREVA and Westinghouse BWR fuel bundles	Proposed: Independent 3rd-party assessment of analysis results to AREVA and Westinghouse BWR fuel bundle designs	October 31, 2009
Proposed: Status/results review meeting with NRC		November 2009
Develop and submit LTR	Underway	February 28, 2010
GNF fuel test plans and testing		Following NRC review of LTR

Status of WCAP-16793-NP

NRC Presentation

Downstream Effects - Components

Brian Davenport, Exelon

Vice-Chairman

Downstream Effects – Components (DSE-C)

The BWROG intends to develop an LTR to either adapt WCAP-16406P or develop new guidance to the BWR fleet

- Commercial discussions are underway to begin this task

BWROG has collected survey information from the US PWRs that will be used in the assessment of this area

Downstream Effects - Components

- Overall target schedule
  - Methodology document finished in 2010
  - Generic component evaluations will be performed in 2011
  - LTR issued to NRC for review in mid-2011

Preliminary Schedule (DSE-C)

Activity	Status	Current Schedule
Adapt WCAP-16406	1. Select a vendor to perform this adaptation 2. Complete survey of PWR treatment of downstream effects on components	1. Vendor selection and schedule determination in progress 2. Complete

Preliminary Schedule (DSE-C)

Activity	Status	Current Schedule
Adapt WCAP-16406	3. Work Scope Specification issued February 15, 2009	3. Complete
	4. Contractor selection ongoing	4. September 2009
	5. Assemble input information on component population for each BWR product line	5. December 2009

Preliminary Schedule (DSE-C)

Activity	Status	Current Schedule
Adapt WCAP-16406	6. Contractor start work	6. December 2009
	7. Contractor Issue Final Methodology Report to BWROG	7. December 2010
	8. Contractor perform “generic” evaluations for major BWR equipment	8. May 2011

Preliminary Schedule (DSE-C)

Activity	Status	Current Schedule
Adapt WCAP-16406	9. BWROG issue LTR for NRC Staff Review 10. NRC Staff Review concludes 11. BWROG issue final report	9. July 2011 10. October 2011 11. January 2012
BWR Plants evaluate if bounded by Generic Component evaluations		2012 and beyond

Preliminary Schedule (DSE-C)

Activity	Status	Current Schedule
Determine strainer bypass fraction (consider PWR results)	1. Action plan for determination of whether analysis or testing is required to develop bypass fractions	1. Under subcommittee review
	2. Determine scope of work for analysis or testing; obtain NRC feedback	2. TBD
	3. Funding for analysis or testing	3. TBD
	4. Conduct analysis or testing	4. TBD

Strainer Head Loss

Edward Holcomb, NPPD

Vice-Chairman

Strainer Head Loss

BWROG plans to solicit the assistance of each strainer manufacturer or utility as required.

- Some vendors developed head loss correlations for their specific strainer designs. In some cases the NUREG/CR-6224 correlation was used. In other cases test data were used directly.

Test data will be reviewed to ensure that the supporting database is adequate.

- Review will include maximum debris loading conditions as well as formation of thin beds.
- Consideration will be given to time-dependent effects of head loss, and how those effects impact NPSH margins.
- Current NRC PWR Guidance will also be considered.

Strainer Head Loss

The need for additional head loss testing is currently indeterminate. This will depend on:

- Review findings
- Adequacy of both generic and plant-specific data
- Outcome of chemical effects testing
- Latent debris characterization & quantities
- Results of confirmatory walk downs
- Impact of changes in analytical methodology or test protocol
- Level of conservatism in existing analysis & testing

Preliminary Schedule (Strainer Head Loss)

Activity	Status	Current Schedule
Manufacturers and utilities revisit their prototype testing for thin bed effects, adequacy of debris source terms, and maximum debris loading.	Ongoing	Dependent on walkdowns (complete mid-2011)
Utilities identify those plants that still have calcium silicate or micro-porous (e.g., Min-K, Microtherm) insulations	Being completed by utilities (Source Term Subcommittee)	August 10, 2009

Preliminary Schedule (Strainer Head Loss)

Activity	Status	Current Schedule
Utilities determine whether original pipe break selection may have omitted microporous debris contributing to high head loss or low-debris generating breaks that could cause thin-beds on strainers	Apply results of source term development to head loss review	TBD
BWROG integrate changes to debris source terms identified by Chemical Effects	Apply results of source term development to head loss review	TBD

Preliminary Schedule (Strainer Head Loss)

Activity	Status	Current Schedule
BWROG assess appropriate, related concerns/gaps on debris erosion/ transport, latent debris quantities, and coatings	Ongoing, depends on walkdowns for latent debris and reactive materials	TBD
BWROG assess the results of steps above, and decide whether additional evaluation or testing is required to validate head loss correlations	Ongoing	TBD

Preliminary Schedule (Strainer Head Loss)

Activity	Status	Current Schedule
Manufacturers/plants perform evaluations and testing, as required		TBD
BWROG document results for NRC		TBD

Discussion and Questions

BWR/PWR Treatment Disparities Review

NRC Presentation