



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 11, 2013

LICENSEE: Calvert Cliffs Nuclear Power Plant, LLC

FACILITY: Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2

SUBJECT: SUMMARY OF JUNE 12, 2013, MEETING WITH CONSTELLATION ENERGY GROUP, INC., TO CONTINUE DISCUSSIONS ON THE PROPOSED RISK-INFORMED APPROACH TO THE RESOLUTION OF GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS" WITH A FOCUS ON REFINED CHEMICAL EFFECTS TESTING (TAC NO. MC4672 AND MC4673)

On June 12, 2013, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Constellation Energy Group, Inc., the licensee at NRC Headquarters, Three White Flint North, 11601 Landsdown Street, Rockville, Maryland. The purpose of the meeting was to discuss the licensee's proposed risk-informed approach to the resolution of Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors (PWRs)" with a focus on refined chemical effects testing for Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (Calvert Cliffs). The meeting notice and agenda, dated May 29, 2013, is available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML13148A396. A list of attendees is provided as Enclosure 1, but may not be all inclusive.

The licensee (1) presented an overview of Calvert Cliffs' GL 2004-02 resolution plan; (2) discussed Calvert Cliffs' test plans and protocol, (CCNPP-CHLE-005, "Chemical Effects Autoclave Experiment Test Plan," Revision 2 [ADAMS Accession No. ML13149A399]; CCNPP-CHLE-006, "Metals Bench-Top Autoclave Experiment Test Plan," Revision 0 [ADAMS Accession No. ML13149A405]; and CCNPP-CHLE-002, "Chemical Effects Head Loss Experimental Test Protocol," Revision 0 [ADAMS Accession No. ML13149A394]); (3) discussed the outstanding phenomena identification and ranking table (PIRT) items; and (4) discussed an open item from the March 20, 2013, public meeting and future meeting dates. (See Enclosure 2).

Discussion of CCNPP-CHLE-005, "Chemical Effects Autoclave Experiment Test Plan"

1. The NRC staff questioned an apparent discrepancy between test duration of 21 hours and 24 hours in the documentation. The licensee clarified that the testing will confirm the exact time needed at 195 degrees Fahrenheit (°F) to match an equivalent material dissolution at the elevated temperatures. Tests will be run for 24 hours with periodic water sampling to determine when the lower temperature corrosion is equal to the higher temperature corrosion.

2. The NRC staff questioned whether the CCNPP-CHLE-005 test had already been completed. This question stemmed from language in the CCNPP-CHLE-002 document that indicated the results of autoclave testing was already complete. The licensee clarified that the testing had not been performed, and in fact a facility for the testing had not yet been selected.
3. The NRC staff noted that the material quantities listed in the experimental parameters appeared to be very small. The NRC staff comment is based on a concern that such small samples of material may not be representative of the bulk material properties. The licensee indicated that they plan to use autoclaves with a 5-8 gallon capacity, much larger than the 1 liter capacity originally envisioned. The licensee's plan to use larger capacity autoclaves was informed by scoping tests with small sample sizes that experienced repeatability issues. The larger autoclave size is also expected to reduce the effects of measurement precision on the tests.
4. Other discussion items of note regarding CCNPP-CHLE-005 included sample size measurement accuracy, concrete surrogate chemical similarity with the plant, buffer addition timing, and chemistry analysis.

Discussion of CCNPP-CHLE-006, "Metals Bench-Top Autoclave Experiment Test Plan"

1. CCNPP-CHLE-006 testing may be conducted in a facility different from the CCNPP-CHLE-005 tests due to time constraints. However, these tests will also be done in relatively large autoclaves with volumes between 5 and 8 gallons.
2. The NRC staff questioned the method of buffer addition for the test and the impact that it may have on material dissolution. The licensee will consider the best methodology to create a realistic pH profile in the tests.
3. The NRC staff noted that many of the comments for CCNPP-CHLE-005 also apply to CCNPP-CHLE-006 due to the similarity of the test plans. Comments regarding flow over coupons, pH profile, chemical sampling, reactive material sample size, water used to soak fiber, etc. should be considered for both test plans.
4. The licensee stated that the tests are run for 48 hours because they expect the majority of the dissolution to occur during the early, high temperature period. Temperature is decreased to 170 °F in 48 hours. The NRC staff noted that there may be some delay in timing of dissolution due to synergistic effects between materials in the tests. Based on the results of the CCNPP-CHLE-006 tests, materials may be omitted from the long term test if; (1) they cannot be detected in solution (no dissolution), and (2) the material is not identified as having a synergistic effect with other materials. The licensee also noted that the test matrix may evolve as they learn more about the interactions between materials or the effects of other test parameters. The licensee will also consider taking samples at times during the tests instead of only at the end. This may help determine saturation limits for various materials and may provide useful trending information.

Discussion of CCNP-CHLE-002, "Chemical Effects Head Loss Experiment Test Protocol"

1. The NRC staff asked if a facility had been selected for this testing. The licensee stated that they have multiple competitive bids, but that they have not made a final selection at the time of this meeting.
2. The licensee stated that the fluid volume of the loop will be about 750 gallons. The NRC staff noted that the flow rate through the debris bed is stated to be 1 gallon per minute (gpm). The NRC staff also noted that the flow through the loop parallel to the debris bed is about 6 gpm resulting in a total flow rate of 7 gpm. The turnover time of the loop is, therefore, greater than 100 minutes. Given the volume of the loop relative to the flow through the debris bed, the NRC staff stated that it was important to characterize the test loop response, as well as the debris bed response to precipitate during shakedown testing. For example, the time between addition of precipitate in shakedown tests and a head loss response, along with reaction kinetics, should be considered when determining hold times for temperature plateaus.
3. Except for debris bed fiber that is not representing plant debris, the NRC staff stated that if fiber is rinsed, boiled, or soaked prior to placing in the test loop that the licensee should consider whether it is necessary to include the water in the test because it could influence chemical reactions. The licensee stated that they would evaluate the need to include this water in the testing.
4. The NRC staff requested that the licensee validate that the flow over the coupons and baskets is representative of the plant. Dense packing of baskets and coupons to the point that flow is precluded should be avoided. The licensee stated that they had considered this and that the packing of coupons and materials in baskets would be such that flow around materials would be representative of the plant. Materials will not be tightly packed into baskets
5. Regarding coatings material in the test tank, areas are scaled based on the surface area of failed zone of influence coatings. For unqualified coatings, they are to be painted on coupons and allowed to fail as they would in the plant. The NRC staff questioned whether fresh coatings would fail similarly to aged and irradiated coatings in the plant. The licensee will consider attempting to remove the need to include coatings from the chemical effects test. Some industry information indicates that they may not be a large contributor to chemical species in the pool. The licensee may perform additional autoclave testing to validate that their plant specific coatings will not contribute to chemical effects. The NRC staff indicated that autoclave testing may be useful to address questions about unqualified coating chemical leaching and to potentially reduce the burden of having to include coatings in each CCNPP-CHLE-002 test tank.
6. The NRC staff questioned the ratio of submerged versus sprayed unqualified coatings in the test tank. The test plan indicated that most of the coatings would be in the spray zone. The NRC staff noted that the unqualified coatings should be considered as failed and submerged per the NRC staffs review guidance on coatings. This concern will either be addressed by the licensee in the revised test plan, or may be superseded depending on the outcome of the potential autoclave work discussed in item number 5 above.

7. For baseline tests to determine the sensitivity of the debris bed to WCAP type precipitates, precipitate concentration should be based on the screen area, not the volume of the loop. The licensee stated that they will consider the appropriate tests required to validate that the new facility test beds are capable of detecting small amounts of WCAP precipitate. The licensee stated that they understood that the amount of precipitate added to the test should be based on the area of the debris bed.
8. Regarding the duration that the spray will run in the test, the licensee stated that for the initial test the sprays will be maintained for the entire test. If various break scenarios are performed during subsequent testing, the spray duration will be as predicted for the scenario.
9. The NRC staff disagreed with the statement in the test plan which states that a 10 percent or less change in head loss as negligible. From an NRC staff perspective, a 10 percent or less change in the measured head loss due to chemical effects still needs to be accounted for in the overall evaluation. The NRC staff stated that previous technical reviews by the NRC staff considered the conservative assumptions in the evaluation, as well as remaining uncertainties. The licensee stated that they are currently re-evaluating how results from the testing will be used in the final analysis.
10. Other Notes: The licensee stated that they will ensure that the loop is designed to preclude hideout of any materials. Also, the scaling description in the procedure will be rewritten to be more specific for each class of material. The licensee will work on scaling of the buffer baskets in the test facility and validate that the concrete and other fibrous material surrogates are appropriately representative for the chemical tests.

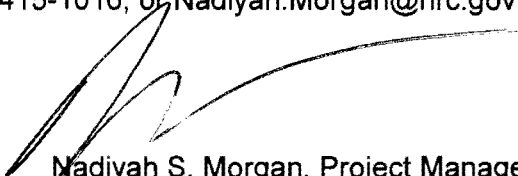
Discussion of Outstanding Phenomena Identification and Ranking Table (PIRT) Items

1. Concerning radiological effects, the licensee stated that they would include strong acids to address the effects of pool pH caused by radiolysis. The licensee noted that fibrous insulation materials are similar to low density fiberglass used in high activity filters and adverse effects had not been noted on the filters. Since discussion of PIRT items was not on the meeting agenda, the NRC staff was not prepared to discuss them in detail.
2. For coatings, the licensee noted that alkyd coatings have been observed to release trace amounts of chemicals that would not significantly impact pool chemistry and that epoxy coatings were judged not to contribute to the post loss-of-coolant-accident chemical environment and were excluded from integrated chemical effects test (ICET). The NRC staff noted that the epoxy considered during ICET was qualified coating and may be significantly different from non-qualified coatings. Also, the alkyd coating study was not formally reviewed by the NRC staff. The licensee may perform autoclave testing on plant-specific coatings to determine whether they should be included in the long term chemical effects testing.
3. With respect to the PIRT item on agglomeration, the licensee stated that they would do nothing to inhibit it.

The NRC staff and the licensee agreed to include PIRT items on the next meeting agenda so that both parties could be better prepared to discuss the issues.

Members of the public were in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-1016, or Nadiyah.Morgan@nrc.gov.



Nadiyah S. Morgan, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures:

1. List of Attendees
2. License Handout - Calvert Cliffs Chemical Effects in Risk-Informed GSI-191 Resolution

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LIST OF ATTENDEES

JUNE 12, 2013, MEETING WITH CONSTELLATION ENERGY GROUP, INC.

RISK-INFORMED APPROACH TO THE RESOLUTION OF GL 2004-02

CALVERT CLIFFS NUCLAR POWER PLANT, UNIT NOS. 1 AND 2

NAME	ORGANIZATION
Nadiyah Morgan	NRC
Paul Klein	NRC
Matt Yoder	NRC
Stephen Smith	NRC
Stewart Bailey	NRC
Robert Beall	NRC
Marioly Diaz Colon	NRC
Aloysius Obodoako	NRC
John Swailes	Constellation Energy Group (CENG)
Craig Sellers	Enercon Services, Inc.
Ken Greene	CENG
Josh Wargo	MPR Associates, Inc.
Tom Konerth	CENG
Andre Drake	CENG
Ron Holloway	Wolf Creek Nuclear Operating Corporation
Robert Peterson	Sargent & Lundy LLC
Ernie Kee	South Texas Project Nuclear Operating Company
Steve Blossom	South Texas Project Nuclear Operating Company

CENGSM

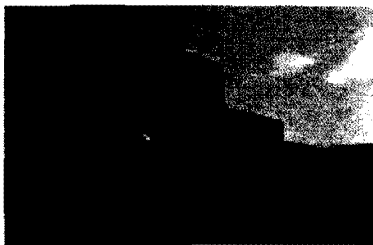
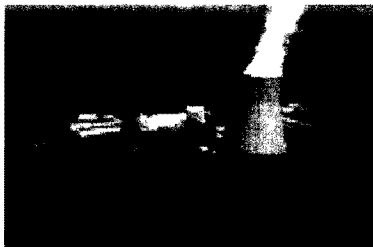
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Energy**



EDF



Calvert Cliffs Chemical Effects in Risk- Informed GSI-191 Resolution

Fourth Discussion With NRC Staff
June 12, 2013

Enclosure 2

Agenda

- Introductions
- Objectives for Meeting
- Overview of Calvert Cliffs GSI-191 Resolution Plan
- Detailed review of CCNPP Test Plans and Protocol
- Discussion of Chemical Effects PIRT Items
- Open Items from March 20, 2013 Meeting
- Schedule for future periodic meetings



CCNPP Attendees

- Tom Konerth – Supervisor Mechanical Design
- Andre Drake – Lead Design Engineer GSI-191
- Ken Greene – Licensing Engineer
- John Swailes – Project Manager GSI-191
- Craig Sellers – Project Manager RI GSI-191
- Andrew Henni – Lead Design Engineer RI GSI-191
- Robert Peterson – Independent Oversight RI GSI-191



Objectives of Meeting

- Review & Work Towards Agreement on Autoclave Test Plans – CCNPP-CHLE-005 & CCNPP-CHLE-006
- Review & Work Towards Agreement on Integrated Test Protocol – CCNPP-CHLE-002
- Obtain Feedback and Resolve Concerns on Conceptual Design of Integrated Test Facility
- Address Unresolved Issues
- Present Propose Schedule for Future Meetings
- Capture Staff Issues and Concerns



Overview of CCNPP GSI-191 Resolution Plans

- SECY-12-0093 Option 2
- Option 2a – Refined Chemical Effects Testing
 - CCNPP Single GSI-191 Issue is Chemical Effects
 - Conventional Debris Bed Head Loss Negligible *3" water*
 - Insignificant Chemical Effects Possible Deterministic Resolution
- Option 2b – Risk-Informed Approach
 - Alternative Solution if 2a Unsuccessful
 - Defense in Depth if 2a Successful
 - Consistent with STP Approach
 - LAR*



Autoclave Test Plan – CCNPP-CHLE-005

- High Temperature Portion of LOCA Profile
 - Compare Corrosion/Dissolution
 - 10 Hours at Temp Profile >195°F
 - 24 Hours at Constant 195°F
 - Determine Appropriate Time Duration to Account for High Temperature Portion of LOCA

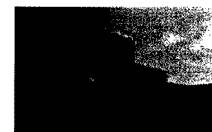
- Section-by Section Review



Autoclave Test Plan – CCNPP-CHLE-006

- Metals Corrosion Experiment
 - Investigate Single and Synergistic Corrosion Effects of Differing Metal Combinations
 - Determine Which Metals are Most Appropriate for Integrated Chemical Effects Head Loss Tests

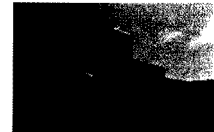
- Section-by Section Review



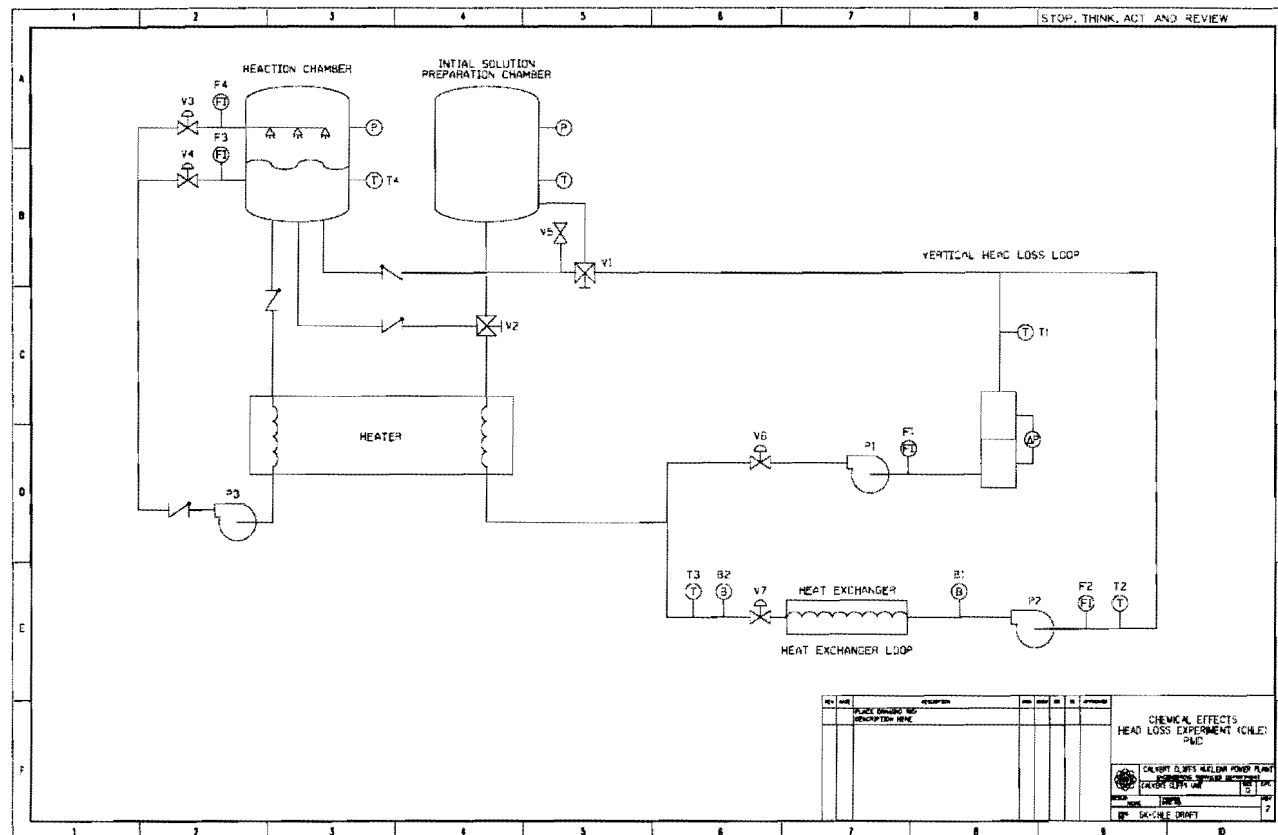
Integrated Chemical Effects Screening Test – CCNPP-CHLE-002

- Time Duration at 195°F – CCNPP-CHLE-005
- Metal Contribution – CCNPP-CHLE-006
- Debris Bed Sensitivity and Repeatability Demonstrated During Shake Down Testing
- Turbidity Criteria Developed During Shake Down Testing

- Section-by-Section Review



Revised Test Facility Conceptual Design

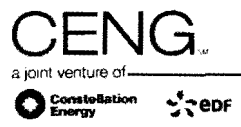


- Does Staff have Concerns with CCNPP Plans to Begin Detailed Design and Fabrication of Facility?



Chemical Effects PIRT Items

- Radiological Considerations
 - Effects on Pool pH Addressed by Addition of Strong Acids
 - Materials Similar to LDFG Used as High Activity Filters
 - Radionuclides in Debris Bed Flushed by Strainer Flow
 - Alkyd Coatings Release Organics and Trace Quantities of Metals with Negligible Impact on Pool Chemistry
 - Epoxy Coatings Are Judged to Not Contribute to the Post-LOCA Chemical Environment and were Excluded from ICET
- Agglomeration
 - Nothing Will be Done to Prevent or Inhibit Agglomeration



Open Items – March 20, 2013 Meeting

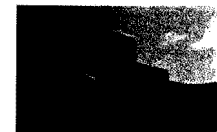
- Piping Less than 2" NPS
 - 1" & 3/4" DP Instrument Piping/Tubing
 - 3/4" Pressure & Level Instrument Piping/Tubing
 - 3/4" Reactor Head Vent Piping



Schedule for Future Periodic Meeting

- August 2013
 - Debris Bypass/Penetration Test Plan
 - Interim Chemical Effects Bench-Top Test Results
- September 2013
 - Chemical Effects Bench-Top Test Results
 - Final Chemical Effects Screening Test Protocol

CHE -072 final



The NRC staff and the licensee agreed to include PIRT items on the next meeting agenda so that both parties could be better prepared to discuss the issues.

Members of the public were in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-1016, or Nadiyah.Morgan@nrc.gov.

/ra/

Nadiyah S. Morgan, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures:

1. List of Attendees
2. Licensee Handout - Calvert Cliffs Chemical Effects in Risk-Informed GSI-191 Resolution

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Package No. ML13182A259

Meeting Notice: ML13148A396

ADAMS Accession No. ML13179A313

Handouts: ML

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NAME	NMorgan	KGoldstein	GKulesa	SBailey	RBeall (A) (DPickett for)
DATE	7/3/13	7/1/13	7/8/13	7/9/13	7/11/13

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