

July 23, 2014

MEMORANDUM TO: Lawrence J. Burkhart, Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

FROM: Bruce Bavol, Project Manager */RA/*
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF PUBLIC AND CLOSED PRE-SUBMITTAL MEETINGS
WITH WESTINGHOUSE ELECTRIC COMPANY REGARDING
TOPICAL REPORT – AP1000 DEBRIS EVALUATION

The U.S. Nuclear Regulatory Commission (NRC) held a public and a closed meeting session on May 22, 2014 with a follow-up closed portion on May 28, 2014, at NRC Headquarters located in Rockville, Maryland. NRC staff met with personnel from Westinghouse Electric Company (WEC), Southern Nuclear Operating Company Inc. (SNC), and South Carolina Electric & Gas Company (SCE&G) to discuss the WEC proposal to submit a topical report for NRC approval that will evaluate AP1000 containment cable debris analysis – and to go over the status and provide updates on the observations made from the February 26, 2014, Non-Metallic Insulation testing audit. There were several members of the public on the bridgeline during the open portion of the meeting.

Enclosed are the meeting agenda (Enclosure 1) and the meeting attendees list (Enclosure 2). The non-proprietary WEC presentation slides, the meeting notice, and the February 26, 2014, Non-Metallic Insulation testing audit summary can be found in the Agencywide Documents Access and Management System (ADAMS), respectively (ADAMS Accession Nos. ML14140A157, ML14126A122, and ML14104B653). Enclosure 3 contains the NRC technical summary.

CONTACT: Bruce Bavol, NRO/DNRL
(301) 415-6715

Discussion

At the end of the open part of the meeting, there was an opportunity for the public to provide comments and ask questions.

The topical report is scheduled to be delivered by WEC for a staff acceptance review in January 2015.

Project Nos.: 0808
0811

Enclosures:

1. Meeting Agenda
2. Meeting Attendees List
3. Technical Summary

cc w/encls (1, 2, and 3): See next page

Discussion

At the end of the open part of the meeting, there was an opportunity for the public to provide comments and ask questions.

The topical report is scheduled to be delivered by WEC for a staff acceptance review in January 2015.

Project Nos.: 0808
0811

Enclosures:

1. Meeting Agenda
2. Meeting Attendees List
3. Technical Summary

cc w/encls (1, 2, and 3): See next page

DISTRIBUTION:

Public	JDonoghue	DMcGovern	DTerao
RidsAcrsAcnwMailCenter	RReyes	YLi	GMakar
RidsOgcMailCenter	LBurkhart	RJoshi	TClark
RidsRgn2MailCenter	SBrunell	RButler	BBavol
RidsNroDnrl	AClinton	JGilmer	DJaffe
RidsNroDnrlLB4	BTravis		

ADAMS Accession No.: ML14174B160

NRO-002

OFFICE	DNRL/LB4: PM	DNRL/LB4: LA	DSRA/SCVB: BC
NAME	BBavol	RButler	JMcKirgan
DATE	07/15/14	07/09/14	07/23/14
OFFICE	DE/MCB: BC	DE/MEB: BC	DNRL/LB4: BC
NAME	DTerao	TClark	LBurkhart
DATE	07/15/14	07/17/14	07/23/14

OFFICIAL RECORD COPY

Meeting Agenda

Thursday, May 22, 2014

One White Flint North, 16 B04

1:00 p.m. – 5:00 p.m.

Purpose: To discuss the Westinghouse Electric Company's (WEC) proposal to submit a topical report for the U.S. Nuclear Regulatory Commission's (NRC) approval that will evaluate AP1000 containment cable debris analysis – and to go over the status and provide updates on the observations made from Non-Metallic Insulation testing audit (NOTE: A continuation to the closed portion of the meeting regarding observations made from Non-Metallic Insulation testing audit was held on Thursday, May 28, 2014 by phone line). The qualification will be for specific uses in the AP1000 design and is expected to be referenced by the AP1000 plants under construction at the Virgil C. Summer Nuclear Station, Units 2 and 3 and Vogtle Electric Generating Plant, Units 3 and 4 sites.

Time	Topic	Lead
1:00 p.m.	Introductions	All
1:05 p.m.	Opening remarks	NRC/WEC
1:15 p.m.	Presentation of Pre-Submittal material by WEC	WEC
1:45 p.m.	Opportunity for Public Comment	PUBLIC
2:00 p.m.	Conclusion of Open Portion/Break	
2:10 p.m.	Presentation of Pre-Submittal material by WEC (CLOSED TO PUBLIC)	WEC
4:50 p.m.	Summary/Action Items (CLOSED)	NRC/WEC
5:00 p.m.	Adjourn	

**PRE-SUBMITTAL MEETINGS WITH WESTINGHOUSE ELECTRIC COMPANY REGARDING
TOPICAL REPORT – AP1000 DEBRIS EVALUATION**

May 22 – 28, 2014

Total List of Attendees

Name	Organization
Bruce Bavol	NRC
Greg Makar	NRC
Boyce Travis	NRC
Clint Ashley	NRC
Y. C. (Renee) Li	NRC
David Terao	NRC
Diego Saenz	NRC
John McKirgan	NRC
Kevin Finn	NRC
Theresa Clark	NRC
Ron LaVera	NRC
Steven DiTommaso	Westinghouse
Tom Kindred	Westinghouse
Shayan Sinha	Westinghouse
Kevin McNamee	Westinghouse
Jonathan Schermaier	Westinghouse
Christian Cancino	Westinghouse
Camille Zozula	Westinghouse
Andrew Pfister	Westinghouse
Kelli Roberts	SNC
Jason Redd (phone)	SNC
Timothy Schmidt (phone)	SCE&G

Enclosure 2

Technical Summary
Public and Closed Meeting with Westinghouse Electric Company (Westinghouse)
Thursday, May 22 – 28, 2014

Staff Comments on Westinghouse Response to Audit Observations

The staff observed that seam-welding only the inner foil encapsulation may not meet the intent of the design control document (DCD) requirement (audit observation I.a.). This is because the encapsulation layer exposed to the loss-of-coolant accident (LOCA) jet (stainless steel box) is not seam welded, and the seam welded layer of encapsulation (the foil) may not be intact when exposed to a LOCA jet. The staff's observation was based on the possibility that thermal effects or aging of the neutron absorber materials could damage the foil during normal operations. Westinghouse responded that the jet impingement test showing no debris generation will demonstrate that their design meets the DCD requirement. The staff reiterated the observation because the testing is being performed on virgin material and the outer, unsealed box will not be opened to assess the condition of the inner foil, insulation, and neutron absorber.

The staff questioned whether aging effects had been fully addressed, since material subjected to aging may perform differently than the virgin material being used in the test program (audit observation I.b.). Westinghouse responded that they are considering design changes to mitigate some aging effects and they will perform a Failure Mode and Effects Analysis using outside subject matter experts. Westinghouse stated that this analysis will be in the topical report.

The staff observed that it was not apparent how the test programs would be able to address repeatability and uncertainty based on the numbers of tests and samples (audit observation I.d.). Westinghouse responded that the numbers of tests and samples are adequate based on their test plan and precedents from EQ test practices and previous Pressurized-Water Reactor Owners Group (PWROG) submergence testing. The staff acknowledged that the numbers of tests and samples is just one consideration in addressing repeatability and uncertainty, and the staff recognizes that it is up to Westinghouse to choose how to address these topics.

The staff observed that the acceptance criteria for the jet impingement testing were unclear (to the staff) because the test procedure appeared to allow some level of physical damage to the outer box without identifying the amount of damage that still constitutes an acceptable test (audit observation II.a.). Westinghouse responded that maintaining the specified initial jet conditions would ensure the proper jet pressures are applied, the test articles would have to remain restrained in the test fixture, and post-test inspections would be performed to detect damage. Staff remains unconvinced that visual inspection of the neutron shielding encapsulation exterior is sufficient to conclusively demonstrate that debris generation does not occur.

The staff questioned how the test specimens for jet impingement testing are configured to bound the allowable seam gap size in the manufactured shield boxes (audit observation II.c.). Westinghouse responded that the test specimens were procured and constructed according to the specifications, but did not say if the gap size on the specimens is bounding.

The staff observed that the acceptance criteria for the submergence testing did not appear to include chemical concentrations or fiber amounts, and that it was unclear how the test results would be integrated with the existing GSI-191 chemical effects analysis (audit observations III.a. and III.b.). The Westinghouse response stated that the test acceptance criteria ensured the test conditions are bounding, the results meet the DCD requirement of no debris generated, and the results are integrated with the existing chemical effects analysis. The staff commented that it was not clear how debris generation was being evaluated. Westinghouse responded that they are testing both for the formation of chemical precipitates and the elemental concentrations for integration with the existing AP1000 chemical effects analysis.

Staff Comments on the Pressure Calculations for Jet-Impingement Testing

Westinghouse assumes that the broken end of the pipe does not separate fully from the nozzle end in their determination of jet pressure at the non-MRI insulation. In a table on Page 18 of the RV arrangement sketches, Westinghouse provided the normal operating condition, the diameter of the equivalent circle break area, the distance of the target insulation, and the resulting jet pressure for postulated breaks at the DVI, hot leg, and cold leg nozzles. The staff noted that the target distances used by Westinghouse in determining the respective target pressures are about 1.5 to 2.5 times longer than the ones that would be calculated based on the relative configuration of the broken pipe axis and the non-MRI insulation. The staff concern is that the difference in the target distance may result in target being within a different jet region (i.e., the three jet regions as discussed in Appendix C of ANS 58.2 Standard) for the determination of jet pressure at the target. Consequently, the resulting target pressure may be underestimated, meaning that the associated distance for jet impingement testing of the insulation may not be appropriate.

Since the postulated breaks are inside an enclosed, limited reactor cavity annulus region, it is not clear how Westinghouse has considered the effects of this configuration on the applicability of a free expansion jet model.

Staff Comments on Electrical Cable Debris Presentation

Based on the pre-application presentation materials and discussions, it appears Westinghouse plans to assume that debris generation from cables will occur because there are cables that are in close proximity to postulated RCS pipe break locations (e.g., PZR heater cables near PZR surge line). It also appears that Westinghouse believes that the amount of cable debris generated in containment and transported to and accumulated on the strainers would be bounded by the current strainer head loss tests. The staff concern is that although it appears Westinghouse plans to assume a conservative destruction pressure (versus testing to determine actual destruction pressure) and subsequent zone of influence for calculating the amount of cable debris generation, there was no information provided regarding cable debris types, amounts or characteristics (e.g., shape, size, and form), limited discussion on potential cable debris transport considerations, and no information provided to support reaching a conclusion that cable debris behaves like the fiber and particulate surrogates used for head loss testing. Therefore, the impact on the long-term cooling safety analysis, due to cable debris generation, transport and accumulation on the sump screens is not clear. In addition, the staff expectation is that existing margins associated with head loss testing are preserved. The potential for reducing available margins adds uncertainty that may require additional analysis and testing to address.

It is not clear to the staff that the cable specimen (e.g., cable arrangement: orientation, spacing, number, and types) being tested bounds the design.

Staff Comments on Counter-Current Flow Limitation/Flooding Presentation

Several assumptions were not clear to the staff: why the Wallis empirical flooding correlation was chosen versus the Kutateladze correlation, how the choice of m was made in the Wallis correlation, and how the subcooling of the injection coolant was accounted for.

The staff observed that a technical justification needs to be provided for assuming that there is no potential for debris to reach the core after 24 hours.

It is not clear to the staff how a strainer bypass fraction can be credited without testing given the variability in bypass fractions with different designs and fiber loading.

DC Westinghouse - AP1000 Mailing List

(Revised 06/05/2014)

cc:

Paul M. Bessette
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004

Mr. Barton Z. Cowan, Esquire
Eckert Seamans Cherin & Mellott, LLC
600 Grant Street, 44th Floor
Pittsburgh, PA 15219

Mr. Paul Gaukler
Pillsbury, Winthrop, Shaw, Pittman
2300 N Street, NW
Washington, DC 20037

Ms. Shannon Bowyer Hudson
Office of Regulatory Staff
State of South Carolina
1401 Main Street
Suite 900
Columbia, SC 29201

Mr. Paul A. Russ
Director, AP1000 Licensing
Westinghouse
1000 Westinghouse Drive
Cranberry Township, PA 16066

Mr. Gary Wright, Director
Division of Nuclear Facility Safety
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, IL 62704

DC Westinghouse - AP1000 Mailing List

Email

agaughtm@southernco.com (Amy Aughtman)
amonroe@scana.com (Amy Monroe)
APAGLIA@Scana.com (Al Paglia)
APH@NEI.org (Adrian Heymer)
awc@nei.org (Anne W. Cottingham)
benjamja@westinghouse.com
bgattoni@roe.com (William (Bill) Gattoni))
Bill.Jacobs@gdsassociates.com (Bill Jacobs)
collinlj@westinghouse.com (Leslie Collins)
CumminWE@Westinghouse.com (Edward W. Cummins)
cwaltman@roe.com (C. Waltman)
david.hinds@ge.com (David Hinds)
david.lewis@pillsburylaw.com (David Lewis)
eddie.grant@excelservices.com (Eddie Grant)
erg-xl@cox.net (Eddie R. Grant)
ewallace@nuscalepower.com (Ed Wallace)
fbelser@regstaff.sc.gov
gcesare@enercon.com (Guy Cesare)
geertc@westinghouse.com (Thomas Geer)
George.Madden@fpl.com (George Madden)
George_Stramback@Charter.net (George Stramback)
james1.beard@ge.com (James Beard)
jcsaldar@bechtel.com (James Saldarini)
jerald.head@ge.com (Jerald G. Head)
jflitter@regstaff.sc.gov
jim@ncwarn.org (Jim Warren)
john.elnitsky@pgnmail.com (John Elnitsky)
Joseph_Hegner@dom.com (Joseph Hegner)
jrappe@nuscalepower.com (Jodi Rappe)
kinneyrw@dhec.sc.gov (Ronald Kinney)
KSutton@morganlewis.com (Kathryn M. Sutton)
kwaugh@impact-net.org (Kenneth O. Waugh)
lchandler@morganlewis.com (Lawrence J. Chandler)
lindg1da@westinghouse.com (Don Lindgren)
maria.webb@pillsburylaw.com (Maria Webb)
marilyn.kray@exeloncorp.com
maurerbf@westinghouse.com (Brad Maurer)
media@nei.org (Scott Peterson)
MSF@nei.org (Marvin Fertel)
nirsnet@nirs.org (Michael Mariotte)
nscjiangguang@sina.com (Jiang Guang)
Nuclaw@mindspring.com (Robert Temple)
patriciaL.campbell@ge.com (Patricia L. Campbell)
paul.gaukler@pillsburylaw.com (Paul Gaukler)

DC Westinghouse - AP1000 Mailing List

Paul.Jacobs@fpl.com (Paul Jacobs)
Paul@beyondnuclear.org (Paul Gunter)
pbessette@morganlewis.com (Paul Bessette)
pshastings@generationmpower.com (Peter Hastings)
Raymond.Burski@fpl.com (Raymond Burski)
rgrumbir@gmail.com (Richard Grumbir)
Richard.Orthen@fpl.com (Richard Orthen)
ritterse@westinghouse.com (Stanley E. Ritterbusch)
RJB@NEI.org (Russell Bell)
robert.kitchen@pgnmail.com (Robert H. Kitchen)
rong-pan@263.net (Pan Rong)
sabinski@suddenlink.net (Steve A. Bennett)
Sandra@sandrakgoss.com (Sandra Goss)
sara@cleanenergy.org (Sara Barczak)
sfrantz@morganlewis.com (Stephen P. Frantz)
shudson@regstaff.sc.gov (Shannon Hudson)
sisk1rb@westinghouse.com (Rob Sisk)
smsloan@babcock.com (Sandra Sloan)
stephan.moen@ge.com (Stephan Moen)
Steve.Franzone@fpl.com (Steve Franzone)
Tansel.Selekler@nuclear.energy.gov (Tansel Selekle)
timothy.beville@nuclear.energy.gov (Timothy Beville)
tom.miller@hq.doe.gov (Tom Miller)
tomccall@southernco.com (Tom McCallum)
TomClements329@cs.com (Tom Clements)
trsmith@winston.com (Tyson Smith)
Vanessa.quinn@dhs.gov (Vanessa Quinn)
vijukrp@westinghouse.com (Ronald P. Vijuk)
Wanda.K.Marshall@dom.com (Wanda K. Marshall)
wayne.marquino@ge.com (Wayne Marquino)
weave1dw@westinghouse.com (Doug Weaver)
whorin@winston.com (W. Horin)