

October 25, 2006

MEMORANDUM TO: Stacey L. Rosenberg, Chief  
Special Projects Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

FROM: Michelle C. Honcharik, Project Manager */RA/*  
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Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF SEPTEMBER 27, 2006, OPEN MEETING WITH THE  
BOILING WATER REACTOR (BWR) OWNERS' GROUP (BWROG) TO  
DISCUSS THE PATH FORWARD REGARDING A NEW APPROACH  
TO THE CALCULATION OF AVAILABLE NET POSITIVE SUCTION  
HEAD (NPSH) FOR EMERGENCY CORE COOLING SYSTEM (ECCS)  
PUMPS DURING POSTULATED BWR ACCIDENTS

On September 27, 2006, a Category 2 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of the BWROG at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose was for the BWROG to present the plans and schedule for the Containment Overpressure (COP) Credit for BWROG NPSH Committee. A list of attendees is enclosed.

Mr. Tim Abney presented an overview of the BWROG and Mr. Alan Wojchowski presented the background for the BWROG NPSH committee effort, planned work scope, schedule for the planned work, and basis for BWROG belief that the work will qualify for fee waiver.

Mr. Wojchowski said that the BWROG does not believe at this point that the need for COP can be eliminated for all plants by eliminating conservatism. As such, the proposed objective of the BWROG is to develop guidance for NRC approval of licensee applications.

The NRC staff stated that prior to the Vermont Yankee (VY) and Tennessee Valley Authority (TVA) extended power uprate (EPU) applications, credit for COP had only been considered for loss-of-coolant accident (LOCA) conditions. However, it is now clear that special events (i.e., anticipated transients without scram, station blackout, and Appendix R to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR)) may need credit for COP as well. Mr. Wojchowski said that the BWROG work scope does include an assessment of the effect on special events, but said that the BWROG does not believe at this time that new analyses will be needed. The BWROG anticipates that the LOCA analysis results can be applied to the special events.

The NRC staff asked that uncertainties be addressed in the realistic analyses to provide a level of confidence in the results. The NRC staff believes that the Advisory Committee on Reactor Safeguards (ACRS) will be highly interested in this aspect. Mr. Wojchowski said that the BWROG would address the uncertainties and believes that a 95/95 confidence level can be demonstrated.

The NRC staff was asked what form the submittal should take and several options were discussed. The NRC staff concluded that a licensing topical report is preferred so that the NRC staff can issue a safety evaluation which could be referenced by future applicants in license amendment requests.

Slide 13 of the BWROG presentation listed the anticipated contents of the submittal to NRC. The NRC staff said that the list appeared inclusive and did not suggest any additional topics. The NRC staff questioned how the risk associated with taking credit for NPSH will be determined and offered several ways to do this. Mr. Wojchowski said that the committee has not determined the specifics of the approach at this point. The NRC staff said that the information requested of VY and TVA would be useful to the BWROG in developing this approach. The NRC staff agreed to provide the BWROG some points to consider regarding how the risk assessment could be performed. The NRC staff comments were provided to the BWROG via e-mail on October 4, 2006, and are enclosed.

The anticipated content of the submittal includes "alternatives to COP credit." The NRC staff asked what this meant and it was explained that this item is to respond to the ACRS statement that credit should be granted where there are no practical alternatives. The BWROG plans to brainstorm alternatives, and address the practicality of each. The NRC staff said that another way of considering this is to use the alternatives to bolster a defense-in-depth argument to help reduce the risk associated with credit. If there are relatively simple things that can be done (e.g., swap ECCS suction to a non-safety related source), a good case could be made that when these type actions are considered, the risk is even further reduced.

Regarding fee waiver, the NRC staff said they believe this qualifies, but stated that the final decision is made by the Chief Financial Officer (CFO). Regarding the fee waiver criteria, the NRC staff said that since there was no written request from NRC, it would be appropriate to base the request primarily on 10 CFR 170.11(a)(1)(iii). Mr. Wojchowski said that the BWROG will request fee waiver with the submittal. Mr. Wermiel said that the NRC staff will support the BWROG position with the CFO.

Regarding the submittal date, Mr. Wojchowski said that the BWROG anticipates sending a draft topical report to the NRC staff for review as soon as the draft is ready, tentatively late summer 2007. A follow-up pre-submittal meeting will be held with the NRC staff at that time to get input so that any additional information needed can be addressed. Mr. Caruso offered to schedule an ACRS subcommittee meeting at the same time to get ACRS comments on the draft topical report as well. All agreed that this is a good plan. Mr. Abney said that after the first of the year, they will be able to give a window of when the meeting can be held.

The NRC staff concluded that the plan presented by the BWROG meets NRC staff needs and were appreciative of the BWROG effort.

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

Project No. 691

Enclosures:

1. List of Attendees
2. Division of Risk Assessment Staff Insights on Developing a Risk Evaluation of a Proposed Containment Accident Pressure Credit

cc w/encl: See next page

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**Public Meeting with Boiling Water Reactor Owners' Group (BWROG)**

**September 27, 2006**

**Meeting Attendees**

<b>NAME</b>	<b>ORGANIZATION</b>
Michelle Honcharik	NRC
Martin Stutzke	NRC
Alan Wojchowski	BWROG/NMC
Tim Abney	BWROG
John Elmerick	BWROG/TVA
Dilip Rao	General Electric
Steven Laur	NRC
Jerry Wermiel	NRC
Richard Lobel	NRC
Ralph Caruso	ACRS

## **Division of Risk Assessment Staff Insights on Developing a Risk Evaluation of a Proposed Containment Accident Pressure Credit**

1. The NRC staff prefers the term “containment accident pressure credit”, or “CAP credit” as opposed to the term “containment overpressure credit”, or “COP credit.” CAP credit is more descriptive of the situation, whereas COP credit has unintended negative connotations. Specifically, COP credit could be misinterpreted as allowing operation of the containment in excess of its design pressure limit. The NRC staff notes that the acronym “CAP” may also be used to denote a licensee’s Corrective Action Program; however, the context of its use should make it clear as to which definition is applicable.
2. The risk evaluation of a proposed CAP credit must be done on a plant-specific basis. It does not seem feasible to perform a generic probabilistic risk assessment (PRA) that would bound all plants and situations. However, developing specific guidance for performing a risk evaluation of a proposed CAP credit that builds upon the general risk-informed decisionmaking guidance provided in Regulatory Guide (RG) 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” could benefit both licensees and the NRC staff. One possible way to promulgate this guidance would be to incorporate it into a Licensing Topical Report, which could then be reviewed and accepted by the NRC staff. It would also be helpful to provide some examples of applying the guidance to specific plants and situations.
3. The risk evaluation of a proposed CAP credit must address all of the five key principles of risk-informed decisionmaking stated in RG 1.174. Merely determining the change in risk metrics (i.e., delta core damage frequency ( $\Delta$ CDF) and delta large early release frequency ( $\Delta$ LERF)) is not sufficient, because this type of analysis only addresses the fourth key principle.
4. Section 2.2.1.1 of RG 1.174 and Section III.2.1.1 of Chapter 19 of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (SRP) discuss defense-in-depth (the second key principle). Some issues involving defense-in-depth are:
  - a. Demonstrating that the proposed CAP credit does not introduce new or additional failure dependencies among barriers that significantly increase the likelihood of a core-damage accident or large early release from containment.
  - b. Discussing the effective redundancy and diversity of the plant design. It would be helpful to discuss, for each initiating event, any additional injection sources that do not depend on the CAP credit or alternatives to the CAP credit (e.g., if enough suppression pool cooling is available, then there will be adequate net positive suction head (NPSH) even if the containment is not intact).
5. Section 2.2.1.2 of RG 1.174 and Section III.2.1.2 of SRP Chapter 19 discuss safety margins (the third key principle). One way that the PRA can support the discussion of safety margins is to show that the plant’s risk profile is not greatly perturbed by the CAP credit (i.e., not only is the overall  $\Delta$ CDF and  $\Delta$ LERF small, but the contributions of individual initiating events are not substantially skewed).

6. The change in risk metrics ( $\Delta$ CDF and  $\Delta$ LERF) should be calculated by assuming that the baseline plant does not need any CAP credit. This approach has been suggested by the Advisory Committee on Reactor Safeguards (ACRS). One pitfall in this approach, however, is that it may not be possible to judge the risk impact due to a change in an existing CAP credit (e.g., changing a CAP credit for 1 psi for 5 hours to a CAP credit for 2 psi for 8 hours).
7. The risk evaluation of a proposed CAP credit needs to consider all initiating events defined in the PRA and all PRA sequences that realistically require the CAP credit to prevent emergency core cooling system (ECCS) pump failure and resultant core damage. It is not acceptable to consider only the design-basis loss of coolant accident (LOCA) and the special events of anticipate transient without scram, station blackout, and Appendix R to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR); conversely, for such events where CAP credit is needed, the scenario should be analyzed realistically, consistent with current PRA practices. For example, if a transient with stuck open safety relief valves would require CAP for ECCS NPSH, such scenarios should be considered in the risk assessment. If the 10 CFR Part 50 Appendix R analysis results in need for a CAP credit, then the risk evaluation should consider fire scenarios realistically to determine whether or not the CAP credit is needed and assess the risk accordingly.
8. The process of determining PRA success criteria from thermal-hydraulic calculations needs to be thoroughly described. Some issues involving PRA success criteria determination are:
  - a. The thermal-hydraulic calculations used to determine PRA success criteria should be based on realistic inputs (as opposed to the conservative inputs used in design-basis analyses). The challenge here is to clearly define and justify what is meant by the phrase "realistic inputs."
  - b. It is anticipated that a CAP credit may only be needed if certain unfavorable plant conditions exist (high service water temperature, high initial suppression pool temperature, low initial suppression pool level, etc.). It may be possible to define a set of unfavorable plant states (with associated probabilities of occurrence) for incorporation into the PRA; however, this approach is only practical if the number of unfavorable plant states is small.
  - c. It is helpful to define alternative success criteria for use in a PRA sensitivity analysis. For example, it may happen that a CAP credit is needed for the design-basis LOCA, but that no CAP credit is needed if some of conservatisms in the design-basis LOCA analysis are removed. In this case, there would be no change in the risk metrics for large LOCAs. However, it may be helpful to postulate an alternative PRA success criteria assuming that large LOCAs actually need the CAP credit.
9. Changes to the baseline PRA model to reflect the proposed CAP credit must be explained. In addition to providing the explanatory text, before-and-after event trees and fault tree diagrams may be helpful in explaining how the PRA was modified. It is not necessary, however, to include listings of PRA input files (e.g., macro files).

10. One plausible failure mode of a proposed CAP credit is the existence of a pre-existing leak from the containment. The risk evaluation should explain how the integrated leakage rate testing (ILRT) interval was considered in determining the probability of a pre-existing containment leak.
11. Explain how the ability to monitor the containment for leaks (e.g., excessive nitrogen makeup to inerted containments) was considered in determining the probability of a pre-existing containment leak.



BWR Owners' Group

Project No. 691

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