George
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Union of Concerned Scientists

October 30, 2000

Dr. Farouk Eltawila, Acting Director
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: COMMENTS ON DRAFT REPORT ON EFFECTIVENESS OF ATWS RULE

Dear Dr. Eltawila:

I appreciate the opportunity to review and comment upon the draft report titled "Regulatory Effectiveness of the Anticipated Transient Without Scram Rule" which you sent to me by letter dated October 18, 2000. I have the following comments and recommendations:

1. On page x of the Executive Summary, the fourth bullet states that "all four reactor types achieved the risk goal of P(ATWS)<1.0E-5 per reactor year." However, data in the report suggests that this conclusion may not be accurate. For example:

   a) The last bullet on page x continuing onto page xi points out that "some BWR risk analyses may underestimate the risk of ATWS" because "Probabilistic risk assessment/individual plant examinations for BWS indicate large variations in the assumptions for reliability of human actions in response to an ATWS. Similarities in design, procedures, and training argue against such variability." According to Table 1 on page 7, the outcome for BWRs after implementation of the ATWS rule modifications was P(ATWS) of 1.0E-6, or one order of magnitude below the stated risk goal of 1.0E-5. **Recommendation:** Perform a perturbation study to determine if the least conservative assumption for human action reliability could cause the BWR P(ATWS) to increase above 1.0E-5. If not, revise the report to include the results of the study to support the conclusion. Otherwise, revise the conclusion accordingly.

   b) The next-to-last bullet on page x states that "ATWS mitigation capability on a PWR is highly dependent on the moderator temperature coefficient (MTC). Mitigative functions are considered non-viable if the ATWS peak pressure exceeds 3200 psig; and a sufficiently negative MTC will limit the ATWS peak pressure." On page 4, the report states "During the first part of the fuel cycle below 100 percent power, the MTC can be positive. It an ATWS occurs when the MTC is either positive or insufficiently negative to limit reactor power and the ATWS pressure increase, all subsequent mitigative functions are likely to be ineffective. The percentage of the fuel cycle time when the MTC is insufficient to maintain the RCS pressure below 3200 psig during an ATWS is designated the 'unfavorable exposure time.' At the time of the ATWS rulemaking, the UET was assumed to be 1 percent for W [Westinghouse] and 50 percent for B&W/CE

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reactors...". Table 1 on page 7 reports the "UET greater than expected for a few plants." Table 6 on page 14 reports that a peak pressure of 3200 psia is exceeded 1 to 10 percent of the time for Westinghouse plants. **Recommendation:** Perform a perturbation study to determine if the plants exceeding the expected unfavorable exposure time causes the P(ATWS) to increase above 1.0E-5. If not, revise the report to include the results of the study to support the conclusion. Otherwise, revise the conclusion accordingly.

c) The next-to-last bullet on page x states that "ATWS mitigation capability on a PWR is highly dependent on the moderator temperature coefficient (MTC). Mitigative functions are considered non-viable if the ATWS peak pressure exceeds 3200 psig; and a sufficiently negative MTC will limit the ATWS peak pressure." On page 11, Section 3.2.4 of the report states "Comparison of the ATWS CDF for all the plants in each reactor group in Appendix B to the P(TWS) expectation for each reactor group found that six licensees do not meet the ATWS risk goals." This statement contradicts, or at least seriously undermines, the conclusion that all reactor types achieved the ATWS goal. **Recommendation:** Revise the overall conclusion to indicate that some reactors did not achieve the AWTS risk goal.

d) The next-to-last paragraph on page 11 reports "Several [PWR] plants routinely operate with blocked power-operated relief valves and their IPEs may underestimate ATWS risk." **Recommendation:** Perform a perturbation study to determine if routine operation with blocked power-operated relief valves causes the P(ATWS) to increase above 1.0E-5. If not, revise the report to include the results of the study to support the conclusion. Otherwise, revise the conclusion accordingly.

2. The report indicates that the effectiveness of the ATWS rule for PWRs is highly dependent on the MTC issue. The last sentence on page 6 states "Information on the plant and reactor group MTCs was obtained from a 1994 NRC survey (Ref. 15), and owners' group presentations to the NRC (Ref. 16), (Ref. 17), (Ref. 18)." The latter three references all date back to 1988. Thus, information on this important parameter is at least six year old. **Recommendation:** Determine the current plant and reactor group MTCs. Revise the report as appropriate. As a minimum, the report should be revised to reference contemporary sources for the MTCs.

3. The third paragraph on page 4 states "In SECY-83-293 it was assumed that a peak pressure of above 3200 psig was unacceptable for ASME Service Level C. ... Also steam generator tubes might fail before other primary coolant system components and bypass containment." Table 6 on page 14 reports peak pressures of 3962 psia for CE plants, 3600-4000 psia for B&W plants, and >3200 psia up to 10 percent of the time for Westinghouse plants. Page 1 defines an ATWS as "an anticipated operational occurrence followed by failure of the reactor trip system (RTS) portion of the reactor protection system (RPS)." On October 11, 2000, a subcommittee of the Advisory Committee on Reactor Safeguards conducted a meeting regarding the differing professional opinion (DPO) initiated by Dr. Joram Hopenfeld of the NRC staff. The meeting transcript is available on the internet at http://www.nrc.gov/ACRS/rrs1/Trans_Let/index_top/ACRS_sub_tran/adhoc001011. In addition to the DPO, the NRC also created Generic Safety Issue 163 (GSI-163) about Dr. Hopenfeld's concerns. Basically, Dr. Hopenfeld is concerned that allowing nuclear power plants to operate with cracked steam generator tubes increases the potential for unacceptable consequences from design bases events. During his presentation to the ACRS subcommittee, Dr. Hopenfeld referred to a May 2000 memo issued by Westinghouse to plant owners informing them that the support plates inside steam generators were designed for a differential pressure of 1,500 psid. If an ATWS can result in a reactor coolant system pressure in excess of 3,200 psia, it seems certain that a differential pressure of at least

2,000 psid will be experienced across the steam generator tube walls. If the operational occurrence that triggered the ATWS is one that causes secondary side pressure to decrease, then the resulting differential pressure across the steam generator tube walls may approach the reactor coolant system pressure. The ATWS rule might not be adequate by accepting peak pressures of the reactor coolant system in excess of 3,200 psia if those pressures cause degraded steam generator tubes to rupture. **Recommendation:** Evaluate the impact of primary side pressures exceeding 3,200 psia on steam generator tube integrity. If tube integrity is assured even under those extreme conditions, revise the report to include the results of the evaluation. Otherwise, revise the report to reflect that the ATWS rule as currently implemented compromises steam generator tube integrity.

4. The NRC is to be commended for evaluating the effectiveness of the ATWS rule. My first impression was that this evaluation was long overdue, but after having reviewed the draft report, I realize that the delay was necessary in order to compile sufficient operating experience to permit a meaningful evaluation.

5. It is a great idea to provide the ADAMS accession number (ML003753154) for the draft report both on the report's cover page and in the transmittal letter. This practice is currently not the norm, but it makes document retrieval much easier. **Recommendation:** Encourage the rest of the NRC staff to adopt this extremely useful practice.

6. The paragraph immediately preceeding Table 6 on page 14 reports that the MTC values summarized in the table came from References 17, 18, and 19. It appears that the information really came from References 16, 17, and 18 instead. **Recommendation:** Check the proper references and revise the report if necessary.

Sincerely,

David Lochbaum
Nuclear Safety Engineer

cc: William S. Raughley, NRC RES