

February 23, 2004

MEMORANDUM TO: J. E. Dyer, Director
Office of Nuclear Reactor Regulation

FROM: Glenn B. Kelly, Sr. Reliability Risk Analyst **/RA/**
Probabilistic Safety Assessment Branch
Division of Systems Safety Analysis
Office of Nuclear Reactor Regulation

SUBJECT: NON-CONCURRENCE WITH THE COMMISSION PAPER ON RISK-
INFORMING 10 CFR 50.46

First, I would like to provide you with my qualifications in the area of risk-informed regulation. I have a Masters degree in mathematics and a Masters degree in engineering. Prior to coming to the NRC, I math-modeled and programmed nuclear power plant simulators. I have been with the NRC since 1976. I have evaluated light water reactor core thermal hydraulics and liquid metal fast breeder reactors for the Analysis Branch, Chapter 15 emergency core cooling system (ECCS) analysis for the Reactor Systems Branch, control room and human factors analysis for the Human Factors Engineering Branch, multiple technical areas (including seismic, fire, equipment qualification, and source terms) for the Office of Policy Evaluation (at that time the technical arm of the Commissioners), and probabilistic risk assessments (PRAs) since 1981. As a PRA analyst, I have overseen the review or performed the review of five major PRAs including Millstone 3, Millstone 1, and the Advanced Boiling Water Reactor (ABWR). I was a principle author of Generic Letter 88-20, whereby all reactor licensees were compelled to perform internal and external event PRAs. I developed many of the security requirements in the Advisories and Orders for nuclear reactors and decommissioning plants following 9/11. I was a project manager for over three years. I also worked extensively on the risk-informing of 10 CFR 50.69 and completed the risk assessment aspects of the 10 CFR 50.44 rulemaking. I am one of the few staff members in the agency who has performed Chapter 15 analyses (i.e., understands a broad range of design bases events), performed preliminary safety analysis report (PSAR) and final safety analysis report (FSAR) reviews for nuclear power plants that operate today, understands PRAs, understands how the systems of a plant work together, and understands our regulations.

I am a principle author of this Commission Paper. I believe in the value of probabilistic risk assessment and risk-informing our regulations. I also believe that the precedent that this rule will set will affect how nuclear power plants are regulated in the future. I object to two last minute changes to the Commission Paper that removed words which alerted the Commissioners to the potential serious safety implications if too simplistic an approach were taken in developing the rule or if inadequate controls were placed on restricting plant changes.

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The first modification was made as follows:

Through the staff's evaluation of the SRM direction, possible rulemaking approaches, available technical information and stakeholder input, we have identified a number of policy and technical issues that need to be resolved to ensure that the new rulemaking for LBLOCA redefinition does not result in an undesirable reduction in plant safety unintended consequences.

The words "unintended consequences" do not convey the significance that "undesirable reduction in safety" does. Use of "unintended consequences" masks the seriousness of the modifications to our regulations we are contemplating. The following are examples of areas that could be affected by the rulemaking: containment ultimate pressure, equipment qualification, containment sump debris capabilities, removal of accumulators in PWRs, increase of core peaking factors, modification of containment spray and fan cooler system capabilities, modification of ultimate heat sink capabilities, increased power uprates, reduced refueling water storage tank (RWST) boron concentration, and modification of motor-operated valve (MOV) test requirements.

The second modification that I object to is the removal of any mention in the cover memo of the potential large uncertainty (and its consequences) in the results to be produced by the Expert Elicitation Process for determining the frequency of loss-of-coolant accident (LOCA) break sizes. Why is this uncertainty important? If the results of the elicitation conclude that large LOCAs are highly unlikely, then most or all large breaks will be excluded from the design-basis. Much of what is in the design-basis of nuclear power plants today is directly affected (e.g., loads, temperatures, and pressures to withstand; required flow rates to mitigate events) by the limiting design-basis accidents as evaluated in Chapter 15 of the FSAR. For many plants, the limiting design-basis event is a large break loss-of-coolant accident (LBLOCA). It is not clear to the staff yet what the level of uncertainty will be on the results reported out by the expert panel. No peer review within the staff or by anyone else has been scheduled at this time. While the panel will provide the most up-to-date estimate of LOCA frequencies available for large breaks, no data exist for break sizes in the region of interest. In addition, it is my understanding that probabilistic fracture mechanics calculations do not yet do a good job of replicating actual data from pipe breaks that have occurred. Never-the-less, the panel of experts has been asked to project frequency estimates for ranges of break flows, including both the median (i.e., 50% of the time the expert expects the frequency to be higher or lower) and the 95th percentile (i.e., 95% of the time the expert expects the frequency to be lower). These estimates do not result in the kind of statistical confidence that is attained in ECCS evaluations using 95% confidence that 95% of the time a fuel pin reaching this departure from nucleate boiling ratio (DNBR) will not depart from nucleate boiling. Today we have regulations that provide mitigation to large break LOCAs, and through their robustness provide severe accident mitigation capabilities, which are beyond the capabilities to which the plants were originally designed. In removing events from the design-basis, we must be careful to not remove too much of our severe accident mitigation capabilities.

When I discussed the issues raised by this Commission Paper with Bill Travers, he told me that this is as complicated and important an issue as any since the ECCS hearings in the 1970s, and perhaps is even more complicated. The risk-informing of 10 CFR 50.46 should be performed methodically, not performed in a rushed manner. When important aspects of the

rulemaking are done in parallel rather than in series (e.g., the expert elicitation and the development of the technical basis for the rulemaking), it is important to allow time to integrate the areas and consider the implications.

I believe that this Commission Paper, except for the two areas discussed above, does a good job of informing the Commission of the policy and technical issues that have been identified so far in the risk-informing of 10 CFR 50.46. When these two areas are rewritten to provide the Commission with an appropriate statement of the significance of the issues, I will wholeheartedly concur in the paper.

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ADAMS Accession#ML040540939

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