

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD ~~82~~ OCT 14 11:48

IN THE MATTER OF)
)
CONSUMERS POWER COMPANY) Docket No. 50-155-OLA
) (Spent Fuel Pool
) Modification)
Big Rock Point Nuclear)
Power Plant)

OFFICE OF SECRETARY
DOCKETING & SERVICE

CONSUMERS POWER COMPANY'S REPLY TO INTERVENORS'
PROPOSED FINDINGS OF FACT ON CRITICALITY CONTENTION

On September 27, 1982, Intervenors Christa-Maria et al. ("Intervenors") filed proposed findings of fact on O'Neill Contention IIE-3 concerning criticality. On October 1, 1982 Consumers Power Company ("Licensee") and the NRC Staff also filed proposed findings on this contention. In accordance with the procedural schedule set by the Atomic Safety and Licensing Board ("the Board"), as modified, Licensee hereby files its reply to "Intervenors' Proposed Findings On Criticality--O'Neill Contention II.E.3 And Licensing Board Questions."

Intervenors assert that Licensee has not shown that its criticality calculation for the Big Rock Point spent fuel storage pool is appropriately conservative. Intervenors' argument, however, amounts to no more than an allegation of bad faith on the part of two of Licensee's witnesses, Dr. Yong S. Kim, a criticality expert, and Dr. Daniel A. Prelewicz, an expert in thermal-hydraulics. This allegation is not supported by the record. Intervenors

8210150470 821012
PDR ADOCK 05000155
G PDR

DS03

merely point out that Dr. Kim performed two different criticality calculations and assert that the reasons for the change have never been properly explained (Intervenors' Proposed Findings at 4). In fact, the whole process of arriving at the criticality calculations has been exhaustively explained, both in the written testimony of Drs. Kim and Prelewicz and in their testimony at the hearings.

In performing criticality analyses, one usually makes some simplifying assumptions (Prelewicz at Tr. 1562). When assumptions are made, they must of course be conservative to ensure safety. Dr. Kim's original criticality analysis contained a number of conservative assumptions. Most of these were suggested by applicable NRC guidance^{1/} and are set out in detail in Dr. Kim's affidavit on summary disposition.^{2/} Two assumptions were made about the thermal-hydraulic conditions that would prevail in the pool assuming loss of all pool cooling systems. The water in the pool was assumed to be 212°F and a steam void fraction of 20.6%, which had

^{1/} NRC Branch Technical Position entitled "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications."

^{2/} "Statement of Yong S. Kim Concerning O'Neill Contention IIE-3", filed with accompanying affidavit on October 5, 1981. Among other assumptions, Dr. Kim assumed fresh rather than burned fuel and he assumed radial and axial infinity. Id. at 9; "Testimony of Yong S. Kim Concerning Criticality Analysis--O'Neill Contention IIE-3" (hereinafter "Kim Testimony") at 14.

been calculated as the condition at the exit of the fuel rods, was assumed to exist for the entire length of the rods.

The pool water temperature of 212°F was provided to Dr. Kim by Dr. Prelewicz (Prelewicz at Tr. 1530-31). This did not represent the highest temperature in the pool, which Dr. Prelewicz had calculated to be 237°F at the top of the fuel racks (Prelewicz at Tr. 1591). Rather it represented the most pervasive temperature in the pool under the assumed boiling condition, and is the standard number used in NRC documents as the boiling temperature for spent fuel pools (Prelewicz at Tr. 1593). Ordinarily this number would be conservative, because to the extent that a higher temperature might occur in the pool it would yield a lower k-effective (Kim Testimony at 6).

Second, Dr. Prelewicz supplied Dr. Kim with the information that the maximum steam void volume fraction at the exit of the fuel rods was 20.6% (Prelewicz at 1591-92). This was not an assumption, but a calculated number (Kim at Tr. 1508). Dr. Kim was not, however, supplied with the boiling length, that is, the length of the fuel rods over which steam voids were formed, as calculated by Dr. Prelewicz (Kim at 1509). Dr. Kim therefore made another assumption: he assumed that this maximum void fraction occurred over the entire length of the fuel rods. This was the most conservative possible assumption consistent with the data supplied

by Dr. Prelewicz (Kim Testimony at 7). Moreover, since Dr. Kim did not know the calculated boiling length, this was the only conservative assumption he could reasonably make.

The Licensing Board's Order of February 5, 1982 denying summary disposition of the criticality contention questioned the conservatism of assuming a pool water temperature of 212°F for the criticality analysis. In light of this question, Drs. Kim and Prelewicz re-examined the thermal-hydraulic assumptions that had been used in the original criticality analysis. This re-examination revealed that the original analysis had indeed been conservative: one of the thermal-hydraulic assumptions had in fact been nonconservative, but the other had been so extremely conservative as to more than offset it.

The assumption of 212°F had in fact been nonconservative, because Dr. Kim's analysis had showed that, unlike most spent fuel pools, the Big Rock pool is undermoderated and thus k-effective increases with temperature (Kim Testimony at 6; Kim at Tr. 1464-65). Dr. Kim had not known that Dr. Prelewicz had calculated a temperature of 237°F at the top of the fuel racks (Kim Testimony at 6). Conversely, Dr. Prelewicz had not known that k-effective increased with temperature at Big Rock; if so, he would have supplied the higher number (Prelewicz at Tr. 1594-95).

On the other hand, re-examination by Drs. Kim and Prelewicz of the thermal-hydraulic assumptions of the

original criticality calculations showed that Dr. Kim's assumption about the boiling length had been unnecessarily conservative. Dr. Prelewicz had calculated that boiling occurs only over the top .276 inches of the fuel length; Dr. Kim had assumed its occurrence over the entire 70-inch length of the fuel. Before this re-examination, Dr. Prelewicz had not known that Dr. Kim had assumed a boiling length of 70 inches in his criticality analysis (Prelewicz at Tr. 1581). The magnitude of the difference between the calculated one-quarter inch and the assumed 70 inches made Dr. Prelewicz conclude that the assumption had been overly conservative, that is, more conservative than necessary (Prelewicz at Tr. 1582-83).^{3/} Dr. Prelewicz recalled that there had been some surprise on the part of Dr. Kim and the project manager that the assumption had been so conservative (Tr. 1587).

3/ Intervenors attempt to cast doubt on this rather obvious conclusion by citing part of an answer given by Dr. Prelewicz at the hearing (Intervenors' Findings at 4). In the full statement, Dr. Prelewicz indicated that it was legitimate for Dr. Kim to make the assumption he had made, but that in light of the facts this assumption was overly conservative:

In doing these calculations, one usually makes conservative, simplifying assumptions. Certainly the assumption that -- the conservative assumption that Dr. Kim made of using -- and I guess perpetrated in some sense by me -- of using the maximum void fraction everywhere was a legitimate, I believe, conservative assumption.

Going to a more realistic model, I believe that the quarter of an inch is also an appropriate model, although it is less conservative than the entire channel, which I believe is in fact overly conservative.

(Tr. 1562).

Based on this re-examination of the thermal-hydraulic assumptions contained in the original criticality analysis, Drs. Prelewicz and Kim decided that it would be more appropriate to perform an analysis using the thermal-hydraulic data calculated by Dr. Prelewicz (Prelewicz at Tr. 1561; Prelewicz Testimony at 7-8). New criticality calculations were then performed using a temperature of 224.5°F, the average between 212°F and 237°F, which is the average temperature over the length of the fuel. The void fraction was calculated using a boiling length of .276 inches.

The thrust of Intervenors' argument is that use of the actual boiling length has not been shown to be appropriate, because this number was known all along and Dr. Kim's assumption about the boiling length was not considered unnecessarily conservative until after the Board's order. The implication is that Dr. Kim changed the boiling length in bad faith in order to come within the k-effective of 0.95 prescribed by NRC guidance at the higher temperature calculated by Dr. Prelewicz. But Intervenors offer no reason to believe it is inappropriate to use actual data for boiling length, temperature, or any other parameter. Moreover, the record shows that before the Board's order of February 5, 1982, neither Dr. Prelewicz nor Dr. Kim were aware of the extent of the conservatism in the assumed 70-inch boiling length. Dr. Kim did not know the actual boiling length; Dr. Prelewicz did not know that Dr. Kim had made the assumption in question.

This lack of communication between the two witnesses explains the change made in the second calculation and it dispels any notion of bad faith as asserted by Intervenors.^{4/}

Intervenors also assert that the lack of explanation they perceive for using the actual boiling length in the revised calculation of k-effective is reinforced by a confusion of responsibility in choosing the conditions for the criticality analysis (Intervenors' Proposed Findings at 5-6). They cite the decision by Drs. Kim and Prelewicz to use 224.5°F, the average temperature along the length of the fuel rods, in the revised calculation. They complain that Dr. Kim appears to depend on Dr. Prelewicz not only for the data but for the conclusions to be drawn from them (Intervenors' Proposed Findings at 5).^{5/} In fact, however, this very question was thoroughly explored on the record in Judge Shon's examination of Dr. Kim (Tr. 1521-22). Dr. Kim testified that Dr. Prelewicz had told him that temperature itself varies in a fashion linear enough to make use of the average

^{4/} Furthermore, all of the other conservative assumptions inherent in the original criticality calculations performed by Dr. Kim remain in the revised calculation, further insuring the conservatism of the overall result (Kim Testimony at 5).

^{5/} Intervenors also state "The Board order suggests that the highest temperature might be appropriate, not an average" (Proposed Findings at 5). This is a mischaracterization of the order that Intervenors have made repeatedly. Moreover, this fact was pointed out to Intervenors' Counsel by the Board Chairman when Counsel attempted to ask this very question of Dr. Prelewicz (Tr. 1554).

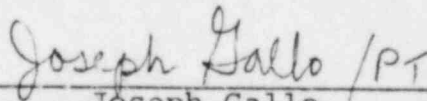
appropriate. He also testified that based on his experience with criticality analyses, reactivity varies with temperature in a fashion linear enough to make use of the average temperature appropriate (see Tr. 1525).

Intervenors have not succeeded in casting doubt on the credibility of the testimony of Drs. Kim and Prelewicz and their proposed findings offer no other basis for believing that Licensee's criticality analysis is inadequate.

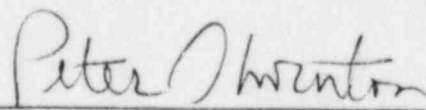
CONCLUSION

For the reasons stated herein and in "Consumers Power Company's Proposed Initial Decision On Criticality Contention", dated October 1, 1982, O'Neill Contention IIE-3 is without merit and should be dismissed.

Respectfully submitted,



Joseph Gallo



Peter Thornton
Two of the attorneys for
Consumers Power Company

ISHAM, LINCOLN & BEALE
1120 Connecticut Avenue, N.W.
Suite 840
Washington, D.C. 20036

ISHAM, LINCOLN & BEALE
Three First National Plaza
Chicago, Illinois 60602
(312) 558-7500

DATED: October 12, 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

IN THE MATTER OF)
)
CONSUMERS POWER COMPANY) Docket No. 50-155-OLA
) (Spent Fuel Pool
) Modification)
Big Rock Point Nuclear)
Power Plant)

CERTIFICATE OF SERVICE

I hereby certify that copies of CONSUMERS POWER COMPANY'S REPLY TO INTERVENORS FINDINGS OF FACT ON CRITICALITY CONTENTION were served on all persons listed below by deposit in the United States mail, first-class postage prepaid, or by Federal Express overnight delivery this 12th day of October, 1982.

Peter B. Bloch, Esquire
Administrative Judge
Atomic Safety and Licensing
Board Panel
U. S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Atomic Safety and Licensing
Appeal Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Mr. Frederick J. Shon
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Richard J. Goddard, Esquire
Counsel for NRC Staff
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Richard G. Bachmann, Esquire
Counsel for NRC Staff
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Herbert Semmel, Esquire
Urban Law Institute
Antioch School of Law
2633 16th Street, N.W.
Washington, D.C. 20555

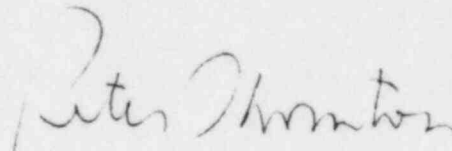
Mr. John O'Neill, II
Route 2, Box 44
Maple City, Michigan 49664

Judd Bacon, Esquire
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Ms. Christa-Maria
Route 2, Box 108C
Charlevoix, Michigan 49720

Mr. Jim Mills
Route 2, Box 108
Charlevoix, Michigan 49720

Ms. JoAnne Bier
204 Clinton
Charlevoix, Michigan 49720



Peter Thornton