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LBP-85-29

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

SERVED AUG 19 1985

ATOMIC SAFETY AND LICENSING BOARD

DOCKETED
USNRC

Before Administrative Judges:

Dr. Robert M. Lazo, Chairman
Dr. Richard F. Cole
Dr. Emmeth A. Luebke

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OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of	Docket Nos. 50-250-OLA-1 50-251-OLA-1
FLORIDA POWER AND LIGHT COMPANY	
(Turkey Point Nuclear Generating Plant, Units 3 & 4)	ASLBP No. 84-496-03 LA (Vessel Flux Reduction)
	August 16, 1985

ORDER

INTRODUCTION

Before us are two motions from the Licensee for summary disposition, two motions to strike which are related to the motions for summary disposition, and a motion from the Intervenors for suspension of the license amendments which are the occasion of this proceeding. We grant one summary disposition motion, on Contention (b), deny the other, and deny the motions to strike and the motion to suspend.

We begin with a brief account of the origin and course of this proceeding, one of three dealing with amendments to the licenses for Units 3 and 4 at Turkey Point. In the course of this account, we rule on the motions to strike, and we pay particular attention to the prehearing conference we held on the summary disposition motions to aid

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us in determining whether any genuine issues existed concerning any material fact. Though the Intervenors had supported the holding of this conference, they ultimately objected to it. We set out our reasons for holding it, and for conducting it as we did. After this account of the origin and course of this proceeding, we shall rule on the summary disposition motions and on the Intervenors' motion to suspend the amendments, which is closely tied to Intervenors' Contention (b).

HISTORY OF THIS PROCEEDING

By letters dated August 19, 1983 and September 9, 1983, the Licensee requested amendments to the technical specifications of Licenses DPR-31 and DPR-41, to support the Licensee's program for reduction of neutron bombardment (vessel flux), and consequent embrittlement, of the pressure vessel walls, and to remove restrictions imposed when the Licensee was operating with steam generators having a larger number of plugged tubes than the steam generators which the Licensee is now using.

Notice of the proposed amendments was published in the Federal Register on October 7, 1983. 48 Fed. Reg. 45,862-63. In response to the notice, the Center for Nuclear Responsibility (CNR) and Joette Lorion filed a joint petition to intervene. The NRC Staff (the Staff) issued the amendments on December 23, 1983, stating that the amendments posed no significant hazards and therefore, under 10 C.F.R.

§ 50.91(a)(4), could be issued without a hearing on the contentions filed by the Intervenors.

The Intervenors filed an amended petition on January 25, 1984. We ruled on the contentions filed then, and on other matters, in our May 16, 1984 Order. We admitted only Contentions (b) and (d), each of which is now the subject of a motion from the Licensee for summary disposition. Contention (b) alleges shortcomings in one of the computer models which, when functioning together, yield predictions of the temperature of the hottest rod in a reactor core during reflood of the core after a loss of coolant accident (LOCA). Contention (d) alleges that under the amendments there is an increase in the probability that films of steam will form around the fuel rods during normal operation and certain abnormal occurrences other than LOCAs. Such films reduce transfer of heat away from the rods. The chief concern of both contentions is that operation under the amendments not increase the risk that the integrity of the cladding of the fuel could be threatened.

The Licensee filed motions for summary disposition on August 10, 1984. Along with the motions, the Licensee also submitted a memorandum of law, statements of material facts as to which the Licensee contended that no genuine issues existed (required by 10 C.F.R. § 2.749(a)), and affidavits from Mark J. Parvin and Edward A. Dzenis, both of Westinghouse Electric Corporation (Westinghouse). Mr. Parvin, whose affidavit is in support of summary disposition of Contention (b), is

senior engineer in the Reload Safeguards Analysis Group of the Nuclear Safety Department in the Nuclear Technology Division of Westinghouse. His professional work has included analyses of LOCAs and preparation of computer code input data for these analyses. Mr. Dzenis, whose affidavit is in support of summary disposition of Contention (d), is Manager of Thermal and Hydraulics Design for the Nuclear Fuel Division of Westinghouse. His principal professional work is management of thermal-hydraulic analysis of fuel for pressurized water reactors (PWRs) which are supplied by Westinghouse. The PWRs at Turkey Point are Westinghouse reactors.

On September 4, 1984, the Staff filed responses in support of the motions. The responses were accompanied by affidavits from Summer B. Sun, on Contention (b), and Yi-Hsiung Hsii, on Contention (d). Both Dr. Sun and Dr. Hsii are nuclear engineers in the Core Performance Branch of the Division of Systems Integration, Office of Nuclear Reactor Regulation of the Nuclear Regulatory Commission. Dr. Sun's professional work includes review of models of core thermal-hydraulic behavior during LOCAs and other abnormal occurrences. Dr. Hsii's work includes technical review of safety evaluation reports and methodological topical reports submitted by applicants and licensees.

On September 4, 1984, the Intervenors responded in opposition to the motions and submitted affidavits from Joette Lorion -- who is one of the Intervenors and Research Director of CNR, which is the other

Intervenor -- and Dr. Gordon D. J. Edwards, President of the Canadian Coalition for Nuclear Responsibility and Professor of Mathematics and Science at Vanier College, Montreal, Canada. Both affiants spoke to both Contentions. The opponent of a motion for summary disposition is required by 10 C.F.R. § 2.749(a) to submit a statement of material facts as to which the opponent contends there exists a genuine issue. The Intervenors did not submit such a statement.

THE MOTIONS TO STRIKE

On September 21, 1984, the Licensee filed a motion to strike both the Intervenors' response and the accompanying affidavits. The Licensee argued that the response should be struck because it was not accompanied by statements of material facts as to which it was contented that no genuine issue existed. Licensee's Motion to Strike at 9-10. The affidavits should either be struck, or the facts as asserted by the Licensee deemed admitted as true, the Licensee argued, because the Intervenors had not met the burden, imposed by 10 C.F.R. § 2.749(b), of showing affirmatively in the affidavits that the affiants were competent to testify to the matters stated in the affidavits. The Licensee cited cases indicating that such competence was to be shown by education or experience which gave the affiant some special knowledge or skill germane to the matters discussed in the affidavits, and that neither a well-informed layperson's general familiarity with issues surrounding nuclear power, nor expertise in an unrelated field of science or

engineering, was sufficient proof of an affiant's competence. Id. at 3-4. The Licensee argued that affiant Lorion, despite her title of Research Director, had no more than a layperson's knowledge of the issues in the proceeding (id. at 4-7), and that Dr. Edwards, though a mathematician, had not shown that he had an expert's knowledge of computer modeling of the behavior of a reactor core (id. at 7-9). The Licensee also argued that some of Dr. Edward's statements amounted to attacks on some of the Commission's regulations and should be struck for that reason alone. Id. at 10-12.

The Staff responded on October 9, 1983, largely in support of the Licensee's motion to strike, though granting Ms. Lorion a general familiarity with nuclear issues, and construing Dr. Edward's statement that as an applied mathematician he had been keenly interested in mathematical modeling to mean that he had expertise in such modeling. See Edwards' Affidavit, Exhibit A at 3; Staff's Response at 6-7.

On October 12, 1983, the Intervenors responded to the Licensee's motion to strike with, among other things, their own motion to strike the Licensee's motion to strike. The Licensee responded to the Intervenors' motion to strike on October 17, 1983. The Intervenors construed the Licensee's motion to strike as an unauthorized reply to the Intervenor's answer to the Licensee's motions for summary

disposition.[1] We, however, construe the Licensee's motion to strike differently. It does not address, as a reply would, the merits of the Intervenors' arguments against summary disposition. Rather, it confines itself to the procedural sufficiency of the Intervenors' response and affidavits. The Licensee's motion to strike is simply that, a motion to strike, and thus is to be either granted or denied, but not stricken. We therefore deny the Intervenors' motion to strike the Licensee's motion to strike, and go on to consider the merits of the Licensee's motion to strike.

In their response to the Licensee's motion to strike, the Intervenors make only oblique defenses of their affiants' competence to testify to the matters they discuss in their affidavits. In defense of Ms. Lorion's qualifications, for instance, the Intervenors appear to concede the Licensee's point. "... Joette Lorion has not represented herself to be an expert witness in the nuclear field ...." Intervenors' Response to Licensee's Motion to Strike at 4. Nonetheless -- or rather, somehow therefore -- the Intervenors conclude (using a wonderfully self-illustrating phrase) that "a finding by this Board that she is unqualified would be inappropriate and superfluously redundant." Id.

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[1] The Intervenors apparently are relying on 10 C.F.R. § 2.730(c), which says, among other things, that "the moving party shall have no right to reply, except as permitted by the presiding officer or certain other officers of the Commission."

at 5. The Intervenors also say that the affiants "have had no fair opportunity to defend their professional qualifications." Id. at 3. Yet the Licensee's motion to strike provides just such an opportunity.[2]

We nonetheless deny the Licensee's motion to strike. We deny it as it applies to the Intervenors' affidavits in opposition to the motions for summary disposition. We are inclined to think that in a proceeding where safety is at stake, a motion to strike a filing and affidavits on summary disposition is most useful when it is directed at a proponent of a motion for summary disposition who puts forward, on the basis of questionable competence, technical arguments before a judicial panel wholly unprepared by education or experience to distinguish competence in technical matters from incompetence in the same. In such a situation, without the motion to strike, safety may receive less than its due.

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[2]The Intervenors also make a general defense of their response to the motions for summary disposition. They argue that, simply by having admitted Contention (b), "the Board has already acknowledged that the Intervenors have raised a substantial issue of material fact suitable for disposition at hearing." Id. at 2. Such a view of the legal significance of the admission of a contention leaves no room for summary disposition.

Here, however, the context of the motion to strike is quite different. First, it is the opponent of summary disposition who puts forth the challenged affidavits. If on the strength of the opponent's representations, the motion for summary disposition is denied, the proponent still has a chance at hearing to persuade the judges that his case is sound. Second, the challenged filings consist, in most telling part, of claims quoted and paraphrased from technically competent Staff discussions, and we found the Intervenors' emphasis on those discussions helpful as a starting point for our coming to a fuller understanding of the technical questions raised by the parties' filings. Last, the members of this Board are, by both education and experience, together competent in several fields related to nuclear power. Denial of the motion in no way compromises safety, and the proponent of the motion can at the hearing challenge the competence of the opponents' witnesses under the more rigorous rules applicable where an evidentiary record is being built.

We also deny the Licensee's motion to strike as it applies to the Intervenors' response to the motions for summary disposition. As the Staff points out (Staff's Response to Licensee' Motion to Strike at 3 n.2), under 10 C.F.R. § 2.749(a), the Intervenors' failure to file statements of the material facts as to which the Intervenors contend there exist genuine issues is grounds not for striking the Intervenors' response, but for deeming as admitted the facts as set forth in the Licensee's statement of material facts as to which the Licensee contends

no genuine issues exist. Finally, though we grant that some of Dr. Edwards' statements in his affidavit can be read as attacks on some of the Commission's regulations, we construe those statements another way in our discussion of Contention (b).

THE PREHEARING CONFERENCE ON MARCH 26, 1985

We found the pleadings and the rest of the written record insufficiently informative for a determination of whether there existed genuine issues about material facts. We therefore called, on February 8, 1985, for a prehearing conference to be held on March 26, 1985, and we ordered that the Licensee be prepared to make didactic presentations in response to issues raised in the parties' filings. In the February 8 Order, we listed, as examples, several such issues.

On February 19, 1985, the Licensee filed a motion calling upon us to clarify or reconsider our decision to hold a prehearing conference on the summary disposition motions. The Licensee claimed such a conference would provide opportunity for testimony that the other parties might regard as unfairly surprising. Motion for Reconsideration at 7. The Licensee noted that the Commission's regulations consistently speak of summary disposition as judgment on the pleadings, and make no mention of oral testimony as a basis for summary disposition. Id. at 3-4. Although the Licensee recognized that there were federal court cases in which oral testimony had, at the discretion of the judge, been given on

summary disposition, the Licensee nevertheless argued that this discretionary power was derived from a rule of federal civil procedure for which there was no analogue in the Commission's regulations. Id. at 5.

Since the Licensee thought that the pleadings supported summary disposition, the Licensee would have preferred a judgment on the pleadings alone. Id. at 9. As next best, the Licensee wanted us to put our questions in writing and order that the answers likewise be in writing. Id. at 7-8. The Licensee suggested that even if we decided to take oral testimony, we nonetheless use written questions -- to avoid surprise and to limit the scope of the additional material to the question of whether a genuine issue existed about a material fact -- and give the other parties an opportunity to examine the witnesses. Id. at 8.

The Intervenors responded on February 25 to the Licensee's motion for clarification or reconsideration. Noting the existence of federal court cases in which oral testimony had been taken on summary disposition motions, the Intervenors supported holding the prehearing conference we had proposed, on condition that testimony taken at it was limited to the question of whether a genuine issue existed, and that other parties were permitted to examine the witnesses. The Intervenors also said that they should be given an opportunity after the conference to rebut elements of the Licensee's presentation.

The Staff responded to the Licensee's motion for clarification and reconsideration on March 6, 1985. The Staff argued that although no regulation explicitly permitted oral testimony on summary disposition, neither did any regulation explicitly prohibit such testimony, and that a licensing board did have the power to request additional information where it believed that the existing record was insufficient to allow summary disposition. Staff's Response to Licensee's Motion for Reconsideration at 3 (citing Cleveland Electric Illuminating Co. (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 752 (1977)).[3] The Staff also pointed out that there had been other boards which had heard oral testimony on motions filed outside of a hearing. Id. at 3 n.2 (citing Pacific Gas & Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-756, 18 NRC 1340, 1343 (1983) (Appeal Board heard oral testimony and cross-examination on motion to reopen the record)).

The Staff agreed with the Licensee that caution had to be exercised, to "avoid a lengthy trial for the purpose of establishing that an actual trial is necessary." Id. at 4, (quoting 6 J. Moore, W. Taggart & J. Wicker, Moore's Federal Practice, ¶ 56.11[1.6]). The Staff

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[3]The Staff could have cited also 10 C.F.R. § 2.749(b), which empowers the board to "permit affidavits to be supplemented or opposed by deposition, answers to interrogatories or further affidavits," essentially the means the Licensee proposed of supplementing the record.

even suggested that one proper course for us was simply to deny the motions for summary disposition, a solution we believed to be more in keeping with the letter of the law on the Licensee's burden of proof than with the spirit of the summary disposition rules, which seek to avoid needless litigation.

The Staff nonetheless saw that permitting only written additions to the record, as the Licensee had suggested, would "deprive the Board of an opportunity to pursue fully questions to determine whether there was a genuine issue of material fact." Id. at 6. The Staff echoed the other parties' call for an opportunity to examine the Licensee's witnesses, and the Intervenor's call for a later opportunity to rebut. Id.

On March 14, 1985, we affirmed by written order our intention to hold the prehearing conference, having determined that under federal court practice and NRC law we had a discretionary power to hear oral testimony on summary disposition motions. We declared unfounded the parties' concern that we would permit unfair surprise. We said that it was manifestly evident that if the Licensee was presented with an additional opportunity to meet its burden on the motions for summary disposition through oral testimony, the other parties would be given an opportunity to respond or rebut. We also clarified what areas we were interested in pursuing and affirmed that oral testimony would be used

solely to determine whether any genuine issues about material facts existed concerning Contentions (b) and (d).

The prehearing conference was held, as scheduled, on March 26, 1985. The Licensee's affiants, Messers. Parvin and Dzenis, and Licensee's witness Michael Y. Young, Manager of the Thermal Hydraulic Applications Group in the Nuclear Safety Department of Westinghouse Corporation, gave didactic presentations on computer modelings of the thermal-hydraulic behavior of the core during reflood after a LOCA, and on how the steam which is formed in primary coolant during normal operation behaves. Each affiant then responded to issues the filings raised in his area of expertise, both the issues we had listed in our order establishing the conference and other issues of which the ones we had listed were examples.

About half way through the conference, Intervenors began to object to the procedure. Tr. 152. At the point of the Intervenors' objection, the Licensee had completed his didactic presentation on Contention (b), and his response to the issues Ms. Lorion's affidavit had raised in connection with Contention (b), and had just begun to respond to issues raised in Dr. Edwards' affidavit. Apparently, the immediate occasion of the Intervenors' objection was that the Licensee had responded to two issues raised by Dr. Edwards that we had not listed in our order establishing the conference (see Tr. 156), though they were, clearly enough, the sorts of issues of which the ones we had listed we had said

were examples. See February 2, 1985 Order. However, as the Intervenors' explanation of their objection took shape, it was clear that the objection was quite broad. They charged that the prehearing conference in fact amounted to a hearing in which the evidence presented had been one-sided and had gone beyond the scope of any question the Board had proposed (Intervenors' April 18, 1985 Comment on Prehearing Procedure at 1 (emphasis supplied)), that the Utility had been in control, presenting evidence on the merits of the contentions, going down lists of the Intervenors' concerns, and providing no opportunity for cross-examination; the Intervenors claimed that the Board should have been asking all the questions during the conference, and confining the answers to the general issue of whether a genuine issue existed about any material fact. Tr. 154-55.

The Intervenors' objections during the conference culminated in, first, a refusal to avail themselves of the opportunity we gave them, as promised, to cross-examine the Licensee's witnesses (Tr. 170-71), and, then, in a motion to strike all the testimony offered at the conference, whether didactic or not, and whether in response to the issues we had explicitly raised or not. Tr. 207-08. The Intervenors also asserted that only if we denied their motion to strike would they avail themselves of the opportunity we had promised them to rebut the testimony given at the conference. Tr. 212. They claimed that either to cross-examine or rebut during the conference was inappropriate, for

it only contributed to turning the conference into an evidentiary hearing. Tr. 171, 203.

We denied the Intervenors' motion to strike the testimony received in the prehearing conference. Tr. 214. We were convinced that there had been no significant departure from the original aim of the prehearing conference, and no defect in fairness toward any party. In retrospect, we could see that some of the testimony appeared to go to the merits, rather than merely to the question of whether a genuine issue existed, and we have pointed out such testimony in our ruling on Contention (b). But we see here nothing which warrants the Intervenors' quite broad motion to strike. Less all-encompassing motions might have been appropriate. Apparently, however, the Intervenors did not want to make such discriminating motions. At no time have they pointed out what portions of the testimony they thought spoke to the merits, and, indeed, they appeared to be confident in our ability to discern such portions, for, despite their motion to strike, they proposed that "the Board take judicial notice and consider in an informal way this presentation by the Licensee; but that this testimony not come in for its truth... . But make no mistake about it, we ask it all be stricken." Tr. at 207-08.

We gave the parties fair warning about the issues we wanted treated in the conference: we listed several in the original order establishing the conference, calling them examples; we made clear both in that order and in the order affirming our decision to hold the conference that we

were asking the Licensee to be prepared to respond didactically to all the issues raised in the Intervenors' affidavits, not just the few we had listed by page or paragraph number in the earlier order. We made equally clear, both before and during the conference, that the Staff and the Intervenors could cross-examine and rebut the Licensee's testimony. Tr. 170-71, 202-03. Indeed, we gave the Intervenors three weeks in which to respond to that testimony (Tr. 215) and made sure they understood the risk they ran if they did not respond. Tr. 202-03. By a filing dated April 18, two days after the end of the three weeks, the Intervenors announced that they would "not further dignify the procedure by submitting rebuttal or other testimony." In the same filing, they also asserted that "the net effect of the Prehearing Conference has been to firmly establish that there are substantial disputed issues of material fact at issue regarding both Contentions (b) and (d)." Which issues they did not say.

STANDARDS FOR SUMMARY DISPOSITION

By and large, licensing boards, when considering motions for summary disposition under 10 C.F.R. § 2.749, will apply the standards established by the courts for considering motions for summary judgment under Rule 56 of the Federal Rules of Civil Procedure. Alabama Power Co. (Joseph M Farley Nuclear Plant, Units 1 and 2), ALAB-182, 7 AEC 210, 217 (1974). Summary disposition is available in hearings on amendments to licenses. Boston Edison Co. (Pilgrim Nuclear Station,

Unit 1), ALAB-191, 7 AEC 417 (1974). A motion for summary disposition will be granted when the record shows that there is no genuine issue as to any material fact, and that the moving party is entitled to a favorable decision as a matter of law. 10 C.F.R. § 2.749(d). The record must be viewed in the light most favorable to the party opposing the motion. See Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), LBP-74-36, 7 AEC 877, 897 (1974) (citing federal court cases). The failure of the party opposing summary disposition to submit evidence against the disposition does not require that the motion be granted. The movant must still meet his burden of proof to establish the absence of any genuine issue of material fact. Cleveland Electric Illuminating Co. et al. (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 753-54 (1977).

CONTENTION (b)

Paraphrased without technical language, the Intervenors' Contention (b) says that the computer model used to make the most recent prediction of the temperature of the hottest spot on the hottest rod in the core after a loss of cooling accident (LOCA) during reflood of the core doesn't meet the NRC regulations applicable to such models, that, in particular, the model does not adequately consider the effect even a slight decrease in the rate of reflooding can have on the temperature of the hottest spot in the core.

Certain aspects of the actual text of the contention, and of the Intervenors' response to the motion for summary disposition of the contention, will be clearer if we first set out some technical matters.

General Design Criterion 10 (GDC 10) requires that

> The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

10 C.F.R. Part 50, App. A.

The "fuel design limit" relevant under this contention is the temperature at which the integrity of the cladding of the fuel is seriously threatened. The "anticipated operational occurrence" relevant under this contention is a LOCA. The "appropriate margin" GDC 10 calls for in this case is established by 10 C.F.R. § 50.46(b)(1), "Peak cladding temperature" [PCT]. "The calculated maximum fuel element cladding temperature shall not exceed 2200° F." The PCT is not to be an average drawn from all the peaks on all the rods in the core, or even from all the peaks on a single rod. Rather the PCT is to be the temperature of the hottest region on the hottest rod in the core after a LOCA. 39 Fed. Reg. 1001, January 4, 1974. The cladding of the fuel in Units 3 and 4 at Turkey point does not become embrittled until its temperature is somewhere between 2500° and 2700° F. Tr. 132-133. Thus

the 2200° limit established by § 50.46(b)(1) entails a safety margin of at least somewhere between 300° and 500°.

Before the amendments which are at issue in this proceeding could be issued, the Licensee had to show that the PCT in Units 3 and 4 under the operating limits to be imposed by the amendments would not exceed 2200° F. Usually a calculation of a PCT requires the use of several models, each one specializing in a different aspect of the behavior of core and coolant after a LOCA. One model will calculate the rate at which the emergency core cooling system refloods the core; another model, with reflood rates as input, will calculate certain numerical variables which specify heat transfer from the rods to steam from the water flowing in from the emergency core cooling system (ECCS). Yet another model will use these heat transfer coefficients as input for calculations of PCTs. The NRC requires that these models conform to the criteria in Appendix K of 10 C.F.R. Part 50. 10 C.F.R. § 50.46(a)(1).

The Licensee used two models to calculate heat transfer coefficients. The oldest of the two, the Full Length Emergency Cooling Heat Transfer (FLECHT) was accepted for use by the NRC at least as early as 1974. See 39 Fed. Reg. 1003, January 4, 1974. FLECHT is simply an equation which expresses a correlation of data points determined by experiment. The other model, "BART-A1: Computer Code for the Best Estimate Analysis of Reflood Transients" (BART), relies on principles of engineering rather than correlations based solely on experiment.

Tr. 111-13. On December 21, 1983, the NRC Staff accepted BART as being in conformity with Appendix K when applied under certain conditions, which included, most important among others, a certain range of operation of the core, a maximum on the distance between cladding points modeled, and a prohibition against the use of a grid-spacer model as part of the BART model. See Staff's Safety Evaluation Report on BART (BART SER), Dec. 21, 1983, at 16. The range of operation of the core was generous enough to include even the possibility of blockage of reflood by swollen or ruptured cladding. Id. at 9-10, 14-15. The Staff judged that the accuracy of the grid spacer model was not yet established. Id. at 9. Inclusion of the model would probably have lowered the calculated PCT, because the grid spacers can be expected to contribute to the transfer of heat from the core to the coolant. Id.

Applied under the conditions imposed by the Staff, BART, in conjunction with several other models -- most particularly LOCTA, which performs the actual calculation of the PCT -- yielded a predicted PCT of 1972° F., 228° under the regulatory limit of 2200° F. Parvin Affidavit, ¶ 5.

The Licensee revised the prediction upward to 2051° F. when it was discovered that there existed a less than adequate connection between BART and the model which predicted the rates of reflood of the core. That rate varies, though not widely. Thus, a curve which charted that rate as a function of time would be gently rolling. The area under the

curve would represent the total amount of water which had entered the core from the ECCS. However, a curve constructed from a small sample of points on the complete curve could miss some of the low points on the complete curve and thus, by overestimating the amount of water in the core, overestimate the amount of steam available for cooling, and, in turn, underestimate the PCT. Letter from E. P. Rahe (Westinghouse) to D. G. Eisenhut (NRC), March 22, 1985.

The Licensee has strengthened the connection between BART and the model which calculates reflood rates, WREFLOOD, so that the input to BART on rates of reflood matches the information available from WREFLOOD on rate of reflood, and so that the total amount of coolant in the core as calculated by BART from rate information equals the total amount of coolant as calculated by WREFLOOD. Id. The Staff has reviewed the Licensee's modifications and has revised accordingly its safety evaluations of the BART model and the amendments at issue here, but concludes anew that the BART model meets the criteria of Appendix K.[4]

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[4]By letter dated March 18, counsel for the Licensee informed us that on March 9 Westinghouse had discovered, in work unrelated to Units 3 and 4, that shortcomings in the procedures for transferring information from WREFLOOD to BART would entail an increase in the PCT predicted with BART. The Licensee's letter to us only briefly described the shortcomings in the procedures and could say about the revised PCT only that it would be less than the 2200° limit imposed by regulation. On March 22, Westinghouse gave the Staff a full account of the

(Footnote Continued)

Board Notification BN-85-055, May 16, 1985. This revision is the principal subject of the Intervenor's motion for suspension of the license amendments and will be considered by us again when we rule on that motion.

Sometime in 1983, the Staff asked the Licensee to calculate the PCT for Units 3 and 4 by using the older model of heat transfer coefficients, FLECHT. Staff Safety Evaluation Report on Amendment 99 to DPR-31 and Amendment 93 to DPR-41 (SER on amendments), May 14, 1985, at 5-6. The Licensee did so, and on December 17, 1983, submitted for Staff review a FLECHT-based PCT of 2130° F., higher than the modified BART figure, but still under the regulatory limit of 2200°. Id. at 6. Thus,

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(Footnote Continued)
shortcomings in the procedures and of how the shortcomings had been corrected, and reported that the revised PCT was 2051° F., to which, again, 10° was to be added during the period of transition between fuel types. During the prehearing conference on summary disposition, Westinghouse witnesses largely repeated what Westinghouse had told the Staff on March 22. Tr. 124-30. The Staff volunteered that it would be appropriate for the Staff to provide the Board and the parties with its review of the information given it by Westinghouse, and we ordered that the Staff do so within two weeks of the conference. Tr. 204-05, 218-19. On April 10 the Staff submitted an affidavit from Summer B. Sun, whose qualifications we have noted, and Norman Lauben. Mr. Lauben is a Section Leader in the Reactor Systems Branch of the Division of Systems Integration of the NRC. He supervises the review of transient and accident analyses and analytical methods submitted by vendors and utilities. The affidavit reviewed the information Westinghouse had given the Staff on March 22, the related testimony the Westinghouse witnesses gave at the prehearing conference, and the affidavit Mr. Sun had submitted in response to the Licensee's motion for summary disposition of Contention (b). On May 16, 1985, in Board Notification BN-85-055, the Staff provided us with the revised safety evaluations of BART and the amendments at issue here.

although the figure calculated using BART was sufficient to meet the 2200° limit, it was not necessary. The Licensee could have met the limit using FLECHT alone. This fact is crucial to our disposition of the motion for summary disposition of this contention.

One small, short-term, adjustment has had to be made in these two figures, the 2051° predicted with BART and the 2130° predicted with FLECHT. The Licensee's principal way of preventing embrittlement of the reactor vessel by neutron bombardment has been to replace part of the low-parasitic (LOPAR) fuel in the core with optimized fuel assembly (OFA) regions at each re-loading of the core. Eventually the cores in Units 3 and 4 will consist wholly of OFA fuel, but for the next few years, the cores will contain a mixture of the two kinds of fuel. The PCTs calculated with BART and FLECHT are applicable to either kind of fuel, but not, without adjustment, to a core containing a mixture of the two.

Experimental work on full-size fuel assemblies of OFA fuel have shown that the OFA fuel causes a 4.5% greater resistance to the passage of fluids than does the LOPAR fuel. Tr. 115. This increased resistance, called hydraulic resistance, can affect the efficiency with which steam from the water flowing into the core after a LOCA cools the core. Engineering equations applied to the 4.5% figure for the increase in hydraulic resistance show that the velocity of steam going past a single OFA fuel rod surrounded by LOPAR fuel is reduced by 2.2% from

what it would be were it surrounded by OFA fuel. Tr. 116. The reduction comes about because steam, following the path of least resistance, crosses over from the single OFA element to the LOPAR fuel, where the hydraulic resistance is less. Tr. 115. No single OFA fuel rod in Units 3 and 4 Turkey Point will be surrounded by LOPAR elements at any time during the transition between the two kinds of fuel, but on the conservative assumption that every OFA rod in Units 3 and 4 is surrounded by LOPAR rods, as was assumed in calculating the 2.2% reduction in velocity (Tr. 117, 123-24), then the predicted PCT for Units 3 and 4 must be increased by not more than 10° F. Parvin Affidavit, ¶ 5.

This 10° was calculated in the following way: mathematical modeling of a three-loop plant like Units 3 and 4 shows that a 5% reduction in the velocity of steam during reflood entails an increase in the PCT of not more than 19°. Tr. 116. A 2.2% reduction, therefore, entails a proportionately smaller increase in the PCT, namely, 8.4°, which the Licensee and the Staff are treating as 10°. Tr. 116-17. This increase applies to both the PCT as predicted with BART, and the PCT as predicted with FLECHT, despite the difference in the two predictions, for the 10° is derived by simple proportion from the ratio of 5% to 19°, and thus does not depend upon the temperature to which it is being added.

Therefore, for the period of the transition between types of fuel, the PCT predicted with BART is 2051° F. + 10° F., or 2061° F., and the PCT predicted with FLECHT is 2130° F. + 10° F., or 2140° F. Both predictions fall within the limit set out in 10 C.F.R. § 50.46(b)(1).

Now we have set out sufficient technical and regulatory background for understanding the Contention and the Intervenor's response to the motion for summary disposition. The Contention is as follows:

> Whether the entirely new computer model used by the utility, for calculating reflood portions of accidents meets the Commission's ECCS Acceptance Criteria; specifically, whether a 2.2% reduction in re-flood rate is misleading because for a small decrease in re-flood rate, there results a large increase in fuel temperature. Re-flood rates are critical if below 1 or 2 inches per minutes.

It will be immediately seen that the contention was drafted without a full picture of BART's uses, or the meaning of the 2.2% reduction. The Contention thus contains certain errors of fact which render it incapable of raising any genuine issue of fact.

First, there is no basis for the claim in the Contention that BART is "entirely new." Of course, BART is in some sense new, but many of its parts are old. The Staff repeatedly says in its safety evaluation

of BART that this or that sub-model within BART is "conventional," or "typical." See e.g., §§ 2.1, 2.2.2., 2.4.[5]

Second, and more important, the 2.2% reduction is not in the rate of reflood, but in the velocity of steam passing by OFA fuel assemblies; it is a reduction only for the relatively short period of the transition from one fuel type to another; and BART had nothing to do with calculating either the 2.2% or the 10° increase the 2.2% entails in the PCTs predicted with the aid of BART and FLECHT. As we reported, the 2.2% is the result of experiment and calculation exclusive of BART, and the 10° follows from a simple proportion. Thus, insofar as one specific concern of the Contention is that BART may not be taking adequate account of the 2.2% reduction, the concern is misplaced, for not only is the reduction not in reflood, neither BART nor FLECHT should take into account the reduction. The Intervenors have taken no issue with the way in which either the 2.2% or the 10° was derived.

Last, and most important, the Contention says nothing about the fact that the Licensee used FLECHT to predict a PCT that falls within the 2200° established by § 50.46(b)(1). Dr. Edwards, in his affidavit in response to the motion for summary disposition, does mention FLECHT,

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[5]The language of the Contention is general enough to permit one to think that the drafter thought that BART, all by itself, modeled reflood. As we have noted above, it does not.

not to argue any defect in FLECHT itself, though, but rather to argue that, given the uncertainties of mathematical modeling, it is a matter of political judgement whether the 2140° predicted with the help of FLECHT, and adjusted for the transition core, can be said to fall within the 2200° limit. Edwards Affidavit at 7, ¶ 9(e). Both the Staff and the Licensee construe Dr. Edwards' argument to be, in effect, an attack on the 2200° limit (Licensee's Motion to Strike at 10-11, Staff's Response to Licensee's Motion to Strike at 9-10); but, construing the argument in the most favorable light, we view it as kin to a question we asked during the prehearing conference on March 26: whether the figures the models had predicted for the PCTs were significant to the four places being quoted us, or rather whether the 2130°, for instance, ought to be rounded off to 2200°. Tr. 130. More generally, we asked whether there was an error band of so many percent associated with the predicted PCTs. Tr. 131-32. The reply was that the models provide four figures, that the Staff required that the predictions be rounded off to the nearest 10°, and that the figures we were shown were upper bounds, that realistic estimates which would be lower. Id. The Intervenors have not seen fit to raise any doubts about this reply to our questions, and ourselves seeing no doubt to be raised, we must conclude that the Intervenors have raised no genuine issue about FLECHT, or about whether the PCT predicted with FLECHT meets the 2200° standard.

Therefore, whatever may be the Intervenors' concerns about the adequacy of BART, as long as the Licensee has met the standard in

§ 50.46(b)(1) using a heat transfer correlation which the Staff has long accepted, and whose conformity to the criteria in Appendix K of Part 50 is not in dispute in this proceeding, we are obliged to grant the Licensee's motion for summary disposition of Contention (b).

We are left then with the Intervenors' criticisms of BART. Before the legal significance of the Licensee's having used FLECHT was clear to us, the concerns the Intervenors had raised about BART seemed to us to be the most important aspect of the litigation of the Contention, and it was largely to find out whether these concerns raised any genuine issues about material facts that we asked the Licensee to make a didactic presentation on March 26. Therefore, it is fitting that, rather than dismiss the Intervenors' concerns simply with the observation that the Licensee has complied with the relevant legal standards, we make brief comments about the chief of these concerns.

Some of the Intervenors' comments about BART are simply general cautions about the uncertainties of computer modeling. See, e.g., Edwards Affidavit at 4, ¶ 7. We have taken note of those cautions and shall not further address them. Of the more than a dozen specific comments, most either misrepresent facts, or expect BART to do what only other codes or equations are to do, or seek to have imposed on BART burdens not imposed by law. A few of the claims appear to raise genuine issues, especially if we apply the rule that the record and affidavits are to be viewed in the light most favorable to the party opposing the

motion. But since the Licensee has used FLECHT to predict a PCT which complies with the standard in § 50.46(b)(1), the few issues raised are not material and therefore do not justify the holding of an evidentiary hearing. We begin with those comments which raise no genuine issue.

1. "... [T]he small break LOCA analysis did not give much weight to the mixed fuel core." Lorion Affidavit at 4; see also id. at 5, item "e".

Most of the Intervenors' attempts to raise genuine issues paraphrase or quote from the Staff's safety evaluation of BART, and this attempt quoted above purports to have the same source. However, the Intervenors' affiants never cite the Staff's evaluation by page, and we have been unable to find what Ms. Lorion is paraphrasing or quoting in the sentence above. Whatever her source, it is the task not of BART, but of other codes, to do small break LOCA analysis. Tr. 135; SER on Amendments, § 4.3. Moreover, we do not know quite what "much weight" might mean here, nor why it is important that the small break analysis did not give much weight to the mixed core.

2. "BART does not have a gap heat transfer model or cladding swelling model as required by Appendix K." Lorion Affidavit at 4; see also Edwards Affidavit at 6-7.

This sentence is simply a quotation from § 3.0 of the Staff's SER on BART at 13. As the sentence says, Appendix K requires both a gap heat transfer model and a cladding swelling model. See 10 C.F.R. Part 50, Appendix K, §§ A.1 and B. But the Appendix does not require that BART contain these models. They are, in fact, contained in LOCTA, the model which makes the ultimate calculations of PCTs. Tr. 135. Moreover, BART does reckon with the consequences of flow blockage caused by cladding swelling, bowing, and other phenomena. Tr. 159-160. Dr. Edwards implies, without citation to any document, that BART deals with such phenomena "simply by assigning a 'numerical penalty.'" Edwards Affidavit at 7. The Licensee, however, reports that the penalty is calculated. Tr. 160-61.

3. "Bart was accepted without a grid spacer model because it was still being reviewed by the NRC staff." Lorion Affidavit at 4.

As we reported above, it was the Staff's judgment that the accuracy of the grid spacer model for OFA fuel had not been established, and that therefore the grid spacer model should, for the time being, not be included in BART. However, as we also reported above, this exclusion only makes BART more conservative since the grid spacers increase the transfer of heat away from the rods. See BART SER, § 2.6. The Licensee's predicted PCIs are doubly conservative, in fact, for they do take account of the grid spacers in one way: Those spacers are largely responsible for the 4.5% increase in hydraulic resistance during the

transition between fuel types, an increase which entails a 10° increase in the PCTs for the transition. Thus the PCTs for the transition reflect a penalty for the increased hydraulic resistance caused by the grid spacers, but the PCTs do not reflect a credit for the increased heat transfer caused by the spacers. Tr. 137-38.

4. "The Flecht Seasta [sic: FLECHT-SEASET] data comparison were [sic] from a series of tests conducted on fuel rods in a 17 X 17 assembly and extrapolated to a 15 X 15 assembly." Lorion Affidavit at 4.

Part of this sentence is drawn from § 2.7.4 of the BART SER. That section says nothing about "extrapolation," a word more appropriate to prediction than to data comparison. The FLECHT-SEASET data were not used by BART to predict heat transfer coefficients for a 15 X 15 assembly. Rather, BART's results for a 15 X 15 assembly were compared to the FLECHT-SEASET results for a 17 X 17 assembly. BART's results were also compared to other test results for 17 X 17 assemblies. See BART SER § 2.7.2. The Intervenors do not say why such comparisons should not be made, or why, among the comparisons made with results for 17 X 17 assemblies, they chose to single out the comparisons with the FLECHT-SEASET data. We note that the BART results were also compared with FLECHT data for 15 X 15 assemblies. See BART SER § 2.7.1 at 10; see also Tr. 141.

The following concerns of the Intervenors are not drawn, as far as we can tell, from the Staff's SER on BART.

5. "Bart does not address or compute the probability that steam generator tube failure and steam binding could stall the reflood." Lorion Affidavit at 5.

6. "BART does not compute the possibility or consequences of gross pressure vessel rupture." Id.

7. "BART does not take into account the aging to the system and components at Turkey Point." Id.

The Licensee reports that its predictions of PCTs do in fact account for steam binding, but that -- and we agree -- Appendix K, which sets the standards for evaluation models of the phenomena which determine PCTs, does not require that such models take into account the other factors mentioned in the three sentences quoted above.

8. "BART has not conducted actual experiments on a mixed transitional fuel core, and instead adopts a purely hypothetical percentage for thermal hydraulic resistance." Lorion Affidavit at 5; see also Edwards Affidavit at 6, ¶ 9(b).

The truth is somewhere between the two extremes the Intervenors set out: No experiments have been done on the mixed transitional core, but the percentage increase in hydraulic resistance is not therefore "purely hypothetical." As we explained above, the 4.5% figure for increase was established by experiment, the 2.2% figure for reduction in steam flow velocity this increased resistance causes was established by engineering equations, and the 10° figure for increase in the PCTs was established by a simple proportion. BART had no part to play in establishing this 10°.

The Intervenors' remaining comments on BART appear to raise genuine issues, at least when the record and the affidavits are read in the light most favorable to the Intervenors. However, as we said, the facts about which these issues have been raised are not material, given the Licensee's use of FLECHT to comply with the regulation on PCT.

9. Again, quoting the Staff' SER without citation to a page, Intervenor Lorion says, "The assumption of constant pressure made in BART may preclude consideration of the oscillating antigravity reflood phenomena." Lorion Affidavit at 4, 5 (quoting Staff BART SER at 3,§ 2.1). Dr. Edwards adds, likewise quoting without citation, that BART does not "encompass all possible expected flow patterns" even if the system pressure is relatively constant. Edwards Affidavit at 6, ¶ 9(c) (quoting Staff BART SER at 3, § 2.1).

The Licensee's response to the comments on the assumption of constant pressure is not clear, but seems to be either that another computer code, WREFLOOD, takes variations in pressure into account (see Tr. 139-140, 158), or that BART's assumption of constant pressure is, for various reasons, reasonable. See Tr. 140-141. This last alternative goes to the merits rather than to whether the Intervenors have raised a genuine issue. To Dr. Edwards' report of the Staff's comment about BART's incomplete coverage of expected flow patterns, the Licensee replies merely that, in comparisons with FLECHT, BART has proved to be conservative. Tr. 158-59. This reply, rather than showing that the Intervenors raise no issue, avoids the issue they raise.

10. "Only one single test was performed in the BART topical as a basis for parameter assessment." Lorion Affidavit at 4 (paraphrasing Staff BART SER at 5, § 2.2.3).

Again the Licensee replies merely that BART has proved to be conservative in relation to FLECHT. Tr. 138-49.

Finally,

> 11. ... "The BART code shows spikes in the calculated results of the heat transfer coefficients. The spikes are indicative of the discontinuous heat transfer regime transitions. However, the overall BART predictions are in good agreement with the heat transfer coefficient data." Of course, it is precisely where the "discontinuous heat transfer regime transitions" occur that cladding failure is likely to occur.

> Cladding failure generally begins as a local phenomenon, not necessarily as an "overall" phenomenon.

Edwards Affidavit at 7, ¶ 9(g) (quoting the Staff SER at 10-11).

It is not clear from the Staff's SER on BART whether these spikes are a product of a discontinuity which actually would exist in the fuel assemblies during reflood, or a discontinuity which exists only in the model. Since BART uses only three heat transfer regimes (see BART SER at 3), there may be more discontinuity between them than there would be between the more numerous regimes in the actual fuel assemblies during reflood. Whatever may be the case, the Licensee replies that, because of the "thermal inertia" of the fuel rods, the spikes have little effect on the PCT predicted with the help of BART, and that even assuming these spikes could cause cladding failure, such failure is taken into account in the BART model. Tr. 165-66. The Licensee adds that, in the event of cladding failure, it is the average temperature in the hot assembly that matters, not the local temperature. Tr. 166. The Licensee thus implies that the model's "overall" agreement with the heat transfer coefficient data is sufficient. This reply appears to go to the merits.

THE INTERVENORS' MOTION TO SUSPEND OR REVOKE THE LICENSE AMENDMENTS

As we have reported, on March 18, 1985, Counsel for the Licensee informed the Board by letter that because of shortcomings in the procedures for transferring information from WREFLOOD to BART, the PCT

predicted with BART would have to be revised upward. In our discussion of Contention (b) we dealt fully with this revised PCT, but must briefly consider it again now in another procedural context.

Toward the beginning of the March 26, 1985 prehearing conference on the summary disposition motions, the Intervenors delivered to the Board and the parties "Intervenors' Motion to Suspend or Revoke the License Amendments." Tr. 93-96. The heart of the Motion was the claim that the Licensee's March 18 letter -- which did not describe the shortcomings in the WREFLOOD-BART link, nor say what the revised PCT would be, but only that it would be less than the 2200° limit imposed by § 10 C.F.R. 50.46(b)(1) -- showed that there was "no valid technical basis for the WREFLOOD-BART computer model," and that there was therefore "no valid legal, technical, or mathematical basis for operation of the Turkey Point nuclear power plants under the subject license amendments." Motion to Suspend at 1, 3. The Intervenor concluded that "the Board must now suspend or revoke these license amendments, with the requirement that the Licensee ... operate the facility in accordance with the original technical specifications ... until this board has determined that there exists a computer model that allows operation of the plant within the requirements of 10 C.F.R. 50.46 and 10 C.F.R. Part 50 Appendix K." Id. at 2. The motion was accompanied by the same two affidavits which accompanied the Intervenors' response to the motions for summary dispositions. Of course, since these affidavits were written before the Licensee's counsel had informed us of the revision in

the PCT, they could not support the Intervenors' claim in their motion that the Licensee's March 18 letter showed that the "WREFLOOD BART computer model" had no valid technical basis. Neither did the motion contain any legal discussion of our authority to suspend or revoke amendments to an operating license.

At the prehearing conference on summary disposition, the Licensee gave the Board and the parties the new figure for the PCT calculated after the shortcomings in the procedure for transferring information from WREFLOOD to BART had been corrected. Tr. 124. The Licensee also explained what those shortcomings had been and how they had been corrected. Tr. 125-30. Later in the conference, on the basis of this new information, the Intervenors withdrew the motion to suspend or revoke the amendments. Tr. 216. Apparently, for the Intervenors, the mere specificity of the revised PCT was enough to put "a valid technical basis" under BART. Intervenors' counsel said, "I think that [the revised PCT] puts the BART model back into the realm of certainty, whereas there was no certainty at the time we filed the motion." Id.

Later in the conference, however, the Intervenors reinstated their motion, arguing that the Licensee's testimony on the circumstances surrounding the revision in the PCT had not been full enough, that "all we have today is [Licensee's March 18, 1985] letter saying those original values are no longer accurate." Tr. 219-222. As we have

noted, we also had the Licensee's witnesses' testimony about the revision in the PCT.

As we have described in our discussion of Contention (b), the Licensee had in fact even before the prehearing conference given the Staff a fuller account of the revision of the PCT. After the conference the Staff reviewed the account and revised its safety evaluations of both BART and the amendments accordingly. The Intervenors have not amended their motion to take into account either the testimony at the prehearing conference, or any of the further filings by the Licensee and the Staff.

The Licensee and the Staff filed in opposition to the Intervenors' motion to suspend or revoke on April 4 and April 10, 1985, respectively. The Staff's filing was accompanied by an affidavit.[6] Neither the Staff nor the Licensee saw any merit in the Intervenors' claim that the upward revision in the PCT meant that the BART code had no valid technical basis, but the Staff and the Licensee disagreed on whether we had the authority to suspend or revoke the amendments, the Licensee arguing that the Intervenors should have filed a petition for suspension or revocation under 10 C.F.R. § 2.206 with the Director of the Office of

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[6]This was the same affidavit which accompanied the Staff's filing on the revision of the PCT. As we noted in our discussion of Contention (b), that latter filing also was on April 10.

Nuclear Reactor Regulation, the Staff arguing that in amendment proceedings in which the board will, in its initial decision, rule on the issue raised by the motion to suspend or revoke, suspension or revocation by the Board could be analogized to a temporary restraining order issued by a federal court, and could be based on the factors for stays of decisions (see 10 C.F.R. 2.788(e)).

However, we need not reach the question of whether we have the authority to suspend or revoke the license amendments,[7] since, as is clear from our discussion of Contention (b), the Intervenors' motion is without substantive merit and must be denied. Whatever the shortcomings of BART may be -- and the Intervenors' motion, being wholly unresponsive to the Staff's and the Licensee's filings on the revised PCT predicted with BART, cannot possibly point to any shortcoming -- BART is irrelevant to the resolution of either the Intervenors' motion to

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[7] We simply note that the Staff's position on a board's authority has at least this advantage, that it is consistent with a recognition that in an amendment proceeding, in contrast to construction permit or operating license proceedings, the status quo is not necessarily benign in relation to public health and safety, and that the board presiding over an amendment proceeding in which the issues raised by the motion to suspend or revoke are already issues in the amendment proceeding is likely to know more than any other Commission officer knows about the issues. Both the cases the Licensee cites in support of its claim that we would not have the authority to suspend or revoke the amendments involve construction permits, and in neither case did the board have already in the ongoing proceeding jurisdiction over the substantive issues raised by the Intervenors' filings, neither one of which was a motion to suspend or revoke.

suspend or revoke, or the Licensee's motion for summary disposition of Contention (b), for, without using BART, the Licensee has met the legal requirements imposed on predicted PCTS.

Accordingly, Licensee's motion for summary disposition of Intervenors' Contention (b) is granted.

CONTENTION (d)

This contention, like Contention (b), is concerned with the effects of running the fuel in Units 3 and 4 at higher temperatures, principally with whether the integrity of the cladding of the fuel would be maintained at certain times. Contention (b) focuses on the integrity of the cladding during reflood of the core after a LOCA; Contention (d) focuses on the integrity of the cladding during normal operation and certain abnormal occurrences other than LOCAs.

In lay terms, the Contention says that the license amendments in issue here make it significantly more probable that the temperature of the cores in Units 3 and 4 will reach the point where the fuel rods will become, in effect, insulated by films of steam, and thus will retain heat that would otherwise be transferred to the water flowing by the rods. The rods thus insulated, the cladding of the fuel is significantly more likely to fail. Moreover, the Contention continues, failure of the cladding would release fission products into the coolant

and thus make it more likely that there would be serious consequences from an accident.

The text of the Contention, and the parties' arguments on summary disposition, cannot be understood without some explanation of how steam behaves during the normal operation of a pressurized water reactor. If the temperature of the fuel in the core of a PWR is high enough, but not too high, bubbles of steam will form on the surfaces of the fuel rods, and will be swept away from the rods by the flow of the coolant. Once in that flow, the bubbles will either condense and thus disappear, or, at some higher temperature, survive in equilibrium with the liquid coolant. The stage of boiling at which the bubbles form and leave the surfaces of the rods is called nucleate boiling. During nucleate boiling, the transfer of heat from the surfaces of the rods to the coolant is efficient and increases more or less in proportion to the increase in the temperature of the rods. The conventional numerical measure of the heat transferred in a given time from a given surface is called "heat flux." See generally Dzenis Affidavit at 3-4.

If the temperatures of operation are high enough, however, some bubbles of steam will remain on the surfaces of the rods, and on each rod adjacent bubbles will coalesce and thus begin to form a film of steam over the surface of the rod. The beginning of the formation of such films marks the beginning of what is conventionally called departure from nucleate boiling (DNB). Such films in effect insulate

the rods, causing heat that would be lost to water at the surfaces of the rods to be retained in the rods. Thus, at whatever temperature films of steam begin to form on the rods, heat flux begins to decline. The heat flux at the beginning of this decline is called the critical heat flux (CHF). With the reduction in heat flux, a vicious circle forms, increasing the probability of failure of the cladding: Heat is trapped by the films, the temperature of the rods therefore increases, the films grow even larger, heat flux declines even further, more heat is trapped, and so forth. The heat flux from a given rod increases again only when the rod is completely covered by a film of steam, at which point, any further increase in the temperature of the rod increases the difference between the temperature of rod and the temperature of the liquid coolant on the other side of the film, and thus increases the amount of heat the film conducts. See generally id. at 4-5.

It is a long way, however, from DNB to a release of significant amounts of fission products to the environment. DNB does not necessarily lead to a breach in the cladding, and even if a breach were to occur, the fission products inside the cladding would be released only into the primary coolant system, which is itself a closed system. Nonetheless, prudence requires avoiding even the first step toward a significant release to the environment. Thus, during the operation of a reactor there must be some proper proportion kept between what the

critical heat flux would be for a given set of operating conditions and what the actual heat flux (AHF) is under those same conditions.

It is, however, not possible to say with a high level of certainty what the CHF for a given kind of fuel, operating under a given set of conditions, in a given kind of reactor, would be. Different experimentally-derived correlations between CHF and these other features afford different degrees of assurance about the CHFs they help predict. The choice of a proper proportion for a given core must be made, therefore, in the face of uncertainty. The choice can, nonetheless, be made prudently, and the NRC generally imposes on its applicants and licensees the following statistical measure of prudence: For a given plant, with a given kind of fuel, and a given set of operating conditions, the minimum ratio between CHF and AHF -- called the minimum departure from nucleate boiling ratio (DNBR) -- must afford at least a 95% confidence level that there is a 95% probability that DNB will not be reached on the hottest rod in the core during either normal operation or certain abnormal occurrences other than LOCAs.[8] This statistical measure of the prudence in the choice of a minimum DNBR, a measure we shall often call the 95/95 condition, is set out by the NRC Staff in its Standard Review Plan (SRP), NUREG-0800 at 4.4-2 to 4.4-3 (July 1981).

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[8]That is, there must be only a 5% chance that the probability that DNB won't be reached is less than 95%.

The SRP is intended largely for the guidance of the Staff in its exercise of its licensing duties, and therefore does not have the status in law of Title Ten of the Code of Federal Regulations, which was the source of the regulation which guided our ruling on Contention (b). An applicant or a licensee need not conform with the standards set out in the SRP, if the applicant or licensee can persuade the Staff that he is conforming to a better standard, or even one just as good. See id. at 4.4-8. However, no party to this proceeding has argued that there is any defect in the 95/95 standard.

The license amendments at issue here impose a different minimum DNBR on each of the two kinds of fuel in Units 3 and 4. The difference between the two minimum DNBRs is a result of the differences between the ways the CHFs in the DNBRs were predicted. For the fuel which is being phased out in Units 3 and 4, the LOPAR fuel, the minimum acceptable DNBR is 1.3. Hsii Affidavit at 2; Dzenis Affidavit, ¶ 22. That is, operating conditions in those units must be chosen so that the predicted CHFs for the LOPAR fuel in those units is at least 30% greater than the corresponding AHFs for that fuel. The 30% reflects the uncertainty with which CHFs can be predicted for the LOPAR in those units. The prediction is accomplished using a correlation between CHF and operating conditions called the L-grid correlation, which Westinghouse established on the basis of an early set of experiments with coolant flowing inside isolated heated tubes, and a later set of experiments with coolant flowing in the channels between rods in rod bundles. Tr. 176-79. This

L-grid correlation is used in analyses which model the operation of the reactor and yield predicted CHFs for various sets of operating conditions. These predicted CHFs vary enough from the CHFs measured in the experiments which established the L-grid correlation, that the predicted CHFs for LOPAR fuel must be at least 30% higher than the AHFs for that fuel, in order to achieve a 95% confidence that there is a 95% probability that DNB will not occur during either normal operation or certain abnormal occurrences other than LOCAs. Dzenis Affidavit at 8-9.

For the fuel which is being phased into Units 3 and 4, the OFA fuel, the minimum acceptable DNBR the amendments in issue here are imposing is 1.17, less than the DNBR being imposed on operations with the LOPAR fuel. Hsii Affidavit at 2. If the predicted CHF of the OFA fuel in those units is always at least 17% greater than the AHF for that fuel, then the 95/95 standard is satisfied. The 17% reflects the greater assurance with which the CHFs of OFA fuel can be predicted. This greater assurance comes from the use of a correlation called the WRB-1, developed by Westinghouse in an extensive program of experiments with the flow of cooling water through arrays of heated rods. The experiments more closely simulated the geometries and conditions of operating PWRs than did the experiments which established the L-grid correlation. Dzenis Affidavit at 6-7. The WRB-1 is known to apply reliably to OFA fuel arrayed in either 17 X 17 or 14 X 14 geometries. The geometry of the cores in Units 3 and 4 is 15 X 15. Hsii Affidavit at 5. The SRP has for some years expressed approval of both the DNBR of

1.3 for LOPAR fuel and of lower DNBRs for OFA fuel where circumstances permitted. SRP at 4.4-3.

The terminology of Contention (d), set out below, is drawn from the conventional terminology which deals with nucleate boiling:

> The proposed decrease in the departure in the nucleate boiling ratio (DNBR) would significantly and adversely affect the margin of safety for the operation of the reactors. The restriction of the DNBR safety limit is intended to prevent overheating of the fuel and possible cladding perforation, which would result in the release of fission products from the fuel. If the minimum allowable DNBR is reduced from 1.3 to 1.7 [sic: 1.17] as proposed, this would authorize operation of the fuel much closer to the upper boundary of the nucleate boiling regime. Thus, the safety margin will be significantly reduced. Operation above the boundary of the nucleate boiling regime could result in excessive cladding temperatures because of the departure from the nucleate boiling (DNB) and the resultant sharp reduction in heat transfer coefficient. Thus, the proposed amendment will both significantly reduce the safety margin and significantly increase the probability of serious consequences from an accident.

The particular focus of the Contention appears to be on the mere fact that the DNBR which the amendments apply to the new fuel in Units 3 and 4, the OFA fuel, is lower than the DNBR which has been applied to the older type of fuel, the LOPAR fuel.[9] We would not be denying summary disposition on the motion if the Intervenors raised no issue

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[9]The wording of the Contention is imprecise enough to permit it to be construed to be saying that the amendments apply the DNBR of 1.17 to all the fuel in Units 3 and 4, even the LOPAR fuel. Such is not the case.

other than the one of this mere difference between the two DNBRs, for, although under the amendments, the differences between AHFs and CHFs for the OFA fuel may be proportionately less than the same differences for LOPAR fuel, these differences are not the true measures of the margins of safety between AHFs and CHFs. The true measures are probability measures: If a lower DNBR, and, consequently, proportionately smaller differences between AHFs and CHFs, do not lessen the probability that a CHF will not occur in normal operation and certain abnormal occurrences, then the lower DNBR does not diminish the margins of safety between the AHFs and the corresponding CHFs.

If this last statement seems counterintuitive, it may be because it is not unusual for a decrease in some measurable magnitude to entail a decrease in safety. Usually, the closer one drives to the edge of a road, the more likely one is to go off the edge of the road. However, the behavior of a prudent driver depends on how clearly he can see the edge of the road. If the edge is shrouded in fog, the prudent driver will steer clear of where he thinks the edge might be, and the more in doubt he is about where the edge is, the more he is inclined to stay away from where he thinks it might be. If, however, the fog clears some, the driver, by moving closer to the edge of the now more visible road, does not increase his chances of going off the road.

Similarly with CHFs in the operation of a reactor: The more doubt there is about what the CHFs are, the greater will be the prudent

minimum DNBR. But if increased precision in the models of the behavior of coolant flowing through bundles of heated tubes allows for increased accuracy in the predictions of CHFs, then the minimum DNBR can be lowered without decreasing the probability that DNB will be avoided.

It is this stability in the measure of probability that the Licensee's affiant has in mind when he says that the lower DNBR applied to the OFA in Units 3 and 4 "in no way implies a reduction in the safety margin of a nuclear reactor." Dzenis Affidavit, ¶ 24. Here, by "safety margin," the Licensee's affiant means the 95/95 standard, which, according to the Licensee, is the standard applied to both kinds of fuel at Units 3 and 4.

The Intervenors' affiant Dr. Edwards, while entertaining the possibility that "the same margin of safety that was previously thought to exist can now be achieved at a higher operating temperature" (Edwards Affidavit, ¶ 9(j)), nonetheless asserts that "it is undoubtedly true that running at a hotter temperature materially increases the probability of DNB, and therefore reduces the safety margin of the nuclear reactor." (Id., ¶ 9(j); see also ¶¶ 9(i) and 10.) Paraphrased so as to remove the seeming self-contradiction from his remarks, and to bring into better focus the differences between his remarks and the Licensee's affiant's claim, what Dr. Edwards says is that although a given probability measure of a margin of safety -- in this case the 95/95 standard -- may now be achievable at higher temperatures, the

probability measure of the margin at those temperatures nonetheless is smaller than it would be at lower temperatures.

Dr. Edwards is, of course, right. If, for a given fuel, a DNBR of 1.17 gives a 95% confidence that there is a 95% probability that DNB will occur, then the imposition of the DNBR of 1.30 would no doubt increase either the measure of confidence, or the measure of probability, or both. Dr. Edwards is, in effect, asking for the imposition of a standard more stringent than the 95/95 standard. Yet he has nowhere argued, nor have the Intervenors argued, that there is any defect in the 95/95 standard.

However incorrect the Intervenors may be in thinking that it is imprudent to permit a lower minimum DNBR for OFA fuel than for LOPAR fuel, facts reported in the Staff's response to the Licensee's motion show that the Intervenors' principal allegation, namely, that there has been a lowering of a DNBR to the point of trimming a safety margin, raises a genuine issue concerning a material fact in the proceeding. Intervenor Lorion's affidavit claims, in particular, that two matters have not been adequately accounted for in setting a DNBR of 1.17 for the OFA fuel in Units 3 and 4: First, as we reported earlier, the experimental base for the WBR-1 correlation established that a DNBR of 1.17 for OFA fuel arrayed either in a 17 X 17 or a 14 X 14 geometry meets the 95/95 standard; however, the arrays in Units 3 and 4 are 15 X 15. Lorion Affidavit at 8. Second, during the years of transition

between fuel types, the difference between the hydraulic resistance of the LOPAR fuel and the hydraulic resistance of the OFA fuel, a difference which was taken into account in predicting peak cladding temperatures, the subject of Contention (b), must be taken into account, Intervenor Lorion says, in determining a minimum DNBR. Id.

The Licensee's motion wholly ignores both of these matters. The Staff's affiant raises them briefly, and one other, which we shall discuss shortly, but brushes them aside, though not before making it appear that, in fact, the applying of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 may well not satisfy the 95/95 standard.

On the next to the last page of his affidavit, the Staff's affiant reveals that in its Safety Evaluation Report (SER) on amendments 93 and 99, published December 23, 1983, the Staff relied on a DNBR of 1.34 for the OFA fuel in the cores in Units 3 and 4, a figure which the Staff says is 12.7% higher than the 1.17 figure applicable to a full core of OFA in an array either of 17 X 17 or 14 X 14. The Staff's affiant says that the 12.7% allowed room for several uncertainties, only the smallest of which he notes in his affidavit, namely, a 2% uncertainty about the applicability of the WRB-1 correlation to OFA fuel arrayed in a 15 X 15 geometry. Hsii Affidavit at 5. The two larger uncertainties reported in the SER are associated with the difference between the hydraulic resistances of the two kinds of fuel (SER on Amendments at 4), and with the bending of the fuel rods during operation (id.), a phenomenon caused

by, among other things, lengthwise expansion of the heated rods while they are anchored at their ends. This bowing can constrict the flow channels between the rods and thus can affect how efficiently heat is transferred from the rods to the coolant.[10] The SER lists the uncertainty associated with the difference in hydraulic resistance as 3%, and the uncertainty associated with rod bowing as 5.5%. Id. That is, we take it, the DNBR of 1.34 which the Staff applied in its SER could have been 2% lower but for the 15 X 15 array, 3% lower but for the mix in the core, and 5.5% lower but for rod bowing.

The implication of the SER's discussion of DNBRs is that since a DNBR of 1.34 allows 12.7% for these three uncertainties, a DNBR of 1.17 does not. The question naturally arises then whether, if a DNBR of 1.17 does not take these three uncertainties into account, it does not amount, in fact, to a reduction in the safety margin the Standard Review Plan would ordinarily impose, that is, whether, under the amendments' imposition of a DNBR of 1.17 there can no longer be a 95% confidence that there is a 95% probability that DNB will not occur during certain specified operating conditions. The last sentence of ¶ 8 of the Staff's affidavit seems to say that there is no longer that confidence: After reporting that the 12.7% difference between the SER's DNBR of 1.34 and the more generally applicable DNBR of 1.17 compensated for the

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[10] Intervenor Lorion does not mention this last uncertainty.

uncertainties identified in the SER, the Staff's affiant says, "Therefore, the DNBR limit of 1.17 for WRB-1 as applied to the Turkey Point 15 X 15 OFA does not result in significant reduction in safety margin." However, he explains neither his "therefore" nor his judgment that the reduction is not significant.

The Licensee sheds no light on whether the application of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 in fact means that the 95/95 standard is not being met. As we said, the Licensee's pleadings on the motion do not even mention either the 1.34 DNBR used by the Staff in its SER on the amendments, nor any of the three uncertainties for which the 1.34 was compensation. During the prehearing conference on March 26, 1985, the Licensee did discuss the two uncertainties which Intervenor Lorion raised in her affidavit. The Licensee did argue that the application of the 1.17 DNBR to the Turkey Point arrays of 15 X 15 was justified (Tr. 180-81), but the Licensee did not say whether, or how, the 2% uncertainty the Staff assigns to such application was accounted for in the DNBR of 1.17. During the prehearing conference, the Licensee did report the 3% uncertainty associated with the difference between the hydraulic resistances of the two kinds of fuel, but simply asserted, without explanation, that the 3% penalty "does not cause any of the fuel to go below its appropriate safety limit as defined previously," by which, we take it, the Licensee meant that even when the 3% penalty is taken into account, the application of the 1.17 DNBR to the OFA fuel in

Units 3 and 4 still meets the 95/95 standard. Tr. 189. The Staff would appear not to agree.

Under this contention three genuine issues as to material facts remain for litigation:

1. Whether the DNBR of 1.17 which the amendments impose on the OFA fuel in Units 3 and 4 compensates for the three uncertainties outlined by the Staff in its December 23, 1983 SER on the amendments, at 4.

2. Whether, if the DNBR of 1.17 does not compensate for those uncertainties, the SRP's 95/95 standard, or a comparable one, is somehow satisfied.

3. Whether, if that standard is not being satisfied, the reduction in the margin of safety has been significant.

The Licensee has the burden of showing in hearing either that the application of a DNBR of 1.17 to the OFA fuel in Units 3 and 4 satisfies the 95/95 standard, or that if such application does not, the reduction in the margin of safety is not significant.

Accordingly, Licensee's motion for summary disposition of Intervenors' Contention (d) is denied.

ORDER

For all the foregoing reasons and upon consideration of the entire record in this matter, it is this 16th day of August, 1985

ORDERED

1. That the Licensee's motion to strike the Intervenors' response and affidavits in opposition to the Licensee's motions for summary disposition, and the Intervenors' motion to strike the Licensee's motion to strike, are denied;

2. That the Licensee's motion for summary disposition of Intervenors' Contention (b) is granted, and the Intervenors' related motion to suspend or revoke the license amendments for Units 3 and 4 is denied; and

3. That the Licensee's motion for summary disposition of Intervenors' Contention (d) is denied.

APPEALABILITY

A denial of a motion for summary disposition is interlocutory and therefore cannot be appealed. Louisiana Power and Light Co. (Waterford

Steam Electric Generating Station, Unit 3), ALAB-220, 8 AEC 93, 94 (1974). Since this Order dismissed some, but not all, of the Intervenors' contentions, the Intervenors are still parties to this proceeding; therefore, the dismissal of Contention (b) is interlocutory, and any appeal the Intervenors may wish to take from that dismissal must await the issuance of an initial decision. See Cleveland Electric Illuminating Co. (Perry Nuclear Power Plant, Units 1 and 2), ALAB-736, 18 NRC 165, 166 (1983).

THE ATOMIC SAFEIY AND LICENSING BOARD

Robert M. Lazo

Robert M. Lazo, Chairman
ADMINISTRATIVE JUDGE

Emmeth A. Luebke

Emmeth A. Luebke
ADMINISTRATIVE JUDGE

Richard F. Cole

Richard F. Cole
ADMINISTRATIVE JUDGE

Dated August 16, 1985
Bethesda, Maryland.