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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454
	)	50-455
(Byron Station, Units 1 and 2)	)	

NRC STAFF'S PROPOSED SUPPLEMENTAL INITIAL DECISION

In accordance with the instructions of the Atomic Safety and Licensing Board (Tr. 10,314-10,317, 10,354-10,359), the NRC Staff files the following Proposed Supplemental Initial Decision using the format and numbering system of Commonwealth Edison Company's Proposed Supplemental Initial Decision (September 10, 1984). For numbered paragraphs which the Staff adopts, it is so indicated. For any paragraph where a modification of whatever type and extent is proposed, the entire paragraph is set forth with proposed additions underlined and the language deleted from the Applicant's paragraph bracketed and lined out. Where it has been necessary to propose an additional paragraph, it has been identified by adding a letter to the number of the Applicant's preceding paragraph.

This proposed decision also reflects the Staff's review of the Intervenors' Proposed Supplemental Decision (September 18, 1984).

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I. INTRODUCTION

1. On January 13, 1984 this Board issued its initial decision denying Commonwealth Edison Company's ("Applicant's" or "CECo's") application for a license to operate the Byron Nuclear Power Station ("Byron").*/ Although we ruled in Applicant's favor on seven of the eight issues in controversy which were litigated during public hearings in the spring and summer of 1983, we found that CECo had not met the burden of proof on the issue of quality assurance.

2. The Staff adopts this paragraph.

3. In the first set of hearings on the quality assurance issue in March and April, we did not consider an item of noncompliance found in the March, 1982 NRC Construction Assessment Team inspection regarding the certification practice for quality control inspectors by contractors at Byron. Our attention was drawn to this matter before the additional hearings we held in August 1983 as a result of granting Intervenors' motion to reopen the hearing record. At that time, testimony was adduced on (1) the training and certification of a former QC inspector of the Hatfield Electric Company ("Hatfield"), (2) the very recently completed program of recertifying inspectors to revised criteria based on ANSI N45.2.6-1978, and (3) the structure and preliminary results of a reinspection program designed to show that inspectors who conducted inspections prior to the revised certification procedures were adequately qualified. On the basis of the evidence before us with respect to this last issue we denied the

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*/ LBP-84-2, 19 NRC 36. In this supplemental decision, citations to the initial decision are to the paragraph numbers only.

operating license application expressing reservation both about the reinspection program itself and the quality of the work of two site contractors, Hatfield and Hunter Corporation ("Hunter"). (I.D. ¶s D-429-441, D-444).

4-9. The Staff adopts these paragraphs.

10. On June 8, 1984, we issued an order setting the scope of the reopened hearing. Beyond the issues discussed above we ruled that certain of the matters proposed by Intervenors should be litigated. We ruled that the NRC Staff should present evidence on certain worker allegations which the Staff had expected would be resolved by the BRP and that the Staff should present evidence on any other allegation which it deemed to have independent and important relevance to the BRP. (Memorandum and Order at 8-9.) For one allegation, that electrical cables were overstressed by excessive pulling during installation by Hatfield, we requested a full evidentiary presentation on the cause and safety significance of the alleged episodes and their relationship to the BRP. (Memorandum and Order at 9.) Finally, we ruled that Pittsburgh Testing Laboratory ("PTL") should be added as one of the contractors to be considered with respect to the BRP. In this regard, we advised the parties that we expected a general showing of the scope of PTL's work and a discussion of whether the BRP has provided reasonable assurance that PTL's work presents no safety problems. (Memorandum and Order at 12-13.)

11. The Staff adopts this paragraph.

12. The NRC staff submitted [~~two~~] the pre-filed direct testimony of three witness panels who addressed [~~these same~~] the issues in the remanded proceeding. In addition, Mr. Keppler, administrator of NRC's Region III, [~~provided~~] submitted pre-filed direct testimony providing an

overview and insight with respect to the Region's judgment concerning the adequacy of the BRP. The Staff also presented, as a panel, Mr. William Forney, an NRC employee who was formerly senior resident inspector at Byron, [~~also testified~~] Mr. D.W. Hayes and Mr. William Little. Mr. Forney testified regarding [An] an affidavit prepared by him which described his differences with the testimony of an NRC staff witness panel with respect to the conclusions to be drawn from the results of the BRP. That affidavit was received into evidence as his direct testimony. (ff Tr. 10,040.) Mr. Hayes testified regarding a memorandum he had prepared which appeared to express a view different than the testimony of the same NRC witness panel. (See memorandum dated February 13, 1984 from D.W. Hayes to R.L. Spessard, p. 1, ff Tr. 10,050.) Mr. Little appeared with Messrs. Forney and Hayes to provide any necessary response regarding the Staff's position. (Tr. 10,037.) Intervenors presented three witnesses. One witness questioned the adequacy of the engineering evaluations performed by Sargent & Lundy of the discrepancies discovered during the BRP. The remaining two witnesses challenged the adequacy of various assumptions used by Edison in the [~~formation~~] formulation of the BRP and the applicability of statistical principles to the results of that program.

13-14. The Staff adopts these paragraphs.

15. An operating license for a nuclear power plant may be issued at such time as the NRC renders the findings required by 10 C.F.R. § 50.57(a). The Commission, subject to the immediate effectiveness provision[~~f~~]s of 10 C.F.R. § 2.764, has vested the Director of Nuclear Reactor Regulation with the authority to make the findings under

section 50.57(a). 10 C.F.R. § [~~2.760(a)~~] 2.760a. Our authority is limited to deciding matters in controversy among the parties. 10 C.F.R. § 2.104(c) and § [~~2.760(a)~~] 2.760a. It was in the context of this regulatory regime that Contention 1A was decided against the Applicant.

16. We were unable to make these findings in our Initial Decision of January 13, 1984 because of outstanding questions raised by an item of noncompliance contained in NRC Staff Inspection Report 82-05. Specifically, noncompliance 82-05-19 questioned the qualifications of contractor QC inspectors certified under procedures which the Staff deemed defective. The Appeal Board agreed that the record previously before us was insufficient to support the issuance of an operating license, but remanded the record to us

> to permit a full exploration of the significance of the [reinspection] program in terms of whether there is currently reasonable assurance that the Byron facility has been properly constructed. Stated otherwise, the focus of the inquiry should be upon whether, as formulated and executed, the reinspection program has now provided the requisite degree of confidence that the Hatfield and Hunter quality assurance inspectors were competent and, thus, can be presumed to have uncovered any construction defects of possible safety consequence.

(Memorandum and Order, dated May 7, 1984, ALAB-770, 19 NRC ___ Slip Opinion at 27, 28~~)~~, footnotes omitted.)

17. Further, subsequent to our initial decision new information regarding another item of noncompliance resurrected questions we had deemed closed in our initial decision. (I.D., ¶ D-442; ¶s 204 - [~~263~~] 264, infra.) Noncompliance 80-04-01, contained in a December 30, 1980 inspection report, asserted that Applicant had failed to take prompt and effective corrective action with respect to deficient equipment supplied to the

Byron Station by Systems Control Corporation ("SCC"). While we had been willing to delegate the closure of this item of noncompliance to the NRC Staff, the Appeal Board, as a result of the new information, directed that we hold further hearings on this issue as well.

18-21. The Staff adopts these paragraphs.

22. A special inspection was conducted at Byron during the Spring of 1982 by an NRC Construction Assessment Team ("CAT"). The CAT findings were published in IE Report Nos. 50-454/82-05 and 50-455/82-04. One of the findings (noncompliance 82-05-19) questioned the adequacy of the onsite contractors' programs for certifying QC inspectors. The CAT inspectors found deficiencies in (i) the contractors' evaluations of initial inspector capabilities, (ii) the documentation of initial certification, and (iii) the criteria used to establish inspector qualification. (Applicant's Exhibit 8; Del George, prepared testimony at 6, ff. Tr. 8406.) Although there was no finding that these deficiencies had compromised the quality of construction, the NRC Region III Staff adopted the position that the site contractors' QC inspector qualification programs had to be upgraded and that the quality of the inspections already completed required verification. (Del George, prepared testimony at 5, ff. Tr. [~~9406~~] 8406.)

23. In response to the Staff's criticisms, Edison initiated a recertification program between June and September 1982, to review in accordance with[~~the guidelines of~~] its commitment to Regulatory Guide 1.58, which invokes and supplements ANSI N45.2.6-1978, and to revise where necessary, contractors' QC inspector certification procedures. These upgraded procedures were used to certify inspectors beginning on September 30,

1982. This action solved the Staff's concern with respect to the qualification of QC inspectors certified after September 30, 1982; however, it did not [~~provide assurance that~~] address whether the inspectors who performed QC inspections prior to that time were qualified. The BRP was constituted to address this latter concern. (Hansel, prepared testimony at 4, ff. Tr. 8901; Del George, prepared testimony at 7-[~~10~~]11, ff. Tr. 8406 [~~Connaughton~~] Little, Staff prepared testimony at ~~16~~ 7-10, ff. Tr. 9510.) */

24. To verify the effectiveness of inspector qualification and certification practices used by site contractors between January 1976 and September 1982, the BRP was structured to reinspect the original QC inspections and to analyze any discrepancies (differences between the results of the original inspections and the reinspections) to determine their significance. The data would then be used to draw inferences about the qualification of the total inspector population on a contractor-by-contractor basis. Thus, the original purpose of the BRP was not to directly validate work quality at Byron. [~~Given the concerns about work quality raised in our initial decision,~~] [~~h~~]However, both Applicant and the Staff determined that the BRP data could also be used as one basis for determining the quality of the construction work. (Del

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*/ A full discussion of the recertification program is contained in paragraphs D-385 through D-393 of our initial decision.

George, prepared testimony at 6, 7, ff. Tr. 8406; Little, Staff prepared testimony at 4, ff. Tr. 9510.)

25. The NRC Staff's characterization of the purpose of the BRP is stated differently than the description we have just articulated. The Region III panel testified that the primary purpose of the BRP was to determine whether QC inspectors had overlooked significant safety-related hardware deficiencies. (Little, Staff prepared testimony at 4, ff. Tr. 9510; Tr. 9577.) However, Mr. Little also agreed, on behalf of the panel, that determining whether QC inspectors had overlooked significant deficiencies was equivalent to determining whether they were competent. ([~~Keppler, Tr. 10,134;~~] Little, Tr. 9582-83[~~,~~]; see also Keppler, Tr. 10,134.) Indeed, William Forney, former Region III senior resident inspector at Byron, testified for the Staff in August 1983 that the purpose of the BRP was "to determine whether or not [the contractors][*] have used qualified inspectors."[**] (Forney, Tr. 7991.) [~~In sum, it~~

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[*] This use of brackets appears in the Applicant's proposed finding.

[**] [~~We note that Mr. Forney's most recent testimony contradicts this characterization.~~] Mr. Forney did testif[~~ied~~]y at the reopened hearing that in his opinion, the fact that inspectors have not failed to discover significant deficiencies is not necessarily a demonstration of their competence. [~~His reasoning appears to be that the Byron plant is so well constructed that there may be very many significant discrepancies to discover.~~] This opinion was based on his view that the failure to identify significant hardware deficiencies is as likely to reflect the good quality of construction and the overdesign of the plant as the competence of QC inspectors. (Forney, Tr. 10,063-64, 10,082[~~,~~] 10,133.) In any event, Mr. Forney himself characterizes [~~his disagreement~~] this distinction as "miniscule" in importance (Forney, Tr. 10,068, 10,129-10,130) and acknowledged that other members of Region III could properly, in the exercise of their engineering judgement, draw an inference as to the capability of the non-reinspected

(Footnote continued on next page)

~~appears-that-any-difference-between-the-purpose-of-BRP-as-stated-by-CECo and-the-NRC-Staff-is-a-matter-of-semantics-rather-than-substance.~~ In any event, these different phrasings of the purpose of the BRP are of minimal relevance since both the Staff and Applicant agree that the BRP has resolved noncompliance 82-05-19.

26-31. The Staff adopts these paragraphs.

32. The table contained in Mr. Del George's testimony shows that Applicant made certain the inspectors selected were [~~not-only~~] sufficient in number [~~but-represented-the-range-of-inspection-activities for-the-entire-six-year-span-of-interest.--The-table-also-shows-that inspectors-were-chosen-from-each-year-of-work-activity.~~] and spanned the period from inception of construction to September 1982, the period of

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**/ (Footnote continued from previous page)

inspectors from the results of the BRP. (Forney, Tr. 10,047.) Mr. D. W. Hayes, Chief of the Region III Projects Section which included Byron, also testified regarding a memorandum dated February 13, 1984, he had written regarding steps required to prepare for any subsequent hearings on Byron (ff. Tr. 10,050.) In that memorandum Mr. Hayes had stated:

> In my opinion, the reinspection program tells us little about the capability and effectiveness of the selected inspectors and thus those not selected and we should not try to make an argument from this standpoint.

At the hearings, Mr. Hayes explained that more accurately stated his view was that "the Reinspection Program did not establish conclusively that the QC inspectors were qualified." (Tr. 10,051). He also testified that the purpose of his memorandum was to stimulate thinking in the Region regarding the Region's conclusions from the BRP. (Hayes, Tr. 10,051). We will come back to an evaluation of Mr. Forney's position in the work quality portion of this decision.

interest for the BRP. (Del George, prepared testimony at 13, ff. Tr. 8406.)

33-36. The Staff adopts these paragraphs.

37. Dr. Martin Frankel, an expert statistician testifying on behalf of Applicant agreed that the inspector sample does not qualify as a "probability sample", mainly because of the addition of designated inspectors whose qualifications were considered suspect by the NRC Staff. (Frankel, prepared testimony at 7-8, ff. Tr. 11,120.) Although the sample of inspectors does not meet the criteria for a probability sample, Dr. Frankel believes that inferences to the total population of inspectors can be drawn if supported by the judgments of individuals with appropriate substantive knowledge. (Frankel, prepared testimony at 7-8, ff. Tr. 11,120.) We agree. The features of the sampling scheme for inspectors which causes it to not constitute a probability sample is the addition of inspectors to the sample by the NRC resident inspector. These additions to the sample were designed to include in the BRP inspectors whose qualifications were suspect. [~~It would be contrary to common sense to reject~~] Since inferences drawn from the results of the BRP were based upon the judgment of [~~by~~] experienced engineers employed by Applicant and Staff, as well as [~~by~~] of independent consultants, [~~based on a ritualistic application of statistical theory,~~] we decline to reject those inferences based upon Dr. Ericksen's argument that a probability sample was not used. We accept the validity of the inspector sample in the BRP and conclude that the results form an adequate basis for inferences to the qualifications of inspectors whose work was not reinspected.

38. The Staff adopts this paragraph.

39. Approximately 80 percent of Hatfield's total inspections performed at Byron (up to the date its revised certification procedures were implemented) were reinspectable. For Hunter, this figure was approximately 70 percent. (Tuetken, prepared testimony at 25, 26, ff. Tr. 8408.) [~~Somewhat~~] Appreciably less than 50 percent of the inspections performed by PTL prior to the implementation of its revised certification procedures were reinspectable. (Tuetken, prepared testimony at 25, 26, ff. Tr. 8408.) This is because PTL performed mainly concrete and soil inspections, which are not recreatable. (Tuetken, Tr. 8664.) It is undisputed that placement of work in either an inaccessible or nonrecreatable category was supported by proper documentation which showed appropriate reasons why a certain inspector's work could not be reinspected. (Hansel, prepared testimony at 17, ff. Tr. 8901; Hansel, Tr. 8982.)

40. Finally, some attributes for work to be reinspected were not captured in the BRP. This was the case for 2 of 11 Hatfield inspection attributes and 5 of 48 Hunter inspection elements. The two Hatfield attributes [~~involving-component-support-and-equipment-final-inspection~~] (cable pan covers and cable pan identification) were not reinspected because they were not inspected by any inspector sampled in his/her first 90 days. The five Hunter inspection elements not reinspected were not captured because this work had not been initiated before September 1982. (Del George, prepared testimony at 17, 18, ff. Tr. 8406.)

41. The first 90 days of each selected inspector's work was reinspected. (Hansel prepared testimony at 11, ff. Tr. 8901; De. George, Tr. 8490.) Both Edison and the NRC Staff agree that the first 90 days of work is an appropriate period to evaluate to determine inspector qualification. If training has been inadequate to produce a qualified inspector, the first 90 days covers the time when an inspector is most likely to make mistakes as a result of that inadequate training. Therefore, in the judgment of the CECo and the Staff, a conservative bias was factored into this element of the BRP. (Hansel, prepared testimony at 11, 12, ff. Tr. 8901; Hansel, Tr. 8948; Del George, Tr. 8790-91; Little, Staff prepared testimony at 5, ff. Tr. 9510; Little, Tr. 9646.) The selection of the first 90 days as the initial period to be sampled was based on the issue of the adequacy of QC inspector certification identified in noncompliance 82-05-19 and was not modeled upon any independent review at other plants because the Staff and Applicant were not specifically aware of other independent reviews focused on the issue of QC inspector qualifications. Little, Tr. 9609-9611; Del George, Tr. 8472.

42. This judgment is disputed by Intervenors' witness Dr. Dev S. Kochhar, a human factors expert from the University of Michigan. According to Dr. Kochhar, inspector performance can be expected to attain its highest proficiency level in the period immediately following completion of training. He testified that in general newly trained inspectors perform better initially because the novelty of the job causes them to be more attentive. ~~[This "initial arousal" wears off as novelty and sensory stimulation]~~ As this novelty wears off, the level

of performance effectiveness declines over time. [~~According to Dr. Kochhar, the level of performance effectiveness also declines.~~] Thus, in Dr. Kochhar's opinion, reinspection of only the first 90 days of inspectors' work is likely to have caused a nonconservative bias in the BRP results. The better course, according to Dr. Kochhar, would have been to reinspect the work of inspectors over the full range of their tenure at Byron. (Kochhar, prepared testimony at 7-10, ff. Tr. 10,538.)

43. We have discerned a fundamental problem with the application of Dr. Kochhar's analysis to Byron. (Kochhar, prepared testimony at 6, ff. Tr. 10,538). Although Dr. Kochhar[~~'s~~] [~~testimony misperceives the very~~] recognized in his prefiled testimony that the purpose of the BRP[~~, which~~] as to determine whether the training and certification procedures used by contractors before 1982 were producing qualified inspectors, he testified that the first 90 days of an inspector's work was an inappropriate period to sample. (Kochhar, prepared testimony at 7-10, ff. Tr. 10,358.) [~~When confronted with this purpose on~~] On cross-examination, Dr. Kochhar agreed that it was necessary to reinspect a period of an inspector's work prior to the time his experience on the job might mask any lack of adequate training. For the reasons set forth in ¶¶ 44-49, infra, we conclude [~~In the Board's view, it is obvious~~] that the period of interest is the first few months of an inspector's job performance. The question becomes therefore, whether Dr. Kochhar's testimony persuades us whether the first 90 day's as opposed to a longer period is appropriate.

44. The Staff adopts this paragraph.

45. Dr. Kochhar further admitted that his experience with inspection activities has been limited, primarily, to assembly line or batch manufacturing operations [~~involving~~] such as a Firestone Tire and Rubber Company assembly line operation where inspectors inspected three or four major attributes on tires which passed by at a controlled rate. (Kochhar, Tr. 10,546 - 10,548.) Dr. Kochhar's laboratory experiments involved television monitors on which simulated products moved across the screen at controlled rates. The subject inspectors were required to identify any faults or defects in the products as they moved across the screen. (Kochhar, Tr. 10,550.)

46. Thus, aside from his review of the BRP, Dr. Kochhar has no experience at all with nuclear plant inspection activities. (Kochhar, Tr. 10,547.) Nevertheless, Dr. Kochhar asserts that his Firestone and laboratory results are applicable to Byron QC inspection activities. (Tr. 10,547-48[~~.~~]; Kochhar, prepared testimony at 6-7, ff. Tr. 10,358.) Surprisingly, Dr. Kochhar makes this assertion without having evaluated the actual duties of the Byron QC inspectors. (Kochhar, Tr. 10,589.) He was aware that the work of QC inspectors was "somewhat varied", that they looked at different kinds of welds, that welds were located in various locations throughout the plant, and that access to some welds was difficult. (Kochhar, Tr. 10,589-91.) Nevertheless, Dr. Kochhar simply assumed that their tasks were similar to [~~like~~] those which were the subject of his experience. [~~would require subjective judgments based on pre-determined criteria.~~ (Kochhar, Tr. 10,589.) On examination by the Board, he agreed that the varied duties of the QC

inspectors might tend to break up the tedium that inspectors on assembly lines ordinarily experience. (Kochhar, Tr. 10,591.)

47. Dr. Kochhar also testified that none of his experiments lasted more than 2 or 3 [~~day~~] hours. (Kochhar, Tr. 10,558.) He is not aware of any studies which have examined this job performance phenomenon over an extended period of time. (Kochhar, Tr. 10,559.) He testified that his predictions concerning long-term job performance are based on a simple analogy to daily performance. (Kochhar, Tr. 10,568, 10,592.) Yet Dr. Kochhar also testified that, based on what he has read in the literature, it is likely that the predicted downturn in inspector performance would begin after only a couple of days. (Kochhar, Tr. 10,562.) Given this, it is logical to assume that any downturn in inspector performance at Byron would have occurred within an inspector's first 90 days. This obviously belies his argument that more than three months of an inspector's work should have been reinspected in order to overcome the initial arousal affect.

48. Finally, Dr. Kochhar was unable to quantify the effect of the alleged nonconservative bias on the results of the BRP. Nor was he able to say when, if ever, an inspector who was initially performing his tasks competently would exhibit unacceptable performance. [~~become incompetent.~~] (Kochhar, Tr. 10,595.) He testified as follows:

> A Yes, well what I'm saying is that I don't think anybody could quantify that bias. The fact is that if you had taken a period of time that was longer and then sampled, it may have been more reflective of the actual working span.
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> * * *
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> Q. Dr. Kochhar, just so we are clear on this, you don't know -- as you sit here today -- whether the reinspection results have been overstated by a half a percent or 20 percent because of the selection of the first 90 days?

A. That's correct. I do not know.
(Kochhar Tr. 10,610, 10,603, 10,604.)

49. Thus, it appears that Dr. Kochhar's theory, which is limited to subjective attributes and based on limited relevant experience, would have its impact, if at all, in the first 90 days of an inspector's job performance. Consequently we are not persuaded that Applicants chouce of the first 90 days was inappropriate. Indeed, we find that reinspection of an inspector's first three months of work was appropriate to determine whether the inspector was adequately qualified following his initial training. In reaching this conclusion, we note that Dr. Kochhar was not the only witness with expertise in human factors who testified in the reopened proceeding. We found Staff and Applicant witnesses, including but no limited to, Messrs. Little and Hansel, to have relevant background in supervising and evaluating the performance of inspectors. Little, Tr. 9646-9648; Hansel, prepared testimony at 2, ff. Tr. 8901.

50-60. The Staff adopts these paragraphs.

61. Physical reinspection activities began in the middle of March 1983. (Tuetken, prepared testimony at 6, ff. Tr. 8408.)*/ The

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*/ The Appeal Board noted that the reinspection program only covered inspectors certified up to September 1982 and the recertification program was not completed until early 1983. It therefore questioned whether Applicant had ensured that inspectors certified between those dates were capable of performing their tasks. (ALAB-770, slip opinion at 29.) To address this concern, Mr. Tuetken explained that the reinspection program examined the first three months of work performed by inspectors [~~right-up-to~~] who were certified before the date the revised certification procedures were implemented. The first three months of work of at least a small number of inspectors who were certified during the summer of 1982 were included in the BRP and this three month period extended beyond September, 1982. (Tuetken, prepared testimony at 18, ff. 8408[~~.~~]; see also Connaughton, Staff prepared testimony at 16-17, ff. Tr. 9510.)

BRP was performed by reinspectors who were properly recertified to ANSI N45.2.6 (1978) before commencing reinspections.*/ (Del George, prepared testimony at 20, 21, ff. Tr. 8406; Tuetken, prepared testimony at 16, 17, ff. Tr. 8408.) The proper certification of the reinspectors was confirmed on the basis of extensive overview inspections by Applicant's project construction and quality assurance departments and the NRC Staff. (Del George, Tr. 8789; Ward, Tr. 9691-92.)

62. Reinspections were performed to the same or more stringent criteria than had been used in the original inspection. (Del George, prepared testimony at 21, ff. Tr. 8406.) If design requirements or inspection criteria had been relaxed subsequent to the initial inspection, acceptability of the work performed by the original inspector was evaluted according to the earlier, stricter criteria. (Del George prepared testimony at 20-22, ff. Tr. 8406.) [a] A further conservatism[~~,-since~~] was introduced whenever the reinspectors, having

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*/ In our Initial Decision, we identified a concern about the number of Hatfield inspectors that required recertification and/or retraining at the inception of the BRP. (I.D. ¶D-436.) In response, Mr. Connaughton explained that as of September 30, 1982, Hatfield employed 46 inspectors all of whom required additional training, testing, and/or documentation to comply with the new QC inspector certification requirements. Mr. Connaughton also explained that there is no particular significance to the number of Hatfield inspectors requiring recertification inasmuch as they were required to meet new, more prescriptive certification standards irrespective of whether they had previously received adequate testing and on-the-job training and all of them were included in the population considered in the BRP. (Connaughton, prepared testimony at 18-19, ff. Tr. 9510.)

been trained to 1983 standards, were required to apply less stringent earlier criteria. Mr. Tuetken testified that in many cases it was simply not possible to ignore the influence of the current standards. (Tuetken, Tr. 8706-07.)

63-69. The Staff adopts these paragraphs.

70. Despite this evidence of conservatism, Dr. Kochhar testified for Intervenors that knowledge by the reinspectors of the identities of the original inspectors could have biased the reinspection results non-conservatively, that is, in favor of conforming reinspections. Dr. Koc[e]hhar testified that the reinspection effort should have been undertaken by individuals with no previous involvement at the site to minimize any bias (Koc[e]hhar, prepared testimony at 10-11, ff. Tr. 10,538.) However, on cross-examination Dr. Kochhar admitted that he could not state whether such knowledge did in fact lead to nonconservative bias in this particular inspection setting. Nor would he even attempt to quantify the amount of bias which may have been introduced. (Kochhar, Tr. 10,604-05, 10,612.) Moreover, [~~consistent with the Staff testimony,~~] Dr. Kochhar admitted that such bias, even if it was introduced, might just as well have led to stricter reinspection rather than leniency. (Kochhar Tr. 10,605.) We conclude that there simply is no evidence that reinspectors' knowledge of the identities of some original inspectors non-conservatively biased the results of the BRP.

71-73. The Staff adopts these paragraphs.

74. As with Dr. Kochhar's earlier theories, we are not persuaded that a mimic effect played a significant factor in the results of the BRP. First, by program definition, the only inspections which were

subject to reinspection were those where the items inspected had been found originally to conform to requirements. (Kochhar Tr. 10,618.) Thus, the original inspection results can be viewed as a constant, the original inspector always having found the items to meet requirements. We find[~~,-as-a-matter-of-common-sense,~~] that the mimic effect is less likely to operate in conjunction with such a constant.

75-77. The Staff adopts these paragraphs.

78. First, Mr. Koca's release from Hatfield in October 1983 was not related in any way to his work on the BRP. (Tuetken, prepared testimony at 8, ff. Tr. 8408; See also Hayes, Tr. 9965[~~,~~]-9968.) Second, Mr. Koca's role in the BRP was limited to supervising the Hatfield QA clerical staff review of certification records to identify the roster of inspectors based on certification dates. Thereafter, his role consisted solely of supervising the clerical staff members who were responsible for searching the inspection record files to identify each individual inspection performed by the selected inspectors during their first 90 days. (Tuetken, prepared testimony at 7, ff. Tr. 8408.)

79-81. The Staff adopts these paragraphs.

82. Part A of the audit finding identified two problems with potential consequences on the analysis of the BRP results. The first problem involved the use of field problem sheets by Hunter rather than discrepancy reports. A subsequent quality assurance surveillance (number 5189) verified that discrepancy reports had in fact been initiated for the particular discrepancies as required by Hunter's procedures. (Shewski, prepared testimony at 9, Attachment F, ff. Tr. 8423.) The second problem involved the [~~reinspection~~] question of whether the attribute of bolt

tongue was recreatable. (Shewski prepared testimony, Attachment E, p. E-7, ff. Tr. 8423.) This item was dispositioned by a letter from Sargent & Lundy which stated that the particular bolt values would relax over time and thus could not be reproduced for purposes of the reinspection program. (Shewski, prepared testimony at 9, Attachment F, p. F-7, Tr. 8423.)

83. Part B of the audit finding determined that Hatfield was using field problem sheets to revolve discrepancies identified during reinspection for conduit and termination attributes. A subsequent quality assurance surveillance (5202 R1) determined, however, that all discrepancies identified on field problem sheets during the BRP by Hatfield were included in the results of the BRP and that Hatfield inspectors were instructed not to use field problem sheets in the future. Shewski, prepared testimony, Attachment G, ff. Tr. 8423. That surveillance also found that Hatfield NCR number 674 was written to disposition a deficient item discovered during [~~reinspection process~~] the reinspection of electrical terminations, which had previously been the subject of a field problem sheet prepared by Production personnel. (Shewski, prepared testimony at 10, Attachment G, ff. Tr. 8423).

84-91. The Staff adopts these paragraphs.

92. Staff oversight of the implementation of the BRP has been extensive. (Little, Staff prepared testimony at 7, ff. Tr. 9510.) In the reinspection area of greatest concern to the Staff because of its subjectivity, i.e., visual weld inspections, the Staff examined a significant number of welds covered in the BRP. (Little, Tr. 9637). These inspections were conducted principally by Mr. Kavin Ward, a weld inspector with approximately 38 years of experience in welding and/or weld inspection. Ward, Staff

prepared testimony at 10-11, Professional Qualifications of Kavin Ward, ff. Tr. 9510. Mr. Ward testified that he and another Staff inspector visually examined and documented approximately 500 welds which had been [~~previously examined~~] reinspected in the BRP, of which approximately 330 had been reinspected by Hatfield, Hunter or PTL inspectors. [~~and which had been subject to the BRP~~] Ward, Staff prepared testimony, at 10, 17-18, Enclosure 1 at 37-38 ff. Tr. 9510). In addition, Mr. Ward looked at thousands of other welds during the course of his inspections at Byron, but did not document his examination of those welds. (Ward, Tr. 9772-9773.) The Staff inspectors examined the welds to determine that they had in fact been reinspected and that the reinspector had not overlooked a discrepancy. Mr. Ward testified that he also examined the documentation of welds generated by the BRP as well as the documentation generated by the original weld inspection. H[~~h~~]e also held discussions with supervisors and lead weld inspectors. (Ward, Staff prepared testimony at 10, 11, enclosures 1, 2, ff. Tr. 9510.)

93. The Staff adopts this paragraph.

94. For other then welding attributes, Staff oversight of Hatfield and Hunter included the review of inspection reports, nonconformance reports, deficiency reports, and the observation of work activities, including inprocess inspections. (Ward, Love, Staff prepared testimony at 10-12, [~~11~~,] enclosure 3, ff. Tr. 9510.)

95. The Staff adopts this paragraph.

96-99. The Staff adopts these paragraphs.

100. For the subjective attribute (visual weld inspection), Hatfield and Hunter each had one inspector whose first three months of work failed

to meet the 90% acceptance criteria. PTL had [~~two~~] three such inspectors. Because the[~~se individuals~~] Hatfield and Hunter inspectors and two of the PTL inspectors had no further work, their qualifications could not be assessed further and under the terms of the BRP were considered indeterminate. The reinspection results for these inspectors were retained in the BRP data base. A substitution was made for each of these inspectors and each substitute's reinspected work was determined to meet program acceptance criteria. (Del George, prepared testimony at 28, ff. Tr. 8406.)

101. The performance of one PTL inspector did not meet the 90% subjective acceptance criterion for either his first or second three-month period. Therefore, all of this inspector's remaining work was reinspected. In addition, PTL was subjected to an inspector sample expansion which captured the first three months of work for visual welding inspection of all remaining inspectors whose work was accessible. Each of the four additional inspectors passed the 90% acceptance criterion.*/ (Del George, prepared testimony at 28, ff. Tr. 8406; Shewski, prepared testimony at 24, ff. Tr. 8423; Little, Staff prepared testimony at 9, 10, ff. Tr. 9510.)

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*/ The two PTL inspectors who did not meet the 90% criterion in the first 90 days and the one PTL inspector who failed to meet the criterion for both the first and the second 90 days, had the effect of reducing PTL's cumulative average agreement rate in the BRP. The acceptance criteria were not, however, directed at contractor-wide performance and the cumulative results did not cause the Staff to be concerned about the qualifications of PTL as the independent testing agency at Byron. (Connaughton, Tr. 9666-9667.)

102. Both Edison and the Staff have concluded that the number of inspectors whose work was reinspected, the amount and type of work reinspected, and the requirement for sample expansion provide[s] a valid basis to draw positive conclusions about the qualifications of the overall population of inspectors, and specifically those for Hatfield, Hunter and PTL. (Del George, prepared testimony 29-53, ff. Tr. 8406; Hansel, prepared testimony at 23, ff. Tr. 8901; Little, Staff prepared testimony at 4, ff. Tr. 9510; Connaughton, Tr. 9876.) [As Mr. Del George emphasized, the fundamental objective of the BRP was to verify by reinspection the adequacy of the qualification and certification practices for contractor QC inspectors. He concluded, as we do, that the BRP demonstrated the effectiveness of these practices for a representative sample of inspectors from which it can be inferred that the same practices were effective as applied to the remaining inspectors and, therefore, as to all inspection work performed by the entire inspector population. Based upon the findings of the BRP that a representative sample of QC inspectors had generally performed competently irrespective of any deficiencies in the practices by which they were certified, the Applicant and Staff conclude, and we agree, that there is reasonable assurance of the capability of Hunter, Hatfield and PTL inspectors whose work was not reinspected. (Del George, prepared testimony at 33, ff. Tr. 8406[,]; Little, Staff prepared testimony at 4-6, ff. Tr. 9510.)

103. The fact that certain inspections were inaccessible or not recreatable does not affect these conclusions, since, as Mr. Del George pointed out, the qualification and certification programs for

inaccessible and non-recreatable attributes were the same as those verified by the BRP. (Del George, prepared testimony at [22] 34-35, ff. Tr. 8406.) Indeed, Messrs, Buchanan and Somsag testified that Hatfield and Hunter QC inspectors were selected and trained in the same manner regardless of the types of inspections they were to perform. (Buchanan, prepared rebuttal testimony at 3, 4, ff. Tr. 11,174; Somsag, prepared testimony at 2-5, ff. Tr. 11,172.) The requirements imposed for prior experience, job training, and performance demonstration have the same general scope and technical content for each of these attributes. In addition, the attributes not reinspected are similar in many respects to those captured for reinspection. (Del George, prepared testimony at 33-35, ff. Tr. 8406; [~~Muffet, Tr. 9871; see generally,~~] Muffett, Staff prepared testimony at 21-23, ff. Tr. 9510.) Although the BRP reveals less about nonreinspectable PTL attributes than it does about Hatfield and Hunter attributes, reasonable assurance as to the quality of the PTL inspections is provided by the BRP and by the fact that, throughout the construction of the plant, nonreinspectable items inspected by PTL have been audited by CECo and inspected by the Staff, resulting in no discovery of significant problems. (Muffett, Staff prepared testimony at 22-23, ff. Tr. 9510; Muffett, Tr. 9870-71.).

104. We have previously found that the sample selection process for inspectors whose work was to be reinspected was appropriate (¶ 37, supra); that the choice of the first 90 days of an inspectors tenure on the site was a proper time period for checking the vaildity of an inspector's training and initial qualification (¶ 49, supra); the acceptance criteria

for establishing whether an inspector was qualified, based on the results of the reinspection are appropriate and conservative (¶'s 53, 57, supra) the results of the BRP are accurate and reliable (¶ 91, supra), and there was extensive oversight of the entire BRP by CECo's QA department (¶¶ 80-91, supra) and the NRC Regional Staff (¶¶ 92-95, supra). Based on the results of the BRP, the Board finds that Applicant has provided reasonable assurance that the Hatfield, Hunter and PTL inspectors who performed inspections at Byron, beginning with the construction of safety-related work in 1976 through September 1982, were qualified, even though their certifications were not in [~~strict~~] accordance with ANSI N45.2.6 (1978).

105. The Staff adopts this paragraph.

106. The Staff adopts this paragraph, as corrected by letter from Mark Furse to the Licensing Board dated September 17, 1984.

107-114. The Staff adopts these paragraphs.

115. The detailed engineering evaluation of the discrepancies in Hatfield objective attributes demonstrated that none of the evaluated discrepancies had design significance and, therefore, they had no safety significance. (French, prepared testimony at 8 ff. 9044.)

116-125. The Staff adopts these paragraphs.

126. The Board finds that, based upon the Sargent & Lundy evaluations of discrepancies in the Hatfield and Hunter objective attributes, none of the discrepancies had design significance and, accordingly, they had no safety significance.

127-148. The Staff adopts these paragraphs.

149. In the case of all 49 ASME discrepant welds, the weld connections met Code design criteria. The Sargent & Lundy evaluations of the Hunter

ASME weld discrepancies demonstrate that, as was true with respect to the Hunter AWS weld discrepancies, as well as the Hatfield weld discrepancies, none of the discrepancies had design significance and, hence, they had no safety significance. Accordingly, the quality of this reinspected work is adequate. (Branch, prepared testimony at 14, ff. Tr. 9051.)

150. The Board finds that, based upon the Sargent & Lundy evaluations of the Hatfield AWS discrepant welds and the Hunter AWS and ASME discrepant welds, none of the discrepancies had design significance and, accordingly, they had no safety significance.

151. On August 20, 1984, at the resumption of the evidentiary hearings, Applicant filed a motion to strike substantial portions of Mr. Stokes' proposed testimony. After oral argument on the motion (Tr. 10,640-10,667), we struck those portions of the testimony which we did not believe to be related to the issues in this remanded proceeding. See generally, Tr. 10,687-10,739, 10,761-10,762. The portion of Mr. Stokes' testimony that was admitted into evidence essentially consists of a call for an independent review of discrepancies based on an alleged lack of objectivity and impartiality on the part of Sargent & Lundy. We will now address the specific concerns raised by Mr. Stokes that have not already been discussed and his allegations regarding the need for an independent review of discrepancies. First, Mr. Stokes asserted that pipe supports which were included in Sargent & Lundy's Hunter AWS welding discrepancy evaluations are subject to fatigue loadings and, thus, convexity should have been considered a defect more serious than a cosmetic flaw. (Stokes, prepared testimony at 18, ff. Tr. 10,770.) However, as Mr. Stokes acknowledged, the American Institute of Steel Construction (AISC) Code does not require a reduction

in the allowable stress in a weld for fatigue loading until the number of stress cycles exceeds 20,000. (Stokes, Tr. 10,841-42; Erler, prepared rebuttal testimony at 7-8, ff. Tr. 11,158.) Further, Mr. Stokes admitted that he did not have adequate information to determine whether pipe supports at Byron would experience 20,000 cycles of fatigue loading over their lifetime. (Stokes, Tr. 10,842-43.) In fact, the number of stress cycles experienced by pipe supports at Byron is substantially less than 20,000. (Erler, prepared rebuttal testimony at 8, ff. Tr. 11,158.)

152. Mr. Stokes also asserts that waterhammer could cause fatigue loading. (Stokes, prepared testimony at 18-19, ff. Tr. 10,770.) The evidence indicates, however, that waterhammer loading on a piping system is not a loading that could cause a fatigue problem. Waterhammer is a dynamic pulse loading with low frequency of occurrence. Therefore, the number of stress cycles is extremely low and fatigue is not a problem as defined in the AISC Code. (Stokes, prepared testimony at [9,] 18-19 ff. Tr. 10,770; Tr. 10,844-65.)

153. The Staff adopts this paragraph.

154. Intervenors' expert also expressed concern because flare-bevel groove welding was included under a prequalified welding procedure*/ designated as 13AA. (Stokes, Tr. 10,800-01.) Such welding should be produced against a qualified welding procedure, i.e., one that is validated by establishing through a field demonstration that the procedure produces

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*/ A prequalified welding procedure is one accepted by the AWS. It does not require field testing before it is employed on any particular project.

an adequate weld. However, the Hatfield AWS flare-bevel welds captured in the Byron Reinspection Program were produced during the period May, 1978 through September, 1982. During that period, flare-bevel groove welds were, in fact, produced under qualified procedures 13Q and 13AB. Procedure 13AA, a prequalified welding procedure, was not approved until December 30, 1983, and flare-bevel groove welding was erroneously included in that procedure. This error is being rectified and the procedure for flare-bevel groove welding is being issued as a qualified procedure. (Erler, prepared testimony at 7, ff. Tr. 11,158.)

155-157. The Staff adopts these paragraphs.

158. All discrepancies subject to ASME Code examination acceptance criteria were [~~reparied,~~] repaired even though they were determined by evaluation not to have design significance. All other discrepancies were either [~~reparied~~] repaired or dispositioned as acceptable "as-is" based on the engineering evaluation results. (Del George, prepared testimony at 36, ff. Tr. 8406.)

159-165. The Staff adopts these paragraphs.

166. In evaluating work quality, we begin with the Appeal Board observation, previously noted, that for purposes of this proceeding a presumption of work quality follows a showing of inspector competence. (ALAB-770, slip opinion at 28.) This is also consistent with the position taken by Edison and by the Staff. As Mr. Laney testified, the presence of competent inspectors suggests that significant discrepancies are unlikely to go undetected. Indeed, as noted above, this very phraseology was used by the Staff in its description of the purpose of the BRP. (Little, Staff prepared testimony at 4-5, ff. Tr. 9510.) By

removing doubt as th the qualification and capability of the whole body of inspectors, the BRP has provided confidence in the quality of the work that was originally inspected. (Laney, prepared testimony at 18, ff. Tr. 9339; Little, Staff prepared testimony at 4-5, ff. Tr. 9510.) We have already found the inspectors in question to be qualified. (¶ 104, supra.) Accordingly, in line with the Appeal Board reasoning, this finding, on its own, raises a presumption of the adequacy of Hatifled and Hunter work quality that has not been rebutted.

167-177.

178. All these judgments on work quality [~~on-work-quality~~] were made on the basis of engineering judgment rather than on the basis of the application of mathematical statistical theory. (Del George, Tr. 8518.[;] The Staff also stated that the sampling methodology in the BRP was based on engineering judgment and "was not statistically conceived." Little, Staff Prepared Testimony at 4, ff. Tr. 9510.) The Applicant also offered the testimony Dr. Anand Singh, Assistant Head of the Structural Analytical Division of Sargent & Lundy, which applied principles of statistics to the results of the engineering evaluations discussed in the testimony of Messrs. McLaughlin, Branch, and French. Singh, prepared testimony at 3-4, ff. Tr. 9055. The conclusions of the Applicant's witnesses based on engineering judgment, however, stand independently of Dr. Singh's statistical analysis. McLaughlin, prepared testimony at 16-17, ff. Tr. 9047; Tr. 9272-9274. Notwithstanding the use by these expert witnesses of engineering judgment as the basis for determining that the work quality was adequate, Intervenors presented the testimony of Dr. Ericksen in an effort to demonstrate that, applying

mathematical statistical theory, inferences could not be made regarding the entire scope of Hatfield and Hunter work based upon the sample of the work reinspected in the BRP.

179. In assessing the significance of the testimony of Intervenors' statistical expert, Dr. Ericksen, we recognize that he does not purport to be an expert in the design, construction or evaluation of nuclear power plants and that he has no experience as a quality control inspector at a nuclear power plant. (Tr. 11,026-11,045.) He is an expert statistician, but he recognizes that the conclusions expressed by knowledgeable professional engineers in this proceeding may in fact not be statistical statements at all, but rather the results of an engineering analysis. (Ericksen, Tr. pp. 11,077-78.) The limited role of a statistician in these circumstances was also recognized by Dr. Frankel, the statistical expert testifying on rebuttal for Applicant, who explained that a sampling statistician is not qualified to draw inferences where a non-probability sample is used, but can only assist the subject matter expert in drawing inferences from that sample and has no role to play when a subject matter expert does not purport to apply mathematical statistical theory at all. (Frankel, prepared testimony at 8-9, ff. Tr. 11,120.) None of the witnesses presented by Applicant or Staff, except Dr. Singh, purported to rest their conclusions on an application of mathematical statistical theory and Mr. McLaughlin specifically stated that the results of a statistical analysis were immaterial to his conclusions. (McLaughlin, Tr. 9272-[74]73.) Thus, recognizing that mathematical statistical theory plays an extremely minor role in the evaluation of the quality of Hatfield and Hunter's work, we turn to a consideration of Dr. Ericksen's testimony.

180. Dr. Ericksen's basic criticisms focussed on a formula used by Dr. Singh to calculate the reliability for Hatfield and Hunter inspection attributes. That reliability calculation expressed the proportion of work items in a total population which had no discrepancies with design significance and is stated in the formula R = 1 - 2.9955/n where R = reliability at a 95% confidence level and n = number of inspections. (Singh, prepared testimony at 6, ff. Tr. 9055.) Application of the formula resulted in calculated reliabilities in excess of 99% for all but two Hatfield inspection attributes (the two which were lower had small sample sizes and were in excess of 99% for all but two Hatfield inspection attributes (the two which were lower had small sample sizes and were in excess of 96%) and for both Hunter attributes. (Singh, prepared testimony at 6, ff. Tr. 9055.) Dr. Ericksen testified that use of the reliability formula in Dr. Singh's testimony was valid only if the inspectors within the sample were homogeneous. (Ericksen, prepared testimony at 10-11, ff. Tr. 11,045.) Dr. Ericksen purported to demonstrate that the inspectors was not homogeneous based on a mathematical calculation of 'intraclass correlation," a statistical technique for measuring homogeneity. (Ericksen, prepared testimony at 11, ff. Tr. 11,045.) However, Dr. Ericksen's calculations on which he based his conclusion that the inspectors were not homogeneous used data relating to observed discrepancies. Dr. Ericksen [~~admitted~~] agreed that a calculation based on design significant discrepancies would lead to a calculated intraclass correlation of zero and thus a conclusion that inspectors were homogeneous. (Tr. 11,058) Of course, observed discrepancies are not a measure of the adequacy of Hatfield and Hunter work. It is only the existence of previously undetected design significant

discrepancies which would call the adequacy of those contractors work into question and it was the likelihood of undetected design significant discrepancies that Dr. Singh was attempting to estimate. We find, therefore, that this [~~criticism~~] criticism of the use of the reliability formula by Dr. Singh misunderstands the basic purpose of the calculation and does not detract from conclusions expressed by any witness regarding the adequacy of Hatfield and Hunter work.

181-183. The Staff adopts these paragraphs.

184. [~~Dr. Ericksen's statistical arguments are similar to those which were rejected by the Licensing Board in the recent Shoreham decision.*/ At Shoreham, an independent verification of construction adequacy was conducted by an engineering firm, Terrey Pines Technology. Witnesses for Suffolk County, an intervenor, criticized Terrey Pines for its decision to rely on engineering judgment rather than statistical methodology in the selection of the structures, systems and components which were inspected during the verification. The Board rejected any suggestion that an application of statistical methodology controlled its evaluation of the adequacy of construction at Shoreham, stating in pertinent part:~~

> ~~[T]here has been no application of statistical methodology to a problem as diverse and complex as the verification of construction of a nuclear power station . . . .~~

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*/ [~~Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), LBP 82 57, 16 NRC 445 (1983).~~]

~~The Commission's Quality Assurance Criteria, 10 C.F.R. Part 50, Appendix B, do not require the use of statistical sampling methodology. Moreover, throughout the nuclear power industry, it is not the practice to utilize statistical methodology in quality assurance auditing programs~~

~~(18 NRC at 619-20.)~~

We believe that the necessary effect of Dr. Ericksen's position is that one cannot rely upon the results of sampling programs to draw broad conclusions regarding aspects of a nuclear power plant unless the sampling program was statistically rigorous. We know from our familiarity with the NRC inspection program that it is based on a sampling approach, since the NRC staff does not have the resources to verify every aspect of construction of a nuclear plant. Furthermore, the NRC's Quality Assurance criteria (10 C.F.R. Part 50, Appendix B) do not require the use of statistical methodology in quality assurance programs.*/ We reject Dr. Ericksen's position.

185-196. The Staff adopts these paragraphs.

197. IE Report 454/84-09, 455/84-07 identified one apparent item of noncompliance involving a single Hatfield discrepancy report (DR-3882) which dealt with the removal of a cable from a conduit. The discrepancy report inaccurately described the pulling force applied in the removal

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*/ Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), LBP-83-57, 18 NRC 445, at 619-620 (1983).

of the cable, resulting in a deficient engineering evaluation. This event was determined to be an isolated occurrence. (Del George, prepared testimony at 45, ff. Tr. 8406.) This matter is discussed fully, infra, [¶293-297] ¶273-277.

198. The Staff adopts this paragraph.

199. Mr. Little, on behalf of the NRC Staff, testified that Region III believes that the reinspection of over 160,000 safety-related elements for Hatfield and Hunter, the results of those inspections, and the analysis and disposition of the reinspection findings provide reasonable assurance that the overall quality of the work of those contractors is good. (Little, Staff prepared testimony at 6, ff. Tr. 9510.) When polled by the Board, the members of the Region III Staff panel reinforced this conclusion with their personal views. For example, Mr. Ward testified that with respect to welding Byron is probably the safest plant ever built. (Ward, Tr. 9872, 9910.) Mr. Muffett agreed with Mr. Ward, adding that the Staff review of Byron construction was unusually "critical" in its search for discrepancies. Mr. Muffett concludes that the results of BRP reinforce the Staff's already positve conclusions about Byron. (Muffett, Tr. 9872.) Messrs. Little, Love and Connaughton each testified that contractor work quality was adequate, even rigorous, and that Byron can be operated safely. These conclusions are based, not only on the results of the BRP, but also on the Region's long and detailed inspection history at Byron. (Little, Tr. 9872-73; Love, Tr. 9875; Connaughton, Tr. 9876-77.)

200. Moreover, the testimony of William Forney, as it concerns work quality, is entirely consistent with that of the Region III panel. Mr. Forney testified, vigorously, that the results of the BRP provided

added assurance that Byron construction quality is adequate. As with the Region III panel, Mr. Forney's conclusions on work quality are based as well on his extensive experience with Byron construction activities. Mr. Forney's point of departure with the testimony of the Staff panel has to do with inferring QC inspector competence from the fact that they did not overlook safety significant deficiencies. (See ¶25, supra.) [Although Mr. Forney's reasoning here is a little vague, one basis for his position appears to be Mr. Forney's very strong belief,] [b]Based on his experience as the senior resident inspector, [that safety-significant discrepancies do not exist at Byron, in] Mr. Forney['s words] stated with respect to the quality of construction at Byron:

> [I]t has been Region III's position all along, and . . . mine, that the construction at the Byron plant was good, because we had not discovered obvious hardware problems like we have at other sites. . . .
>
> I feel at this time that the information provided by the reinspection program did, in fact, provide a very large data base to confirm Region III's position that the quality of the Byron site is acceptable and that it is generally good. . . .
>
> And when you couple this with the work . . that the workers do, which I believe to be generally of good quality, the inspection programs that not only does the NRC undertake, but Licensee has inspection programs, they've had reinspection programs, they've had overinspection programs, you have that coupled with the construction testing before it's turned over to preoperational testing, and when you put those all together and you have the overlap, . . . it's my belief and my professional opinion that those together have provided that degree of assurance required by 10 CFR 50, Appendices A and B, as to the requisite safety and health of the public.

(Forney, Tr. 10,044-45.) This being the case, [there is simple no reason for Mr. Forney's "miniscule" disagreement with the Staff panel to] the differences between Mr. Forney and the Staff panel in the

reopened proceeding regarding the inferences that can be drawn as to QC inspector competence do not weigh against our finding that work quality at Byron is adequate. Indeed, Mr. Forney's testimony shows that he believes strongly in the adequacy of Byron work quality.

201-202. The Staff adopts those paragraphs.

203. Intervenors' only real challenge to the overall quality of the Hatfield and Hunter work lies in their assertion that, based upon mathematical statistical theory, inferences could not be made regrading the entire scope of the Hatfield and Hunter work based upon the sample of work reinspected in the Byron Reinspection Program. As noted, above, we do not believe that there has been any showing that Applicant's use of statistics was erroneous. In any event, mathematical statistical theory played little, if any, role in the conclusions reached by the engineering witnesses. These witnesses made clear that their conclusions were based on engineering judgment[~~,--As-did-the-Licensing Board-in-the-recent-Shoreham-decision-when-it-noted-that-10-CFR-Part-50, Appendix-B,-does-not-require-the-use-of,-nor-is-it-the-practice-in-the nuclear-industry-to-utilize, statistical-sampling-methodology,-we specifically-decline-to-base-any-conclusions-regarding-work-quality-on the-application-of-that-methodology,~~] and articulated sound bases for their judgments. We find it unnecessary to rely upon the application of statistical methodology to draw a conclusion on the quality of Hatfield and Hunter work at Byron. We find that the numerous bases presented by Applicant, considered together, [~~demonstrate~~] provide reasonable ssurance that the overall quality of the Hatfield and Hunter work at the Byron plant is adequate.

204-206. The Staff adopts these paragraphs.

207. Evidence presented at the 1983 hearings and the remanded hearings recounted the history and extent of the corrective action program regarding SCC's work. In early 1980, as a result of discussions between the Staff and Applicant following receipt by Region III of an anonymous allegation that welding on local instrument panels did not conform to engineering specifications, the Applicant identified a generic problem with welds on local instrument panels supplied by SCC. [~~At the same time, as the result of allegations by an SCC employee, the NRC Staff was conducting an investigation of SCC quality assurance activities~~] (I.D., ¶D-97-98; Hayes, Connaughton, prepared testimony at 4-5, ff. Tr. 10,478.) To resolve this problem, on February 15, 1980 Applicant implemented an inspection program for local instrument panels. All safety-related local instrument panels shipped prior to that date were inspected at Byron by Pittsburgh Testing Laboratory (PTL) and either repaired and reinspected on site or sent back to SCC for repairs. Local instrument panels initially shipped from SCC after February 15, 1980 were inspected by PTL prior to shipment ("source inspected"). Ultimately, all safety-related local instrument panels were independently inspected by PTL and accepted. (Hayes, Connaughton, prepared testimony at 5, ff. Tr. 10,478.)

208-217. The Staff adopts these paragraphs.

218. To assure that the finite element analysis addressed the as-built condition of the control panel welds, Mr. Maurer, accompanied by a Westinghouse Level II welding engineer, visually inspected all of the accessible welds in each of the control panels in the main control

room. (Maurer, prepared testimony at 8-9, ff. Tr. 10,158.) The minimum values for weld length and size found as a result of the visual inspection (the "lower bound weld condition"), and the maximum seismic loads acting on each type of structural member as determined by the finite element analysis, were then applied in a calculation to determine whether specific welded connections would have sufficient strength to withstand applied loads. (Maurer, prepared testimony at 10, ff. Tr. 10,158; Maurer, Tr. [~~10,310~~] 10,210-11, 10,165-67, 10,283-84.) The maximum stress calculated was found to be within the allowable stress criteria prescribed by the applicable codes. (Maurer, prepared testimony at 11, ff. Tr. 10,158; Maurer, Tr. 10,284.) In view of the margin of safety present in the construction of the main control panels, Mr. Maurer concluded that the structural integrity of the Byron main control panels, including those supplied by SCC, will be maintained in the event of design basis earthquake for the Byron Site. (Maurer, prepared testimony at 11-13, ff. Tr. 10,158.)

219-226. The Staff adopts these paragraphs

227. In 1981 discrepant welds were found on the SCC DC fuse panels during an inspection by Sargent & Lundy level III inspectors. Of the 2,170 welds inspected, 986 were found discrepant. In addition stitch welds were missing on one location in one of the panels, Panel No. 2DC10J. These inspection results caused Applicant to question the efficacy of a seismic qualification analysis of the DC fuse panels performed by Wiley Laboratories in 1980. Consequently Sargent & Lundy was requested to requalify these four DC fuse panels by performing a further analysis. (Kostal, prepared testimony at 46-[~~47~~] 49, ff. Tr. 10,159.)

228-245. The Staff adopts these paragraphs.

246. Mr. Kostal detailed the several engineering evaluations that have been performed on varying aspects of the cable tray hanger system over the last several years, none of which ever found any weld discrepanices of design significance. (Kostal, prepared testimony at 12-20, ff. Tr. 10,159.) The most significant of these evaluations was conducted in 1984 pursuant to Applicant's nonconformance reports regarding weld quality discrepancies found by Hatfield Electric Company on the SCC shop welds. (Kostal, prepared testimony at 12, ff. Tr. 10,159.) To address the general concern for SCC weld quality, Sargent & Lundy identified for weld inspection a random sample of 80 hangers out of the population of 5717 SCC cable tray hangers at the Byron Station. The sample captured all commonly used connection types, and 44 connections that were deemed to be highly stressed. (Kostal, prepared testimony at 12-13, ff. Tr. 10,159.) The 80 selected hangers included 358 SCC shop-welded connections. Of these, 252 were found to have no discrepancies, and 106 were found to have some form of discrepancy such as underlength, undersize, overlap, undercut, and craters. Two of the discrepant connections were missing portions of welds. No cracks were found on the welds. (Kostal, prepared testimony at 12-13, ff. Tr. 10,159.)

247-251. The Staff adopts these paragraphs.

252. Under the expanded hanger connection inspection program, if a portion of a missing weld is found, an evaluation will be performed to determine whether the capacity of the connection is reduced by greater than 53 percent. (Muffett, Tr. 10,512/) If any hanger connection is found to have a capacity reduction in excess of

53 percent, the program will be further expanded to include all inaccessible connections. (Muffett, Tr. 10,483, 10,512-13.) However, further expansion of the inspection program may not be necessary if Applicant can demonstrate to the NRC Region III Staff circumstances associated with the connection which would obviate the necessity of inspecting all inaccessible connections on the hangers. (Muffett, Tr. 10,483-84.)

253-264. The Staff adopts these paragraphs.

New paragraph 264A. We believe that the evaluations of SCC equipment described in ¶¶204-264 resolve the concerns which lead the Appeal Board to include the issue of SCC supplied equipment in the reopened proceeding. The Appeal Board noted that in paragraph D-442 of our Initial Decision we relied upon the 100 percent reinspection of SCC equipment committed to in Mr. Reed's January 26, 1981 letter to Mr. Keppler in reaching our conclusion that the determination of the adequacy of SCC supplied equipment was properly delegable to the Staff. ALAB-770, 19 NRC , slip op. at 30-32. The Board Notifications from the Applicant and the Staff brought our assumption into question. The issue of the adequacy of SCC supplied equipment has now been adequately addressed on the record of this proceeding and the one remaining issue (with respect to cable tray hangers) we believe to be delegable to the Staff.

265. The Staff adopts this paragraph.

266. Applicant presented two witnesses to address this issue. James O. Binder, Applicant's Project Electrical Supervisor at Byron, discussed the history of the cable overtensioning issue at Byron and explained Applicant's response to items of noncompliance and open items regarding cable over-

tensioning which were identified by the Staff during various inspections. Bobby G. Treece, Sargent & Lundy's Senior Electrical Project Engineer at Byron, described the analysis performed by Sargent & Lundy of all of the safety-related electrical cables installed in conduit at Byron before December, 1982. The purpose of this analysis was to determine whether any of those cables had been rendered unacceptable due to overtensioning. (Treece, prepared testimony at 3, ff. Tr. 9408.) The testimony of R.S. Love of the NRC Staff also addressed the question of possible cable overtensioning. (Love, prepared testimony at 25-27, ff. Tr. 9510.)

267-268. The Staff adopts these paragraphs.

269. The Construction Assessment Team ("CAT") inspection conducted in the Spring of 1982 found that Hatfield's cable installation procedures did not address the requirements for calculating electrical cable sidewall pressure and did not provide instructions regarding cable rework. (Binder, prepared testimony at 6 and Attachment C - Inspection Report 82-05/82-04 at C-70 to C-71, ff. Tr. 9406.) In response, Hatfield revised its procedures to address allowable pulling tension considering sidewass pressure limitations and instructions regarding electrical cable rework. The revised procedures were implemented in December, 1982. The NRC Staff found the revised procedures satisfactory and closed this portion of the item of noncompliance. (Binder, prepared testimony at 6-7 and Attachment B Inspection Report 83-16 at B-6, ff. Tr. 9406.)

270-279. The Staff adopts these paragraphs.

280. We identified this tabling issue as a proper subject for the remanded hearing, insofar as the BRP would address our concerns regarding tabling. Applicant addressed this concern through the testimony

of Malcolm Somsag. Mr. Somsag is the site quality assurance supervisor for Hunter at Byron. He has previously testified for Applicant, primarily in response to Mr. Smith's allegations. (Somsag, prepared testimony at 1 -2, ff. Tr. 9452.) Messrs. Connaughton and Ward addressed the tabling issue on behalf of the Staff. (NRC Staff, prepared testimony at 19-21, ff. Tr. 9510.)

281. The Staff adopts this paragraph.

282. Mr. Somsag described the inspection program in which the BRP was applied in detail. The program consists of four broad inspection types to which all safety-related work, including the installation of safety-related component supports, is subjected. Type 1 inspections are conducted during initial installation [~~of~~] activities to verify the existence and adequacy of required documentation. Type 2 inspections are also conducted during installation activities and are designed to determine whether the hardware meets design requirements and whether the documentation continues to reflect the status of construction and inspection. (Somsag, prepared testimony at 2, 3, ff. Tr. 9452.)*/

283. Once the work and Type 1 and 2 inspections associated with the work on [a] construction drawings are completed, Type 3 inspections are conducted to verify the overall adequacy of work. Type 3 inspections include a detailed review of documentation generated during construction to verify that all required inspections have been conducted and documented,

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*/ Mr. Somsag testified that this program was established in March, 1980. Hunter conducted an inspection of 100% of the supports installed prior to March, 1980 to assure that these supposts had been properly installed and documented. (Somsag, prepared testimony at 2, ff. Tr. 9452.)

and that the hardware conforms to the requirements of the construction drawings and associated as-built documentation. (Somsag, prepared testimony at 3, ff. Tr. 9452.)

284-285. The Staff adopts these paragraphs.

286. The Staff adopts this paragraph, as corrected by letter from Mark Furse, dated September 17, 1984.

287. The Staff adopts this paragraph.

288. The Staff adopts this paragraph, as corrected by letter from Mark Furse, dated September 12 , 1984.

289. The audits covered Hatfield's work activities, including welder qualification testing, material traceability, procedures, inspections, auditing, personnel qualifications, corrective actions, training, installation activities, calibration activities, records, fire protection, the BRP, storage and housekeeping, field change requests, design control and document control. (Shewski, prepared testimony at 32, ff. Tr. 8423.)

290-291. The Staff adopts these paragraphs.

292. Hatfield's [~~correction~~] corrective actions consisted of additional inspections, auditing, training, review of personnel documentation packages and review of discrepancy reports to ensure proper disposition. Mr. Shewski testified that for all audit findings acceptable corrective action by Hatfield has been achieved or is underway. (Shewski, prepared testimony at 33, ff. Tr. 8423.)

293. The Staff adopts this paragraph.

294. In Hunter's case, Applicant's quality assurance organization has conducted 14 audits and at least 142 separate surveillances between August , 1983 and the start of the reopened hearing. The audits covered

the key aspects of Hunter's work activities and quality program requirements, including [~~width~~] whip restraint installations, handling, storage and shipping, non-conformances, welder qualification testing, inspector qualifications, the BRP, design and installation methodology, control of field change notices, concrete expansion anchors and bolted connections, equipment installation, corrective action, auditing, piping and equipment component support, installation and engineering activities, document control and quality assurance implementation in general. (Shewski, prepared testimony at 30, ff. Tr. 8423.)

295-298. The Staff adopts these paragraphs.

299. The PTL audits identified 10 deficiences (4 findings and 6 observations). These involved an inspector improperly accepting seven two-inch welds, a receiving inspector not having proper certification, whiteout having been used by one person on sample logs, and incomplete documentation on ultrasonic test records. Corrective action for these deficiencies basically involved retraining. Mr. Shewski testified that these PTL findings and observations did not have significance and that adequate corrective measures were easily achieved. (Shewski, prepared testimony at 31- 32, ff. Tr. 8423.)

300-303. The Staff adopts these paragraphs.

304. A two month long Applicant audit of over 10,500 records was conducted in late 1982 to verify the authenticity of contractor QC documentation. Another related audit was performed for the BRP in early 1984 by Applicant's general office quality assurance department. Hunter, Hatfield and PTL records were covered by the audit. One purpose of the audits was to make certain that no fradulent documentation practice has

occurred. The contractors' method of control and administration of QC qualification tests were reviewed, including reviews to verify that retests were done with a different test than the original and that tests and test answers were controlled. Calibration records were reviewed to ensure that information and [~~date~~] data were unique, complete and not improperly altered and that signatures on documents were orginal and by authorized personnel. Reviews were also conducted to verify that site QA personnel were checking contractor welder qualifications and QC inspector qualification packages for acceptability and authenticity. No fradulent activities were identified. (Shewski, prepared testimony at 26, ff. Tr. 8423.)

305-313. The Staff adopts these paragraphs.

314. The three allegations whose resolution was supplemented by data from the BRP all concerned Hatfield welding. (Hayes, prepared testimony at 4 and Attachment C, ff. Tr. 9964.) One allegation, that approximately 90 percent of certain Hatfield hangers which were covered with fireproofing and which were inspected because of missing weld travelers were rejectable, was disproven by results of inspections which were conducted to resolve a related nonconformance report. The BRP reinspected welds that were covered with fireproofing and found none that required repair, thus confirming the above results. (Hayes, prepared testimony at 4, ff. Tr. 9964.) A second allegation claimed that the rejection rate for Hatfield hanger welds merited removal of fireproofing to reinspect additional welds. This allegation was resolved in the course of the BRP, during which [~~removed~~] all the fireproofing in areas identified by the alleger was removed and [~~the finding thereby of~~] only one unacceptable

connection was found out of the 300 connections examined. (Hayes, prepared testimony at 4-5, ff. Tr. 9964.)

315. A third allegation charged that fireproofing covered tack welds and that there was no documentation of such unacceptable welds. This allegation was resolved by the inspection and completion of the welds identified by the alleger, and the BRP inspection of 5,500 fireproofed welds which found only two tack welds. Further, it was found that discrepancy reports were not issued because the [~~tack~~] welds on the subject hangers had not yet been accepted by QC at the time of the allegation. (Hayes, prepared testimony at 5, ff. Tr. 9964.)

316-317. The Staff adopts these paragraphs.

318. Based on this supplemental decision, several of the findings and conclusions in our Initial Decision of January 13 must now be either modified or withdrawn. The Summary and Comments Section of our Initial Decision does not constitute any portion of our factual findings and we make no change in that part of our Initial Decision. [~~Similarly, we make no change in~~]. Paragraphs 1 through 7 and 10 of the Conclusion and Order Section of the Initial Decision [~~stating, however that it is~~] which relate to the quality assurance issue are withdrawn and are superseded [~~in its entirety~~] by the Conclusions of Law and Order Sections of this Supplemental Initial Decision. Paragraphs 8 and 9 of the Conclusions and Order Section, which relate to the emergency planning phase of this proceeding, are retained. We note that pursuant to our September 14, 1984 grant of the "Agreed Motion for Time Extension Regarding Emergency Planning Committment W" (dated September 13, 1984), Intervenors reserved the right to petition for a hearing only if they have evidence that Applicant has failed to show good

faith in discussing concerns raised by the mayors identified in Commitment W or in reviewing plans proposed by the mayors.

319-320. The Staff adopts these paragraphs.

321. The concerns expressed in findings D-403 and D-404 regarding possible fradulent contractor practices have now been resolved [~~in~~] to our satisfaction and CECo has established that Hatfield documentation is not fraudulent and is adequately reliable and accurate. (See ¶'s 301-306.)

322-329. The Staff adopts these paragraphs.

330. Finding D-441, which concludes that Hatfield's quality assurance program in inadequate, is withdrawn. The BRP results, together with the other testimony [~~is~~] in the reopened hearing, show that Hatfiled quality control inspectors were qualified, that Hatfield work quality is adequate and that Hatfield's quality documentation is adequate.

331. The Staff adopts this paragraph.

332. The Staff adopts this paragraph, as corrected by letter from Mark Furse, dated September 17, 1984.

333. The Staff adopts this paragraph.

334. Applicant has met its burden of proof with respect to Contention 1A, and we find in Applicant's favor on that contention. [~~the contention is hereby rejected~~]. Having decided in our previous decision that Applicant had met its burden of proof with respect to the other seven issues in controversy, the Licensing Board concludes with respect to each of these contentions that there is reasonable assurance that the Byron Nuclear Power Station can be operated without endangering the health and safety of the public. We retain our requirement that any

operation of the Byron Station above five percent of power be subject to the three conditions with respect to emergency planning set forth in the Conclusion and Order section of our Initial Decision.

XX. Order.

~~[WHEREFORE, IT IS ORDERED, in accordance with 10 C.F.R. §§ 2.760(a) and 2.762, that the Initial Decision as modified by this Supplemental Initial Decision shall constitute the final action of the Commission thirty (30) days after the date of issuance hereof.] Within ten (10) days after service of our~~

Wherefore, it is ordered that, our Initial Decision, as modified by this Supplemental Initial Decision, authorizes the Director of Nuclear Reactor Regulation to issue full-power licenses for Byron Nuclear Power Station, Units 1 and 2. In accordance with 10 C.F.R. § 2.764(f), this authorization is, however, limited to fuel loading and low power (up to 5 percent of rated power) testing pending the decision of the Commission upon its review to determine whether our Initial Decision, as modified by this Supplemental Initial Decision should become immediately effective. Pursuant to §2.764(f)(2)(ii), the parties may file brief comments with the Commission pertaining to the immediate effectiveness issue. To be considered, such comments must be received within 10 days of the date ofthis Decision.

Pursuant to ALAB-770, 19 NRC ____, slip op. at 35-36, and 10 C.F.R. §§2.760(a), 2.762, 2.764, 2.785 and 2.786, the Initial Decision, as modified by this Supplemental Initial Decision, shall not constitute final agency action pending the decision of the Appeal Board on the Applicant's appeal pending before it. Within ten (10) days after service of our Supplemental

Initial Decision any party aggrieved by that decision shall notify the Appeal Board of its intention to modify its pleadings and briefs before the Appeal Board. The form of such further pleadings and briefs and the time within which such further pleadings and briefs shall be filed, shall be in accordance with an order issued by the Appeal Board.

Respectfully submitted,

Stephen H. Lewis

Stephen H. Lewis
Deputy Assistant Chief Hearing Counsel

Dated in Bethesda, Maryland
this 24th day of September 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
COMMONWEALTH EDISON COMPANY	)	Docket Nos. 50-454
	)	50-455
(Byron Station, Units 1 and 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S PROPOSED SUPPLEMENTAL INITIAL DECISION" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or as indicated by an asterisk through deposit in the Nuclear Regulatory Commission's internal mail system, or as indicated by a double asterisk by use of express mail service this 24th day of September 1984:

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