ORIGINAL

UNITED STATES
NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

DOCKET NO: 50-456 OL
50-457 OL

COMMONWEALTH EDISON COMPANY

(Braidwood Station, Units 1 and 2)

LOCATION: CHICAGO, ILLINOIS

PAGES: 16710 - 16912

DATE: THURSDAY, NOVEMBER 6, 1986

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	
COMMONWEALTH EDISON COMPANY	Docket No. 50-456 OL 50-457 OL
(Braidwood Station, Units 1 and 2)	

Pages 16710 - 16912

United States District Courthouse
Courtroom 1743
219 South Dearborn Street
Chicago, Illinois 60604

Thursday, November 6, 1986.

The hearing in the above-entitled matter reconvened at 9:00 A. M.

BEFORE:

JUDGE HERBERT GROSSMAN, Chairman
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C.

JUDGE RICHARD F. COLE, Member,
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C.

JUDGE A. DIXON CALLIHAN, Member,
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C.

APPEARANCES:

On behalf of the Applicant:

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On behalf of the Intervenors:

ROBERT GUILD, ESQ.

EXHIBIT INDEX	Marked	Received
Intervenors' Exhibit No. 188	16808	16841
Intervenors' Exhibit No. 189	16845	
Intervenors' Exhibit No. 190	16878	16895

TESTIMONY OF LOUIS OWEN DEL GEORGE

JUDGE GROSSMAN: Good morning. This is the 87th day of hearing.

Do we have any preliminary matters? None?

MR. GUILD: Mr. Chairman --

JUDGE GROSSMAN: Mr. Guild?

MR. GUILD: -- I have some exhibits that are in production, and they're being photocopied -- or being composed and photocopied as we speak.

I want to avoid a delay. I informed the Applicant that if they want to take up the offer of the testimony first and my motions with respect to that, that would be fine by me.

I'd ask if we could take a brief recess if necessary at that point before my cross begins so that I can get these documents.

JUDGE GROSSMAN: That's fine.

You may proceed, Mr. Steptoe, calling your next witness.

MR. STEPTOE: Judge Grossman, our next witness is Louis O. DelGeorge. I ask that he be sworn at this time.

(The witness was thereupon duly sworn.)

LOUIS OWEN DEL GEORGE

called as a witness by the Applicant herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STEPTOE:

Q Mr. DelGeorge, would you state your full name for the record?

A Louis Owen DelGeorge.

Q By whom are you employed and in what capacity?

A I'm employed by Commonwealth Edison Company as an assistant vice-president responsible for engineering and licensing activities.

Q Have you prepared a document entitled "Rebuttal Testimony of Louis O. DelGeorge on Rorem QA Subcontention 2, Harassment and Intimidation"?

A Yes.

Q Now, this document originally was filed in November, and it has gone through -- there have been some revisions. Excuse me.

It was originally filed in August, and there have been some revisions to it since that time, have there not?

A Yes, sir.

MR. STEPTOE: I'll state to the Board that those revisions are included in the document which was just handed out; but just to be clear, the most recent revisions were forwarded to the Board on November 3, 1986.

BY MR. STEPTOE:

Q Mr. DelGeorge, would you just identify the pages on which those revisions took place?

A The revisions are -- relate to Pages 17, 19, 26, 38 and 41.

Q And what was the reason for those revisions?

A If we could refer to Page 17, a reassessment by me of the CSR data base required a modification to the number of Comstock inspectors referred to, in response to Answer 15, that were captured or included within the CSR data base.

Q Mr. DelGeorge, why did you perform that reassessment of the CSR data base?

A To assure that my response to this question was accurate.

Q Okay.

And is that result from the S & L October, 1986, recount of weld discrepancies and discrepant welds?

A As it turns out, it is my opinion that it did not result from the work that Sargent & Lundy has done.

In fact, it was a result of the data base change that took place in late September of 1986 and had just not been previously reflected in the modification to my testimony.

Q Okay.

In general are the modifications to your testimony a result of the data base changes that have been made by S & L?

A No. In fact, in general the reasons for the changes in my testimony are attributable to that intermediate change that took place in late September.

Q Okay.

Let's go on to Attachments 2C DelGeorge-1, 2, 3, 4, 5 and 6, which are the graphs attached to your testimony.

Who prepared these graphs?

A These graphs were prepared for me by George Orlov, based on a sorting of the CSR data base.

Q Okay.

And do they accurately reflect the CSR data base which has been put into evidence yesterday as Attachment 2C Kaushal-4 Revision 2?

A I believe they do.

I should point out at this point that with respect to these graphs, to the extent they have changed, they are generally -- those changes are generally the result of the data base modification resulting from the reassessment done by Sargent & Lundy in the welding area.

Q One more point, Mr. DelGeorge:

At Question and Answer 6, there's a question, "What have you done to prepare this testimony"; and as of August, 1986, you give an answer.

You have also been in this hearing room frequently, have you not, since August of 1986?

A Yes, sir.

Q Have you listened to some of the testimony that was given in this case since that time?

A Yes, sir.

MR. STEPTOE: I have no further questions -- well, one further question.

BY MR. STEPTOE:

Q Mr. DelGeorge, as modified, is your testimony accurate, to the best of your knowledge and belief?

A Yes, sir.

MR. STEPTOE: Judge Grossman, I move that the testimony of Louis O. DelGeorge be admitted into the record as if read.

JUDGE GROSSMAN: Mr. Guild?

MR. GUILD: First, Mr. Chairman, if I could just have a clarifying question with regard to Mr. DelGeorge's change, the first change alluded to.

JUDGE GROSSMAN: Certainly. You may voir dire.

VOIR DIRE EXAMINATION

BY MR. GUILD:

Q Mr. DelGeorge, you alluded to a September reassessment.

Was that a reassessment that made further allocations of CSR inspection results to L. K. Comstock inspectors?

A It affected the allocation of reinspection results to L. K. Comstock inspectors, and I believe it was discussed in the testimony provided by Mr. Orlov --

Q Yes.

A -- a few weeks ago.

Q Yes.

That was based on errors in the original allocation among Comstock inspectors; for example, cases where multiple inspections had taken place, but only a single attribution was made?

A That may be the case.

My recollection, with respect to the specific inspectors that were -- that affect my testimony, is that it related to the -- specifically to the electrical equipment population and the way in which the electrical equipment deficiencies were attributed to inspectors in that population.

I don't recall specifically whether there were errors in allocation between inspectors, as opposed to a change in the way deficiencies were counted with respect

to a specific inspector.

Q Well, let be more precise, then.

What accounted for the change at Page 17 of your testimony?

A The original data base that I had reviewed identified that 20 of the 24 Comstock inspectors that had made their concerns known to the NRC in 1985 were captured by the data base prior to the end of September of 1986.

A reassessment of the data after the changes that were, as I said, discussed by Mr. Orlov indicated that one additional inspector did not perform work that had previously been allocated to him.

I am not certain as to the reason for the re-allocation.

Q So one inspector who was identified as among the 24 dropped out?

A That's correct.

Q Who was that?

A Mr. Gorman.

MR. GUILD: All right.

Mr. Chairman, Intervenors object to receiving Mr. DelGeorge's testimony in general on grounds that Mr. DelGeorge apparently is being tendered as an expert witness within the meaning of Federal Rule 702.

There is, of course, no formal tender and no formal

tender required. Perhaps I could inquire, as a preliminary matter, whether my understanding is accurate that Applicant tenders Mr. DelGeorge as an expert within that rule.

MR. STEPTOE: That's correct.

MR. GUILD: Mr. DelGeorge is not appropriate -- Mr. DelGeorge's testimony is not appropriate to be received, in our view, as expert testimony, Mr. Chairman.

The federal rule clearly permits the receipt of expert testimony where, in the judgment of the Licensing Board, that testimony will aid the trier of fact.

The federal rule has a very liberal view of what "expertise" consists of within the meaning of the rule on expert testimony. However, what is really at issue here is the opinion evidence that Mr. DelGeorge offers.

Now, we certainly have no objection to Mr. DelGeorge offering opinion evidence as a lay witness, as a lay witness who has certain background and experience. As a lay witness, his opinion evidence, therefore, is going to be judged as the opinion evidence would be of any other lay witness.

But the testimony of Mr. DelGeorge page after page after page is replete with opinion evidence that is characteristic only of an expert and, therefore, is

being offered as if Mr. DelGeorge had expertise that was greater than a lay person.

The most striking contrast and the point where this objection we think is most telling is where one compares and contrasts Mr. DelGeorge's testimony with the testimony of Dr. Frankel.

Take Dr. Frankel as an example of someone who, aside from whether his expert testimony should be credited or not, is clearly the type of testimony that is traditionally offered as expert testimony by a person who -- at least on the face of his background, training and experience -- appears to possess the requisite expertise to express, at least in general, expert testimony of the character expressed.

The Board should be aware that Dr. Frankel's testimony is focused on very narrow points of expertise; and this is not accidental, in the judgment of Intervenors. This is because as to points other than those narrow points, the subject of Dr. Frankel's testimony, he simply lacks sufficient expertise to offer expert opinion evidence. At several points Dr. Frankel makes that acknowledgment: "I am not an expert. Therefore, I can't express opinions about something involving nuclear construction," for example.

What happens here is the areas where Dr. Frankel

concedes that, as a statistician, he is not an expert to offer opinion evidence, wholesale we see Mr. DelGeorge being offered as the source of expertise, inappropriately, we believe, for the following reasons:

Mr. DelGeorge, of course, as his prefiled testimony reflects, is indeed a partisan in this case. Mr. DelGeorge appears to have primary responsibility within Applicant's organization for obtaining an operating license for the Braidwood nuclear facility. He is the director of nuclear licensing. He clearly has responsibility for the areas involving the subject of this hearing.

But he is not, by any stretch of the imagination, someone who can express dispassionate and objective expert opinion evidence about these subjects.

I'd like to direct the Board's attention in particular, by way of illustration, to Page 38 of Mr. DelGeorge's prefiled direct testimony.

Page 37; excuse me. Give me one second, Mr. Chairman.

Pardon me. It's Page 36, Question and Answer 33. Note in particular where Mr. DelGeorge offers the following opinion, quote, "I believe with an extremely high degree of confidence that no significant adverse trends actually exist in the population from which the

samples were chosen."

Well, note that this opinion is stated with respect to a point where Dr. Frankel himself, using his expertise as a statistician, disclaims explicitly the ability to attach any significance to the data that he observes.

If you recall, Dr. Frankel showed an attachment in his prefiled testimony reflecting a scatter diagram to which he attempts to fit a curve. He applies standard statistical measures to the fit of that curve and determines that the data, in effect, exhibit no significant trend from a statistical standpoint.

Now, that's Dr. Frankel expressing an opinion based on his expertise.

Mr. DelGeorge inappropriately, we believe, based not on expertise, based not on expertise as the Federal Rules contemplate, then seizes upon what an expert can't testify to and expresses the opinion, "I believe with an extremely high degree of confidence," et cetera.

Now, that's simply an example.

What's going to happen is Mr. DelGeorge's testimony, in that example and dozens of others which I will cite, will be a matter of record in this case and will be cited by Applicant as not simply the opinion of the nuclear licensing director of Commonwealth Edison

Company but the opinion of a man who has been qualified as an expert.

We believe opinion evidence from Mr. DelGeorge, because of his lack of qualifications, because of his interest in this matter, because he expresses opinions on matters that are not subject to expert opinion evidence that will aid the trier of fact in this case, should not be received.

Let me simply make references for the record, please, to the points I have in mind.

At Page 6 Mr. DelGeorge expresses opinion evidence in Answer 5, the middle of the paragraph: "It is my opinion that the data from these two repeat inspection programs can be used to reliably evaluate what effects," et cetera.

Page 10, Answer 8, the second paragraph: "It is my judgment, based on my familiarity with," et cetera; expert opinion.

Page 11, Answer 9: "I would expect those results to show two things," et cetera; expert opinion.

Page 12, the middle of the page, second paragraph: "I would expect some correlation"; again, expert opinion.

Page 13, Answer 10: "I have concluded that: (1) LKC QC inspections were effective, and (2) there is no

apparent relationship," et cetera.

Page 14: "The overall agreement rates for the work subjected to repeat inspection are, in my judgment, acceptable." That's at the end of the second sentence, the first paragraph there.

Page 15, Question 13: "In your judgment, is it reasonable," et cetera. It seeks an opinion inappropriately.

Page 20: "My determination of how much information is sufficient to allow trending is a qualitative judgment, unlike Dr. Frankel's calculation," et cetera.

Page 21, Question 18, seeks opinion evidence: "To the extent there is sufficient CSR data to permit trending analysis, did you observe any trends?" It seeks an inappropriate opinion from this witness.

Page 29, Question 23: "Dr. Frankel testifies that, in performing his analysis, he only used the items from the CSR sample which were selected using random sampling." I'm paraphrasing. "Have you reviewed the remaining non-probability portion," et cetera. It seeks an opinion.

Page 33, Answer 28, the last paragraph: "Because of the size of the PTL overinspection sample," et cetera, "I believe this data base can be used to evaluate changes"; inappropriate opinion evidence.

Page 36, Question 33: "What conclusion, if any, do you draw from Dr. Frankel's testimony that there is a slight linear trend?" I've already referred to that opinion evidence in Answer 33.

Page 43, Question 37: "In your opinion, does the fact that the PTL overinspections are not a probability sample preclude its use in assessing Comstock QC Inspector performance?" It seeks and elicits opinion evidence.

Finally, at Page 49, what indeed expresses an opinion on the ultimate issue in this case, the testimony beginning, "On the basis of the facts contained in this hearing record which I have reviewed," et cetera, "I conclude that" there are no harassment and intimidation effects.

Mr. Chairman, as the record reflects, Mr. DelGeorge is a manager of Commonwealth Edison Company. We believe he's a lay witness. We believe he's appropriate to consider as a lay witness. His testimony should stand on foundation -- should have a stature that is no greater than that of a lay witness.

Mr. DelGeorge also, of course, is a lawyer. But the fact that he's a lawyer doesn't give him any expertise. Perhaps if there were fewer of us lawyers involved in reviewing nuclear safety issues, we'd have

safer nuclear power plants.

The fact of the matter is, though, it's inappropriate for Edison to be able to put in, in the guise of expert opinion testimony, the testimony of a partisan, of a man who is a manager, of a man who has line responsibility for assuring that the Braidwood Station receives the operating license that, of course, is the subject of this proceeding.

We think that couching Mr. DelGeorge's testimony as expert testimony simply substitutes for the unavailability of offering such evidence through someone who indeed does possess the expertise, who indeed does possess the absence of interest, the requisite independence and expertise to offer such opinion evidence.

It's inappropriately offered through this witness. We believe the testimony should not be received for that reason.

JUDGE GROSSMAN: Mr. Steptoe?

MR. STEPTOE: Judge Grossman, let me address the point of Mr. DelGeorge's affiliation with Commonwealth Edison Company.

First, under the Federal Rules of Evidence, Rule 601 -- it's entitled "General Rule of Competency" -- the relevant portion says, "Every person is competent to be

a witness except as otherwise provided in these rules."

A note of the Advisory Committee on the Rules states --

JUDGE GROSSMAN: I don't think we have to spend time on this. I don't believe that his position in the company disqualifies Mr. DelGeorge from being an expert witness.

That certainly goes to whatever weight, as far as Mr. Guild would want to brief that in the findings. But certainly it's not a disqualifying matter that Mr. DelGeorge is employed by the Applicant in this case.

The big question is whether -- and I understand Mr. Guild does not object to Mr. DelGeorge giving the testimony. My understanding is that he merely objects to Mr. DelGeorge being considered a statistical expert, because I believe those portions of the testimony that were cited by Mr. Guild go to statistical matters.

Mr. Guild I think is not disputing the fact that Mr. DelGeorge may give the company's position on that, including the opinion of the company, but that he shouldn't hold himself out as a statistical expert to offer this in the guise of expertise.

I'll have to say I'm inclined to agree -- but I'll hear further on that -- that we can't consider him a statistical expert; that he has an engineering

background as well as a legal background, but that he is competent to give the company's position and to have us consider those positions or those opinions on the merits, without the backing of any claim of statistical expertise for that.

But I'll hear further from you, Mr. Steptoe.

MR. STEPTOE: All right, Judge Grossman.

I think that Mr. DelGeorge is a competent engineer. His direct testimony indicates he's received substantial training in engineering.

Mr. Guild has not purported to probe what background Mr. DelGeorge has in statistics. I think you will find, if those questions were raised, that Mr. DelGeorge does have a familiarity with statistics.

Moreover, if you think that a statistician has the answers to analyzing the results of these reassessment programs, I think you're mistaken.

I think Dr. Frankel was very clear on this point: that particularly when you deal with non-probability samples, that is not a job for a statistician. In fact, he says so on Page 8 of his prefiled testimony: "Non-probability samples are somewhat more difficult to use than probability samples, for the purpose of making inferences to a large population."

MR. GUILD: Is that Dr. Frankel?

MR. STEPTOE: Yes.

"This is because the adequacy of a non-probability sample is not assured by the sample selection method, but instead must be evaluated by an individual or individuals who have substantive knowledge and experience related to the quantities under study"; that is, Mr. DelGeorge.

Mr. DelGeorge is not himself offered as a statistical expert, but he is offered as an expert in the design and review of reinspection programs as someone who is competent to take the results of something that a statistician does and factor it in with his substantive knowledge of the quantities under study and come to an expert conclusion.

I believe that you will find, when Dr. Frankel gets here, that he will be the first to disclaim the limits of what his expertise is.

One needs an expert, one needs somebody with engineering expertise, with expertise in the review of the results of programs like this, to make sense out of them and to see what the numbers tell you.

JUDGE GROSSMAN: Well, I hear what you're saying, Mr. Steptoe, and it appears to me as though there may not be any dispute.

You agree that Mr. DelGeorge is not a statistical

expert, and I believe Mr. Guild is willing to accept Mr. DelGeorge's opinions as offered for matters of judgment and opinion as far as they relate to engineering and the company's position.

But it appears to me he disputes only his use of any claim to statistical expertise for what may be statistical matters.

If that's the case and we're all agreed that he's not a statistical expert, I would think that we would accept his testimony and, to the extent that we may decide that some of it may require statistical expertise, that his testimony may not be worth that much on those areas.

To the extent that we find that statistical expertise is not needed but the engineering expertise is sufficient, we'll weigh those portions.

Have I misrepresented your position, Mr. Guild?

MR. GUILD: I don't think you've misrepresented it, but maybe you've misunderstood it, perhaps slightly. Let me just be clear.

Of course, now it is understood that the concession has been made by Applicant that Mr. DelGeorge is not a statistical expert. That did not appear in anybody's testimony. That appeared only by inference in Dr. Frankel's testimony that Mr. Steptoe cited.

I appreciate that, and now I have a little better understanding of what the limits of Mr. DelGeorge's expertise are now.

Nevertheless, using the rubric of engineering expertise, in the absence of statistical expertise, of what Mr. DelGeorge has to say we think is an inappropriate basis for qualifying his testimony as expert testimony for the following reason:

This Board has to make judgments about this record. They have to make judgments about the facts in this record, the appropriate inferences to be drawn from the facts in this record.

To say that Applicant, through presenting Mr. DelGeorge, in place of the Board reaching these conclusions, can simply rest on what, in effect, is proffered as the expert testimony of this witness we think is inappropriate.

Indeed he has knowledge. Indeed his knowledge is going to have to either support or not support his testimony. I look forward to talking with him about the substance of his testimony.

My concern is that by cloaking him with expertise, in effect, on matters that are beyond either his qualification or the qualification of any expert, in effect, Applicant is asking an expert witness to provide

what is appropriately the province of this Board; that is, drawing inferences from the facts in this record.

JUDGE GROSSMAN: Well, I think that we can't make a blanket ruling at this point but that, having heard the arguments, it's up to us to distinguish for ourselves, when we get the proposed findings, as to how much of the testimony can be accepted as within Mr. DelGeorge's expertise and how much is basically in the province of statistics, for which we would not accept Mr. DelGeorge's opinion as being expert opinion but as being only an opinion of the company, as an informed officer of the company.

So the ball is really in our court -- not right now, but ultimately -- to see how much of the testimony would be acceptable as given per se as an expert within the field of expertise. I think that's as far as we can go right now.

Mr. Steptoe, do you have a disagreement with that?

MR. STEPTOE: I don't have a disagreement with what you said, Judge Grossman; but Mr. Guild made a reference to a concession, so I'd better make it clear what we're conceding and what we're not conceding.

JUDGE GROSSMAN: You're certainly not conceding any more than you have to.

(Laughter.)

MR. STEPTOE: That's it. We are not conceding --

JUDGE GROSSMAN: You are not making a blanket concession that Mr. DelGeorge is not versed in statistics?

MR. STEPTOE: That's correct.

JUDGE GROSSMAN: But if you're going to want to get more of this opinion testimony accepted by the Board that goes into statistical evaluations, I think it's going to be up to you to disclose or to determine Mr. DelGeorge's expertise in those particular areas.

As of now, all you've shown is the engineering and the legal background. If there's any further background of Mr. DelGeorge's that would bolster his judgments here, then I think it's up to you to bring that out.

MR. STEPTOE: I think I'd better do that, then, Judge Grossman.

May I do some additional voir dire?

JUDGE GROSSMAN: Certainly.

VOIR DIRE EXAMINATION

BY MR. STEPTOE:

Q Mr. DelGeorge, would you describe what background, if any, you have -- what education or background, if any, you have with respect to statistics?

A I have one undergraduate course in experimental methods

that dealt specifically with the review of experimental data and the statistical treatment of data of that type.

As well, I've taken one graduate-level course in engineering statistics at the Bettis Atomic Power Laboratory.

In addition, throughout my engineering career, I have had occasion to review, for purposes of identifying trends, the results of many programs.

In my experience at the Bettis Atomic Power Laboratory in the design of support structures for a nuclear fuel core, I was responsible for the design as well as the evaluation of the adequacy of that design after fabrication.

That entailed a review of configuration data with respect to those components to determine whether or not the manufacturing process for the component was under control and the ultimate quality of the product was within the accepted design basis that we had set.

I have also had experience at Commonwealth Edison with respect to a number of programs, some of which are referred to in my testimony, where I was called upon to review the results of programs, one program of which is very -- the Byron Quality Control Inspector Reinspection Program is very closely related to the kind of review that I've done in this case to determine the consequence

of that data with respect to inspector -- the effectiveness of Quality Control Inspectors.

Q Okay. Mr. Guild referred to a number of opinions which you've given in your testimony.

Are any of those opinions statistical in nature?

A It seems to me that whether or not they are may be better judged by others.

In reaching those opinions or conclusions myself, I was not thinking in statistical terms. My intent was to perform an engineering evaluation of the data base that was presented to me to determine whether or not there were any significant engineering trends apparent in that data base.

My general educational experience and work experience may have been influenced by some of the training and past reviews that I have been exposed to.

To the extent I relied on what I had learned in a statistical sense, that may be factored into my opinion. But I did not at the outset intend to make statistical judgments.

MR. STEPTOE: That's all I have, Judge Grossman.

JUDGE GROSSMAN: Okay. I don't think that we have to make a dispositive ruling now.

It appears to me offhand -- and maybe the Board

Members concur; maybe not -- that what Mr. DelGeorge has is some statistical background that's useful to an engineer. But I wouldn't say that his formal training of one undergraduate and one graduate course would really qualify him per se as a statistical expert.

But we'll certainly take into account his statistical background of what is useful to an engineer as part of his engineering background anyway, and we'll just have to evaluate his testimony on that basis.

MR. GUILD: Mr. Chairman, if I might have one brief question by way of voir dire on this point.

JUDGE GROSSMAN: Sure.

VOIR DIRE EXAMINATION

BY MR. GUILD:

Q Mr. DelGeorge, on Page 3 of your prefiled testimony, sir, you make reference to your participation in, quote, "the development of numerous construction verification programs developed to address questions raised concerning the adequacy of construction activities."

I take it the Byron reinspection program was one of those?

A Yes, sir.

Q All right.

What were the others that you had in mind in that reference, sir?

A I have been involved in the development of programs at the LaSalle County Station with respect to the verification of structural steel configuration.

In addition, at LaSalle County Station I've been involved in the development of a program to verify the adequacy of the weld quality and configuration control for heating, ventilating and air-conditioning, HVAC, supports.

I might point out at this point that those are very similar to electrical component supports.

I have been involved in reviewing the results of a similar program at Byron Station with respect to structural steel configuration and also the Byron Quality Control Inspector Reinspection Program.

MR. GUILD: Mr. Chairman, I understand the Board's ruling and the Board's position on this matter.

With that understanding, I would simply want to ask the Board to note that we reserve our right under Rule 703, which relates to bases of expert opinion evidence, at the conclusion of my cross examination of Mr. DelGeorge, to seek by motion to strike portions of his testimony which are not based on matters appropriately the basis for expert opinion evidence.

JUDGE GROSSMAN: That's fine.

Mr. Berry?

MR. BERRY: With the understandings expressed by all the parties, particularly the Board Chairman, the Staff has no objection.

JUDGE GROSSMAN: I'm sorry. Your mike just went out.

MR. BERRY: We believe it is proper for a witness to present the company's position.

As I said, with the understandings that have been reached by the Board and by Applicant and Intervenors, with that understanding, it's acceptable to the Staff as well. We have no objection to Mr. DelGeorge's testimony being received in evidence.

JUDGE GROSSMAN: Fine. Then we'll admit Mr. DelGeorge's testimony on the basis that's just been discussed.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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(Braidwood Station Units 1 and 2)	)	

REBUTTAL TESTIMONY OF LOUIS O. DEL GEORGE
(ON OREM Q.A. SUBCONTENTION 2)
(Harrassment and Intimidation

November
~~August~~ 1986

UNITED STATES OF AMERICA
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TESTIMONY OF LOUIS O. DEL GEORGE
(ON ROREM Q.A. SUBCONTENTION 2)
(Harassment and Intimidation)

Q.1. Please state your full name for the record.

A.1. Louis Owen Del George.

Q.2. Who is your employer and what is your occupation?

A.2. I am employed by Commonwealth Edison Company (CECo) in its Corporate Offices in Chicago, Illinois.

I am an Assistant Vice-President, responsible for Engineering and Licensing activities.

Q.3. What are your responsibilities in this position?

A.3. In this capacity, I am responsible for all engineering activities related to the Company's operating nuclear reactors at Dresden, Quad Cities, Zion and LaSalle County Stations, as well as, Byron Unit 1. The engineering organization that reports to me maintains functional oversight of the engineering activities related to the reactor facilities under construction. The purpose of this oversight is to provide for the

uniform application of Commonwealth Edison's engineering procedures at both our operating nuclear plants and nuclear plants under construction.

In addition, I am responsible for all nuclear licensing activities for the Company's operating nuclear facilities and for the nuclear reactors which Commonwealth Edison is currently constructing at Byron and Braidwood.

Q.4. Please state your education and professional experience.

A.4. I received a Bachelor of Science Degree in Engineering Science from the Illinois Institute of Technology in 1970. I also received a Juris Doctor degree from the Chicago Kent College of Law of the Illinois Institute of Technology in 1977.

I began my professional career at the Bettis Atomic Power Laboratory in 1969 where I held various positions of increasing responsibility related to the design and fabrication of nuclear reactor internals. While employed at the Laboratory, I was appointed to the Shock and Vibration Design Review Committee which assessed the adequacy of vibration design practices for all pressurized water reactor plants designed at the Laboratory, including the Shippingport facility. I also attended the Laboratory's Reactor Engineering

School which provided graduate level instruction in the design of nuclear power systems.

In 1974, I joined Commonwealth Edison and have held positions of increasing responsibility in the Station Nuclear Engineering and Licensing Departments. In connection with my engineering experience, I managed numerous backfit projects related to the Dresden and Quad Cities Stations between 1974 and 1978.

In connection with my licensing experience, from 1978 to 1981, I was responsible for all licensing activities related to the LaSalle County Station including development of the Company's response to all NRC questions concerning design and construction activities. In addition, I participated in the development of numerous construction verification programs developed to address questions raised concerning the adequacy of construction activities.

In July, 1981, I was appointed Director of Nuclear Licensing for Commonwealth Edison at which time I assumed responsibility for all licensing activities related to the Company's nuclear facilities both operating and under construction. In this capacity, I participated directly in major decisions affecting the licensing of Braidwood Station including management meetings and enforcement conferences requested by the Nuclear Regulatory Commission.

In January, 1983, I assumed the position of assistant to the Assistant Vice-President of Engineering and Licensing with primary responsibility for coordinating all Company positions affecting the licensing of Byron Station, including hearings before the Atomic Safety and Licensing Board. I gave testimony to that Board in March, 1983 and July, 1984 on matters related to Commonwealth Edison's nuclear licensing activities and the Byron Quality Control Inspector Reinspection Program, (QCIRP) which I helped develop. I directed Commonwealth Edison's review of that Program and its results, and I directed the preparation of the report documenting those results and the Company's conclusions.

In November, 1983, I assumed my current position of Assistant Vice-President. In this position, I am responsible for all engineering activities at Dresden, Quad Cities, Zion, LaSalle County and Byron Unit 1. This responsibility includes the direction of all safety related modification work at those facilities. I am also responsible for managing communications between Commonwealth Edison and the Nuclear Regulatory Commission. This responsibility involves directing those Edison employees who have any contact with the Nuclear Regulatory Commission, and assuring that all

questions raised by that agency and directed to any Commonwealth Edison nuclear facility are understood, thoroughly reviewed and effectively answered. In this regard, I and the licensing personnel reporting to me, review Commonwealth Edison's commitments to the NRC Staff to ensure that the Company's actions are adequate and responsive to the NRC Staff's questions or concerns. In this capacity, in 1984 I coordinated the efforts of several Commonwealth Edison senior managers who developed the Braidwood Construction Assessment Program (BCAP). Subsequently I monitored the implementation of that program by means of monthly technical reviews which I directed, and in which those same senior managers participated.

Since March 1985, I have been responsible for directing all Commonwealth Edison's technical and licensing actions in connection with litigation of the quality assurance contention raised by intervenor Bridget Rorem, et. al.

Q.5. Mr. Del George, what is the purpose of this testimony?

A.5. The purpose of this testimony is to show how the results of the BCAP Construction Sample Reinspection (CSR) and the results of the Pittsburgh Testing Laboratory (PTL) Overinspection Program address the claims of pervasive production pressure and harassment

and intimidation of L.K. Comstock (LKC) QC inspectors which have arisen in this proceeding. The CSR and the PTL overinspection program were conceived, designed and carried out independently of each other, and for reasons unrelated to intervenors' claims of production pressure, harassment and intimidation. Nevertheless the evaluation documented in my testimony is based on the reinspection data compiled in these two programs. It is my opinion that the data from these two repeat inspection programs can be used to reliably evaluate what effects if any the alleged pervasive production pressure, harassment and intimidation had on the ability of LKC QC inspectors to identify quality problems, to initiate, recommend or provide solutions to any such problems, and to verify implementation of such solutions.

Q.6. What have you done to prepare this testimony?

A.6. In general, my preparation for this testimony entailed a review of the harassment contention submitted by intervenors in this proceeding, the regulations applicable to the conduct and activities put in issue by that contention and information relevant to the alleged harassment. That information included:

1. Deposition transcripts of all L.K. Comstock (LKC) QC inspectors identified by intervenor as having

been involved in the specific activities included in the contention, and testimony before this Board given by these QC inspectors at the time my testimony was prepared.

2. The BCAP Program document and the results of the BCAP Construction Sample Reinspection related to LKC.
3. The Pittsburgh Testing Laboratory overinspection program and the results of those overinspections for the period from July, 1982 to June 1986.
4. Inspection checklists employed by LKC, BCAP and PTL related to electrical construction activities at Braidwood.
5. Construction verification programs, with which I was involved at other nuclear sites, for related construction activities.
6. Rebuttal testimony prepared by other Commonwealth Edison witnesses in connection with this proceeding.

Q.7. What is your understanding of intervenors' claims with respect to L.K. Comstock QC inspector performance?

A.7. It is my understanding that intervenors claim "there is historic, tangible, powerful and pervasive production pressure at the Braidwood facility" (Guild at Tr. 7903-4), that this pressure was manifested through acts of harassment and intimidation by QC management of QC inspectors, and that these specific

acts as well as the general management climate affecting the LKC quality control function provide a sufficient basis for inferring that "there have been effects of such pressure and harassment and intimidation" (Guild at Tr. 7934).

Most of intervenors' allegations in this case involve Mr. R. Saklak and I. De Wald, who assumed their QC management positions in July, 1982 and August, 1983 respectively. The most specific allegations of undue pressure, harassment and intimidation involve the alleged imposition of production quotas during the reduction of the LKC QC backlog in 1984, the transfer of inspector J. Seeders in the end of September 1984, the termination of inspector W. Puckett in August, 1984 and the R. Snyder incident on March 28, 1985 which led to 24 LKC QC inspectors making allegations to the NRC on March 29, 1985. Intervenors characterize these specific allegations as "fitting into a larger scheme" caused by production pressure from Commonwealth Edison (Guild, Tr. 7908).

It is my understanding that the intervenors urge this Licensing Board to infer that the alleged production pressure, the alleged lack of independence from cost and schedule considerations, the alleged incidents of harassment, intimidation and retaliatory

treatment have had a deleterious effect on the adequacy of QC inspections. Intervenors argue that this presumed deleterious effect on QC inspections precludes licensing the Braidwood facility (Guild at Tr. 7903, 7912).

Q.8. How do the results of the CSR and the PTL over-inspections pertain to intervenors' claims?

A.8. Both the CSR reinspections and PTL overinspections provide the results of a large number of repeat inspections of LKC QC accepted work. These repeat inspections were produced by qualified inspectors independent of the LKC QA/QC organizations. The extent of the deficiencies found through these repeat inspections can be used as a measure of the effectiveness of the original LKC QC inspections. In addition, since this data spans the entire time period of electrical construction at Braidwood, variations over time in the reinspection results can be used to trace the impact, if any, on inspector performance of the events which intervenors characterize as improper production pressure, harassment and intimidation.

Intervenors' witness Dr. Arvey has recommended a reinspection of some sort directed towards the hardware installed and QC inspected by LKC. Dr. Arvey appeared to indicate that a sample reinspection program should provide a clear indication of the

existence of a true problem, if harassment and intimidation occurred and through "observational learning" in the work place reduced the effectiveness of QC inspector performance. In response to a question from Judge Callihan, Dr. Arvey stated that he did not know enough about the hardware to give an opinion on how such a reinspection program should be designed and implemented. (Tr. 4433) However, Dr. Arvey opined that if a 10% random sample of hardware items (consisting for example of 1000 welds) were reinspected and 30 percent of those welds had "significant defects," that would be a clear indication that additional remedial action should be undertaken. (Arvey, Tr. 4436)

It is my judgment, based on my familiarity with the electrical hardware at Braidwood and my experience in the design and review of reinspection programs, that the CSR and the PTL overinspection program are adequately structured and have generated sufficient information to provide a reliable answer to intervenors' claims. I explain the reasons why I believe the CSR and the PTL overinspection program together are adequate for this purpose later in this testimony.

Q.9. Based on intervenors' claims and the testimony of intervenors' experts Dr. Ilgen and Dr. McKirnan, what would you expect the results of the CSR and PTL overinspections to show?

A.9. I would expect those results to show two things: unacceptable work; and trends or variations of the results over time which could be correlated with periods of intense production pressure and acts of alleged harassment and intimidation.

If, as has been alleged, the production pressure on LKC QA/QC was "historic, tangible, powerful and pervasive," and as a result impaired the effectiveness of LKC QC inspections, the CSR and PTL overinspection results should identify numerous significant defects in the LKC QC accepted work. For example, intervenors' witness Dr. McKirnan contends that individual events of harassment and intimidation involving disincentives to quality inspector performance will "anchor" the employees criterion for good or bad work, and that the resulting "quantity over quality" values anchored in the workplace would "lower the performance standards of the quality control inspectors generally, such that the norms differentiating 'good' from 'bad' work may become less clear" (McKirnan at 12). Dr. McKirnan infers that inspectors <u>as a class</u> or presumably in subclasses would "generally understand that the standard of quality for passable work is becoming lower". (McKirnan at 12)

Intervenors' consultant Dr. Ilgin has provided prefiled testimony which suggests that the inspector work force as a whole was subjected perhaps unconsciously through "observational learning" to a model for behavior that promoted "quantity over quality". He remarks that he would be surprised "if the inspection behavior of at least some of the inspectors was not affected by the pressure" (Ilgen at 21). Dr. Ilgen goes on to say that the quality of actual workmanship, in this case the effectiveness of inspector performance, is an obvious behavior trace evidencing work behaviour. (Ilgen at 24)

Second, I would expect some correlation in time between acts of harassment and poor inspector performance as revealed by the repeat inspection results. In his deposition, Dr. McKirnan predicted that the inspectors' "anchor" (i.e., their performance standards) would move in response to events such as the discharge of Mr. Saklak. (McKirnan Dep. Tr. 136-140, 204-209). Dr. Ilgin indicated in his deposition that it would be useful to examine the results of a sample reinspection program to determine whether the quality of Comstock QC inspection, plotted as a function of time, could be associated with alleged episodes of harassment. (Ilgen Dep. Tr. 72-76).

Q.10. Mr. DelGeorge, please summarize the conclusions you have drawn from the results of the CSR and PTL repeat inspections.

A.10. Based on my review of the CSR reinspection data and the PTL overinspection data, I have concluded that: (1) the LKC QC inspections were effective, and (2) there is no apparent relationship between LKC QC inspector performance, as reflected by the variation over time in the CSR and PTL results, and the incidents of alleged harassment and intimidation and the periods of alleged intense production pressure described in the testimony presented to this Licensing Board.

Q.11. Mr. DelGeorge, what is the basis for your conclusion that the LKC QC inspections were effective?

A.11. One basis for this conclusion is the results of the CSR as described by Dr. Kaushal, Mr. Kostal and Mr. Thorsell. The most important result of the CSR is that there were no design significant discrepancies in the electrical work. This means that whatever the work climate was at LKC, the QC inspectors did not ignore or overlook important construction defects. Moreover the nature and rate of occurrence of discrepancies identified in the CSR, as discussed by Mr. Kostal and Mr. Thorsell, does not appear to me to be unusual, based on my own experience at Byron and elsewhere.

The PTL overinspection data provides a supporting basis for my conclusion. Although there are no engineering evaluations of discrepancies comparable to those performed for the CSR, the overall agreement rates for the work subjected to repeat inspection are in my judgment acceptable. Over the four-year period from July 1982 through June 1986, 92.56% of the welds which LKC QC inspectors found to be acceptable were also found to be acceptable by PTL overinspectors. When the results of S&L Level III inspections performed in the last year are taken into account, the agreement rate increases to 93.28%. The agreement rate for objective (non-welding) work overinspected by PTL from June 1985 through June 1986 is 95.98%, which I also consider to be acceptable. These results are comparable to the results for the reinspection of the same hardware attributes at Byron, where those results have been accepted as adequate.

Q.12. How did you calculate agreement rates for purposes of your review of the CSR and PTL data?

A.12. I calculated agreement rates in two ways. For the CSR, where the results have always been presented on an inspection point basis, I defined the agreement rate as being the number of inspection points determined by the CSR inspections to be acceptable divided by the total number of inspection points

reinspected in the CSR for the same period. In addition, for CSR weld reinspections I also calculated agreement rates on a weld basis, that is, as the number of welds found acceptable by the CSR divided by the total number of welds reinspected in the CSR for the same period. This latter definition of agreement rate is the same as that used by myself and by Mr. Marcus in reviewing the results of the PTL overinspections for welding.

Q.13. In your judgment, is it reasonable to use these agreement rates as measures of Comstock QC inspector performance?

A.13. Yes. Calculating agreement rates on an inspection point basis allows one to focus on the numerous judgments which a QC inspector is required to make in inspecting a hardware item. However, presenting the agreement rates on a weld basis is also useful because it allows one to compare the CSR results with the PTL overinspection results displayed in the attachments to Mr. Marcus' testimony.

The approach I have taken, which focuses on agreement rates, assigns to the original LKC inspector responsibility for each discrepancy identified by the CSR or PTL inspector. In my experience with reinspection programs, the cause of such discrepancies is not always attributable to the performance of the original

QC inspector. For example, procedural or inspection practice enhancements between the original inspection and the reinspection, design document clarifications after the original inspection, and to some extent the effectiveness of the reinspector's performance can all affect the actual acceptance rate of the original inspector. My review of the CSR and PTL programs indicates that each of these mechanisms was present to some small degree. Each of these other effects, though individually small, collectively add a measure of conservatism to the assignment of all observed discrepancies to the original LKC inspector. It is for these reasons that I believe that the agreement rates presented in my testimony and in the testimony of Mr. Marcus and Dr. Frankel provide a reasonable measure of LKC QC inspector effectiveness.

Q.14. Mr. Del George, please describe how you reviewed the CSR and PTL data to determine whether there was any relationship between LKC QC inspector performance and the allegations of harassment, intimidation and production pressure which have been made in this case.

A.14. My review of both data bases took the following form.

First, all repeat inspection results were sorted by the date of the original LKC hardware inspection. In this way the number of LKC inspections and the corresponding agreement rates between the original LKC inspection and the CSR reinspection could be displayed

as a function of the time the original inspection was done. These agreement rates were used as a measure of the effectiveness of the LKC QC hardware inspection activity as a function of time. I then performed a review of the data, considering: (1) performance of all inspectors as a group; (2) performance of inspection sub-groups (i.e., subjective and objective attribute inspections); (3) performance of the complaining inspectors as a class (i.e., those identified inspectors who expressed concerns to the NRC on March 29, 1985 about the existence of harassment or intimidation); and finally, (4) performance of individual inspectors.

Q.15. Of the class of 24 LKC inspectors who expressed concerns to the NRC Staff on March 29, 1985, how many did inspections which were reinspected in the CSR and overinspected by PTL?

A.15. A total of 19 of these 24 LKC inspectors were included in the CSR sample. This includes 18 of the 20 weld inspectors who made allegations on March 29, 1985, and 1 of the 4 inspectors who were not certified as weld inspectors.

A total of 20 of the 24 LKC inspectors were captured in the PTL overinspections. This includes 19 of the 20 weld inspectors and 1 of the 4 inspectors who were not certified as weld inspectors.

Q.16. Mr. Del George, do you have any graphs which illustrate the variation over time of the CSR results?

A.16. Yes. Attachment 2C (Del George-1) has two graphs. The top one shows the number of inspection points sampled in the CSR versus the time the corresponding Comstock QC inspections were performed (by calendar quarter). The bottom graph shows the CSR agreement rate, calculated on an inspection point basis, for the same time periods.

Attachment 2C (DelGeorge - 2) is in the same format. It shows agreement rates versus time for the CSR inspection point data for all welding sampled.

Attachment 2C (DelGeorge - 3) also shows agreement rates versus time for all welding sampled, but on a weld basis rather than an inspection point basis.

Attachments 2C (DelGeorge - 4) and (DelGeorge - 5) show the agreement rates versus time for all of the complaining LKC weld inspectors, on an inspection point basis and on a weld basis, respectively. Eighteen of the 20 weld inspectors who made allegations to the NRC Staff are represented in these figures.

Attachment 2C (DelGeorge - 6) shows the number of CSR inspection points for the class of complaining inspectors for both welding and non-welding inspections.

In fact, as the bottom graph shows, two of the complaining LKC QC inspectors are responsible for most of the non-welding inspections performed by this class and captured in the CSR.

The format in which these attachments are prepared helps one to judge whether there is sufficient data so that variations in the CSR results from one time period to another are meaningful.

Q.17. In your opinion is there sufficient information in these graphs to trend the effectiveness of L. K. Comstock inspections as a function of time?

A.17. The CSR reinspection data base is quite large. In the case of the CSR data, 733 hardware equipment items were reinspected, including more than 10,000 welds and 276,000 separate inspection points distributed over the entire period covered by the CSR sample. The CSR resulted in the repeat inspection of the work of ~~50~~ 75 inspectors, of which ~~34~~ were welding inspectors. As previously indicated, ~~20~~ 16 of the 24 inspectors who made allegations to the NRC on March 29, 1985 had some of their work reinspected under the CSR program. Thus I believe it is reasonable to evaluate variations in the agreement rates over time for all CSR electrical inspections, as shown in Attachment 2C (DelGeorge - 1).

When one starts focusing in on subsets of the CSR data, for example, welding inspections only, or the

inspections performed by the class of complaining inspectors, the quantity of data is smaller and more caution has to be used in examining variations in agreement rates from one time period to another.

My determination of how much information is sufficient to allow trending is a qualitative judgment, unlike Dr. Frankel's calculation of the coefficient of variation for purposes of his testimony. In making this judgment, I considered the number of inspection points or welds in adjacent time periods, the variation in these quantities over time, and the number of LKC QC inspectors whose work was represented in the sample for each time period.

In my judgment, there is sufficient data for the cumulative sample of all CSR electrical inspections as represented by Attachment 2C (DelGeorge - 1), and for the subgroup of welding inspections, as represented by Attachments 2C (DelGeorge - 2) and (DelGeorge - 3), to support analysis of variations in agreement rates. I am less confident about the sufficiency of the data for the class of complaining inspectors, as shown in Attachments 2C (DelGeorge - 3), (DelGeorge - 4) and DelGeorge - 5). Attachment 2C (DelGeorge - 6) demonstrates that there is insufficient data to support analysis of trends in non-welding inspections performed by the complaining inspectors.

Q.18. To the extent there is sufficient CSR data to permit trending analysis, did you observe any trends?

A.18. No. In my review of the CSR data, including Attachments 2C (DelGeorge - 1 to DelGeorge - 5), I did not find any apparent trend attributable to the alleged undue pressure, harassment and intimidation claimed by intervenors to have occurred at Braidwood involving the work activities covered by the CSR. Moreover, this finding is supported by the testimony of Dr. Frankel whose analysis identifies no statistically significant trend in agreement rates derived through the CSR inspection program. I have reviewed Dr. Frankel's testimony and I believe his approach, including his method of combining construction categories and the levels of significance used in his calculations, is appropriate.

Q.19. Dr. Kaushal testifies that the CSR only included reinspection attributes which (1) were required by applicable codes and standards, (2) could potentially have an effect on the item's ability to perform its safety-related functions and (3) are currently observable. How, if at all, do these limitations affect the usefulness of the CSR results in assessing Comstock QC inspector performance?

A.19. In my opinion, the usefulness of the CSR data is derived from its predefined scope and distribution in time. Because the effectiveness of QC inspector performance is at issue, an evaluation of that effectiveness requires first an assessment of the

character of the inspection activity at issue and then a measurement in understandable terms of the significance of deviations from defined inspection criteria. My previous experience with the evaluation of inspector effectiveness through hardware reinspection indicates that inspection activities are divisible into two primary types, subjective and objective. A subjective inspection involves an inspection that cannot be truly measured and is dependent upon senses and judgment. An objective inspection involves an inspection element that can usually be quantified or measured. Examples are: material, size, shape, traceability, dimensional configuration, etc. If a reinspection program is defined in such a way that these subjective and objective inspection activities are adequately surveyed over time, inspection effectiveness can then be assessed. The design of the CSR sample addressed these considerations.

Furthermore, it is both reasonable and appropriate to direct the reinspection effort at those construction attributes having the potential for an effect on a hardware item's ability to perform its safety-related function. In such a way the attributes of significance to the safe operation of the nuclear facility can be assessed, and be assessed in a

quantitative manner. Directing the focus of activities in this way may exclude from consideration non-safety related work activities from reinspection, and might limit the inferences that can be drawn with respect to such ancillary activities. However, where the question to be answered is whether a nuclear facility can be operated without undue risk to the health and safety of the public such a limitation is of no consequence.

In addition, a limitation of reinspection activities to those attributes observable at the time of reinspection, though having the effect of reducing the construction population subject to reinspection, does not affect the inferences to be drawn from the reinspection effort if: (1) the population actually reinspected includes construction attributes of the type no longer observable which were inspected by persons having both observable and unobservable work, such that some of their work remains subject to reinspection, and (2) where the sub-population of work no longer observable is not related to the question that has precipitated the reinspection effort in a manner different than the work that is observable.

Having reviewed the CSR data base and those attributes excluded from reinspection under the CSR, I find no measurable limitation on the usefulness of the

CSR data for assessing collective QC inspector effectiveness for the period covered by the CSR. In this regard, the CSR sample limitations are not unlike those in the Byron Quality Control Inspector Reinspection Program. Certain work activities are either not accessible or not recreatable at the time of a reinspection. In this regard, this minor limitation in the CSR is equivalent to that identified and accepted in the Byron Licensing Board's October 16, 1984 Supplemental Initial Decision with respect to non-recreatable attributes addressed in the Byron QCIRP. Moreover, there is no basis for concluding that harassment and intimidation would have a different effect on the limited number of unreinspectable or non-recreatable inspections because such inspections are typically identical in character and were in fact performed by the same inspectors for whom observable inspections were reinspected.

A possible exception is the case of in-process inspections such as verification of weld preheat. However, such non-recreatable attributes are typically first inspected because of the greater likelihood that work deficiencies not detected in-process would result in physical hardware damage. For example, because weld preheat is itself required to reduce the

potential of weld shrinkage cracks, a design significant consequence of a deficient in-process inspection of such an attribute would be manifested as a weld crack which itself would be manifested and observable by the reinspector. Moreover, such in-process inspections are often subjected to redundant owner oversight, reducing further the potential for inadequate in-process review. An example of such an in-process inspection is cable pull force, for which CECo site QA monitors the contractors set-up for all cable pulls not made by hand. (Cable pulls by hand are unlikely to cause damage.) For these reasons, the limitation attendant to the inability to reinspect such in-process attributes is not significant.

Q.20. Dr. Kaushal also testifies that certain CSR reinspection observations were declared "invalid" or "out of scope." How, if at all, does the exclusion of these items affect the usefulness of the CSR results in assessing Comstock QC inspector performance?

A.20. I do not believe that these exclusions affect the usefulness of the CSR results. Repeating the point made previously in response to Question 19, the usefulness of such reinspection data is dictated by the scope of coverage of the program and the distribution in time of the attributes actually reinspected. Having reviewed the LKC observations declared "invalid" or "out of scope", I have identified only

one reinspectable inspection activity that has been precluded from evaluation either generally or as a function of time. That activity is cable pan hanger configuration which, because of a 100% walkdown effort then being conducted by Sargent & Lundy in conjunction with LKC QC personnel, fell outside the CSR scope. The characteristics of this specific inspection activity are typical of other LKC objective activities actually reinspected under the CSR. Moreover, a review of the LKC inspector certification records for the period covered by the CSR indicate that only ~~two~~ one LKC QC inspector, who did field inspections and whose work ~~was~~ could have been reinspected under the CSR ~~was~~ were certified in cable pan hanger configuration only. In fact, most inspectors certified in that area also held welding inspection certifications, among others, for which the underlying inspection work was reinspectable and was reinspected under CSR.

Of the 24 inspectors who expressed concerns to the NRC on March 29, 1985, 20 were previously certified in and conducted welding inspections. As previously stated, 18 of these welding inspectors are captured by the CSR data base. Only 5 of these 24 inspectors were not reinspected within the CSR sample for some work activity. Moreover, each LKC construction activity

and each area of field-installed hardware inspection certification as a class was reinspected under the CSR sample.

Q.21. Mr. Del George, Dr. Frankel testifies that, based on his review of the CSR data, there is not a statistically significant difference between the discrepancy rate for L.K. Comstock QC inspectors prior to July 1, 1982 and after July 1, 1982. Why is July 1, 1982 a significant date (if it is) for purposes of determining whether harassment and intimidation may have affected the work of the Comstock QC inspectors?

A.21. Based upon my review of the Intervenors' harassment and intimidation contention, as well as the record in this case, I understand that intervenors contend that Mr. R. Saklak had a pervasive deleterious influence on the overall inspection system during his tenure. Therefore, after consultation with Dr. Hulin, who will also be submitting rebuttal testimony in this case, I recommended that the significance of this date, which was the date on which Mr. Saklak assumed the position of QC Supervisor for LKC, be statistically evaluated with respect to the effectiveness of LKC inspector performance as manifested by the acceptance rate as a function of time deduced from the CSR data.

Q.22. Mr. Del George, Dr. Frankel also testifies that he finds no statistically significant difference in the CSR data between the error rate prior to August 1, 1983 and after August 1, 1983. Why is August 1, 1983 a significant date (if it is) for purposes of determining whether harassment and intimidation may have affected the work of the Comstock QC inspectors?

A.22. On the basis of a similar review as was described in response to Q.21., it is my understanding that intervenors contend that Mr. I. DeWald had a pervasive deleterious effect on the overall LKC QC inspection system. Therefore, after consultation with Dr. Hulin, I recommended that the statistical significance of this date, which was the date on which Mr. DeWald assumed the position of QC Manager for LKC, be evaluated with respect to the effectiveness of LKC inspector performance as manifested by the acceptance rate deduced from the CSR data.

In this regard, it is also worth noting that one of the primary objectives that Mr. DeWald testified he devoted himself to upon assuming his position was the elimination of the LKC inspection backlog that existed in the Fall, 1983. Mr. DeWald's management initiatives in late 1983 through the Fall, 1984 when the major backlog item of hanger weld inspection was eliminated, are alleged to have demonstrated an interest in quantity of inspections to the detriment of the quality of those inspections. For this reason, a review of the relative effectiveness of welding inspection before and after August 1, 1983 should manifest a downward trend in inspector performance after August 1, 1983 if, as has been alleged, a pervasive environment of harassment and intimidation

through the setting and enforcement of welding inspection quotas by Mr. DeWald and his management subordinates existed and, in fact, affected inspector effectiveness.

Q.23. Dr. Frankel testifies that, in performing his analysis he only used the items from the CSR sample which were selected using random sampling. Based on Dr. Kaushal's testimony, this means a portion of the total CSR sample was excluded. Have you reviewed the remaining non-probability portion of the CSR sample for any changes in Comstock QC inspector performance over time which might be attributable to harassment or intimidation?

A.23. Yes.

Q.24. How did you go about performing this evaluation?

A.24. I described in response to Q.14. how I reviewed the CSR data to evaluate the effectiveness of LKC QC inspector performance. As part of that process, I reviewed the non-probability portion of the CSR sample as well as the combined random and non-probability sample data. I made a comparative evaluation of the shape and distribution in time of the data sorted in this manner to identify any apparent differences in the form of or trends manifested by the data. On this basis, I was able to develop certain engineering judgements with respect to the possibility of any changes in QC inspector performance manifested by the non-probability portion of the CSR sample which might be attributable to harassment or intimidation.

Q.25. What did you conclude?

A.25. I have concluded that the non-probability portion of the CSR sample does not manifest any visible changes which might be attributable to harassment or intimidation. Specifically, the shape and absolute value of the data defined by acceptance rate as a function of time displays only minor differences from that provided by the random portion of the CSR sample, and no trends that I believe are attributable to harassment or intimidation.

Q.26. Have you reviewed the CSR results for individual Comstock inspectors to determine whether there were any changes in an individual's performance over time, which might be attributable to harassment or intimidation?

A.26. Yes. However, in general, there is not sufficient CSR data to examine the effectiveness of individual inspector performance. This is due to the fact that individual inspectors did not have a sufficient number of inspections reinspected in multiple consecutive time intervals to allow for meaningful trending of the results.

Q.27. If there isn't sufficient CSR data to examine inspection performance on an individual basis, what value, if any, does the CSR data have for purposes of determining whether harassment and intimidation occurred?

A.27. Although quantitive conclusions with respect to individual inspectors would be difficult to support,

this fact alone does not preclude reliable conclusions being drawn from the CSR data with respect to whether harassment and intimidation occurred at LKC during the time period covered by the CSR; and perhaps of greater importance, whether harassment and intimidation if it did occur diminished the effectiveness of QC inspector performance.

The intervenors here contend that events and conditions within the LKC quality control department brought about by specific named individuals with the knowledge and at least unvoiced support of QA/QC management generally, created a pervasive and debilitating atmosphere of harassment and intimidation. Intervenors rely on the fact that 24 LKC QC inspectors went to the NRC on March 29, 1985 with such complaints. Although an event involving Mr. Saklak that occurred on March 28, 1985 was the event that triggered the complaints by these inspectors, intervenors would have us believe that LKC QC management had for a considerable time, i.e., at minimum during the tenure of Mr. Saklak as QC Supervisor and Mr. DeWald as QC Manager, promoted inspector production over inspection quality. Because this alleged pressure on inspectors is alleged to be pervasive, data on group performance covering all work activities, the welding activity separately or the

work activity of the class of 24 inspectors should manifest any deleterious effects produced by such pressure. The CSR data base is sufficient to make an engineering evaluation of these three performance parameters.

Q.28. Mr. Del George, turning to the PTL overinspection results presented by Mr. Marcus, in your opinion what value, if any, do they have for assessing whether the performance of the Comstock QC inspectors was adversely effected by alleged harassment and intimidation?

A.28. The PTL overinspection results are also instructive with respect to whether the effectiveness of LKC QC inspectors was adversely affected by the harassment and intimidation which is alleged to have occurred. This data base consists of reinspections performed by PTL of generally 10% of all welding that was QC accepted by LKC between July, 1982 at Mr. Saklak's arrival and June, 1986; and generally 10% of all objective hardware inspections performed by LKC between June, 1985 and June, 1986. This data base is described in greater detail by Mr. Marcus.

With respect to welding inspections, 19 of the 20 welding inspectors who expressed concerns to the NRC on March 29, 1986 were reviewed under the PTL overinspection program. The number of welds reinspected in the period reviewed is 28,422 overall, and 11,311 for the class of inspectors who made

allegations to the NRC on March 29, 1985. This represents an extremely large though not technically a randomly selected sample. The PTL weld overinspection sample reinspects the work of 100 LKC inspectors. The PTL non-weld overinspection conducted over the past year reinspects the work of 45 LKC inspectors, including 5 of the class of 24 and contains a total of 4,650 elements.

Because of the size of the PTL overinspection sample and the methods for selecting the sample, which are described by Mr. Marcus, I believe this data base can be used to evaluate changes in the effectiveness of LKC QC inspector performance as measured by the agreement rate between the results of the original LKC inspection and the PTL overinspection.

Q.29 What evaluations, if any, have you made of the PTL overinspection results?

A.29 I have reviewed the overinspection data for welding for the period July, 1982 through June, 1986; and the non-welding data developed for the period June, 1985 through June, 1986. I have compared that data to the data generated by the CSR program. I have reviewed the data from the standpoints of inspection activities as a class, i.e., welding (subjective) and non-welding (objective), the performance of the class of 24 inspectors who made allegations to the NRC Staff on

March 29, 1985, as well as the performance of individual inspectors. I have assessed the data in light of my knowledge of similar data developed at other Commonwealth Edison construction sites involving similar activities.

Q.30 What are the results of your review of the PTL overinspection data for all LKC inspectors?

A.30 My review did not identify any apparent trends or changes in the data that support intervenors' claims of undue pressure, harassment or intimidation of LKC inspectors. Although occasional changes in agreement rates were identified, there appeared to be no confirmatory indications or trends linking these changes to the alleged misconduct which intervenors contend existed and caused deleterious effects. This leads me to conclude that changes in these agreement rates are isolated and unrelated.

Q.31 What are the results of your review of the PTL overinspection results for the class of 24 LKC inspectors who made allegations to the NRC Staff on March 29, 1985?

A.31 The results of my evaluation of these inspectors are the same as for all LKC inspectors. In particular, as shown in Attachment 2C (Marcus-4), the agreement rates for the months preceding March 29, 1985 for this group are uniformly acceptable.

Q.32 Have you evaluated the PTL results for individual inspectors?

A.32 Yes. The data was sorted for review by Mr. Marcus and I in such a way that we could, for each inspector whose hardware inspections were reinspected, review which inspectors were captured by the PTL sample, in what months an inspector's work was originally inspected and how many inspections were reinspected as well as the number of rejects identified by the overinspector in that month.

My review of this PTL data indicates that of the 100 weld inspectors whose work was overinspected, sufficient data exists to make a reliable assessment of the effectiveness of the performance of 78 of those inspectors. The limited amount of data available (less than 50 welds reinspected) precludes drawing definitive conclusions for the remaining 22, although Mr. Marcus' testimony addresses the three inspectors out of this group of 22 whose agreement rates were less than 90%. Of those 78 inspectors for whom sufficient data does exist, it is my opinion that the PTL overinspection data demonstrates the acceptability of the work of 75 inspectors. The performance of the remaining 3 inspectors is either unacceptable or is deficient in a way that requires remedial action. Those three inspectors are Messrs. Asmussen, Arndt

and Hunter. Mr. Marcus and I performed this analysis jointly. I have reviewed the discussion reported in his testimony and I agree with it.

The small number of inspectors whose work appears questionable does not detract from the strength of the conclusions otherwise drawn with respect to the effectiveness of QC inspector performance as a class. In fact, the known inspector-specific deficiencies are themselves generally isolated and dissimilar and suggest no common cause. In addition, my review of the QC inspector testimony in this case suggests no obvious causal link between these isolated deficiencies and the alleged undue pressure, harassment and intimidation.

Q.33 What conclusion, if any, do you draw from Dr. Frankel's testimony that there is a slight linear trend of improving inspections in the data?

A.33 This conclusion by Dr. Frankel is instructive for a number of reasons. First, the PTL data base is entirely independent of the CSR data base. Because Dr. Frankel has reached similar conclusions with respect to both, I believe with an extremely high degree of confidence that no significant adverse trends actually exist in the population from which the two samples were chosen.

Second, the quantitative assessment by Dr. Frankel confirms my own engineering evaluation of the PTL data. My review did not identify any apparent trends or changes in the data that support intervenors' claims of alleged undue pressure, harassment or intimidation of LKC inspectors.

Q.34 Are the results of the CSR and the PTL overinspections consistent?

A.34 Yes. By way of foundation, I have previously testified that I reviewed the inspector checklists used to implement both of these programs. Although there were minor differences in these checklists, they are equivalent in terms of substantive inspection attributes. It is my impression that the CSR measurement techniques and acceptance criteria are sometimes more conservative than those employed by LKC. Furthermore, I have reviewed the sampling techniques used under both programs and as I previously testified, I conclude that each individually provides a reliable indicator of the effectiveness of LKC QC inspection activity.

After reviewing each data base individually as I have previously discussed, I attempted to determine whether on the basis of a comparative analysis any material differences existed. The composite mean agreement rate from the PTL welding data base is

about 93% and from the CSR welding data base is about 85%. The fact that the PTL agreement rate is greater than the CSR agreement rate is not surprising to me. First, as Mr. Kostal testifies, the weld discrepancies identified in the CSR included a very high percentage of insignificant deficiencies. Second, the CSR was conducted long after most of the LKC inspections which were reinspected, while the PTL overinspections were generally performed soon after the LKC inspections. The agreement rate between contemporaneous inspections performed using equivalent procedures would be expected to be higher. Finally, there was intense oversight of the CSR inspections by CECo, the IEOG and the NRC Staff, which contributed to the very conservative inspection results produced by the CSR.

Q.35. Does the fact that prior to June, 1985 the overinspections only applied to welding affect the value of results in determining whether the alleged harassment and intimidation of Comstock QC inspectors affected their performance?

A.35. In my opinion, the fact that prior to June, 1985 the PTL overinspections only applied to welding does not affect the value of the overinspection results in determining whether the alleged harassment and intimidation of LKC QC inspectors reduced the effectiveness of their performance. First, as I have observed previously, most of the inspectors who have

expressed a concern upon which the intervenor contention rests have been welding inspectors. Because of the extremely large percentage of inspectors in this single certification class who expressed concern, the intervenors' psychologists' testimony strongly suggests that:

1. There exists a pervasive occupational learning model in the LKC weld inspection area that promotes quantity over quality.
2. This class of inspectors as a group, whether or not acknowledged or known by them, should have been influenced through occupational learning, with a resultant reduction in the quality performance norm for the class.

As previously stated, the PTL overinspection results do not show any reduction in the quality of Comstock inspections over time. This is true even though, as Mr. Marcus' testimony indicates, the monthly agreement rate figures are quite sensitive to poor performance by individual inspectors.

Moreover, although I have no expertise in industrial psychology, my experience with the review of inspection activities leads me to conclude that welding inspections may in fact be a more sensitive indicator of any real negative effects due to production pressure or other harassment and

intimidation where such effects would lead to a reduction in the quality values of the QC inspector work force. Because weld inspections are subjective and by their nature amenable to a greater degree of qualitative judgement by an inspector than are most objective hardware inspections; if a reduction in quality norms were to occur, a shift in performance might occur and be less obvious to the sensibilities of the individual inspector who is relying on qualitative judgement to make inspection decisions. Moreover, in the case of a subjective inspection, an inspector may be influenced to err non-conservatively where he knows the decision is recognized by others as judgemental. Welding reinspections should therefore be able to detect a shift in the performance of the original inspectors as a class. The PTL overinspection program demonstrates that no such shift in performance occurred.

Q.36. Does the gap in the PTL overinspection data in October and November 1982, the minimal amount of data for November and December of 1983 and May of 1985, and the fact that the PTL overinspection results have not been compiled for period prior to July 1982, significantly affect the value of this data base in assessing the performance of Comstock QC inspectors?

A.36. In my opinion, taken collectively, this limitation does not have a significant effect on the value of the

PTL data base in assessing the effectiveness of LKC QC inspector performance.

First, July, 1982 was chosen at my direction as the starting point for purposes of the review. Review of the the CSR welding information indicate that no statistically significant difference exists in the inspected welding data base before and after July, 1982. Because none of the PTL data for those early years had been compiled in a computer data base, the extensive expense and more importantly the extensive time necessary to compile the pre-July, 1982 data was judged by me to be unnecessary. My decision was also influenced by the fact that July, 1982 was the time at which Mr. Saklak assumed supervisory oversight of inspection activity for LKC and could have affected weld inspection activity. This date also precedes all the time periods of specific production pressure identified by the intervenors. The PTL data base has been developed and used to assess inspection effectiveness from July, 1982 through June, 1986. In my opinion, the lack of analysis of PTL data prior to July, 1982 has no material effect on the review undertaken by Commonwealth Edison.

Second, the total time after July, 1982 during which very limited or no PTL overview data was generated is very short; involving only 5 months of

the 48 months from July, 1986 to June, 1982 that were assessed. Based on my knowledge of the record developed in this case, there were no specific events of harassment or intimidation affecting either the welding area or other LKC inspection areas in those time periods. Had there been such an event, a review of the trends in the data before and after these short gaps would still be instructive as to any affect on performance due to such an event. This is particularly true of the data for May, 1985 which followed soon after the March 29, 1985 allegations to the NRC by 24 inspectors concerning harassment and intimidation concerns. In that case, the entire period prior to the event was overviewed by PTL and the data is available in this study. Moreover, as Mr. Bowman (Tr. 6830-32) and other QC inspectors have testified, the March 28, 1985 incident that preceded the report to the NRC really represented a culmination of concerns that had allegedly been growing for some months. A review of the data in the period prior to April, 1985 should be instructive as to any developing impact on inspector effectiveness that might have occurred. As previously stated, the PTL results for the months preceding April, 1985 show no such impact. Furthermore, intervenors' witness Dr. Ilgen testified that once such an effect is anchored, it is not easily

modified. In discussing the perceptions developed by an inspector based on personal observations or discussions with other employees, Dr. Ilgen indicates that these perceptions "die slowly". He goes on to say, "It is often not enough to simply make some minor change of course, and certainly not enough to merely proclaim such changes" (Ilgen Prefiled at 17). With this intervenor testimony in mind, I believe that the 1 month period in May, 1985 for which very little PTL overinspection data is available is of no material significance; especially where PTL overinspection results for an extended period from June, 1985 to June, 1986 are available and show no adverse trends in the effectiveness of LKC QC inspector performance.

Q.37. In your opinion, does the fact that the PTL overinspections are not a probability sample preclude its use in assessing Comstock QC inspector performance?

A.37. No. Because of the fact that the PTL overinspection program typically covered 10% or more of all work done, including for a substantial period 10% or more of the work of all inspectors, the sophistication of a probability sample was not necessary to perform engineering trending of the reinspection results. In other words, the extensive sampling of almost all work, generally covering all inspectors over an

extensive period of time diminishes the need for more refined sampling techniques.

The fact that intervenors allege the existence of a pervasive debilitating environment covering the period after July, 1982 which, if it did exist, should have affected the LKC QC inspectors as a class, also reduces the need for a refined survey tool to determine the existence of a substantial problem. If such a pervasive problem did exist, the extensive sample used in the PTL overinspection program would have identified it.

Furthermore, in my view, the actual sample chosen has some features that are also used in formal random sampling programs which increase its reliability. All the inspection work on a given inspection request was within the population subject to the sample. Moreover, the selection of a specific report or inspection within an inspection request was not biased in a way that work activities as a class, or inspectors as individuals, or time periods of potential interest were excluded.

Q.38. **The PTL results for certain inspectors do not seem to be continuous. That is, not every weld inspector was overinspected every month. Have you tried to ascertain why?**

A.35. Prior to June, 1985 the PTL overinspection program did not require that each inspector be reinspected

regularly, even when the inspector had performed inspection work. So it is unsurprising that this observation can be made. In addition, very few inspectors were certified in only welding or some other sole inspection activity. Most inspectors had and used more than one of their certifications. Furthermore, as has been made clear through QC inspector testimony, redefinition of task priorities often resulted in inspectors rotating between various inspection activities. I believe these circumstances caused the observed gaps in the overinspection sample for individual inspectors.

Q.39. Would you compare and contrast the strengths and weaknesses of the CSR and the PTL overinspections in assessing whether the performance of the Comstock QC inspectors was adversely affected by alleged harassment and intimidation?

A.39. By way of summary, the CSR inspection and PTL overinspection data bases both provide relevant and I believe dispositive evidence that the effectiveness of LKC QC inspector performance was adequate throughout the period of LKC's involvement at Braidwood. The CSR data, developed as it was based on engineering judgement and statistical sampling methods, provides an extensive sampling of all previously inspected work activities from the start of LKC work through June 30, 1984, at which time all of the persons alleged to have

harassed or intimidated employees had been at the site for almost 1 year and before which many of the events related to alleged production pressure involving the backlog had occurred. The CSR data base ends at June, 1984 and does not cover the period when other specific alleged acts of intimidation or harassment occurred. I do not believe this limitation significantly affects the strength of conclusions drawn from the CSR data for the reasons discussed in response to Q.21., Q.22., and Q.27. As discussed in response to Q.26., the CSR data is of limited use in assessing individual inspector performance. However, as further developed in response to Q.27., this limitation has minimal significance.

The strengths of the PTL data base are in its sheer size. Its focus on the welding area, which is arguably the area most prone to the debilitating learning model which intervenor's psychological witnesses conclude existed allows for an extensive review of this area. Although the PTL sample is not a probability sample, its size and distribution in time outweigh the effects of this limitation. In addition, the PTL data base allows a more extensive inspector specific assessment for the welding area, which itself

provides confirmation of conclusions otherwise drawn from the CSR and PTL data bases for all weld inspectors as a class.

Q.40. Mr. DelGeorge, in response to Q.10. you stated that there is no apparent relationship between Comstock QC inspector performance, as reflected in the variation over time in the CSR and PTL inspection results, and the incidents of alleged harassment and intimidation and the periods of intense production pressure described in the testimony in this proceeding. How can you reconcile this conclusion with intervenors' claims.

A.40. In my opinion, there are three alternative explanations for the fact that the results of these two independent repeat inspection programs do not manifest a negative impact on QC inspection activities of the type hypothesized by intervenors.

First, the alleged undue production pressure, and the alleged acts of harassment and intimidation were not perceived by the LKC inspectors as requiring them to sacrifice quality for quantity, and therefore would have had no effect.

An alternative explanation is that pressures normal to the construction work environment did exist; that sporadic instances of management labor dispute did in fact occur; and that some QC inspectors may have believed that LKC management was encouraging them to sacrifice quality for quantity. However, the absence of any significant trends in the CSR and PTL repeat

inspection data demonstrates that the LKC inspectors did not allow these perceptions to compromise the effectiveness of their inspections.

The final possibility is that the alleged undue production pressure and acts of harassment and intimidation of LKC QC inspectors actually took place and had an effect on the quality of inspections which was constant over time. Although in my opinion this alternative seems furthest from the facts of record, nevertheless, even accepting this third alternative explanation, the adequacy of the LKC QC accepted work can be and is established by the CSR and PTL repeat inspection data. The CSR data demonstrates with a high degree of reliability that LKC work as inspected by the LKC QC department was acceptable. Through June, 1984 the results of the CSR effort support with high confidence the conclusion that no unidentified programatic design significant problem existed in the LKC work scope. The PTL data base extends this conclusion for the LKC welding area, though not statistically, through June, 1986 and for a more limited period for all other QC inspected work. Those results, which are based on an extensive amount of data, lead me to conclude that the combination of conservative design, good LKC craft labor performance

and the LKC QC inspections have produced work which was adequate and remains adequate at this time.

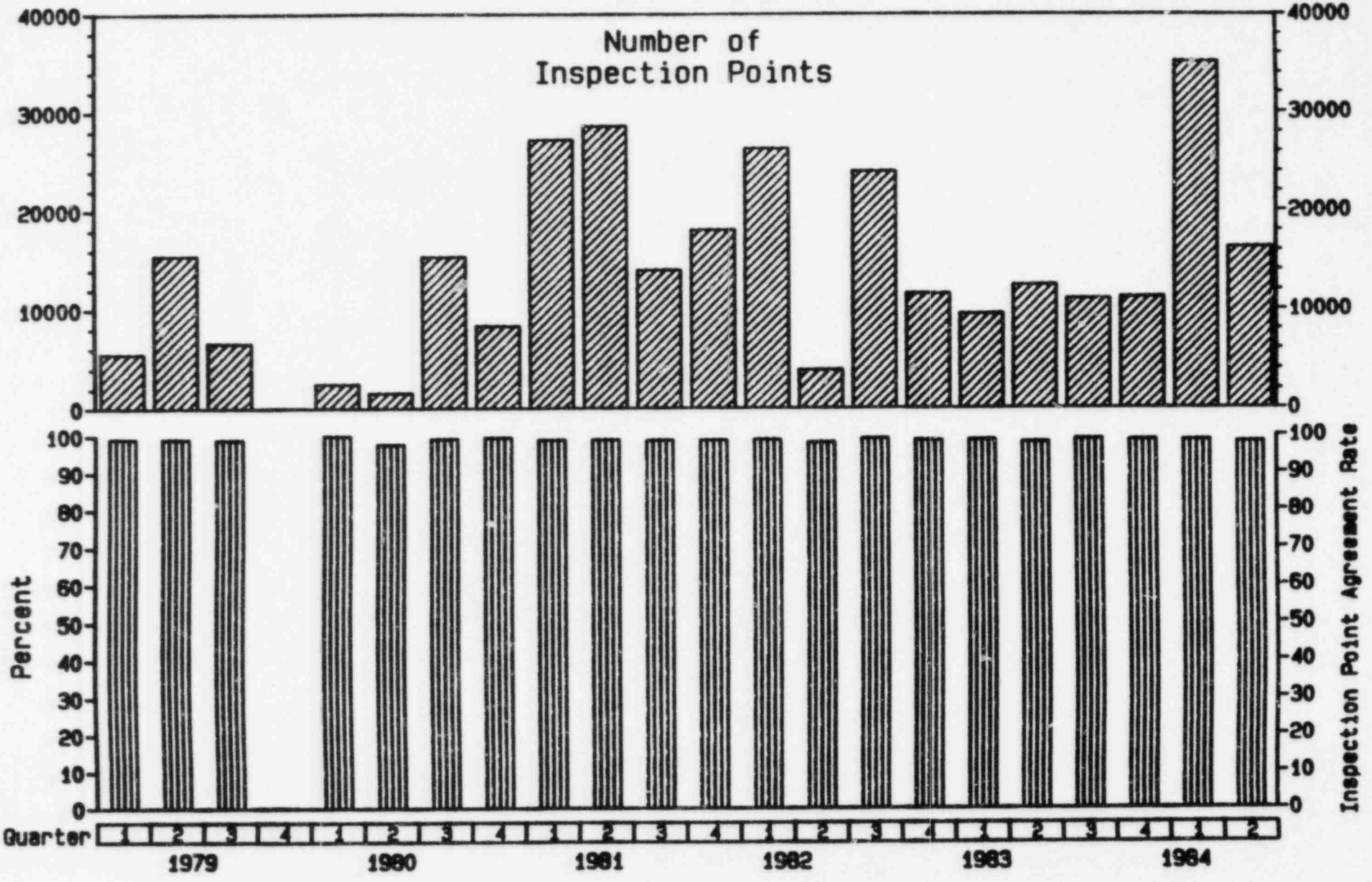
On the basis of the facts contained in this hearing record which I have reviewed, including the CSR and PTL data, as well as my review of the conditions and events which together comprise the environment in the LKC QA/QC department, I conclude that the persons and organizations performing quality assurance functions for LKC had sufficient authority and organizational freedom to identify quality problems; to initiate, recommend, or provide solutions; and to verify implementation of solutions. Those LKC persons and organization had sufficient independence from cost and schedule when opposed to safety considerations to assure the effective implementation of the LKC quality program.

Q.41. Does this conclude your testimony?

A.41. Yes.

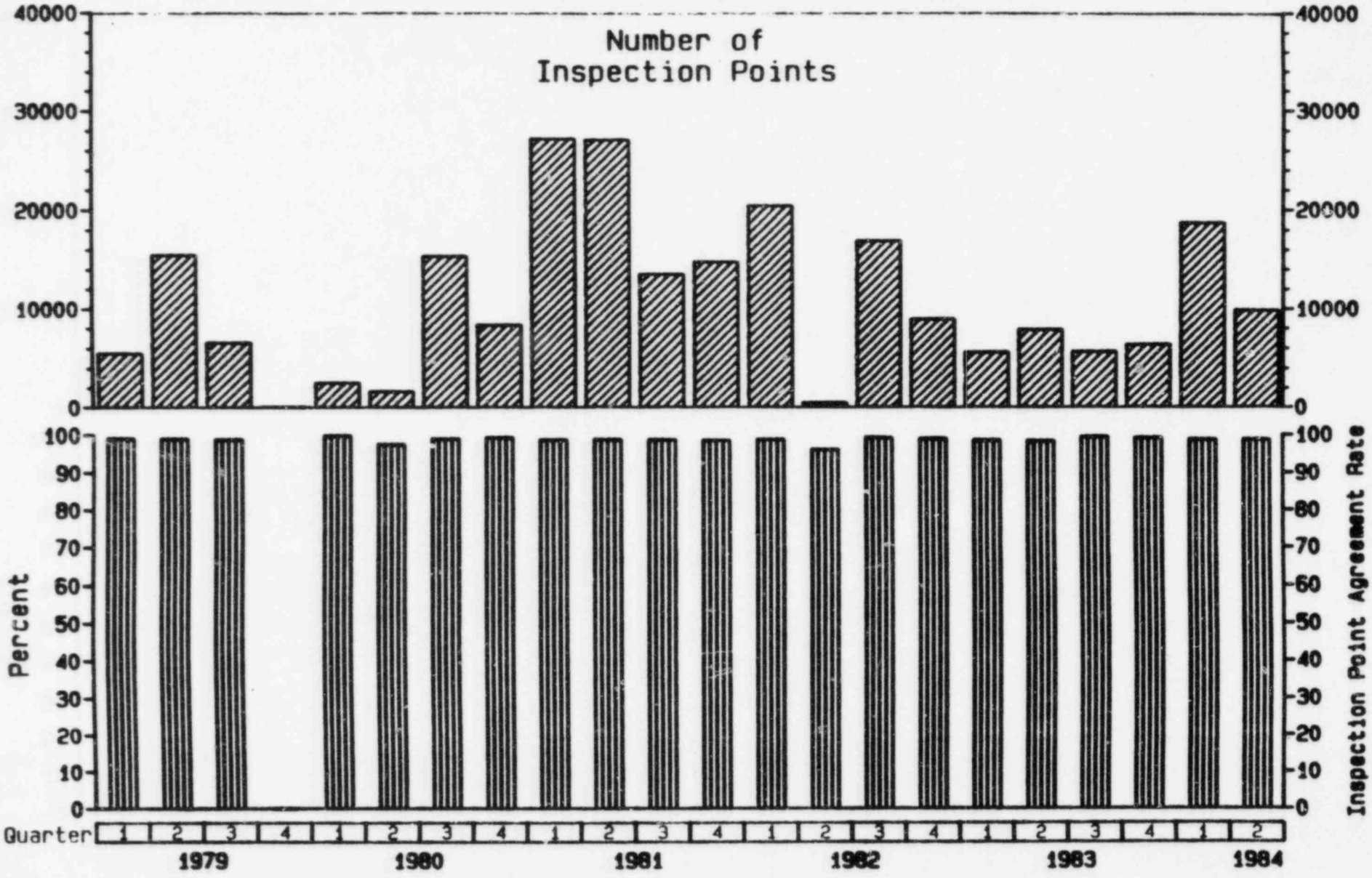
CSR REINSPECTION RESULTS FOR LKC

All Populations, All Samples, Welding and Non-Welding



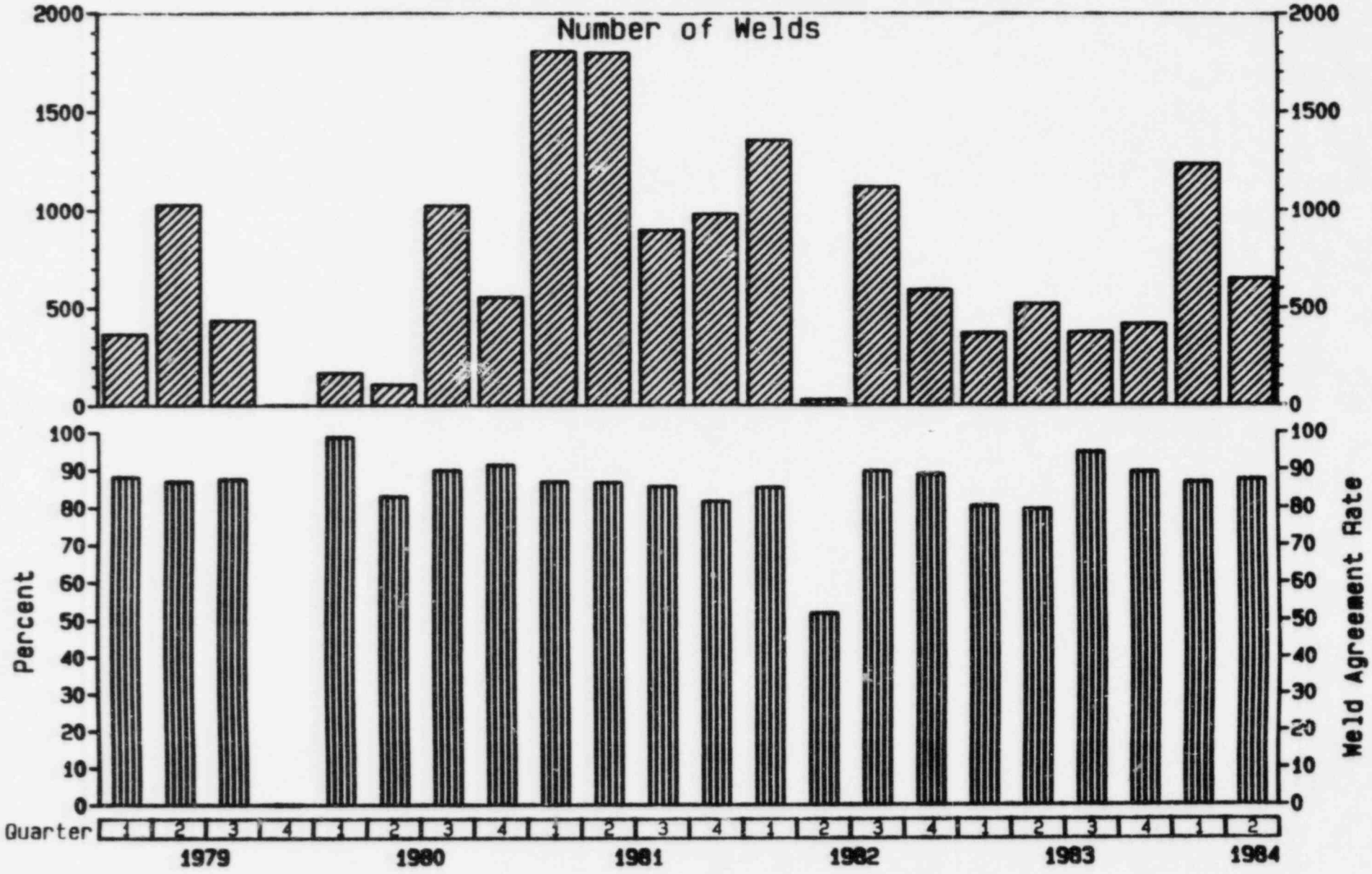
CSR REINSPECTION RESULTS FOR LKC

All Populations, All Samples, Welding Only



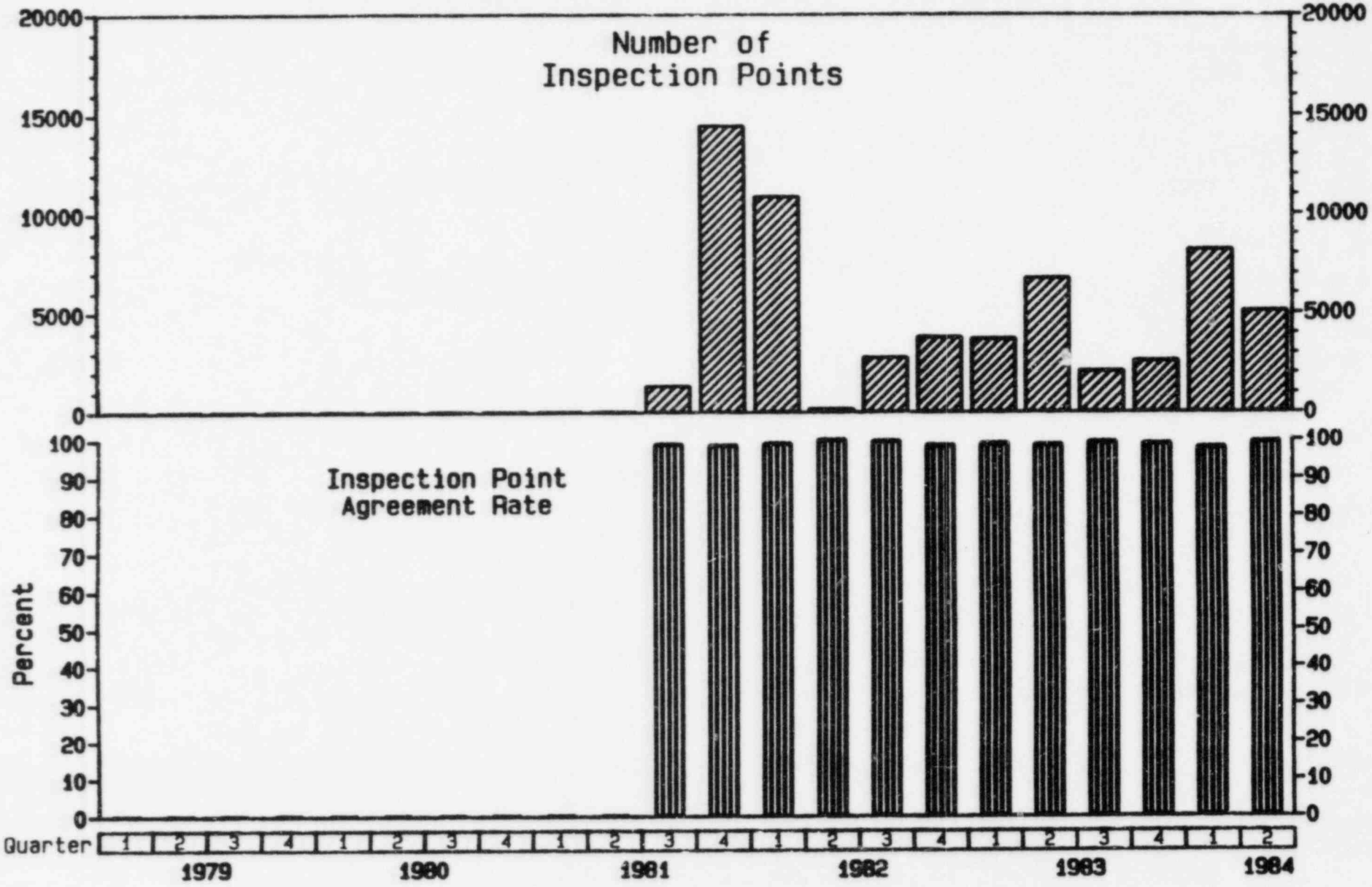
CSR REINSPECTION RESULTS FOR LKC

All Populations, All Samples, Welding Only



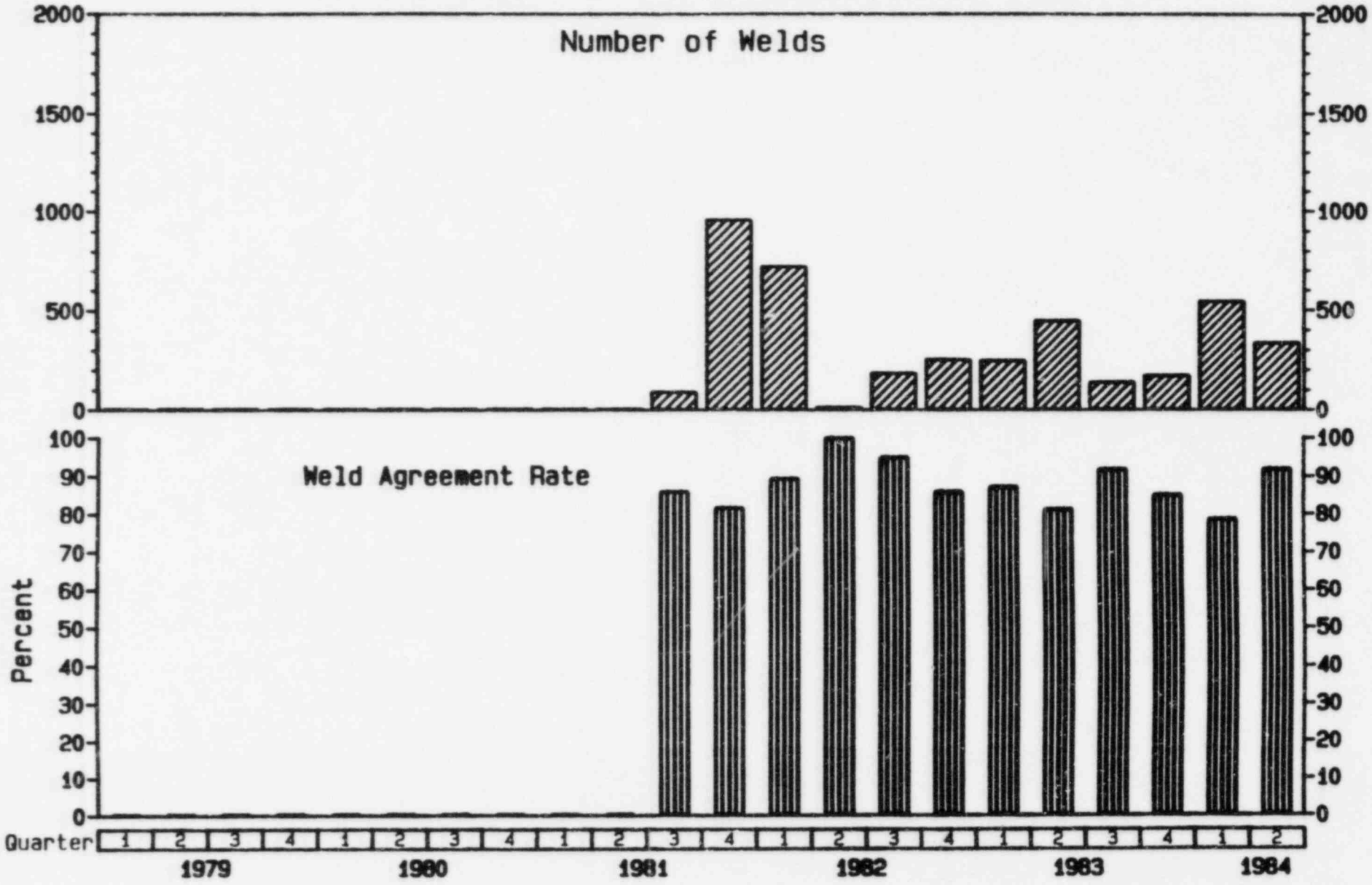
CSR REINSPECTION RESULTS FOR LKC

24 LKC Inspectors, All Samples, Welding Only



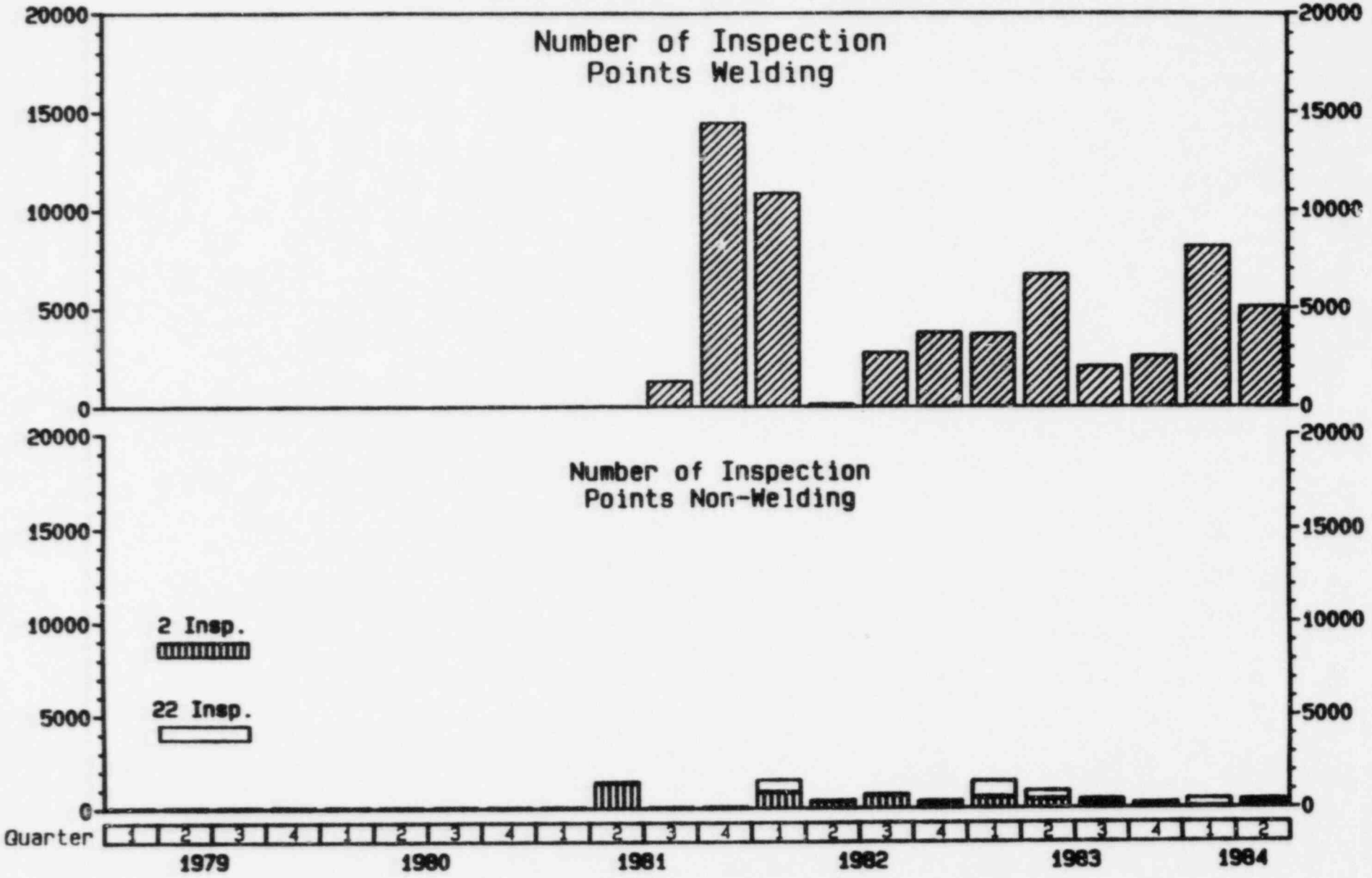
CSR REINSPECTION RESULTS FOR LKC

24 LKC Inspectors, All Samples, Welding Only



CSR REINSPECTION RESULTS FOR LKC

24 LKC Inspectors, All Samples



JUDGE GROSSMAN: I take it that concludes your direct examination.

Mr. Guild?

MR. GUILD: My direct examination?

MR. STEPTOE: Yes, it does conclude my direct examination.

JUDGE GROSSMAN: There should be a period after that.

(Laughter.)

MR. GUILD: Mr. Chairman, if we could stand down briefly, I'm still awaiting those exhibits. Then I'll be prepared to cross-examine.

JUDGE GROSSMAN: Fine. So we'll take a 10-minute recess.

(WHEREUPON, a recess was had, after which the proceedings were resumed as follows:)

JUDGE GROSSMAN: We're back in session.

Mr. Guild?

MR. GUILD: Thank you, Mr. Chairman.

Good morning, Mr. DelGeorge.

THE WITNESS: Good morning.

CROSS EXAMINATION

BY MR. GUILD:

Q Now, what is your present title with the company, sir?

A I'm assistant vice-president in the nuclear area.

Q Is your title formally Assistant Vice-President for Nuclear Licensing?
A No, it isn't.
Q I saw a name tag on the wall at the company's headquarters building, and it said "Vice-President of Nuclear Licensing." I assumed that was your position.
A I believe, if you'll check that tag again, it is incorrect and is out of date. It may still hold my title from a few years back when I was Director of Nuclear Licensing.
Q You are still responsible for nuclear licensing, I take it?
A Yes.
Q And that includes for the licensing of the Braidwood facility; that is, the operating license for which this proceeding is being conducted?
A Yes.
Q And I take it, as you state in your prefiled testimony, being not only an engineer but a lawyer, you are aware that in order to get a license, you have to establish that the plant has been constructed in accordance with regulatory requirements?
A Yes.
Q And it's your job to see that the NRC is persuaded that the Braidwood Station has been indeed constructed in

accordance with those regulatory requirements?

A It's my job to assure that the NRC has sufficient information in order to complete their review responsibilities.

Q And the scope of that review is to assure that it meets regulatory requirements; that is, the Braidwood Station?

A Yes, sir.

Q Well, you'd concede, would you not, Mr. DelGeorge, that you are not really in a position to offer a dispassionate judgment on the question of whether the Braidwood Station meets regulatory requirements; it's your job to persuade the NRC that it does?

A No, sir, I wouldn't concede that.

Q Well, it is your job to persuade the NRC that it meets the regulatory requirements?

A It's my job to provide the NRC with sufficient information so that they can complete their review within the responsibilities that they hold.

Q I see.

Well, would you concede that -- you are a lawyer by training, Mr. DelGeorge.

Would you concede that you have an interest in the matter in which you are testifying?

A Well, first with respect to the foundation for the question, I am both an engineer and a lawyer by

training.

With respect to whether or not I have an interest, I have a responsibility for communicating information with respect to the adequacy of our plants.

I believe that this testimony represents an extension of that responsibility.

Q Well, you've taken a consistent position outside of the scope of your expert testimony here, proffered expert testimony, that the Braidwood Station indeed does meet regulatory requirements, have you not?

A Yes, sir. Based on my knowledge of the plant, the people that have built it and the controls that have been placed on it, I do hold that opinion.

Q Yes, sir. As you stated, it's your task to assure that the Braidwood Station is licensed, receives the operating license that's the subject of this proceeding.

Now, as a lawyer, wouldn't you acknowledge that that responsibility that you have for nuclear licensing represents an interest that affects your testimony here?

A I'm not sure that it -- I don't believe that it does, and again I guess I'd like to go back to the foundation for the question.

I don't consider it my task to get a license. I consider it my responsibility to provide information to the NRC upon which they can conduct an adequate review

so that they can exercise their responsibilities under the nuclear regulations.

Q All right. So let me back up a moment.

You've been responsible for licensing matters at the Braidwood Station, construction-related licensing matters, for some period of time, have you not, prior to this proceeding being initiated?

A I have been involved with the licensing activities at Braidwood, that's correct.

Q All right, sir.

You'd concede, wouldn't you, Mr. DelGeorge, that should it be determined by this Licensing Board that the Braidwood Station fails to meet regulatory requirements, that Edison, your company, has not demonstrated that Braidwood Station meets those regulatory requirements, that would adversely reflect on your work performance as the nuclear licensing -- as the person responsible for nuclear licensing?

A I'm not sure that that's true.

Q Well, do you believe it to be true?

A Well, it would depend upon the basis given for our failure to meet regulatory requirements.

Q Do you believe it could be true?

Let's put it that way.

A It is a possibility.

The probability, however, is one that I couldn't attach any value to.

Q All right, sir.

But it might happen that, should this Board reach an adverse determination, that might reflect adversely on your job performance?

A It is a possibility.

Q All right, sir.

Would that represent an interest, a legally cognizable interest, that bears on your testimony here, that possibility?

A It would, and I think the limited possibility that that may present just creates even more, in my mind, an understanding of the responsibility I have in providing truthful, accurate, complete information.

Q Yes, sir.

Of course, whatever influence might exist from that interest is not influence that is necessarily within your power to eliminate?

You are who you are as you take the stand, Mr. DelGeorge?

MR. STEPTOE: I object to the form of the question. I don't understand it.

MR. BERRY: The Staff would join in that objection. We don't understand the question.

MR. GUILD: I apologize. Let's see if I can be a little more lucid in my question.

BY MR. GUILD:

Q You didn't give up your job to take the stand and be a witness in this proceeding, Mr. DelGeorge, did you?

A No, sir.

Q So whatever influence your position may have, the interest you have in the position that you hold, whatever influence that may have on you -- that influence bears on your testimony today?

A Yes, and I think I've tried to characterize the influence as I perceive it.

Q Understood.

A It is one of an understood responsibility.

Q All right, sir.

You'd concede, would you not, Mr. DelGeorge, that if we applied the same standards of independence that were used to define the relationship of, say, the Independent Expert Overview Group in the BCAP program, you, Louis DelGeorge, would not meet those standards of independence?

A I am an employee of the company and, as such, would not fulfill the same criteria that were imposed with respect to the Independent Expert Overview Group, that's correct.

Q All right, sir.

Well, you don't qualify as independent within the meaning of the term "independent" as used in application to the Independent Expert Overview Group?

A I'm not sure that I understand what that means, but it is true that I am an employee of Commonwealth Edison.

To the extent that makes me fall outside of the independence criterion that was imposed for the IEOG, then I would accept that.

Q There are additional factors; among them, for example, you have been involved intimately in matters relating to the licensing of the Braidwood Station for a period of years before you undertook your testimony here?

A That is true, but I don't understand the relationship between that fact and the testimony that I'm providing here.

Q But for purposes of whether you'd qualify as "independent," within the meaning of that term as used for the IEOG, your past involvement with Braidwood Station would eliminate you as an independent person, as that term is used in BCAP?

A I don't agree with that, sir.

Q Well, sir, you've been involved for years with the Braidwood Station licensing, haven't you?

A I have had an involvement for a number of years, that's

correct.

But that -- but my involvement has not, to my recollection, been one related specifically to an assessment of the effectiveness of Quality Control performance at Braidwood.

In that sense, my previous activities are, in effect, independent of the testimony that I'm giving now.

Q Well, that may be some comfort and some measure of independence, but the real focus of my question is:

If you compare the standards of independence that BCAP used in identifying the Independent Expert Overview Group and, to paraphrase, one of those standards is, as you stated, affiliation with Commonwealth Edison Company, you wouldn't meet that requirement.

You have been affiliated with Edison; correct?

A Yes, sir.

Q Secondly, the requirement was that you not -- the entity not be involved in the -- not have any prior involvement in the design, engineering or construction or Quality Assurance activities for the Braidwood Station.

You wouldn't meet that requirement, either, would you?

A And that's where I think we are not in agreement.

Q Okay.

A My understanding of the criterion with respect to the IEOG is that they would be uninvolved with activities subject to their review within their responsibility as the BCAP IEOG.

I have not been involved in the construction activities with respect to the electrical contractor at Braidwood. I have not been involved with the design activities with respect to the electrical contractor at Braidwood, nor have I been involved with the oversight or control of the inspection activities with respect to the electrical contractor at Braidwood.

In that sense, I believe I am independent of the activities being reviewed here.

MR. GUILD: May I have one moment, Mr. Chairman, please?

JUDGE GROSSMAN: Sure.

BY MR. GUILD:

Q Well, Mr. DelGeorge, let me direct your attention to the BCAP program document, June, 1984, Page Roman V-2. Again the subject is the qualification of the Independent Expert Overview Group.

There I read, quote, "The Independent Expert Overview Group members will be free of any significant contacts with Commonwealth Edison Company. They will not have participated in the design, construction or

Quality Assurance activities related to the Braidwood Station or with Braidwood site contractors within the past five years," period.

So you wouldn't meet that qualification, would you?

A There are a number of qualifications within the comment you just made, and I think I have accepted the fact that my involvement with Commonwealth Edison would not allow me to answer the question, "Yes, I'm independent."

I have a difference of opinion with respect to the other attributes that you just referred to in that statement.

Q Well, I don't mean to beat a dead horse, Mr. DelGeorge, but let's establish what we can agree to and what we cannot agree to.

You gave me an answer a moment ago that suggested it would be acceptable for the IEOG, applying the term "independence" to them, if they were independent of the activities that they were working on. By that definition you said, "I am independent, since I haven't been involved in reviewing electrical QC Inspector activities," et cetera.

A I haven't been involved in design, construction or QC activities and have had no oversight or control of the electrical contractor at Braidwood.

My only involvement with respect to that contractor

has been in the review of data such as this, which I am presenting for purposes of my testimony here.

Q All right, sir, all right.

Well, Mr. DelGeorge, you were responsible for reviewing the items of noncompliance identified by the NRC, with respect to the electrical contractor, contained in Inspection Report 8309 and communicating the company's position on those matters to the NRC, were you not?

A That's correct.

Q And --

A I did communicate the company's position, and I did review the company's response prior to its being submitted.

But there were responsible managers in the construction disciplines within Commonwealth Edison that were responsible for preparing those positions.

My responsibility was directed at assuring that their review of the questions and concerns presented by the NRC Staff were properly responded to.

Q Well, sir, the company's report that represented the work of many people working for you went out over your signature, didn't it?

A No, sir.

The people to whom I made reference, who would have

prepared that response, who were in substantial part responsible for the assessment made and the preparation of the information presented to the NRC, did not work for me.

Q The report went out over your signature, Mr. DelGeorge.

A Yes, it did.

Q The July, 1984, report said such things as, "Here are the improvements that are going to be made in the L. K. Comstock Quality Control Department," among other things.

That went out over your signature, didn't it?

A Yes, it did.

Q And that represented your judgment that there were adequate responses by Edison to assure that whatever problems had existed in the Comstock Quality Control Department were corrected?

That's a paraphrase, but that's the position you took, isn't it?

A That is the position that Commonwealth Edison Company took that I sponsored with my signature and which I satisfied myself, through the normal conduct of reviews within the company, was correct.

Q All right, sir.

My only point, Mr. DelGeorge, is that you're not dispassionate and uninvolved in these matters as you

take the witness stand; you're intimately involved in matters relating to the Braidwood Station, including being intimately involved with matters of past problems in the L. K. Comstock Quality Control Department?

A I won't deny my involvement in some fashion, and I think we've discussed to some extent the degree to which I've been involved.

Q Yes.

A I don't believe -- I believe that I can be dispassionate. Maybe a better way to say that is that I believe I have been objective in my review of this matter.

But again we may have a different opinion as to my involvement with the electrical contractor at Braidwood.

In my opinion, I have had little contact and no oversight of the electrical contractor at Braidwood.

Q All right, sir.

Whatever involvement you had, it was enough for you to feel comfortable making whatever assurances you made in Edison's July, '84, response to the NRC's Inspection Report 8309 on those subjects?

A Yes. But that communication was in large part in reliance upon information presented to me by other Commonwealth Edison officials, including the Quality Assurance Department for Commonwealth Edison.

Q I assume including the Quality Control Department and directly for L. K. Comstock?

A That may be the case, but I had no direct contact with that department at the time the response was prepared.

JUDGE GROSSMAN: Excuse me.

Mr. DelGeorge, it seems to me as though you're saying that your function was only limited to communicating things to the NRC that people in the company told you.

Is that a correct understanding?

THE WITNESS: In large part, Judge Grossman.

But the responsibility of the Licensing Department within Commonwealth Edison, for which I had responsibility, is to assure that the questions presented by the Staff have, in fact, been answered and to provide a level of assurance that those answers are true and correct, to the best of our knowledge.

We do not -- just because of the size of that department, we do not prepare those responses nor are we in a position to validate every statement made within them.

We do rely on the functional departments that are responsible for the work brought into question, and in that sense we communicate the position established by those departments.

I won't deny that I will, by signing any letter that I submit to the NRC, stand up for the position that we take. It is a company position and one which I share.

JUDGE GROSSMAN: Well, you've just said that it's your responsibility to determine that the statements are true and correct.

Now, what if the NRC had some complaint and the company people gave you some response to give to the NRC that these problems had been corrected and were no longer problems?

Wouldn't you then have to make some judgment as to whether those statements are true and correct so as to transmit them to the NRC?

THE WITNESS: Yes, sir.

JUDGE GROSSMAN: If you determined that they weren't true and correct, wouldn't it be your obligation to go back to the company and tell them that they have to correct what the problems are and take the necessary corrective action and then give a further statement that you can determine is true and correct?

THE WITNESS: Yes, sir.

In the particular case of the inspection report to which Mr. Guild made reference, 8309, I did, in fact, address additional questions to the Project Manager for

the Braidwood site to assure myself that the answers that had been provided were not only accurate to the best understanding of the discipline engineer responsible for the contractors but that they had received a management review at the site.

It was on the basis of that management review at the site that I then had sufficient confidence to process the response to the NRC.

I was not in a position -- nor was the one nuclear licensing administrator responsible to me -- to validate every statement made in that report.

We did have to rely on other managers, but I satisfied myself that the review conducted at the site was thorough and that the people who were offering those responses to me were people in whom I had trust.

JUDGE GROSSMAN: Well, now, if we were to determine that any of those responses that you sponsored to the NRC were incorrect, wouldn't that reflect badly on your past performance?

THE WITNESS: Yes, sir.

JUDGE GROSSMAN: Okay.

BY MR. GUILD:

Q Now, Mr. DelGeorge, you set out what your purpose is in offering this testimony at Page 6. There you refer to your conclusion; that is, the conclusion that you, in

reliance on the PTL and CSR overinspection data, among other things, rebutted the Intervenors' contention that harassment, intimidation and production pressure had adverse work performance effects among Comstock Quality Control Inspectors.

That's the task you set out for yourself, is it not?

A My task was to determine whether or not there was an effect. My conclusion was that there was not such an effect.

Q I see.

So you had an open mind on the question when you set out; and that was to find out whether or not we were right, whether or not Intervenors' concerns had merit?

A Yes, sir.

Q All right.

And I take it that if I asked you, you'd tell me that you set out dispassionately to probe that question?

Did you set out dispassionately, Mr. DelGeorge?

A I set out objectively.

I'm not sure I understand what "dispassionately" means. I'm not a passionate person by nature.

(Laughter.)

Q By that I mean: When you set out, did you have in mind what the answers were going to be before you started the

process?

A No, sir, I did not have the answers in mind.

Q Well, Mr. DelGeorge, you didn't have in mind that you would set out to show that there had not been adverse work performance effects from harassment and intimidation?

A As I previously indicated, my purpose was in determining what effects, if any, were apparent, given the two data bases that we reviewed.

Q Sir, that's not exactly responsive to my question.

My question is: Did you not set out to -- strike that.

Didn't you set out to demonstrate that there had been no adverse effects of harassment and production pressure on Comstock inspectors?

A I will admit that it was my hope that I could demonstrate that.

Q Right.

A But again when I set out on this task, it was to determine what effects, if any, did exist.

Q Yes.

Well, having that hope in mind, though, Mr. DelGeorge, I take it that you might have missed a few methods of empirical demonstration that indeed Applicant's concerns were well founded?

JUDGE GROSSMAN: Intervenors' concerns.

MR. GUILD: Intervenors' concerns, yes, Mr. Chairman.

A I may have missed some empirical techniques, but I don't believe that the fact of a miss was related in any way to my initial hope as to the outcome of the review.

BY MR. GUILD:

Q Okay. Well, let's find out.

We've got a phenomenon which I can identify as a cause; and that's harassment, intimidation and production pressure. Let's call it "production pressure." We've got an effect, and that's work performance effects.

Now, in order to measure empirically that cause and that effect, we'd have to have some kind of empirical measurement of both the cause and the effect, would we not?

A I'm not sure that that's true.

Q Well, did you set out to identify all possible relevant empirical measures of both cause and effect when you set out on your task of measuring?

A The suggestion that one needs to establish an empirical basis for the cause is, I think, at odds with my testimony, because there was a presumption on my part that the events alleged to have indicated harassment,

intimidation or production pressure were assumed by me to be a valid indication of harassment, intimidation or production pressure.

So I did not test or seek out additional empirical data to establish the cause.

Q Right.

A What I tried to do was to review existing empirical data from two separate sources to assess if one could determine whether or not there were apparent trends in the data base with respect to the performance of work by QC Inspectors that could then be related to the assumed -- for purposes of the argument, the assumed harassment, intimidation and production pressure.

Q Let's start with the first proposition first, and that's the cause.

Now, I've read your testimony. Your testimony reflects that you decided that you would look at inspections before July of 1982 -- June of 1982 -- excuse me -- and inspections after June of 1982 and see what the acceptance rates -- how the acceptance rates compared for those two periods. That's the period before and after Mr. Saklak was hired.

That's one thing you did; right?

A That's one thing that Dr. Frankel did in part in reliance on a recommendation from me.

Q All right, sir.

A I have -- I looked at the results provided by the CSR and PTL data base throughout the period from late 1978 through June of 1986.

Q You looked at the period -- you and Dr. Frankel together looked at the period before and after Mr. DeWald came on in August of '83 and compared the agreement rates for the period before and the agreement rates for the period after?

A Dr. Frankel does that.

I do not in my testimony make a specific statement with respect to periods before and after that date. I have, however, looked at the results before and after that date.

Q Yes.

And you opined that the period during 1984, when there was the most severe backlog of Quality Control inspections at L. K. Comstock, is when you would expect under this hypothesis to see the effects of production pressure?

A Yes, sir.

Q Okay.

Now, aside from doing those things, did you make any other effort to empirically measure production pressure?

By that I mean harassment, intimidation and production pressure.

A Well, in this context. I'm not sure what it means to make an empirical assessment.

But what I did do is to reread the deposition transcripts from all of the Quality Control Inspectors.

Q I'm going to interrupt you, Mr. DelGeorge, and I apologize for doing so.

My question is focused. It's not everything you did. My question is simply:

Did you make any empirical measurements of harassment, intimidation and production pressure?

A Before I could answer the question, I would ask that you define what you mean by "empirical assessments."

Q Well, if someone were performing a social science empirical study and one were going to measure the effects of some stimulus -- let's say, the administration of electric shock -- to a laboratory animal, we would certainly want to be able to empirically measure that cause, that stimulus.

We would measure it perhaps in a variety of terms: voltage, amperage.

Now, using in this case, in our effort to test Intervenors' hypothesis, production pressure as the cause, I ask you, sir: In that sense, did you make any

efforts to empirically measure production pressure?

A I don't know how I can draw a direct comparison, but it is my belief that I did investigate the alleged causes of harassment, intimidation and production pressure.

Q All right, sir.

It's clear you did not empirically measure that phenomenon; can we agree on that?

A Well, I don't know what statistic or parameter it is that I would be measuring.

Q Indeed you don't.

A I did count -- I did locate in time. I did evaluate the events identified in this record --

Q Yes.

A -- associated with harassment, intimidation and production pressure.

Q But you didn't empirically measure that phenomenon, did you?

That's a pretty simple question, and it seems to me it calls for a straightforward answer.

A That may be the case in your mind, sir, but I just don't understand the question.

I'm not in a position to answer because I don't know what it would take to provide an empirical data base in response to that.

Q Indeed.

And not knowing what it would take, you can assure us, can't you, Mr. DelGeorge, that you didn't do what I asked?

You did not identify an empirical measure of production pressure?

MR. STEPTOE: Well, I object to the form of the question.

The witness has said several times that he doesn't understand what the term is that counsel is using. Now counsel is saying, "Since you don't understand what I'm saying, you didn't do it."

I think counsel should be more specific.

JUDGE GROSSMAN: Okay. That's sustained.

He claims not to understand that question, and perhaps you can --

MR. GUILD: I think the record will be clear, Mr. Chairman, that the witness says that he doesn't understand how he would go about doing that, having defined the term. I believe not knowing how he would go about doing it establishes, by inference, that he didn't do it.

I'll try again because I do want to get this point clear if I can.

BY MR. GUILD:

Q Do you have a scale of production pressure that you have

adopted, in terms of orders of magnitude of production pressure, that you use as the causal force that is considered against which effects -- that is, work performance effects -- are measured?

A I believe I do, and it's a simplistic one.

Q Indeed.

A If an event of alleged harassment, intimidation or production pressure occurred, it should have an effect. It's 100-percent effective.

Q What is the unit of measure that you've adopted, then, in your simplistic efforts to empirically measure production pressure, Mr. DelGeorge?

A It's just 100-percent effectiveness. If the event occurred, it is a harassment event that should produce negative results.

Q I see, okay. Now let's see if we can figure out what the actual causal links are.

Do you assume, for purposes of your analysis, that that 100-percent effect will happen an hour after the act of harassment takes place, for purposes of your analysis?

A I didn't make an assumption of one hour. I think my assessment was more macroscopic than that.

I did, however, expect it to occur subsequent to the event taking place.

Q Cause would take place first; effect would take place second. That's logical.

But you don't know whether it took place an hour later.

How about a day later? Would the effect of harassment take place one day after the 100-percent assumed effect occurs -- assumed cause occurs?

A Again, my analysis was not as microscopic as that. The data base provided would not have allowed that kind of inference to be drawn.

I think it is fair to say that I did look at events on a quarterly basis.

Q Indeed, that's what you did look at. You looked at a three-month basis.

That's how you measured in your bar graphs using agreement rates: comparing one quarter to another quarter; correct?

A Yes, sir.

Q All right.

And you did that for large groups of inspectors and large samples of items, did you not?

A I did it for groups of inspectors that were aggregated in that period and for samples of items that were aggregated in that period.

Q Yes.

And you opined in your testimony that, in your opinion, to do otherwise, to use disaggregated data, was inappropriate, because of the small sample sizes, for the CSR data?

A With respect to certain aggregations that I attempted, that's correct.

Q Yes. I mean, for three of the aggregations you attempted, you determined the sample sizes were too small.

For the data reflecting the aggregation of all inspection points and the aggregation of all welding, you determined, in your opinion, that the data was sufficient to compare those results, agreement rates, on a quarterly basis?

A Yes, sir.

Q All right.

Now, returning to our cause-and-effect connection, we've agreed that your assumption is that effects followed cause. You say you don't know whether they followed by a day or an hour.

Do you know whether they followed -- did you assume that they followed by a week?

A I didn't make that assumption.

Q Did you assume that they followed by a month?

A I didn't make that assumption.

Q All right, sir.

Did you assume that they followed by three months?

A I made no assumption as to when the effect would manifest itself --

Q I see.

A -- whether it be an hour, a week or three months.

Q I see.

A What I did do was to assess whether or not there was, within a period of a quarter, any event demonstrating a deleterious effect on the performance of the Quality Control Inspectors whose work was assessed within that quarter.

Q Yes.

A And to the extent such a deleterious effect could be observed, a judgment could be reached as to whether or not there was a cause associated with that apparent effect.

Q Yes.

And you aggregated the data -- that is, the effect data that you used, the agreement rate data -- in the fashion we've just agreed to: You aggregated it for all inspection points, and you aggregated it in another case for all welding?

A Yes, sir.

Q And you aggregated it over the quarterly period of time

that you display in your bar graphs?

A Yes, sir.

Q All right.

You, therefore, don't show data for more disaggregated groups of inspectors, individual inspectors or disaggregated periods of time in part because the data -- the sample sizes are too small?

A That's correct.

Q Now, then, again you looked, turning finally to the effect that we're testing the hypothesis on, at the effect of work performance.

I think we've agreed that you used, as a measure of work performance, agreement rates; that is, the rate at which the reinspector or overinspector, in the case of PTL, shows by his result agreement with the work of the original Comstock inspector?

A Yes, sir.

Q All right.

And you define "agreement rate" as the relationship between the defects found by the second inspector and 100 percent?

A Well, I think it's just the inverse of that: The agreement rate is the exception found by the reinspector and the total number of items originally accepted by the original inspector.

Q If, just by way of example, the overinspector or reinspector finds 10 percent defects, that suggests a 90 percent agreement rate?

A Yes, sir.

Q We'll return to that subject in a moment.

Now, in shouldering this task -- that is, testing Intervenors' hypothesis -- again with the hope that the results would bear out your past belief that there were no failures to meet regulatory requirements at Braidwood, you looked at two phenomena:

Those are whether or not there was generally effective work performed by the Comstock inspectors and, secondly, whether or not you could identify any correlations, any trends, in the data that you reviewed that correlated with acts of harassment, intimidation and production pressure?

A Yes, sir.

Q All right. Let's talk about the first point first.

Now, you concluded that in the absence of what you characterize as design-significant discrepancies, having found no design-significant discrepancies in the samples, that evidenced that the performance of the L. K. Comstock Quality Control Inspectors had been acceptable; correct?

A Yes. I believe from the fact that there are no

significant discrepancies as characterized by this design significance review --

Q Yes, all right.

A -- that the performance of the inspectors were adequate.

You know, whether we choose the word "acceptable" or "adequate" -- clearly there were deficiencies identified, and I don't want to suggest any denial of that.

The fact that there were no significant discrepancies is defined by design significance.

Q Yes.

Well, of course, you don't make any concession in your prefiled testimony that there were any adverse performance effects from any cause on L. K. Comstock inspectors, do you?

You don't acknowledge any adverse performance by the Comstock inspectors in your prefiled testimony, do you, Mr. DelGeorge?

A Well, the reporting of results I think itself is evidence of that performance.

Q Yes, sir. Well, that's a matter of how one interprets those bar graphs of yours.

But there is nowhere in your narrative testimony, is there, Mr. DelGeorge, any acknowledgment of adverse performance by the Comstock inspectors?

A I don't believe that's true.

I think I do make some specific statements about certain specific inspectors related to my review of the PTL data base.

Q Indeed you do, and I stand corrected. I'm glad you pointed that out.

You mentioned three instances where the agreement rates were -- I'm not using your term -- unacceptable; correct?

A Where the performance was unacceptable based on the review.

Q The performance was unacceptable as measured by agreement rates?

A Yes.

Q Laying those aside -- that is, Mr. Asmussen, Mr. Arndt and Mr. Hunter; correct?

A Yes.

Q -- you don't acknowledge anywhere else that there was any adverse performance by Comstock inspectors in your narrative direct testimony, do you?

A That's correct.

Q All right.

At Page 13 I direct your attention to Answer 11. That is the question which says, "What is the basis for your conclusion that LKC QC inspections were effective?"

A I'm sorry. Could you give me that reference again?
Q Yes. It's Page 13, Answer 11.
A Okay.
Q There you refer to the conclusion by Dr. Kaushal, Messrs. Kostal and Thorsell, Sargent & Lundy men, that, having evaluated the discrepancies found by the BCAP for the electrical populations, none of them were, in their judgment, design-significant.

That's the reference you make there?

A Yes, sir.
Q All right.

Now, in the course of the L. K. Comstock Company's management of their Quality Control Program, did they evaluate the performance of their inspectors on the basis of whether or not they identify or fail to identify design-significant discrepancies, Mr. DelGeorge?

A I don't know.
Q You don't know?
A I have no knowledge that that was done, but I have no specific knowledge of the nature of the review done by the Comstock organization of their individual people.
Q It's certainly not your belief that they did that, is it; that Comstock management evaluated their inspectors' job performance on the basis of whether they identified

or failed to identify design-significant discrepancies?

A I guess I wouldn't have expected them to.

Q No.

In fact, it's not even within the scope of a Quality Control Inspector's responsibility, let alone qualification, to identify a design-significant discrepancy or a nondesign -- to distinguish a design-significant discrepancy, is it?

A I would agree that it is -- it would be difficult for an inspector to distinguish a design-significant discrepancy --

Q Right. It would be -- I'm sorry.

A -- in every instance.

Q Well, inspectors don't make engineering evaluations in the field, do they?

They're not supposed to; it's inconsistent with their responsibility, is it not?

A That's true, but I do believe that inspectors can identify major or gross discrepancies which are likely to be design-significant discrepancies.

So there's a relationship between their capabilities and the question that you ask.

Q There may or may not be, but you certainly wouldn't expect to measure an inspector's performance by only whether he or she identified design-significant

discrepancies?

A I agree with that, and that's one of the reasons that that's not the only characteristic that I rely on in my testimony.

Q Yes.

In fact, the question of whether a discrepancy is design-significant is uniquely in the province of an engineer to evaluate based in part on the inspector's findings but also based on a variety of other data and expertise that is not immediately known to the Quality Control Inspector?

A That is generally true, yes.

Q All right, sir.

You're aware, are you not, for example, that when L. K. Comstock tests its Quality Control Inspectors to determine whether they are qualified to perform certified Quality Control inspections, the measure of qualification is whether or not they can effectively inspect to established acceptance criteria?

A Yes.

Q All right.

And in those cases where an inspector fails to identify conditions that are rejectable pursuant to those acceptance criteria, Comstock can and has flunked or failed to qualify an inspector on the basis of that

performance?

A That has been the practice after a specific point in time at the site, yes.

Q Well, you know, of course, of the case of Mr. Worley Puckett, who was hired as a Level III. You probably sat through Mr. Puckett's testimony in part.

You're aware of Mr. Puckett's case, where Mr. DeWald determined that he had failed his mock practical weld inspection exam because of the failure to identify a number of conditions specified in the Comstock weld inspection acceptance criteria?

A That was -- that is correct as to the practical exam.

Q So you didn't measure inspector performance in your direct testimony here by the standards of inspector performance that are applicable to measure inspector performance at L. K. Comstock, did you?

A Well, I'm not sure that that's correct.

First of all, your reference is specifically, I believe, to the requirements for a practical examination and the acceptance criteria with respect to the results of a practical examination at Comstock.

I have indicated earlier that the practice for Comstock has not been the same through time. There was, for example, at the outset of the Comstock work, no requirement for a practical examination.

Q I see.

A The requirement for 100-percent acceptance rate on the practical examination was introduced sometime in the 1981-1982 time frame. So the practice has not generally been the same.

Moreover, I don't believe that the acceptance criteria on the practical examination necessarily reflects the expectation of Comstock or Commonwealth Edison as to the performance of the individual generally with respect to his work in the future after that examination is taken and acceptably passed.

Clearly, when we certify an inspector, we establish a higher threshold to satisfy ourselves that an individual has been properly trained and has the necessary experience to perform work responsibly.

Q I see.

A I don't know that any of us -- and that includes myself -- would expect that everyone would perform work perfectly throughout his tenure at the site. That's one of the reasons we recertify people on a periodic basis.

The general site acceptance criteria with respect to practical examinations is 80 percent, and that has typically been my experience with respect to such exams at other plants.

Comstock is somewhat more restrictive in their

procedure. As I say, that was implemented until '81 or '82.

Q I see. Well, that's all helpful information but somewhat tangential.

The fact of the matter is, Mr. DelGeorge, that when Commonwealth Edison Company provided that PTL perform overinspections of field Quality Control Inspectors' work, Comstock included, they measured the work performance of those Quality Control Inspectors not on the basis of whether there were design-significant defects identified or not identified but on the basis of whether the original QC Inspectors found or failed to find conditions that were rejectable pursuant to the established acceptance criteria?

A That's correct.

Q All right.

And CSR, in performing its reinspection program, used checklists derived specifically for BCAP; but those checklists followed the acceptance criteria of either the AWS D1.1 welding code or the visual weld acceptance criteria of the NCIG?

A That's not correct.

Q Which one did they use?

A The AWS code.

Q So they didn't use some standard of whether or not the

inspector failed or succeeded in identifying a design-significant defect, did they?

A Well, I think I have to disagree with you on that point.

First of all, one needs to recall that the CSR reinspections were not contemporaneous with the original inspections performed by the Comstock inspectors. As such, CSR was looking back over an extended period of time, over which the Comstock procedures had changed.

It would have been very difficult to implement a program whereby the inspection of the particular item of interest was reinspected with the exact identical inspection criteria imposed at the time.

The Comstock procedures were formulated on the basis of the AWS code, as were the CSR procedures. My review of those procedures has led me to conclude that they are, for all practical purposes, the equivalent.

There are minor differences, but they are, in my view, equivalent.

Q All right, sir.

Well, that's a long way of saying that the answer to my question is yes, CSR used the acceptance criteria, not the measure of design significance, to measure the performance of Quality Control Inspectors?

A They did use -- well, no, that isn't correct, either.

The CSR was not focused on inspector performance.

It was focused on the quality of the underlying work --

Q All right, sir.

A -- being reviewed.

Q Let me stop you.

Recognizing that fact, you measured the quality of underlying work, in the case of welding, according to the AWS welding acceptance criteria?

A That's correct.

Q In your testimony, you used those CSR measurements -- agreement rates derived from those measurements to measure Comstock Quality Control Inspector work performance?

A I believe that's correct, but could I have the question read back just to be sure that I have it in mind correctly?

(The question was thereupon read by the Reporter.)

A (Continuing.) Yes, as an indicator of the effectiveness of the Quality Control Inspector.

JUDGE GROSSMAN: Why don't we take a 10-minute break.

Mr. Steptoe, I think you should talk to the witness about trying to get more direct answers. I really don't think that it should take half an hour, first, for the witness to agree that an adverse determination here

might be a reflection on his responsibilities, to begin with. There are simple questions and answers.

Nor should it take half an hour to determine that design significance is not one of the attributes with which originally one would test the effectiveness of a QC Inspector.

Now, perhaps I'm misrepresenting it. But in my judgment, it just seems as though we're spending a lot of time on points that are not really debatable, unless we want to turn this into some sort of debate.

I just don't think we want to spend all that time on things that aren't important and things that we could probably agree to in a much shorter time.

Now, if you wish to say something about that, Mr. Steptoe --

MR. STEPTOE: I'm sorry, Judge Grossman. I just have a totally different impression of the witness' answers.

But I will speak to him. I do want to speed this hearing up as much as we possibly can, but I have to disagree with the implications. But I understand that each listener hears things differently.

JUDGE GROSSMAN: Okay, fine. Let's take a 10-minute break.

(WHEREUPON, a recess was had, after which

the proceedings were resumed as follows:)

JUDGE GROSSMAN: Mr. Guild, please continue.

MR. GUILD: Thank you, Mr. Chairman.

BY MR. GUILD:

Q Mr. DelGeorge, let's look at some other measures of Comstock Quality Control Inspector work performance.

Let me direct your attention to Applicant's Exhibit 181, which is a corrected version of Intervenors' Exhibit 145, displaying percentage discrepant welds, discrepant items and notable items in the BCAP CSR electrical populations.

THE WITNESS: I don't have a copy of that.

MR. GUILD: Let me make one available to you.

(Indicating.)

THE WITNESS: Thank you.

BY MR. GUILD:

Q Now, the corrections have been made to this document, I understand, to reflect the recounts of welds and weld -- excuse me -- weld discrepancies and discrepant welds performed by Sargent & Lundy.

Now, sir, in your opinion, looking at the data here, the column "percent discrepant items in sample," those are items where one or more sample -- sample items where one or more rejectable condition was identified by BCAP as rejectable, according to their acceptance

criteria.

Now, do those data, sir, in your opinion, reflect acceptable work performance by the L. K. Comstock inspectors?

A I don't believe this -- these values provide sufficient information to draw a defensible conclusion.

Q You simply don't know how to answer my question from these data?

A No, sir.

My answer is that, having reviewed this data, I don't believe one can draw a defensible conclusion with respect to the quality of the underlying work based on this -- these numbers.

Q The work performance of the Comstock inspectors?

A That's correct.

Q I see.

Do the data reflected in the "percent discrepant items in sample" column, in your opinion, reflect any unusual work performance by Comstock inspectors, as you use the term "unusual" at Page 13 of your testimony?

A Well, given what I know of the discrepancies which serve as the basis for the calculated values in that column, I don't -- again, I don't believe there is a basis for reaching that conclusion.

Q I see. Well, let me ask you the same question with

respect to whether these data exhibit, in your opinion, adverse work performance by the Comstock inspectors; again, the "percent discrepant items in sample" data.

The same answer?

A Yes, sir, that's true; and it's based on my knowledge of the nature of the discrepancies upon which these values were calculated.

Q Let's look, then, at some other data on this exhibit. Let's look at the far right-hand column, "percent notable items in sample."

You are familiar with the term "notable" as it was used in the CSR reinspection, are you not?

A Yes, sir.

Q All right, and "notable" is used the same way for this data.

From the data exhibited in that column, 8.9 percent notable items -- that is, for the case of cable pan -- of the items in the sample -- that is, 90 items -- 8.9 percent of those 90 items exhibited one or more notable discrepancies.

Now, with that understanding, does the data that appears in the column "percent notable items in sample," in your opinion, Mr. DelGeorge, exhibit acceptable work performance by L. K. Comstock inspectors?

A My answer would be the same, sir.

I guess I would have to refer back to your comment earlier that, given the fact that a QC Inspector is not privy to what type of discrepancy constitutes a significant or an insignificant discrepancy, it's difficult for me to use this index as a basis for assessing the performance of a QC Inspector.

Q Well, that is right, and that's fair enough.

But in a different context, Mr. DelGeorge, I was asking you about design significance; and that's an engineering evaluation. The "notable" characterization is simply a reflection of the magnitude of the discrepancy in very obvious terms, such as reduction in weld area.

You understand that to be the case, don't you?

A Yes, sir.

Q All right, sir.

And you'd agree with me there that "notable" is a reflection of conditions that, generally speaking, are much more apparent within the scope of an inspector's field of responsibility?

A No, sir, I wouldn't.

Q All right.

So your answer is the same with respect to the data in the "percent notable" column: You don't have enough information to express an opinion about those data?

A I have an opinion, and it's that this index cannot be used to assess inspector performance.

Perhaps an example would be helpful in this regard.

Q That's quite all right. Perhaps your lawyer would like to ask you a follow-up question, Mr. DelGeorge, on that score.

Let's turn to a column that perhaps we can agree on, since you don't like any of this data, Mr. DelGeorge, and that's discrepant welds.

You, in fact, use that measure in your own testimony, do you not: welds inspected and welds found to be discrepant?

A Yes, sir.

Q All right.

Now, let's look at that data. For the populations in which there are welds included, cable pan, we had 11 percent discrepant welds; conduit hanger, 8.3 percent discrepant welds; for cable pan hangers, the corrected value is 18.4 percent discrepant welds; and equipment is 15.9 percent.

Now, sir, for those data, do they, in your opinion, exhibit acceptable work performance by the Comstock inspectors?

A Again, sir, for reasons that I base on my understanding of the nature of the discrepancies that provide the

bases for these numbers, I don't think you can draw a defensible conclusion without more facts.

Q I see.

Well, then, let me ask you whether or not they exhibit, in your opinion -- that is, again the "percent discrepant welds" data -- any unusual work performance, as you use the term "unusual" at Page 13 of your testimony.

The same answer?

A That's -- my answer would be -- would be the same; and it's because one needs to have a better definition of the nature of the discrepancies which form the basis for these ratios, these percentages.

Q I see.

Finally, do those data -- that is, "percent discrepant welds" -- in your opinion, exhibit any adverse work performance on the part of Comstock inspectors?

The same answer there, too?

A You say "any adverse work performance."

I don't want my answers to suggest that the existence of deficiencies is acceptable. That's not my position.

Q Well, let me ask the question directly. I appreciate you wanting to be careful in your answer.

Do the data "percent discrepant welds" reflected on Applicant's Exhibit 181 exhibit, in your opinion, any adverse work performance on the part of Comstock inspectors?

A To the extent the discrepancies which form the basis for these ratios are attributable to Comstock inspectors, then they do represent some measure of the performance of the inspectors and may have -- I want to be sure I address the specific words that you used in your question.

Do they have any adverse effect? I believe they --

Q Do they exhibit any adverse work performance?

A Given the conditions that I previously mentioned, these ratios could exhibit an adverse effect.

Q I see. All right, sir.

Now, I assume that you're being consistent in your testimony, Mr. DelGeorge, that to the extent that you tell me that these data -- that is, the data that appear on Applicant's 181, formerly Intervenors' Exhibit 145 -- that these data are insufficient to base opinions on, you would have told us, would you not, if any of the data that you relied on in forming your opinions were similarly insufficient evidence on which to base opinions?

A Yes.

Now, I believe I did do that in a number of instances in my prepared testimony.

Q I take it you believe you did it in all instances where you are aware that there were insufficiencies in your data on which to found opinions?

A I attempted to do that, yes.

Q All right, sir.

Now, at Page 38 of your prefiled testimony, Mr. DelGeorge, you exhibit two values; and I'd like to simply first clarify what the derivation of those values is.

Beginning at Page 37, the last sentence, "The composite mean agreement rate from the PTL welding data base is about 93 percent and from the CSR welding data base is about" -- I believe 85 percent is the corrected value; is that right?

JUDGE COLE: What page is this, Mr. Guild?

MR. GUILD: Pages 37 and 38, Judge.

JUDGE COLE: Thank you.

A Yes, sir.

BY MR. GUILD:

Q All right.

Now, first of all, what is a "composite mean agreement rate," as you use that term, Mr. DelGeorge?

A Well, it is the cumulative average over the entire

duration of the review performed under PTL overinspection and the CSR reinspection activity.

Q I see.

A So it is the mean of the entire data base for CSR and PTL.

Q All right, sir.

If you look at Applicant's Exhibit 181, formerly Intervenors' 145, the data for discrepant welds, the "percent discrepant welds" column, does your 85 percent value shown at Page 38 for the CSR welding data reflect the mean of the discrepancy rates that appear on this exhibit?

A It should be consistent.

If one were to weight the percent discrepant welds by the number of welds of a particular construction category and sum those weighted values, it's my expectation that that collected ratio would be equivalent to the value that I've reported in my testimony.

Q All right, sir.

That's what you mean when you use the term "composite mean agreement rate"?

A Yes, sir. It considers all of the construction categories for which welding was an attribute.

Q It weights them appropriately, the different categories

in which welding was evaluated in CSR, for example?

A Well, so that we're clear on this, the 11.2 percent for cable pan hanger welding on Exhibit 181 --

Q Yes.

A -- is representative of 605 welds.

Q Right.

A The 8.3 percent for conduit hangers is representative of 1,854 welds.

It's not enough to just take the average between 11.2 and 8.3 to determine what the cumulative average is for cable pans and conduit hangers.

Q All right.

A One needs to weight that ratio -- or that percentage before that combination is made in order to get an accurate reflection of the cumulative average.

It's on that basis that I made my prior statement.

Q It would be the total number of --

JUDGE GROSSMAN: Excuse me.

Why do we have to go into the intricacies of weighting if what you're saying is you just add up the total number of welds and the total number of discrepant welds and just divide the two?

Isn't that what you're really saying?

THE WITNESS: Yes, sir, except that the total number of discrepant welds is not identified on this

exhibit.

BY MR. GUILD:

Q Exactly.

That's what you did; right?

A Yes, sir.

Q Now, in your opinion, Mr. DelGeorge, does the 85 percent composite mean agreement rate found by the CSR sample exhibit acceptable work performance by the Comstock inspectors?

A If the only basis for drawing a conclusion was the 85 percent number, I would say no.

However, given my understanding of the underlying deficiencies that together constitute that value and the distribution of the deficiencies as a function of time, I have reached the conclusion that that value is not surprising to me and that it does represent an acceptable value.

Q All right, sir.

Well, "surprising" is sort of one of those qualities that depends on the eye of the beholder, I suppose, Mr. DelGeorge.

Is it unusual, that result, that 85 percent figure, "unusual" as you use the term at Page 13 of your direct testimony?

A It was my view, in reviewing that number, that it was

consistent with what I had expected it to be, based on past evaluations of similar data.

Q All right, sir.

Therefore, not unusual?

A Yes, sir.

Q Finally, does that 85 percent composite mean agreement rate for CSR welding exhibit any adverse work performance on the part of Comstock inspectors, in your opinion?

A As a composite number, no.

I don't think you can -- I have not concluded, based on a review of that number alone, that there is -- that there has been adverse performance on the part of Comstock QC Inspectors.

Q That's not exactly my question, Mr. DelGeorge, because you told me a moment ago that you considered other information -- I appreciate the fact that you did -- in arriving at your conclusion that the work was, nonetheless, acceptable.

But does the 85 percent composite mean agreement rate exhibit, in your opinion, any adverse work performance?

A To the extent it is not 100 percent, it exhibits a potential adverse effect. I think that the real question is one of degree of significance, and my

previous answers were premised on that.

Q I see.

Now, again at Pages 37 and 38 of your testimony, you are asked whether or not the CSR and PTL overinspections are consistent.

You note there that they concluded that there were differing composite mean agreement rates; that is, one of 93 percent for the PTL overinspections and one of only 85 percent for the CSR.

You conclude that those results are consistent --

A Yes, sir.

Q -- in short?

Now, one of the interesting bases for your reaching that conclusion, Mr. DelGeorge, is the last sentence of your Answer 34, Page 38.

I quote: "Finally, there was intense oversight of the CSR inspections by CECo, the IEOG and the NRC Staff which contributed to the very conservative inspection results produced by the CSR."

That's your testimony; correct?

A Yes.

Q All right.

Well, sir, you acknowledge by that testimony, don't you, Mr. DelGeorge, that inspection work performance, inspector agreement rates in this case, the conservatism

of Quality Control Inspectors' work performance, is influenced by, in this case, intense oversight; correct?

A Yes.

Q Well, sir, don't you acknowledge also that inspector work performance could be influenced by intense pressure from, say, the Commonwealth Edison Company Project Construction Department, if it existed?

A I've never denied that possibility.

Q I see.

So implicit in your recognition that such pressure -- either from oversight or production pressure, if it existed -- might influence inspector work performance is a recognition that inspectors' work is affected by pressure from management?

A No, sir. Implicit in my statement is the fact that inspector work performance may be affected by pressure from management --

Q If it exists?

A -- and depending on the nature of the pressure imposed.

Q I see.

But you recognize, do you not, that the work performance of Quality Control Inspectors can shift, as it did, according to you, in the 10 percent range between the PTL composite mean results and the CSR composite mean results from such influences as pressure

on the job?

A Again, so long as we have a common understanding of what we mean by "pressure on the job," I think that it is fair to say that while there is always pressure on the job, undue pressure or excessive pressure can have an effect on the performance of individuals.

Q Yes.

It can have the effect on the composite performance of large numbers of inspectors performing large numbers of inspections; and, in your opinion, it did on the PTL and CSR weld inspections?

A My statement was with respect to the CSR weld inspections.

Q As compared to the PTL?

A Yes, sir.

JUDGE GROSSMAN: Excuse me just for a second. Is this sentense actually correct: that there was intense oversight of the CSR inspections by these groups --

THE WITNESS: Yes, sir.

JUDGE GROSSMAN: -- or was there oversight of the calculations, basically?

THE WITNESS: No, sir. There was intense oversight of the inspection activity specifically, as well as the other activities that fell within the BCAP

program.

JUDGE GROSSMAN: Did any of these groups -- CECo, IEOG or the NRC Staff -- actually go out in the field?

THE WITNESS: Yes, sir, they did.

JUDGE GROSSMAN: Oh, okay, fine.

THE WITNESS: The Commonwealth Edison Quality Assurance Department had a site-specific QA team with QC Inspectors who -- and I believe testimony was given by Mr. Smith with respect to that oversight.

The IEOG also participated with inspectors in the field, monitoring both ongoing work and past work performed by CSR inspectors. Those results are recorded in their report.

The NRC I think, evidenced by the -- not the least of which is the CAT team inspection, where they reviewed, as a part of their inspection at Braidwood, the completed CSR inspections and made comments with respect to those inspection activities. Dr. Kaushal indicated that that resulted in a reassessment of the inspection activities within the BCAP CSR before they were continued.

You may recall that there was reference made to a midpoint look that was stimulated in large part by findings made by the CAT team for the NRC.

JUDGE GROSSMAN: The NRC Staff actually went out in the field?

THE WITNESS: Yes, sir.

JUDGE GROSSMAN: Okay, fine.

BY MR. GUILD:

Q Well, Mr. DelGeorge, you acknowledge that there was pressure in one direction on the CSR inspectors; you believe it was positive, I take it.

Is it possible that there was pressure in the other direction on the PTL inspectors; that is, that the PTL inspectors' agreement rate is as high as it is because they were under pressure to agree with the inspection findings of the Comstock inspectors whose work they were overinspecting?

MR. STEPTOE: I object; lack of foundation.

JUDGE GROSSMAN: Overruled. The witness can answer that question. I don't think it requires a foundation.

A No, sir. It is my opinion that no such converse pressure existed, based on my understanding of the conduct of that program.

In fact, overinspections subsequently performed by additional Level III Inspectors not of the PTL organization have concluded that the overinspection activity of PTL is generally conservative with respect

to its welding overinspections.

BY MR. GUILD:

Q That's not really responsive to my question, Mr. DelGeorge.

My question is: Is it possible -- I understand your opinion to the contrary, but is it possible there was pressure driving the PTL agreement rates up, as well as the pressure that you identified driving the CSR agreement rates down?

A For the reasons I've already stated, I do not believe that such a possibility exists.

Q All right.

Is it possible that lack of comparable qualifications and competence on the part of the PTL overinspectors drove the PTL agreement rates up?

MR. STEPTOE: I'll object to the form of the question.

Comparable to what?

MR. GUILD: Comparable to the CSR. That's the basis for the question, the CSR inspectors.

A To the extent that were the case, such a possibility would exist.

My review of the qualifications of the individuals who performed the PTL overinspections for which data is included in my data base for review doesn't lead me to

conclude that that would be a problem.

BY MR. GUILD:

Q All right, sir.

I take it that when you express that opinion, you're also aware of the results of the Quality Control Inspector Reinspection Program for PTL at Braidwood?

A Yes, sir, I am.

Q You took those into account in expressing that opinion?

A Yes, sir, I did.

Q Okay.

I take it that, Mr. DelGeorge, when you express your belief as to the reasons for the disparity in agreement rates between PTL at 93 percent and CSR at 85 percent, you are unable to quantify specifically what accounts for the 8 percent disparity, attributing one reason or the other?

A Well, I've attempted in a qualitative way to make that comparison in my testimony.

Q Yes, but you haven't quantified that or --

A Well, I have -- I have attempted to.

Specifically if one were to look at the agreement rates calculated on the basis of welds accepted versus welds inspected for the overlapping periods -- that is, the periods reviewed both by PTL and by Daniels under the CSR reinspection program -- the relationship between

those two ratios is much closer.

I have concluded from that that these ratios are in large part time-dependent.

The ratio calculated for PTL -- the cumulative agreement rate for the overlap period, for PTL, between June of 1982 -- excuse me -- July of 1982 and June of 1984, which is a period also reviewed by Daniels under the CSR -- the cumulative agreement rate for PTL in that period was 90.05 percent.

The cumulative agreement rate in the same period, based on the CSR results, was 88.97 percent, a difference of only about 1 percent.

In fact, to me, this reinforces what appeared to be a slight trend identified statistically by Dr. Frankel, which shows that the agreement rates under the CSR in the period prior to mid 1982 are lower than in the period after mid 1982.

It's also reflective of the fact that the PTL agreement rates improve subsequent to the period June, 1984. There is, in fact, an increasing trend; and for the overlap periods, the two programs identified a very similar result.

Q Let's work backwards, Mr. DelGeorge. That was a mouthful.

Dr. Frankel, who is the statistical expert,

acknowledges that any such curve upward -- a "slight upward trend," in his jargon -- is statistically insignificant?

A He makes that point.

Q He does make that point, doesn't he?

A Yes.

Q All right, sir.

And I guess still you haven't told me whether or not you have quantified empirically the effects of the intense oversight pressure that you identified on the CSR inspectors.

A I indicated that I had qualitatively assessed that.

Q Right.

A I have not quantified it.

Q And I take it that's not because you're holding on to some information you haven't shared with us yet; it's because you don't know how to quantify the results of that intense oversight pressure; is that true?

A That's correct.

Q Now, we've talked about Part 1 of your testing of the harassment, intimidation and production pressure hypothesis; that is, the work performance generally, whether it's effective or acceptable or unusual or whatever term you want to use.

The second half of your analysis, Mr. DelGeorge,

has to do with looking, based on measures you and Dr. Frankel and Mr. Marcus use, for any correlation between work performance effects and harassment, intimidation and production pressure; correct?

A Yes, sir.

Q All right.

Now, the basis for measurement that you use in making that search for correlations is agreement rates; correct?

A Yes, sir.

Q And you define "agreement rates" on Page 14 of your prefiled testimony; correct?

A I know it's been defined in this testimony. If you can direct my attention --

Q Sure. It's Question and Answer 12, Mr. DelGeorge: "How did you calculate agreement rates for purposes of your review" --

A Yes, sir.

Q You express the judgment at Page 15, in answer to Question 13, that it is appropriate to use such agreement rates to measure Comstock QC Inspector work performance?

A I believe the question was whether it was reasonable, and I concluded that it was reasonable.

Q All right.

I take it that, as a corollary, you believe it's appropriate, too?

A Given my experience, this is an index that, to me, is reasonable. Depending on how we define these words -- I'm not a semanticist -- I guess it's appropriate, also.

Q Well, the point of all this exercise, Mr. DelGeorge, is to dispassionately determine whether or not there is data to support Intervenors' hypothesis of adverse work performance effects from harassment, intimidation and production pressure, is it not?

A Yes, sir.

Q All right.

And in that context, is it your opinion that, using "agreement rates" as you've defined those terms, agreement rates are appropriate to test that hypothesis?

A Well, I don't mean to take issue with you, but -- maybe I shouldn't.

I think they're appropriate based in large part on the fact that the index is one that I have used before and that it has been reviewed by technical members of both Commonwealth Edison, the Staff and other experts to whom I've had access; and it has been their conclusion that inferences can be drawn on the basis of such a comparison.

For that reason, I believe that the use of

agreement rates defined in this way is both reasonable and appropriate.

Q All right, sir. Well, none of those experts are with us right now, Mr. DelGeorge, and I'm afraid the buck is on the witness stand before you.

I take it that you hold the belief --

A Yes, sir, I do.

Q -- that those agreement rate measures are appropriate here; correct?

A Yes, sir.

MR. GUILD: Mr. Chairman --

JUDGE GROSSMAN: Do you want to break for lunch?

MR. GUILD: -- I'm told that it's almost noon.

JUDGE GROSSMAN: Okay. That's fine. Why don't we return at 1:15.

MR. GUILD: Thank you.

(WHEREUPON, the hearing was continued to the hour of 1:15 o'clock P. M.)

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	:	
COMMONWEALTH EDISON COMPANY	:	Docket No. 50-456 OL 50-457 OL
(Braidwood Station, Units 1 and 2)	:	

Met pursuant to recess.

Thursday, November 6, 1986.
1:15 P. M.

JUDGE GROSSMAN: Mr. Guild.

MR. GUILD: Thank you, Mr. Chairman.

BY MR. GUILD:

Q Mr. DelGeorge, before the luncheon recess, we were talking about your reliance on agreement rates as a measure of Comstock Quality Control Inspector work performance.

By the use of that measure, you assume that the overinspector or reinspector's inspection is accurate, do you not?

A Yes, sir.

Q All right.

And you attribute the rejectable findings, the

discrepancies found by the overinspector or reinspector, to the original Comstock inspector?

A Yes, sir.

Q All right.

And I believe you expressed the opinion in your testimony such an attribution may not be warranted in all cases, and in some, in your belief, has a conservative effect on use of agreement rates?

A Yes, sir.

Q Okay.

Well, let's talk about what influences agreement rates, Mr. DelGeorge.

We've prepared a table. This is a document of three pages I have placed before you, Mr. DelGeorge.

(Indicating.)

MR. GUILD: Mr. Chairman, I'd ask that the document be marked for identification as Intervenors' Exhibit 188.

(The document was thereupon marked Intervenors' Exhibit No. 188 for identification as of November 6, 1986.)

BY MR. GUILD:

Q The document is entitled "Table No. 1." Table No. 2 follows and the third page reflects a sample calculation.

The first table is entitled, "Agreement Rates as a Function of Craft Error Rate, QC Inspector Accuracy, and Overinspector Accuracy."

If you will look on the first table, Mr. DelGeorge, the X axis of this matrix is entitled "QC Inspector Accuracy Rate" and displays various accuracy rates: The lowest, in the bottom, 50 percent; the highest, the top, 90 for 90 percent; craft error rate in percent across the horizontal axis, 10, 20 and 30 percent -- all right -- and the data that's displayed in the body of the matrix is identified as agreement rates.

All right. Now, the explanation that appears in the narrative on the first page, which also applies to the second page, is that the agreement rate data displayed to the left of the slash mark is based on the assumption that items found defective by the QC Inspector in the first inspection are repaired and reinspected. They stay within the sample.

The agreement rates to the right of the slash mark assume that the items found defective by the original QC Inspector are removed from the sample, are not reinspected by the overinspector.

Now, can we agree, Mr. DelGeorge, in general, that the variations in the accuracy of the craft who performs the original construction work that's being sampled will

influence the accuracy of the Quality Control Inspector inspecting that work?

A I'm not sure that I can agree with that.

Q All right, sir.

Can we agree that the accuracy -- the error rate -- excuse me -- of the craft will influence the accuracy of the overinspector?

A I don't believe that the product quality or the craft error rate will influence the -- again, your term, with respect to --

Q Accuracy.

A -- the accuracy of the inspector or the overinspector. I don't believe that to be the case.

Q All right, sir.

Well, let me ask the question somewhat differently.

Will that factor -- that is, the craft error rate -- influence the agreement rate, in your opinion?

A Of what?

Q Well, the agreement rate as you used the term agreement rate.

A I believe that the product quality, which is the inverse of the craft error rate that you make reference to -- that's the way I'm thinking of it --

Q Sure.

A -- can affect the agree[illegible]at might be

developed.

Q All right, sir.

Let's test that hypothesis a bit here.

Now, can we agree, also, that the accuracy of the first inspector -- that is, the Comstock inspector in these cases -- will have an influence on the agreement rate?

A Again, under what circumstances?

I'm not sure we're together yet with respect tc that.

Q I don't know whether we are or not. I don't know whether we will ever be.

The question, really, is one that --

A I don't understand the question.

Q All right, sir. Let me try again.

Let's control for all other variables and say that the craft error rate -- strike that.

Let's control for all other variables and say that the accuracy of the original Comstock inspector varies. All right.

Will that variation influence the agreement rate, the agreement rate being the term that you used, the value that you used in your testimony?

A Yes.

Q That's essentially what you assume when you use the

agreement rate as a measure of accuracy?

A Yes, sir.

Q All right, sir.

So that's a variable, the accuracy of the original inspector.

Now, we've agreed that the craft error rate can influence the agreement rate. That's two variables.

Now, the third variable that's included --

JUDGE GROSSMAN: Excuse me. Wait.

I'm not sure he did admit that, did you?

THE WITNESS: I think I took issue with an aspect of what had been said previously, and I am not sure that what was just said --

BY MR. GUILD:

Q Let me repeat it.

Do we agree, Mr. DelGeorge, that the craft error rate can influence the agreement rate?

A I believe I did say that there could be an influence on the agreement rate.

Q Okay, right.

And finally, can we agree that the accuracy of the overinspector can influence the agreement rate?

A Yes, sir.

Q All right.

Now, again, for purposes of your use of this data,

you assumed the accuracy of the overinspector?

A Yes, sir.

Q All right.

Now, those are three variables now we've identified. One is the craft error rate, one is the accuracy rate of the first inspector and one is the accuracy rate of the overinspector.

Now, what I ask you to do is look at the table -- let me ask you to turn to the third page of this document.

All right, sir. Now, an example of the calculation that has been used to derive the data displayed on this exhibit is contained on the third page.

We assume that there are 100 attributes in the sample; that is, sample size. We assume that the craft has an error rate of 20 percent.

In this case, we're talking about welds. There's 100 welds; that there will be 20 defective welds out of 100.

We assume that there is an accuracy rate by the first QC Inspector -- an error-detection rate of 70 percent, and we assume that there is an accuracy rate -- an error-detection rate by the overinspector in the case of the data that's the subject of your

testimony -- that would be the CSR and the PTL inspector -- of 90 percent.

All right, sir. There are two cases shown here, and the cases are A -- well, they are not -- the cases are A and B.

One case is where the initially-found defective welds are removed from the sample and not reinspected and the second case, B, where the initial -- initially-identified defective welds are repaired and returned to the sample.

Step 1, the sample calculation contains the 20 defective welds. That is a result of multiplying craft error rate times the -- as a result of -- excuse me. Strike that.

As a result of multiplying the craft error rate, which is 20 percent, times the QC error-detection rate -- that's the accuracy of the first inspector. In this case, that is 70 percent -- the QC Inspector will identify 14 percent of the sample as defective -- he will find 14 rejectable welds.

Do you follow me that far, Mr. DelGeorge?

A Yes, sir.

Q All right.

Now, Case 1, the defective welds are removed from the sample. They are not reinspected.

Assume the 14 welds are removed from the sample and not reinspected. The overinspection now contains 86 welds, 100 less 14, of which 6 are defective.

The overinspector, in BCAP's -- in your testimony's terms, the PTL and CSR inspector find 90 percent of those remaining 6 defective welds which are in the population, the sample -- excuse me -- subject to the overinspection. That's 5.4. 5.4 defective welds comprise 6.2 percent of the overinspected sample compared to 100 --

JUDGE GROSSMAN: Excuse me a second. Compared to a hundred, Mr. Guild?

MR. BERRY: Compared with 86.

MR. STEPTOE: Compared to 86.

THE WITNESS: It's compared with 86.

MR. GUILD: Well, I stand corrected. Thank you.

BY MR. GUILD:

Q -- compared to 86, and that produces an agreement rate of 93.8 percent; again, the first case where the -- where the defective welds were removed from the sample.

The second case, B, assumes that the 14 defective welds found by the first inspector, with a 70 percent accuracy rate, are repaired and reinspected. They are again back in the sample. The overinspector, who has a

90 percent accuracy level, finds 5.4 percent of the 6 defective welds. The 5.4 discovered defective welds comprise 5.4 percent of the overinspected sample. The overinspector's reported agreement rate is 94.6 percent.

All right. Now, in the way the data is displayed in the table, the 93.8 percent agreement rate -- that is, when the welds initially found rejectable are removed from the sample -- will be to the left side of the slash mark; the 94.6 percent agreement rate -- that is, for welds which are repaired and returned to the sample -- are at the right side of the slash mark, and -- I'm sorry. I stand corrected.

The value -- the A and B are reversed in the display on the first two charts. That is, the Case B, where the defective welds are repaired and subject to the overinspection, they are returned to the sample. That appears on the left side of the slash mark and that's what it says in the text on the first page.

Now, with that calculation in mind, Mr. DelGeorge, if we look at the case of an inspector --

MR. STEPTOE: Excuse me.

Counsel, are you going to ask Mr. DelGeorge whether he agrees with those numbers?

MR. GUILD: I haven't asked the question yet.

If you would just be patient with me, Mr. Steptoe,

we will get there.

BY MR. GUILD:

Q In the case of an inspector who has an accuracy rate -- L. K. Comstock Quality Control Inspector with an accuracy rate of 50 percent, Mr. DelGeorge, and a craft error rate of 10 percent, with an overinspection accuracy of 90 percent, wouldn't that reflect an agreement rate, depending on whether we're going to include the rejected welds in or remove them from the sample, of 95.5 percent or 95.3 percent?

MR. STEPTOE: I ask that if -- that the witness be allowed -- if the witness is being asked to perform a calculation, I ask that he be given enough time to do it.

BY MR. GUILD:

Q Let's take the case -- let's take the case -- let me withdrew that question, Mr. Chairman.

Let's take the case of the example that was -- the sample calculation that I just went through.

Do you agree with the mathematics, Mr. DelGeorge?

Did you follow that sample calculation, sir?

A Yes.

Q All right.

Are the mathematics correct to the best of your knowledge, to the best of your belief?

JUDGE GROSSMAN: Did you say that was a craft error rate of what on this one?

MR. GUILD: In the sample, the third page, Mr. Chairman, the craft error rate is 20 percent. There are 20 percent defective welds out of 100 welds in the sample.

BY MR. GUILD:

Q Do you agree with the mathematics, Mr. DelGeorge?

MR. STEPTOE: I make the same request, that Mr. DelGeorge be allowed to check it.

MR. GUILD: I'd be more than happy to allow him to do that.

BY MR. GUILD:

Q Would you do that, Mr. DelGeorge.

MR. STEPTOE: Do you have a calculator, Mr. DelGeorge?

THE WITNESS: Not with me.

MR. STEPTOE: May I hand the witness a calculator?

(Indicating.)

JUDGE GROSSMAN: Certainly.

A I get the same result --

MR. GUILD: All right, sir.

A (Continuing.) -- for the sample calculation.

BY MR. GUILD:

Q All right, sir.

Now, that sample calculation, therefore, reflects, does it not, Mr. DelGeorge, given the assumptions that I have asked you to make, that where the original inspector, the Comstock Quality Control Inspector, had only a 70 percent accuracy rate, that the agreement rate that you would display, again given these assumptions, would be approximately 94 percent?

A Given these assumptions, that's correct.

Q All right, sir.

Now, can we agree that a 70 percent accuracy rate for a Comstock inspector -- that is, in the case of 100 welds, finding the defective welds only 70 percent of the time -- that that is an unacceptable work performance -- that reflects unacceptable performance by a Comstock inspector?

A Yes, I would agree with that.

Q All right, sir.

And yet given the assumptions that I have asked you to make, they are correct, that unacceptable performance would be masked with a 94 percent agreement rate, would it not?

A If the assumptions that are to be made are limited to those that you have suggested, there is the possibility of that being masked, that's correct.

Q All right, sir.

Now, I've asked you to assume a 90 percent agreement rate -- I'm sorry -- 90 percent accuracy rate in this example for the overinspector.

It's your belief, is it not, that the -- in the case of the CSR inspectors, as you testified, their accuracy rates are higher than the accuracy rates for the original Comstock inspectors?

A I have said that the accuracy rates for the Comstock -- for the CSR inspectors are more conservative -- are conservative in the sense that they will more likely overcall discrepancies than not, and given that as an assumption, I think it's also true that their accuracy -- well, I'm not sure that it's fair to draw an inference one from the other.

I believe that the CSR inspectors are performing work conservatively, and as a result will, in many instances, identify what would otherwise be truly acceptable work as discrepant, and in that sense, I don't know how to characterize their accuracy.

Q Well, if accuracy is a measure of the ability to identify rejectable conditions, is it your belief, consistent with your testimony, Mr. DelGeorge, that the overinspectors, the CSR inspectors, were more likely to identify rejectable conditions than the original

Comstock inspectors?

A I'm not sure that I would say that they are more likely. They are at least as likely.

Q All right, sir; all right, sir.

Now, do you believe that there are inherent levels of inaccuracy in Quality Control Inspector inspection performance?

A Yes.

Q Do you believe that they are on the order of 80 percent; by that I mean, 80 percent accuracy finding both rejectable conditions correctly or accurately and also identifying acceptable conditions accurately?

A I am familiar with that index, and I would agree that that is probably representative of inspection activities generally.

I'm not sure to what extent one could say that it is, in fact, representative of nuclear inspection activities where the environment is unique.

Q It might be better than 80 percent accuracy for nuclear inspectors, would you expect?

A I think it's more a function of the specific activity in question.

Certain activities, where the call upon the inspector is relatively straightforward, I would expect the agreement rate to be higher, and for other

activities that are more complex and subject to more qualitative judgment, there is the possibility that it could be lower than that.

Q I see. All right.

I take it you have not done any quantitative measure of the accuracy of Quality Control Inspectors at Braidwood, other than --

A I'm sorry. I didn't hear that.

Q I take it you have not made any qualitative measure of the accuracy of Quality Control Inspectors at -- strike that.

Let me try one more time. Have you made any quantitative measure of the accuracy of Quality Control Inspectors at Braidwood?

A This assessment is one attempt at evaluating that accuracy rate.

There have been other assessments of Quality Control Inspectors at Braidwood.

Q Yes, I know there are.

But do you have a value in mind?

I asked you generally whether you will agree with 80 percent. You said it may or may not be 80 percent. It might be higher than that for nuclear inspectors.

Have you made a study to establish an accuracy level for Quality Control Inspectors at Braidwood?

A I have not made a study, no.
Q All right, sir.
If there is a base line expectancy of accuracy -- that is, on average, a level of accuracy to be expected -- would you agree that, in testing the harassment, intimidation and production pressure hypothesis, one would expect to see accuracy levels reduced below the expectancy -- the normal expectancy?
A Yes.
Q All right.
And does it follow, also, Mr. DelGeorge, that if, as you believe, the CSR inspectors were more conservative in their judgments, perhaps more accurate, that they would at least have the normal level of accuracy and perhaps might have an accuracy level better than normal?
A Yes.
Q And would you agree, also, that there is a level of inaccuracy -- a defect rate, if you will -- that is present in the performance of craft work at the Braidwood facility, such as welding?
A Yes.
Q It's obviously not a known quantity in advance, is it?
A That's correct.
Q All right.

But there is some level of error to be expected in the performance of safety-related construction activities?

A Yes.

MR. GUILD: If I may have a moment, Mr. Chairman.

JUDGE GROSSMAN: Sure.

BY MR. GUILD:

Q Mr. DelGeorge, now, I ask you to take a look at the two tables that are marked for identification Intervenors' Exhibit 188.

Again, the first table assumes a 90 percent accuracy for the overinspector, the second table assumes an 80 percent accuracy for the overinspector.

Now, would you agree, sir, assuming that the calculations -- the math is right, and again, making the same assumptions as the input data being assumed -- would you agree, sir, that the agreement rate uniformly is higher than the accuracy rate for the original QC Inspector?

I don't mean to say uniformly. I should say always. It's always higher; it's not a uniform proposition at all.

JUDGE GROSSMAN: Universally.

MR. GUILD: Universally.

Thank you.

A Yes, sir.

MR. GUILD: All right, sir.

Mr. Chairman, I would certainly invite the parties to check Intervenors' math, and we certainly could well be wrong on the mathematics.

This is intended as an example. The math is really not the critical element here.

JUDGE GROSSMAN: Well, there's one critical element that we haven't gotten to, and that's what this is based on, what the assumptions are based on.

MR. GUILD: Indeed.

JUDGE GROSSMAN: I don't know the text. I'm sure Mr. Steptoe does.

MR. GUILD: I'm sorry?

JUDGE GROSSMAN: The text from which you derive these figures.

MR. GUILD: Well, that's an excellent point, Judge.

That aside, the first point -- and that is, the mathematics -- I would certainly invite the parties, the Board, if they would like, to check our math.

But on the basis of the math being accurate and accepting any corrections necessary to that math, we would offer this document in evidence at this time.

I'd be happy to address your last point, if you like, but I wanted to offer the document with the understanding that the math is believed to be accurate by lawyers here, but it's certainly subject to check.

JUDGE GROSSMAN: Mr. Steptoe.

MR. STEPTOE: Not by one lawyer here.

JUDGE GROSSMAN: I'm sorry.

You will have to speak up or turn your mike on.

MR. STEPTOE: The math is not accurate by one lawyer here, Judge Grossman.

The one example we went into, notwithstanding my witness having done a calculation, I think there's a rounding error; but the more significant point is that there is absolutely no evidentiary foundation for the assumed -- the assumptions that are used in this table.

Now, if Mr. Guild has a point to make, he can argue it in his brief; but failing having an expert witness here to say that assumptions are 10 percent, 20 percent, 30 percent craft error rate or that these QC accuracy rate assumptions have some relationship to anything that goes on at Braidwood, he can't get in into evidence. There's not a proper foundation.

JUDGE GROSSMAN: Is Dr. Frankel going to establish the foundation for this, Mr. Guild?

MR. GUILD: Mr. Chairman, I believe that two

points can be made -- no, I don't believe Dr. Frankel will.

JUDGE GROSSMAN: I'm trying to guess where you got this from.

Why don't you just tell us.

MR. GUILD: All right, sir.

It's derived by making assumptions; and I believe the assumptions are supported by the record.

The assumptions are three, and those are, first, that, at least in terms of numerical assumptions, those are an accuracy rate for the first inspector, an accuracy rate for the overinspector and a craft error rate.

Now, we have assumed a variety of values, the values are intended to cover a range of possibilities, and demonstrate that there is, as the witness acknowledged, a universal relationship, although not uniform, and that is that agreement rates are a little higher than the accuracy of the first inspector.

The point, though, is to demonstrate, with a variety of assumptions, about levels of craft error. Those levels of craft error range from a 10 percent error rate to a 30 percent error rate, with various range of assumptions about the accuracy of the original inspector, ranging from 50 to 90 percent accuracy, and

of the overinspector, in one case, 80 percent, the second table; in the first table, 90 percent; that the mathematics demonstrate that the agreement rate that will be the product of those assumptions is universally higher than the original accuracy rate and in the range of values that Applicant has found as a result of CSR.

Now, I would suggest that the record already well reflects that the ranges of values assumed by Intervenors are supported.

No one has a precise number for what the accuracy of the originators were, the overinspectors or the craft error rates.

We'd be happy to run these calculations with any assumed values that the parties or Board wishes to suggest.

I'm simply not aware of the definitive statements of what those values are.

I know that there's been a range testified to. For example, accuracy of inspection, the 80 percent figure is cited by a number of witnesses from Mr. Juran's handbook on quality control.

JUDGE GROSSMAN: That's not my problem, Mr. Guild, and maybe I'm missing something that's very simple, but I don't find any basis in the record, any foundation, for assuming that the formulas that you use

are appropriate or correct; that if you assume a certain craft error, if you assume a certain QC Inspector accuracy and if you assume a certain overinspector accuracy, that you would get a final figure of anything that you depict in your tables.

MR. GUILD: Well, I believe that's established through the witness; but if that's not clear, I'd be happy to ask the further foundation questions, Mr. Chairman.

JUDGE GROSSMAN: That's fine.

MR. STEPTOE: Before we go on this, I should say my problem is that I think these are unsupported assumptions.

I don't know where in the evidence -- where in the record there is any support for craft error rates of 10 percent, 20 percent, 30 percent or any other number.

(Indicating.)

JUDGE GROSSMAN: Well, I don't have a problem with that.

If Mr. Guild can demonstrate that you can find, for example, a 95 percent agreement rate, and that could reflect, as an example, a 70 percent craft error rate -- or, actually, a 30 percent craft error rate and a QC Inspector accuracy rate of 70 percent, I don't think that he has to supply those particular figures.

If he just shows his final figure and he can say, either inductively or deductively, "You can use these figures as a basis for arriving at that final figure," he's made his point. That's efficient.

But the problem I have is with that formula that he based it on being appropriate.

Do you follow what I'm saying?

You may disagree. I don't mind you disagreeing. I just want you to follow what I'm saying.

MR. STEPTOE: I follow what you are saying, and I disagree, and I appreciate you don't mind that I disagree.

Thank you.

JUDGE GROSSMAN: Yes, okay.

MR. GUILD: Let me try to --

MR. STEPTOE: But I really think this is argument and not evidence, Judge Grossman.

JUDGE CALLIHAN: Mr. Guild --

MR. GUILD: Yes, sir, Judge Callihan.

JUDGE CALLIHAN: -- before we go too far, would you look first at Table 1 --

MR. GUILD: Yes, sir.

JUDGE CALLIHAN: -- and look at your sample calculation 2a5 and correlate the two, please.

MR. GUILD: You've lost me there, Judge.

JUDGE CALLIHAN: All right.

Table 1 --

MR. GUILD: Yes, sir, I've got Table 1.

JUDGE CALLIHAN: -- the sample calculation, which is Page 3 of your epistle --

MR. GUILD: I follow you, yes, sir. The --

JUDGE CALLIHAN: -- Population 2a5.

MR. GUILD: Got you. Yes, I've got you.

THE WITNESS: If I could be of assistance, I think the error in rounding that my lawyer referred to is the fact that the 93.8, calculated to 4 significant figures, is really 93.72 and should be rounded to 93.7, which I believe is the value contained in the matrix provided by Intervenor.

MR. GUILD: I'm informed that that's correct, it was a rounding error, and the 93.7 is the value that appears on the first table.

JUDGE CALLIHAN: Which way do you want to make it?

There's an inconsistency, and I think we ought to get inconsistencies out first.

So which way are you going?

MR. GUILD: 93.7 is the accurate rounding of that number.

JUDGE CALLIHAN: So your sample calculation

Item 2a5 should be 93.7?

MR. GUILD: Yes, sir.

JUDGE CALLIHAN: Thank you.

MR. GUILD: Yes.

And if you would look at Table 1, Judge, under the vertical column for the 70 percent QC Inspector accuracy and the 20 percent craft error rate, you will see the value is 94.6 and 93.7.

That's the same calculation with the rounding done properly.

JUDGE CALLIHAN: In some instances, you give agreement rates to two significant figures; in other cases you give them to three.

Is that of any importance?

For example, in Table 2, the 90/20 point right of the slash is 98.

MR. GUILD: Yes. It should be three -- three significant. It should be a zero.

JUDGE CALLIHAN: A zero?

MR. GUILD: Yes, sir.

JUDGE CALLIHAN: Thank you.

MR. GUILD: In both cases.

JUDGE GROSSMAN: Mr. Guild, why don't you come up and make that correction right now on Intervenors' Exhibit --

MR. GUILD: On the record copy, Judge?

JUDGE GROSSMAN: -- on Intervenors' Exhibit 188 on the Reporter's copy.

That is on the third page, changing the 93.8 percent to the 93.7 percent.

MR. GUILD: Thank you, Judge.

And I'm also correcting the first page to add the .0 in the two places I just mentioned to Dr. Callahan, the .0 for the upper left figure in the matrix and 98.0 for the one below that.

JUDGE COLE: And do it on Table 2, also.

JUDGE CALLIHAN: If you are going that far, the 50/20 point, I assume, is 90.0?

MR. GUILD: That's correct, Judge.

JUDGE CALLIHAN: If you want to go still further, on Table 2, that 90/20 point is 98.0, I presume? Table 2, 90/20, the second --

MR. GUILD: Yes, sir, that's correct, 98.0 it should be.

JUDGE CALLIHAN: Thank you.

MR. GUILD: Thank you.

BY MR. GUILD:

Q Mr. DelGeorge, let's talk about this calculation some more, please.

Now, again, turning to the sample calculation,

please, if we have a -- I asked you to assume that there are 20 percent defective welds. We're talking about welds here just by way of example. There's a craft error rate of 20 percent, so the craft has performed 20 percent deficient welds, defective welds in the sample. There are 20 there.

The question is:

Are they going to be identified and in what proportion, given the accuracy of the inspection and the overinspection, and what level of agreement rate will be reflected for craft error rate and two levels of inspector accuracy, the 20 bad welds?

The first inspector has a 70 percent accuracy rate.

He will find 70 percent of those 20 defective welds, will he not, given those assumptions?

A I'm sorry. I didn't hear the number.

Q Yes.

20 percent defective welds are 20.

70 percent accuracy, he will find 70 percent of the 20 defective welds?

A Yes.

Q And those are 14 in number?

A Yes.

Q All right.

There are, therefore, 14 defective welds that are

found.

All right. Let's take the second case -- that is, B at the bottom here -- the 14 defective welds are repaired. Say, for example, ICR's are written by the original Comstock inspector, the ICR's are processed, craft goes out and fixes the defective welds.

Okay. In the second case, Case B, the 14 welds, let's say, are on a hanger. They've been fixed. They are now part of the sample of 100 welds, say, on that hanger that will be overinspected.

All right. In that second case, the overinspector, who has a 90 percent accuracy rate, will find there are 6 defective welds remaining from the original 20, the first guy -- the first inspector having found only 14 of them.

The second inspector, the overinspector, will find 5.4 of those welds, given a 90 percent accuracy rate, will he not?

A Yes, sir.

Q All right.

5.4 -- the defective welds represent 5.4 percent of the overinspected sample, because the 100 welds are still in the sample, and that is associated with a 94.6 percent accuracy rate, is it not, given those assumptions?

A Well, the difficulty I have in -- the number calculated in the way that you suggest it be calculated would, in fact, be 94.6.

Q Yes.

A The problem I have is in the identification of that bottom-line number as an accuracy rate.

Q That's an agreement rate I mean to say. I --

A I think there's a distinct difference between the accuracy rate for the original inspector and the agreement rate between inspectors.

Q I misspoke.

I mean to ask you, sir:

The 94.6 percent would be the agreement rate resulting given those assumptions, would it not?

A Yes.

JUDGE GROSSMAN: Okay.

And I take it all the other numbers, if the mathematics have been done correctly, would reflect that same logic here?

THE WITNESS: If done correctly, I would assume so, yes, sir.

JUDGE GROSSMAN: Okay.

MR. GUILD: Mr. Chairman, we renew our request that we admit the document.

MR. STEPTOE: The same objection as before,

Judge Grossman: No foundation.

JUDGE GROSSMAN: Mr. Berry.

MR. BERRY: Staff is not objecting to the receipt of the document.

It appears to the Staff, Mr. Chairman, that the document is relevant; and I take it Intervenor is offering this document to impeach the weight to be accorded to the results of the PTL overinspections, the other affirmative evidence presented by the Applicant.

It's my --

JUDGE GROSSMAN: Okay, fine.

MR. BERRY: It's my understanding that that would -- that this is a material matter, and that extrinsic evidence on a material matter is admissible. Ordinarily extrinsic evidence, if it was collateral, would not be.

You know, this document, Intervenors' Exhibit 188, appears to the Staff to just be evidence offered by the Intervenor which, if true, would tend to contradict or certainly detract from the weight to be accorded to the evidence presented by the Applicant.

For that reason, I would think it would be admissible, without intimating any weight to be attached to this evidence by the Board.

Also, I would think, Mr. Chairman, that this

document, Intervenors' Exhibit 188, also is an aid in understanding the position that Intervenors are taking.

I think it's clear that they've been -- that they've questioned the results of the PTL inspection, the CSR inspection, this whole notion of the agreement rates, and I think now we can see their position and understand why they've raised the question on it, and I think that's reflected in Intervenor Exhibit 188, also.

And for that reason, I believe it would be helpful to have it in the record to understand the party's position.

Again, the Staff is not objecting to the receipt in evidence of Intervenors' Exhibit 188.

JUDGE GROSSMAN: Mr. Guild --

JUDGE COLE: Mr. Guild, there's another assumption in here, and I don't see it stated and I don't recall whether you said that or not, and that's a 100 percent overinspection rate is assumed in here.

Is that your intention, sir?

MR. GUILD: It really only is with respect to this particular item.

We're taking an item, not a general rate, and it's just by way of example, using 100 as a round number for purposes of clarity, Dr. Cole.

It certainly doesn't mean to suggest that a 100

percent overinspection rate of PTL of any sort or CSR, if that's your --

JUDGE COLE: I mean, I'm thinking about how this might be used; and if you are going to then correlate this with what has happened here with the inspections and overinspections, the assumption of 100 percent overinspection might not necessarily apply, so, consequently, the way these numbers are calculated might not directly be applicable to the situation at hand.

MR. GUILD: I'm not certain --

JUDGE COLE: But with that understanding, I see how you get the numbers, and I think it is, in fact, the calculation with the assumptions clearly stated; and if it applies, it applies, and if it doesn't, it doesn't.

MR. GUILD: Yes, sir.

I'm not real clear on what the concern is; but what it means to represent is just, by example, of 100 items, and you could take a hanger with 100 welds on it or you could take 100 welds that somehow otherwise happened to be the subject of inspection. It's simply an example.

JUDGE COLE: I understand.

JUDGE GROSSMAN: It could be 100 of the sample welds that were inspected?

MR. GUILD: Exactly.

JUDGE GROSSMAN: I would think that it would apply to whatever number you wish to apply this to.

MR. GUILD: Welds happens to be the unit of measure by example; but it could be 100 of any attribute that was subject to inspection judgment.

I mean to make it analogous to what Mr. Juran uses when he talks about inspector accuracy. They apply to any inspector judgment, as I understand the concept.

JUDGE GROSSMAN: Okay.

Without saying much more, I don't even view this as extrinsic evidence. I think it relates to the internal logic of the witness' position.

It's a table based on whatever logic has been used, and it's certainly usable for that, nor do I think it just goes to the weight. It gives possible alternative suggestions to what figures could have gone into producing an agreement rate on which the witness has testified, so there are alternative bases for arriving at that particular agreement rate, and as long as the logic is clear, we can accept those alternative bases; and it goes to more than the weight. It goes to possibly a full explanation or alternative explanations for the same conclusion.

So certainly it's admissible and can be used however the parties wish to use it in their proposed

findings.

So we'll receive Intervenors' Exhibit 188.

(The document was thereupon received in evidence as Intervenors' Exhibit No. 188.)

BY MR. GUILD:

Q Now --

JUDGE GROSSMAN: Hold on for a second.

MR. GUILD: Sure.

JUDGE GROSSMAN: Mr. Guild, you may proceed.

MR. GUILD: Thank you, Mr. Chairman.

BY MR. GUILD:

Q Now, Mr. DelGeorge, it is true, is it not, sir, that in your review of the CSR data -- that is, the agreement rates that are the subject of your testimony -- you did not control for variables in the error rate by the craftsmen?

A That's correct. That underlying value was not identifiable.

Q All right, sir.

Nor did you control for variation in the accuracy of the original QC Inspectors?

A That's correct.

Q And, finally, nor did you control for variations in the accuracy of the overinspectors?

A Well, that's correct; and having said that, when you say we did not -- having admitted that we did not control for that value, the value was not identifiable in advance.

I think it is true -- well, I don't agree that this is an accurate representation of accuracy of inspection, because I think it does depart from the suggested method of reviewing such accuracy in Juran.

Given the information that was available to us, I believe that we performed the assessment in a manner that is reasonable, as is said in my testimony, and consistent from Juran, from which I think you attempted to draw this algorithm.

Q Well, don't presume too much, Mr. DelGeorge.

But the fact of the matter is, to the extent that variations in craft error rates, accuracy rates by Quality Control Inspectors, or accuracy rates by overinspectors exist, you don't know what influences those variables had on the agreement rate data that you evaluated in your testimony?

A I don't know -- not knowing them in advance, I don't have specific knowledge as to what the influence might be.

Q Yes.

Now, you and Dr. Frankel review the agreement rate

data, CSR, PTL, over time to test the Intervenors' hypothesis regarding harassment, intimidation, production pressure, and determine whether or not there are discernible trends and variations in agreement rate that you attribute to that phenomena?

A That's correct.

Q All right.

A Excuse me.

You make reference to that phenomena. I'm not sure what --

Q Production pressure, harassment, intimidation.

Now, if you would, sir, turn to the attachments to your table.

The first attachment, the bar graph, reflects, for the period of time in question -- and that extends from the first quarter of '79 through the second quarter of '84 -- the numbers of inspection points for all samples, welding and non-welding?

A Yes, sir.

Q And its data is displayed on a quarterly basis?

A Yes, sir.

Q DelGeorge 2 reflects the numbers of inspection points for all samples over that period for welding only?

A Yes, sir.

Q And DelGeorge 6, your last bar graph -- I'm sorry. I

see.

DelGeorge 6 reflects the CSR inspection points, both welding and non-welding, for the 24 Comstock inspectors that you identify as the complaining inspectors?

A Yes, sir.

Q Now, those are, in effect, the sources of data from which you derive the agreement rates, are they not?

A Those inspection points, yes, have associated with them some number of discrepancy points which are then used as a basis for determining the agreement rate.

MR. GUILD: Yes.

If you would give me a second, Mr. Chairman. I'm looking for a document.

Mr. Chairman, if I could have a moment, please. I'm finding a document here.

JUDGE GROSSMAN: You wish to take a break now?

MR. GUILD: If you can just let me have a moment, I think I can put my hands on it.

BY MR. GUILD:

Q Mr. DelGeorge, let me show you a bar graph here --

(Indicating.)

MR. GUILD: Mr. Chairman, I'd ask that this document -- it's entitled "CSR Reinspection Results For

LKC, All Populations, All Samples, Welding and Non-Welding -- be marked for identification as Intervenors' Exhibit 189.

(The document was thereupon marked Intervenors' Exhibit No. 189 for identification as of November 6, 1986.)

BY MR. GUILD:

Q Now, Mr. DelGeorge, the bar graph that's placed before you was prepared by Intervenors, and it is derived from the DelGeorge attachments that I just identified.

If you would, sir, turn to DelGeorge 1 again, please.

Again, that is the total inspection points, all samples, welding and non-welding.

And would you agree, sir, that the total -- the size of the bars depicted on Intervenors' Exhibit 189 accurately reflects the bar graph that's depicted in DelGeorge 1?

It's simply a tracing is what it is.

MR. STEPTOE: Well --

A Well, I'm not sure that's true.

MR. STEPTOE: Well, I'm going to object unless the witness is given the time to do a careful review.

MR. GUILD: Would the witness like to place a

copy of Intervenors' 189 over DelGeorge 1?

I think that the answer to my question is readily discernible from simply doing that.

THE WITNESS: Does this purport to be a tracing of Rev 2 of DelGeorge Exhibit 1, because if it is, I don't believe it's accurate?

MR. STEPTOE: Neither do I, Judge Grossman.

BY MR. GUILD:

Q You revised your bar graph, didn't you?

A Yes, sir.

I think that was indicated at the outset of my testimony today.

Q Would you take -- you have -- you have DelGeorge Rev 1, Mr. DelGeorge?

A Rev 0?

I think this corresponds to the initial bar graph included in my testimony prefiled in August of '86.

Q Well, I'm --

A At least it would be appear to be close to that.

JUDGE GROSSMAN: It appears to me to correspond to Rev 1 -- DelGeorge 1 -- I'm sorry -- and that may be Rev 0.

Is that so?

THE WITNESS: Yes, sir, I believe so.

JUDGE GROSSMAN: Are the changes that you

have to Rev 2 significant from this?

I don't think we want to spend too much time redoing this whole thing if the changes are not significant, and I think we'd just as soon go ahead.

Is there any problem with that?

MR. STEPTOE: Well, Judge Grossman, I think you are asking the wrong person whether the changes are significant.

It's Mr. Guild's cross examination. I think he's trying to --

JUDGE GROSSMAN: Let me put it this way:

Are they significant from a point of view of a bar graph?

THE WITNESS: I can't be sure, your Honor. I haven't looked at the data in this way.

You know, it could be insignificant for most purposes and have some significance for another purpose, depending on what Mr. Guild plans to use it for. I'm just not certain.

JUDGE GROSSMAN: Okay, fine.

Why don't we use this right now, and we'll put the onus on Mr. Guild to redo this later on with the revisions in mind and have those revisions submitted to Mr. Steptoe for his approval after, of course, he consults with his expert.

Mr. Berry, do you have a problem?

MR. BERRY: I don't have a problem with that. I just want a clarification, Mr. Chairman, that we're looking at Attachment 2C DelGeorge-1.

JUDGE GROSSMAN: Yes, in the top graph.

MR. BERRY: Okay, fine.

JUDGE GROSSMAN: Well, there's, obviously, more information in there, but we're talking about the outlines of the --

MR. BERRY: The top part.

JUDGE GROSSMAN: -- of the bars rather than everything that goes into the bars, and that should correspond to that top graph.

MR. GUILD: Mr. Chairman, I'm looking at -- I'm working from a document that has August 8, 1986, on it. It reads, "Attachment 2C DelGeorge-1."

JUDGE GROSSMAN: Oh, that's --

MR. GUILD: It's DelGeorge 1.

Now, indeed, I understand there is a revision to this reflecting the new weld count.

I'd be more than happy to submit a revised document to reflect that.

JUDGE GROSSMAN: Yes, okay.

MR. GUILD: It's the same data, but it may change -- there may be some variation to the revision.

If I may, I'd like to proceed in my examination.

I apologize for not incorporating the revised data.

JUDGE GROSSMAN: Okay. We'll make our definitive ruling on this now.

We'll let Mr. Guild use this, even though it's Revision 0, the original one, and then we'll have him subsequently revise it, according to the revisions, and have that go to Mr. Steptoe for his approval of the revisions.

Of course, whatever objections you have to what's being examined on now with regard to Revision 0 would apply, of course, to the Revision 2 graph.

But proceed, Mr. Guild.

MR. GUILD: Thank you, Mr. Chairman.

If you may have a moment, Mr. Chairman.

JUDGE GROSSMAN: Sure.

MR. GUILD: Mr. Chairman, I'm trying to lay hands on DelGeorge Rev 2 so we can eliminate the possibility that what I believe to be very minor changes in this document have any affect on this depiction that's significant in my examination.

JUDGE GROSSMAN: Well, if that's so, then we wouldn't require that you put a revised exhibit in.

It would certainly simplify things for us.

MR. STEPTOE: Excuse me.

Was this document prepared just by tracing -- totally by tracing from Attachment 2C DelGeorge-6?

Whatever revision you used, you took --

MR. GUILD: Well, there's a different scale for a couple of the revisions, if that's the trick to your question, Mr. Steptoe.

MR. STEPTOE: Well, it wasn't meant to be a trick, but my point was --

MR. GUILD: No, it was not.

The answer was it was traced from DelGeorge-1 and derived from the other DelGeorge exhibits with the scale changes.

Mr. Chairman, let me proceed in my examination, if I might.

JUDGE GROSSMAN: Sure.

MR. STEPTOE: Well, I guess -- I think I understand what the Board is trying to do.

I think there may be -- this chart may be substantially misleading for reasons unrelated to the revision that's being used, and based on cursory examination, I'm concerned about that.

JUDGE GROSSMAN: Oh, okay.

Well, what we're saying is we'll certainly entertain those objections now; but the other objections, I think, can be overcome.

MR. STEPTOE: Well, can we use --

JUDGE GROSSMAN: Excuse me.

Let me --

MR. STEPTOE: Just for demonstration, I'll show you what concerns me.

JUDGE GROSSMAN: Oh, okay. Certainly.

MR. STEPTOE: If you look at Intervenors' Exhibit 189, which, I guess, is the graph, if you look at the first quarter of 1984, there is a -- the next to the last bar there, if you look at the cross-hatched section, which is supposed to be weld, complaining inspectors, it looks like there are approximately 10,000 inspection points attributable to that cross hatching; yet if you go to DelGeorge -- well, if you go to DelGeorge Attachment 2C, No. 6, Revision 0, you'll find that there are about 8,000 identified inspection points for that same period, and if you go to DelGeorge 6, Revision 2, you will find that there are about 4,000, 4,500 inspection points, so that we have a real mismatch here.

MR. BERRY: Could we go off the record for one second, Mr. Chairman?

MR. GUILD: Let's do this:

What we would like -- I would like to proceed with this examination.

I apologize. It was inadvertent that I didn't see the revisions were incorporated.

So that there's no possibility for suggestion that the witness is being misled by my examination, I would respectfully request that we recess. We will make a new chart. We will incorporate those revisions in the method that I just described, derivation of those charts; and I would like to proceed with the examination at that point.

I fear that doing otherwise is simply going to undermine the value any answers the witness might give on the assertions that somehow he was misled by use of an incorrect depiction.

And I apologize again for having inadvertently failed to incorporate that data; but it's important to my examination that I do this accurately.

JUDGE GROSSMAN: Well, Mr. Steptoe is objecting not on the fact that the revisions weren't incorporated, but on what he believes to be an error based on scale, because some of the other charts were at a different scale and then the items were taken out of scale.

Were then assumed to be on the same scale and put in incorrectly?

MR. GUILD: That's not the -- that's not what

I understand either from Mr. Steptoe or to be the case.

JUDGE GROSSMAN: Why don't I suggest now that we'll take a recess and you and Mr. Steptoe go over this, find out where you have the problems, and I think we still want to proceed today as though we have no problem and just get all the ducks in a row off the record and come back.

I don't think that the -- I think you could probably skirt the inaccuracies in the testimony.

You don't believe so, Mr. Guild?

MR. GUILD: Not from what I hear of -- I don't think there are significant -- there are some changes, but I don't think there are any errors that are significant; but I don't want the record in the state that it's in right now where Mr. Steptoe says that the witness is going to be misled. That's his prediction.

It makes anything he might say about this document, uncorrected, of no value, and it's --

JUDGE GROSSMAN: Well, I think you can phrase your questions, "Assuming that such and such accurately reflects this area, reflects what's on chart such and such, aren't your conclusions."

I don't see that they are insurmountable problems, and I am trying to find a way of speeding this up.

MR. GUILD: Mr. Chairman --

JUDGE GROSSMAN: I don't believe Mr. Miller wants us to delay because of a bar not being drawn exactly correctly when we can do that off the record and submit the revised drawing.

MR. GUILD: Yes, sir, I'll be happy to do that.

Maybe we could have perhaps a brief recess, and I'll consult with counsel for Applicant and see if we can reach an understanding.

I'm still concerned by Mr. Steptoe's remark.

JUDGE GROSSMAN: Okay. We'll take a 15-minute recess now, and longer if necessary.

(WHEREUPON, a recess was had, after which the hearing was resumed as follows:)

JUDGE GROSSMAN: Okay.

Back on the record.

I understand Mr. Guild has 10 or 15 minutes' worth of questioning before we get back to that exhibit, which we haven't gotten yet.

So, Mr. Guild, why don't you just continue.

MR. GUILD: All right.

Thank you, Mr. Chairman.

BY MR. GUILD:

Q Mr. DelGeorge, could I ask you to look at Intervenors' Exhibit 158, please. This is an excerpt from the BCAP

program document.

The reference is --

A I'm sorry, sir. I don't have it

I now have a copy.

Q The reference is Page Roman II-3 of the BCAP program document, that portion of the BCAP program document describing the CSR sample and selection criteria.

Do you have that before you?

A Yes, sir.

Q Now, at first there's a statement made at the bottom of that page about the basis for the sample size. That is, the statement is made that, for large populations, a sample size of 60 supports a 95 percent confidence level, 95 percent reliability level; correct?

A Yes, sir.

Q All right.

The statement then goes forward on the following page, Roman II-4. At the top it reads, "Since the work activities in the plant are non-homogeneous, it is not appropriate to utilize a rigorous statistical sampling approach for the CSR."

Do you see that, sir?

A Yes.

Q All right.

Now, I want to talk a moment about the respects in

which the work activities in the plant -- those are the work activities subject to the CSR for electrical populations -- are, indeed, non-homogeneous.

First of all, there are different kinds of electrical installations.

There are, for example, cables and conduits and cable pan hangers.

That is one respect in which items in the electrical area are non-homogeneous?

A That's correct.

Q All right.

And in recognition of that fact, you break the electrical area of the CSR work down into construction categories; six to be precise?

A Yes, sir.

Q All right.

But those six categories themselves are non-homogeneous with respect to the work activities that are reflected in those categories; would you agree?

A Well, that depends on what you consider to be an index of homogeneity.

Q Yes, it does.

But homogeneity -- for purposes of sampling, as that term is used in the BCAP program document, you would agree, would you not, that even within the sample

BCAP CSR construction categories, there is a lack of homogeneity?

A There is a lack of identity; but, again, I guess I prefer that you define for me what you mean by homogeneity.

Q Well, I mean what you mean, Mr. DelGeorge, and I'm quoting from your own document, which is the BCAP program document.

And I mean homogeneity within the meaning of the term used on Roman II-4, since the work activities in the plant are non-homogeneous; homogeneity in that sense, sir.

A But recall, sir, that that reference is made to the plant as a whole, and it's not been broken down in the refined way as you have just suggested in your question.

Q That's why I'm asking the question, sir.

And within a population category such as cable pan hangers, the work activities are non-homogeneous, are they not?

A Again, the work activities that you are referring to now are craft work activities?

Q Work activities as the term "work activities" is used in your document, Mr. DelGeorge, Page Roman II-4, the BCAP program document, Intervenors' Exhibit 158.

A I don't mean to be difficult, but, again, that statement

refers to plant activities as a whole and has not been broken down to a specific statement with respect to cable pan hangers, as you have suggested in your question, and I'm not sure that I can extend this comment to respond to your question without a better definition of what it is you are asking.

Q No, sir.

Well, I want to use your terms, because I don't want to have you answering a question that I'm not asking, Mr. DelGeorge; and work activities as the term work activities is used in the BCAP program document, in the language just quoted.

Now, using that definition of work activities, applying it within the electrical populations, will you agree that those work activities are non-homogeneous?

A Within the population -- the entire population of electrical work, I would agree, yes.

Q Now, that's not what I was asking about.

A That was the question that you asked me.

You changed the question.

Q I don't believe it was; but I'll be happy to ask it again --

A Okay.

Q -- more clearly.

Within each of the CSR electrical construction

categories -- let's take, for example, cable pan hangers.

Will you agree that the work activities in that construction category are non-homogeneous?

A They are not all -- each work activity is not identical, and to the extent that's the equivalent of non-homogeneous, I would agree with that statement.

You've referred to this document as my document, and I have to admit that I don't take any editorial responsibility for that particular statement, so I can't speak to the intent of the original author with respect to that phrase.

My understanding is as I have just described it.

Q Well, that's not my document. It's Commonwealth Edison Company's program document describing what you were going to do in the BCAP CSR sample process.

You agree with that, don't you?

A Yes, the statement is contained in the Commonwealth Edison document.

What you are asking is that I interpret that statement, and what I have attempted to say is that having not written that statement, I'm not in a position to provide you with a definition any better than the one that I have already provided.

Q Well, a little curious, Mr. DelGeorge, because you are

the so-called expert witness of Commonwealth Edison Company telling us we should interpret the BCAP CSR sampling results and reach the same conclusions that you opine about in your testimony, and you are telling me that you don't understand what the meaning is of the terms used in Edison's BCAP program document.

MR. STEPTOE: I object.

That's argumentative, Judge Grossman.

JUDGE GROSSMAN: Well, I don't think there's a question pending.

BY MR. GUILD:

Q All right, sir.

Let's take an example.

Cable pan hangers come in non-uniform sizes, don't they?

A Yes, sir.

Q So as to size, the cable pan hanger population is non-homogeneous; would you agree with that?

A It's not identical.

Q Well, sir, do you understand homogeneity to suggest anything other than identity?

A I think there are potential implications that go beyond that interpretation.

Q Well, why don't you tell me what homogeneity means to you, Mr. DelGeorge, so that we can be absolutely certain

that the words that appear on this document have a common meaning.

A Well, I could conceive of General Motors expecting that every car that they produce of a particular model is homogeneous, and I think we would all agree that having received different cars supplied by General Motors of that same model, that we wouldn't necessarily have gotten the same product.

So the fact that it has identity doesn't necessarily mean that it's, in fact, identical.

Q Well, that's helpful.

But what does homogeneity mean to you with respect to the BCAP sampling process, sir? How did you mean homogeneity with respect to the use of that term in the BCAP program for sampling purposes?

A That's my point: I didn't define this.

The work activities that I have addressed myself to in my testimony are specifically related to the work activities associated with quality control inspection.

Q Understood.

Now, Mr. DelGeorge, just help me.

How do you believe the word "homogeneity" is used with respect to the BCAP sampling program, CSR sampling?

If the answer you is don't know, please just state that, sir.

A I guess I don't -- I don't know now and I don't have any present recall as to what the specific meaning of that term was.

Q All right, sir.

Cable pan hangers come with different numbers of welds on them, don't they?

A Yes, sir.

Q Some with only a few welds and some with many welds?

A Yes, sir.

Q Some with hundreds of welds, some with maybe tens of welds?

A Yes, sir.

Q All right.

Some with welds that are of varying dimensions, some with welds of various sizes and various lengths?

A Yes, sir.

Q All right.

The cable pan hanger population is non-homogeneous with respect to the numbers of welds and dimensions of welds that exist on individual hangers; would you agree to that?

A Yes, sir.

Q There are standard details, connection details, DV-7, for example, a DV-22, that represent standard means for connecting various members in cable pan hangers.

Those don't occur in a homogeneous fashion throughout the cable pan hanger population, do they?

A I don't know what you mean by "occur in a homogeneous fashion."

There are --

Q Let me be more precise then.

There aren't the same number of DV-7's in the same place on every cable pan hanger in the cable pan hanger population; would you agree with that?

A I don't understand the question.

Q A DV-7 is a standard detail connection.

If you --

A Yes.

Q -- were to assume it's a standard detail connection, would you agree that the incidence of DV-7 connections is not uniform throughout the cable pan hanger population?

A Well, I've already indicated that every hanger in the plant is not the same, and I think it's -- I would agree that every hanger in the plant does not necessarily have a DV-7 connection in it, and if that's --

Q Yes, that's the question.

A -- if that's the intent of the question, then I would agree -- I would agree that every location, every hanger, does not have -- is not homogeneous in the sense

that you have stated.

Q All right, sir.

Some hangers may have no DV-7 connection, some hangers may have more than one DV-7 connection, for example?

A Yes.

Q And if I asked you that same question about any number of standard details, DV-22's, the answer would be the same, would it not?

A Yes, sir.

Q Some hangers have diagonal braces, do they not?

A Yes, sir.

Q Some hangers do not?

A That's correct.

Q Some hangers have more than one diagonal brace, some do not?

MR. STEPTOE: Judge Grossman, could we move ahead?

JUDGE GROSSMAN: Pardon?

MR. STEPTOE: Could we move on?

This is not the point -- this is pointless.

JUDGE GROSSMAN: Well, Mr. Steptoe, it's necessary to get to the particulars, if there's no agreement on the general question, and there wasn't, so that Mr. Guild has to go into particulars.

If there had been agreement on the fact that there was non-homogeneity, there wouldn't have been need for this, but there wasn't, and so this is necessary.

THE WITNESS: Could we have the question?

MR. GUILD: Would you read it back, please.

(The question was thereupon read by the Reporter.)

A That's correct.

BY MR. GUILD:

Q And I could ask you questions of the same sort for each of the electrical populations, Mr. DelGeorge, and in some respects, unique to those populations, they, too, lack homogeneity in the same -- in the sense that I have been asking you about cable pan hangers, for example?

A In the sense that you have been asking, yes, that's correct.

Q Yes. All right.

Now, would you agree, sir, that the differences in the hangers -- the differences in the items of the populations may have a bearing on the accuracy of the quality control inspection of those sample items?

A Yes.

Q Some items are more complex in the sample, and they may or may not have an influence on the level of accuracy of the Quality Control Inspector inspecting that item?

A Yes.
Q All right.
Now, if you would, sir, look at the same document that I directed you to earlier, Intervenors' Exhibit 158, Roman II-4, the second full paragraph on that page. It begins, "Even though the populations."
Do you see that, sir?
A Yes, sir.
Q All right.
"Even though the populations of the construction categories are non-homogeneous, engineering judgment indicates that sample sizes in the range of those discussed earlier in this section will support a conclusion about the quality of the work with high confidence.
"This engineering judgment is based upon the conservatism of the sample bias in the large number of categories into which the reinspection program will be divided.
"The sample sizes selected for the work categories will be at least as great as those which would be suggested for a random sampling of a homogeneous population to conclude, with 95 percent confidence, that at least 95 percent of the population is defect free."
All right, sir. Now, it is your understanding, is

it not, Mr. DelGeorge, consistent with that last statement that I read, that even despite the absence of homogeneity in these populations, that for each of the electrical populations, the random number -- the random sample size was selected consistent with the program document statement that I have just read?

A I believe that to be correct.

Q All right.

And to that size sample -- 60, that is the size, is it not, the sample size number?

A I'd have to refer to the document, but I believe that's in the range of what was --

Q If you look at the preceding page, the number stated is 60.

That is the number discussed for homogeneous large populations, 60?

A Well, it says for a large population, the number would be different depending on the population size.

Q All right, sir.

But 60 is that number, is it not?

A For which?

Q Regardless of the size of population, so long as it's a large population?

A So long as it's a large population, that's correct.

Q All right, sir.

All of the CSR electrical categories are large populations within the meaning of that term, are they not?

A Yes, I believe so.

Q All right.

So you started with a base of 60, and the 60 were the 60 that were selected using a random sampling method, were they not?

A I believe so, yes.

Q All right.

But then, because of the lack of homogeneity, you added an additional engineering judgment sample?

A If that's a question, yes.

Q You did, did you not?

A Yes, sir.

Q All right.

And in part, that engineering judgment sample in some instances consisted of further sampling -- samplings that were selected using a random sampling method?

A That's correct.

Q All right.

In addition, they may have included items that were sampled using subjective engineering judgment, taking into account the incidence of past deficiencies and

perhaps more-highly-stressed components?

A Yes, sir --

Q All right.

A -- among other reasons.

Q Among other things.

Now, let me ask you, sir, to turn in Dr. Frankel's prefiled testimony -- do you have that, sir?

A Yes.

Q -- to Page 4.

Do you have that, sir?

A Yes, sir.

Q The question that appears there, Question 5, states, "Can you define the terms probability sample, non-probability sample and random sample," and Dr. Frankel goes on.

First he states, "A probability sample is a sample that is selected by a procedure that gives each element in a defined population a known calculable non-zero probability of being included in the sample."

Now, do you agree with that definition, sir?

A Yes, sir.

Q All right.

Then Dr. Frankel goes on, and I won't read that -- the document's before you -- "The term random sample is often used in three different ways," and he states those

ways, Page 4 and continuing on to Page 5.

And do you agree with Dr. Frankel's definitions of random sample, the term "random sample"?

A Yes, sir.

Q All right.

Now, if I could get you, please, to turn to Page 29 of your own testimony. All right, sir.

There the statement -- Question 23 reads, "Dr. Frankel testified that in performing his analysis, he only used the items from the CSR sample which were selected using random sampling."

He asks you -- or you were asked, then, whether you have reviewed the non-probability samples, and you answered that you have, and you go on to provide testimony about that review --

A Yes, sir.

Q -- correct?

All right. Now, my question, sir, is:

What did Dr. Frankel review?

Did Dr. Frankel review a probability sample as he defined the term probability sample in his prefiled testimony?

A I think that question is best directed to Dr. Frankel.

Q Well, you can bet I will ask Dr. Frankel that same question; but I'd like to know, first, how you divided

responsibility as you understand it.

Do you understand that Dr. Frankel reviewed a probability sample as he defines that term?

A I believe the random sample chosen within the BCAP CSR constitutes a probability sample as defined by Dr. Frankel, and my understanding is that he reviewed that random sample on the basis that it was, in fact, a probability sample.

Q Oh, I see. All right, sir.

You, of course, reviewed the non-probability sample.

Now --

A Well, just by way of clarification, I have, in my review, looked at both data bases within the CSR, both the random and the --

Q Indeed, for different purposes.

But at this point in your testimony that I just referred to you -- referred you to, you were reviewing the non-probability sample; correct? That is, Page 29, Answer 23, and following?

A Yes, sir.

Q All right, sir.

Now, here's my problem:

Intervenors' Exhibit 158, the excerpt from the BCAP program document, makes clear that the CSR populations

to be sampled are non-homogeneous, and that, therefore, as stated, "It is not" -- I'm quoting now -- "It is not appropriate to utilize a rigorous statistical sampling approach for the CSR."

Now, did you inform Dr. Frankel, Mr. DelGeorge, that there was a lack of homogeneity within the CSR sample populations?

A I didn't need to inform Dr. Frankel, because he was intimately involved in the development of the BCAP samples.

Q Well, I'm sure.

But did you inform Dr. Frankel that hangers -- for example, cable pan hangers had differing incidence of size, numbers of welds, numbers of differing kinds of details, for example?

A I did not so inform him, but I am of the opinion that he was aware of that fact.

Q All right, sir.

You informed Dr. Frankel, then, that the CSR sample populations -- in this case, the electrical categories -- were non-homogeneous in the respects in which we've discussed that term this afternoon?

A Again --

Q You believe he understood that?

A Yes, sir.

Q All right.

And, therefore, it's your belief that when Dr. Frankel was using the term "random" to describe the portion of BCAP that he reviewed, that he correctly interpreted that to mean a probability sample?

A I'm not sure exactly what that question asks of me.

I believe Dr. Frankel reviewed the random portion of the CSR data base because of and on the basis of his belief that it constituted a valid probability sample.

Q All right, sir.

And you, as you sit here today, believe, as Dr. Frankel defines that term, that the CSR sample, that portion selected on the basis of using a random number table, the 60 or perhaps more than 60, if further sample items were selected using that method, constitutes a sample, quote, "That is selected by a procedure that gives each element in a defined population a known calculable non-zero probability of being included in the sample?"

A Yes; and I hope we have a common understanding of the word "element."

Q Well, that may be another point of non-understanding.

Let me ask the question this way:

What is the known calculable probability of a DV-7 connection being sampled in the cable pan hanger

electrical population?

A I don't know.

Q Is that a known value?

A I don't know.

Q Do you know whether or not there was an identification -- a calculation of the incidence of any of the elements in the electrical population that I used by way of example when I asked you about homogeneity this afternoon?

A I don't know.

Q Do you know whether or not Dr. Frankel knew -- Dr. Frankel had a value for the probability of a DV-7 connection being sampled in the cable pan hanger population, for example?

A I don't know.

Q Now, why don't you tell me how you understand Dr. Frankel uses the term "element" in his definition of a probability sample.

A Well, it's my understanding, in using the cable pan hangers as an example, that all of the cable pan hangers were identified in a way that they could be sampled using a random number technique, and a sample was selected from an identified population randomly.

Q Yes.

And how is element used in that example?

A Each hanger assembly in the list to which the random number was identified was an element. That's my understanding.

Q I see.

So element and item are synonymous as you understand the use of the term "element"?

A I believe that to be the case, yes.

Q Item in the sense of X number of cable pan hangers, X number of items in the population?

A Yes, sir.

Q And since each of those items was assigned a number and then a random number table was used to select from those numbers, each item had an equal chance of being selected; is that your position?

A That's my understanding, yes.

Q All right, sir.

And that's the sense in which Dr. Frankel defined the CSR randomly selected sample as a probability sample.

A That's my understanding.

Q Despite the variation in big hangers and little hangers, hangers with five welds or ten welds, hangers with a hundred welds, that variability was not taken into account in the random selection sample process; correct?

A Well, again, you would have to address that question to

Dr. Frankel, who was involved in making those judgments at the time.

I don't know specifically what he did or the BCAP Task Force did in that regard.

It gets back to the discussion we had earlier about the interpretation of what homogeneous or non-homogeneous means with respect to the work activity in question.

Q All right, sir.

Well, you don't understand that there was any account taken in the BCAP sample selection process -- that is, the at-random aspects of that -- for hangers of different configuration, size, complexity, do you, for example?

A Well, I think there was account taken of that.

Whether or not it was taken in the random sampling, I'm not certain; but the engineering judgment sample was intended to capture within it complicated supports.

Q Yes, sir. Well, that's another factor.

But in terms of the random aspects -- that is, the sample portion that you and you believe Dr. Frankel to characterize as a probable -- probability sample -- excuse me -- do you understand that there was any account there taken of the distinctions and variations among items in the population?

A Not having been involved in that specific aspect of the work, I don't know how it was done.

MR. GUILD: All right, sir.

Mr. Chairman, that's about all I can do until we get the --

JUDGE GROSSMAN: I believe Mr. Orlov is back with the documents.

MR. GUILD: Excellent.

May I have just a moment, please, Mr. Chairman.

Mr. Chairman, I'm ready to proceed.

JUDGE GROSSMAN: Sure.

BY MR. GUILD:

Q Mr. DelGeorge, you have before you a document that's the corrected version of what has been marked previously as Intervenors' Exhibit 189?

A Yes, sir.

MR. GUILD: All right.

Mr. Chairman, I'd ask this be marked for identification as Intervenors' 190.

It bears the title, "CSR Reinspection Results for LKC, All Pop's" -- "All Populations, Samples, Weld and Non-weld."

(The document was thereupon marked Intervenors' Exhibit No. 190 for identification as of November 6, 1986.)

MR. GUILD: Mr. Chairman, I appreciate Applicant making the corrected exhibit.

I'd ask that Applicant stipulate that it reflects the -- it's derived from the data depicted in Mr. DelGeorge's attached exhibits.

JUDGE GROSSMAN: Is that correct, Mr. Steptoe, the Revision 2?

MR. STEPTOE: It's derived from the same data that's -- that's correct, Judge Grossman; and I don't have any problem stipulating as to the numbers.

Under the circumstances, given the fact that Mr. Orlov had to prepare this hastily, I'd like to have the freedom to have him check it one more time overnight.

JUDGE GROSSMAN: Why don't you stipulate now if you ever find, and I won't even restrict you to overnight, there are some inaccuracies here, you can always come back and ask us if you can retract that stipulation and then correct it.

MR. STEPTOE: Thank you, Judge Grossman.

JUDGE GROSSMAN: Why don't we, though, since that last part was not fully entered here, correct the Reporter's copy, also, and put in for those hatches all the way over to the right, those slopes, that it's non-weld non-complaining.

Why don't we --

MR. GUILD: I'll write that on the Reporter's copy if that's acceptable, Mr. Chairman.

JUDGE GROSSMAN: Yes.

BY MR. GUILD:

Q All right.

Mr. DelGeorge, I take it that you believed -- in testing Intervenors' hypothesis -- that is, the hypothesis that production pressure, harassment and intimidation had affected work performance of inspectors -- determined to evaluate the work performance of the 24 inspectors who were identified as those who complained to the NRC in March of '85?

A That was a part of the review I conducted, yes.

Q Yes.

And you attempted to segregate the data for that group of inspectors and reviewed that?

A Yes, sir.

Q And that's what's, in part, depicted on this exhibit; correct?

A Yes, sir.

Q All right.

For the complaining inspectors, the 24 inspectors, there are, in fact, only 19 of the 24 reflected here; correct?

A That's correct.

Q All right.

For the complaining inspectors, you also distinguished their welding inspection and their non-welding inspection?

A Yes, sir.

Q Okay.

And non-welding would include what's been referred to as the objective inspection attributes; cable pulling, for example?

A Yes, sir.

Q All right.

And then you are able to distinguish the sample sizes for welds over time; that is, the number of inspection points sampled for each quarter over the period of time within the scope of the CSR sample?

A Yes, sir.

Q And that's depicted on what's been marked as Intervenors' Exhibit 190?

A Yes, sir.

Q All right.

Now, the variable that you were testing for was changes in agreement rates over time; correct?

A Yes, sir.

Q All right.

And on the assumption that if there were effects of

acts of harassment, you would see some measurable effect of those acts of harassment in the agreement rates over time?

A Yes, sir.

Q All right.

Now, the measures that you used over time -- well, Dr. Frankel takes this CSR data and he looks at agreement rates on the average for the period before and after Mr. Saklak was hired, June of 1982; correct?

A Yes.

Q And Dr. Frankel also looks at the average agreement rates comparatively for the period before and after August of '83, when Mr. DeWald became Quality Control Manager?

A Yes, sir.

Q All right.

Now, looking at your exhibits, the results, it's generally your conclusion that you could discern no trends from those results attributable to harassment, intimidation or production pressure?

A Yes, sir.

Q And that also is your understanding of what Dr. Frankel's conclusion was?

A I believe Dr. Frankel's conclusions are consistent.

They may have been stated in a different way.

Q Well, Dr. Frankel compared the average agreement rate for the period before and after the point in question, the Saklak hiring and the DeWald hiring, and found that the difference was statistically insignificant?

A That's correct.

Q Now, on the basis of the lack of variation, then, the lack of trend exhibited in those agreement rates, you concluded that Intervenors' hypothesis -- that is, the hypothesis that harassment, intimidation and production pressure had adversely affected work performance -- was invalid?

A That was one element that contributed to the conclusion that I ultimately reached, which you stated, yes.

Q Yes. All right, sir.

Now, what I want to determine, Mr. DelGeorge, is whether or not you controlled for other variables, aside from harassment, production pressure, that may have had -- may have determined the CSR agreement rates that you concluded showed no trend or variations.

Let's look at the data displayed on Intervenors' Exhibit 190.

Now, I notice that for the periods 1979, 1980 and through the first quarter of 1981, there is nothing but welding in the CSR sample; correct?

A That's correct.

Q All right.

And there is no welding for the complaining inspectors, the 19 of 24 sampled?

A In that period, yes, that's correct.

Q All right, sir.

And into the second quarter of 1981, almost all of the inspection points are for welding, still welding by non-complaining inspectors; would you agree with that, sir?

A Through the second quarter of 1981, yes, that's correct.

Q All right.

For the second quarter of '81, there is only what appears to be 2,500, say, inspection points that are non-welding; would you agree with that?

A In what period, sir?

Q The second quarter, '81.

A That's approximately correct, yes.

Q All right, sir.

Now, looking at the non-welding, would you agree that for the last period shown on your chart, the data is primarily -- strike that.

Would you agree that the non-welding, the objective sample data, appears primarily in the latter half of the CSR sample period?

A Yes, sir.

Q All right, sir.

Would you agree, also, that the -- strike that.

Mr. DelGeorge, would you agree, sir, that after the complaining inspectors' data begins to appear -- and that is in the second quarter of 1981 and thereafter -- that the proportion of data for complaining inspectors and non-complaining inspectors varies for each quarter?

A The variance being between complaining and non-complaining?

Q Yes, sir.

Once there is any data for complaining inspectors -- again, the second quarter of '81 -- it is proportional -- that is, the proportion of data for complaining inspectors as compared to non-complaining inspectors varies for each quarter?

A It does vary; and I'd have to look at it a lot more closely to say whether it varied for every quarter, but it appears to vary for most quarters, yes.

Q All right, sir.

Would you agree that the proportion of welding to non-welding inspection points for each quarter varies from quarter to quarter after non-welding begins in the second quarter of 1981?

A They are not identical. In some cases, they are relatively close, but they do vary, yes.

Q In some cases, they are not relatively close?
A That's correct.
Q Now, you agree, don't you, that the accuracy levels of Quality Control Inspectors may vary between welding and non-welding inspections?
A When you say "accuracy level," are you, in fact, referring to the inspector specific accuracy level or are you talking about agreement rates?
Q Well, let's take them one at a time.

Let's start with the base phenomenon that you were trying to measure, and that's accuracy.

You would agree that accuracy may vary between -- accuracy rates may vary between welding and non-welding inspection?
A They may vary.
Q And you would also agree, would you not, that to the extent that agreement rates capture accuracy -- whether they do or not, lay that aside -- those agreement rates may themselves vary between welding and non-welding?
A They may.
Q Well, in fact, you have used a differing measure for at least review of overinspection results for welding versus non-welding, because of the recognition that there may be a variation in the accuracy levels of inspection for subjective as opposed to objective

inspections?

A Well, those differences are attributable to what we believe to be the potential for non-agreement associated with the different kinds of inspection, welding versus non-welding --

Q Yes.

A -- and is not necessarily reflective of an expectation with respect to the underlying accuracy of the inspection performed by the first line inspector.

Q All right, sir.

But since you can only measure -- or you have only measured accuracy by way of agreement rate -- that is, the extent to which the overinspector's result agrees with the previous result -- the net effect is that, in terms of agreement rates, you recognize that there is a difference between welding and non-welding inspections?

A Yes, sir.

Q All right.

You expect a lower agreement rate for welding, the subjective inspection, than you do for objective inspections?

A Yes, sir.

Q You've used, for example, for other purposes, a screening value of 95 percent for objective inspections overinspected and a 90 percent screening value for

subjective or welding inspections to recognize that variance between the two?

A Yes, sir.

Q Now, you also, in your own hypothesis, testing process, assumed that there would be a different accuracy level between the 24 complaining inspectors and the non-complaining inspectors, did you not?

A Well, as I had indicated earlier, that was not an initial assumption on my part.

We did test the performance using this methodology of that class of 24 to determine what, if any, trends there might be, but I don't know that I assumed at the outset that there would be a difference between the complaining inspectors and the non-complaining inspectors.

Q Well, you at least advanced it as a hypothesis.

I take it that you had an open mind on the question and used it as a hypothesis because you believed there might be some basis in fact to expect a different level of accuracy or rate of accuracy for the complaining inspectors as compared to the others, did you not?

A Just so we're clear, it was my opinion that, given the expression of concern made by this class of inspectors, that the potential existence of harassment, at least as alleged, was greater with respect to that class than

might have existed for any other inspector who had not raised a complaint --

Q All right.

A -- and that is what led us to evaluate -- led me to evaluate the specific class of inspectors separately.

Q Yes. All right, sir.

Well, in point of fact, you can't be certain that, indeed, it was the non-complaining inspectors who were more likely to exhibit the effects of production pressure, since they didn't take the initiative to complain?

A I wouldn't have made that assumption, and that's why we -- why the review that I did included the remainder of the inspectors.

Q All right, sir.

But in any event, those who suffered the effects of production pressure might exhibit different agreement rates reflecting different levels of -- rates of accuracy from those who did not suffer from production pressure, whoever they may be?

A Yes.

Q All right.

Now, I take it that there are also variations in the type of work that was going on over the period of time that the CSR sample was taken.

For example, I understand that cable pan hanger installation and inspection took place before cables were pulled.

Isn't that generally the case?

A Yes.

Q You have to have a cable pan hanger and a cable pan to put a cable in, don't you?

A Yes, sir.

Q All right.

And that phenomenon is reflected by Intervenors' Exhibit 190, in the fact that the welding inspection points fall predominantly in the early part of the period, and the non-welding, which would include cable pulling, fall in the latter portion?

A Yes.

Q So the work activities that are being sampled varied significantly over the time being sampled, at least in terms of the variability between welding and non-welding; correct?

A Well, you have chosen the word "significantly."

There is, in fact, a difference, and the distribution is, I believe, descriptive of the way in which the work was actually conducted at the site.

Q All right, sir.

Now, did you inform Dr. Frankel of any of the

variations in, let's take, construction activities over time that took place during the CSR sample period?

A I did not personally advise Dr. Frankel, but I know him to have been intimately involved with the conduct of the BCAP activity, and I believe him to have been aware of that fact.

Q All right.

And was he aware, for example, that the welding activities predominantly took place before June of 1982 as opposed to after June of 1982; that being, of course, the date which he chose as the point of differentiation for the two periods compared?

A He was given a copy of my figures, and I am aware that he reviewed those figures, so I might be -- I guess I have to assume that he was aware of the distribution of welding as a function of time.

Q How did Dr. Frankel control for that variable, if he did, Mr. DelGeorge?

A Again, I think you are going to have to ask Dr. Frankel, because I don't know specifically.

Q Are you aware of whether he controlled for that variable at all?

A I don't know.

Q Are you aware of whether he controlled for the variable in the variation in welding activities before and after

August of '83?

That's the other point in time that he uses for the comparative periods.

A I don't know.

Q Did you inform Dr. Frankel of your opinion that there might be variation in the agreement rates or accuracy between welding and non-welding inspections?

A As a matter of fact, Dr. Frankel was advised by me of that fact in the summer of 1984, before this activity was even begun, based on a prior --

Q So he knew that fact?

A -- working relationship.

Yes, sir.

Q All right.

Now, do you know whether or not -- strike that.

Do you know whether or not Dr. Frankel controlled for variability in agreement rates between welding and non-welding inspections?

A I don't know.

Q Well, sir, you advanced the conclusion, Mr. DelGeorge, that the lack of variation in the agreement rates over time, the lack of apparent trends, is explained by the absence of harassment, intimidation and production pressure.

Having failed to control for these variables, if,

in fact, these variables were not controlled for, how do you know that the lack of variation or lack of trends was not caused by variations in the incidence of welding versus non-welding inspection, sampling for complaining inspectors versus non-complaining inspectors, or some other variability that's in the data that's reflected in Intervenors' Exhibit 190?

A Well, if, by controlled, you are asking whether or not we provided some weighting factor within my Figure 1 to account for those potential variabilities, we did not, but because of those potential variabilities, we did, in fact, assess each class of inspection activity and each class of inspector, there being two, those who had complained and those who had not, separately, and those are provided in other figures within my testimony.

Q Yes, sir.

And those --

A That information was, in fact, provided to Dr. Frankel, and I know him to have reviewed it.

Q Yes, sir.

And those are the samples which you have concluded are too small in size on which to found any opinion evidence?

A Well, the statement that I made earlier and which is reflected in my testimony is that with respect to Figure

6, that being a specific reference to the distribution of inspection points for the class of 24 over the period of the CSR, there was insufficient information, in my opinion, to draw defensible conclusions because the majority of the work associated with that work activity was attributable to a very small number of inspectors.

Q Yes.

A I had, as I indicated in my testimony, less confidence in the data base associated with certain other sorts of the data and higher degrees of confidence with respect to --

Q Yes, sir.

A -- Figure 1, Figure 2 and Figure 3, that being the cumulative inspection points as a function of time for welding and non-welding, the cumulative inspection points as a function of time for welding only and the cumulative welds as a function of time for all inspectors.

At least for those three --

Q Yes.

A -- I have a relatively high degree of confidence that there is --

Q Sufficient data --

A -- sufficient data; and with respect to the class of 24, in the welding area, I also believe there to be

sufficient data.

But clearly there isn't as much data available, and so any confidence level that I have assigned relative to the first three assessments would be somewhat lower --

Q Well, the --

A -- and that's --

Q Yes. I understand.

A -- that's stated in my testimony.

Q Understood, understood.

MR. GUILD: If I may have a moment, Mr. Chairman.

Mr. Chairman, that concludes my examination.

JUDGE GROSSMAN: Mr. Berry.

MR. GUILD: If I haven't, I meant to offer Intervenors' last two exhibits, 189 and 190.

JUDGE GROSSMAN: 189 and 190?

MR. GUILD: Yes, sir.

MR. STEPTOE: I object to 189. I don't object to 190, Judge Grossman.

MR. GUILD: Let me ask that 189 simply be marked and travel with the record.

I'd like it to be included in the record, Mr. Chairman, but I don't offer it.

I'll withdraw the offer.

JUDGE GROSSMAN: Mr. Guild really hasn't had

an opportunity to verify 190. He's done 189 to his satisfaction, and so I think we'll really -- I think we really ought to admit both of them.

Is there a problem with that, Mr. Steptoe?

MR. STEPTOE: Yes, Judge Grossman.

I don't believe there has been any testimony by anyone Intervenors' Exhibit 189 is accurate.

In fact, it was based on an old --

JUDGE GROSSMAN: Okay.

Why don't we just have it travel with the record, then, unless Mr. Berry has some other objection.

MR. BERRY: No objection from the Staff, Mr. Chairman.

JUDGE GROSSMAN: Okay, fine.

So we'll admit 190 and have 189 travel with the record even though not admitted.

(The document was thereupon received in evidence as Intervenors Exhibit No. 190.)

CROSS EXAMINATION

BY MR. BERRY:

Q Good afternoon, Mr. DelGeorge.

A Good afternoon.

Q I just have a couple questions for you.

Directing your attention to Answer 34 of your

prefiled testimony --

A Sir, could you give me a page reference?

Q Yes.

A I think I have it. Page 37.

Q Well, Page 38 is where I'm going to direct your attention to; and that is, Mr. Guild, at -- you responded, in connection with questions from Mr. Guild, that there had been -- your testimony states that there was intense oversight of the CSR inspections by CECo, IEOG and the NRC Staff.

Could you just explain for us, if you could, what do you mean by "intense"? I mean, how do you distinguish intense inspections -- intense oversight from just oversight?

A Well, I think the testimony of Mr. Smith speaks directly to the characteristics of the oversight with respect to the CECo inspections that I make reference to; and the reason I consider that to be intense is that the overinspectors from Commonwealth Edison were very aggressive in their review of the BCAP Task Force inspection work force.

There were numerous tests in a large population of work reviewed by that CECo QA inspection force, and I considered that activity to be an intense one.

It wasn't just a casual one. The QA Department

made it very clear that they would be making continuous reviews of the CSR work activity.

With respect to the IEOG, again, there were very senior individuals looking over the shoulder of CSR inspectors.

It's one thing to have an overinspector come at some point later in time and review an inspector's work. That is normal oversight -- and I think we've had testimony in this proceeding to indicate that inspectors take very seriously that level of oversight -- but to have an overinspector standing over your shoulder as you are making a call, I think, represents intense oversight, and that took place as a part of the BCAP activity.

I consider any oversight by the NRC to be intense; and I know in particular that the CAT Inspection activity was a very aggressive one. The scheduling for the CAT was based in part upon the recognition that the CAT inspectors would take account of work being done by the BCAP inspectors, so there was a planned oversight that was, in my view, somewhat of an extension of the normal Staff activities.

Beyond that, I know for a fact that Mr. Gardner regularly overlooked work being done by CSR inspectors.

And by way of a reference back to my previous

discussion, I consider that to constitute a more intense level of oversight when the reinspector is, in fact, looking over the inspector's shoulder as he's conducting his work.

Think about your father looking over your shoulder as you are doing some activity for him. I think that has an effect that's somewhat different than when your father might be out of the house.

JUDGE GROSSMAN: We understand that word overlook to mean overview.

MR. BERRY: Okay.

THE WITNESS: Yes, sir.

BY MR. BERRY:

Q Mr. DelGeorge, would it change your conclusion -- would it affect your conclusion any if it turned out that, say, for example, with respect to the NRC, that there -- throughout the CSR inspection program, the majority of it, there was one NRC Inspector devoted, dedicated, to that task, and he overlooked or looked over the shoulders of the CSR inspectors on a periodic basis?

A It wouldn't have a substantive effect on my conclusions because of the nature and intensity of the remaining oversight activities.

Q On Page 47 of your prefiled direct testimony -- I'm sorry.

On Page 49 of your prefiled direct testimony, in the first full paragraph, starting with the words, "On the basis of the facts contained in this hearing," you go on to recount your review -- you state, "as well as my review of the conditions and events which together comprised the environment in the L. K. C. QA/QC Department."

Could you explain for me just what are the conditions and events comprising the environment to which you are referring?

A Yes, sir.

As I indicate in my testimony, I reviewed a large portion of the evidentiary record for this proceeding and factored into my review of inspector performance such things as the changes in number of inspectors within the Comstock organization and the training program attributable to -- or that took place as a consequence of that increase in inspectors.

I took into account -- or at least considered the pay scale changes that took place at Comstock. I took into account the interaction between the Comstock QC organization and Commonwealth Edison that was alleged to reflect a condition of excessive pressure by Commonwealth Edison as well as the specific acts of alleged harassment identified by the QC Inspectors in

this proceeding.

Q Thank you.

Finally, Mr. DelGeorge, just so there's no misunderstanding on my part, could you explain for me again what do you mean by an agreement rate?

I mean, what is an agreement rate?

A An agreement rate is the rate at which a reinspector or overinspector agrees with the product of the work presented to him, and that product is a combination of the underlying work product of the craft as well as the QC Inspector, since the information -- or the items presented to the overinspector or the reinspector have been QC accepted.

So the degree to which that overinspector or reinspector finds the product offered him to be acceptable, he reaches agreement with the first line inspector, who, in effect, made that item available to him for overinspection.

Q Again, just so, then, I'm clear:

Say, for example, you had a weld -- I mean, you had a piece of equipment, a hanger that had 10 welds on it. The first inspector accepted 8 welds and rejected 2. The second inspector or the overinspector came along, reviewed all 10 welds. They were acceptable -- all 10 welds were acceptable to the overinspector.

Would the agreement rate be 80 percent, inasmuch as they agreed on 8 of the welds and and disagreed on 2?

A I'm not sure that the overinspection or reinspection activity was conducted in a way that that case would have presented itself.

To the extent the reinspection or overinspection came close enough in time to find a condition where the first line inspector had both accepted and rejected items within the sample to be reviewed, those portions of the item that were not acceptable would be identifiable.

So it's not clear to me that they would -- that -- I believe that the reinspection would have included the 8 items.

The further apart in time you get between the original inspection and the reinspection, different things can happen, the defects that you identified could be repaired; but the only items offered to the reinspector are acceptable items, so I don't see that scenario taking place.

Q All right.

Well, just let me cover all the bases.

If the original inspector accepted all 10 welds, they were all acceptable, and the overinspector came along, examined the same 10 welds and found only 8 of

them acceptable, 2 of them in the overinspector's view should have been rejected, would that be an agreement rate of 80 percent?

A Yes, sir.

MR. BERRY: Thank you.

That's all I have.

JUDGE GROSSMAN: Mr. Steptoe -- oh, I'm sorry.

JUDGE COLE: That's okay.

BOARD EXAMINATION

BY JUDGE CALLIHAN:

Q Mr. DelGeorge, just for my clarification, would you define items which you used in your testimony?

For example, some places we find reference and values for inspection points and then there is a number of 200-some-odd thousand separate inspection points. Elsewhere we find items, so forth.

Now, tell me, please, to which attribute or to which observation those terms apply as you have used them in your testimony.

A I make reference, sir, to items in the context of the 733 sampled items within the BCAP CSR, and those items would have included runs of conduit, runs of cable pan, cable pan hangers, conduit supports, electrical equipment installations, including junction boxes and

things of that sort.

Each of those individual items have associated with them a number of inspection attributes.

In the case of a cable pan hanger, it has both welding attributes and what we've referred to as objective attributes or configuration attributes.

Those attributes -- in the case of a weld, there being 17; with respect to configuration, there being a number slightly less than that but on the order of 10 to 12 -- those attributes would have been aggregated, and they are what I refer to as inspection points; in other words, the points at which an inspector must make a decision as to the acceptability, the product quality, that he's reviewing.

I have also looked at agreement rates on the basis of the number of welds accepted by Comstock QC Inspectors, and rather than reviewing -- on a more refined basis, using inspection points associated with welding, I've aggregated the inspection points associated with the welds, and whether there was 1 discrepancy on the weld or 17 discrepancies on the weld, that discrepancy was counted as a discrepant weld, a discrepant entity, and so there were -- the items are construction items, the inspection points are inspection decisions associated with attributes of the construction

items and the welds are separate individual welds associated with construction items.

Q Let me play that back, at least one instance, please.

Cable pan hangers, one item?

A A cable pan hanger would be one item.

Q Okay.

Now, there may be 10 or more welds on that hanger.

An inspector looks at each of those welds for 17, I think you said -- like 20 different attributes --

A Yes, sir.

Q -- true?

Now, so that's 170 observations, we'll call them. 17 attributes, 10 welds?

A 170 inspection points.

Q Now, those are inspection points?

A Yes, sir, for welding.

Q For welding.

And you have in here some place a number of like -- 280,000 I think --

A Yes, sir.

Q -- you use?

I'm not sure.

A 270 --

Q It's on Page 19 of your testimony. 276,000 separate inspection points.

So those are individual observations; true?

A They are individual attributes for which an inspector had to make a distinct decision.

Q And in my terminology, then, a single weld would entail -- and I use your number -- 17 inspection points?

A Yes, sir.

Q 17 attributes?

A Yes, sir.

Q That's a unique example in my terminology.

JUDGE CALLIHAN: All right. Thank you very much.

JUDGE GROSSMAN: Mr. Steptoe -- oh, I'm sorry.

JUDGE COLE: Just one or two questions.

BOARD EXAMINATION

BY JUDGE COLE:

Q On Page 20 of your testimony, Mr. DelGeorge, the first full paragraph on that page, the first sentence reads, "My determination of how much information is sufficient to allow trending is a qualitative judgment."

I'm not sure -- I think I know what you mean there, sir, but do you mean sufficient to be able to identify trending, is that what you meant, or why did you use the word "allow" there?

A Well, sir, it may be easier if I can explain to you what

led me to that conclusion, and then we can decide whether it was an appropriate word.

But, for example, in order to establish a trend, one must have confidence that an interpretation of the statistics in the adjoining time intervals have a relationship that justifies drawing a distinction between the two time steps.

If, for example, there were two inspection points in Time Step 1 and 1 of those inspection points was found discrepant, whereas in the second time step, there were 2,000 inspection points and 1 inspection point was found discrepant, I would not be, in my view, allowed to trend the different discrepancy agreement rate, which would be 50 percent in the first time step and some very high agreement rate in the second time step, because there is no equivalence of the data.

There has to be some ability to weight the data, so it would -- that's really what I intended by the use of the word "allow."

Q That's helpful, and it tells me why you used that word. It also is what I thought you meant by that.

But there might be a trend in those small numbers, but you wouldn't be able to identify it because the statistics wouldn't permit you to do so?

A And, again -- that's true; and I am not, again, trying

to make statistical judgments.

Trending in itself is not something I think that is a science, it's more an art; and we have had to make some judgments about how much data constitutes adequate data for purposes of trending reviews of this type.

Q All right, sir.

On that page, you refer to analysis of variations in agreement rates, and my question to you is, sir:

What do you mean there when you use the term "analysis of variations"?

Are you referring to statistical tests and analyses to identify and analyze variations, or just what are you referring to there?

A No, sir. Again, I have relied on Dr. Frankel's statistical assessments to provide variations in the context of statistics.

My review has been limited to what I would call an engineering review of changes in the data where the data base, in my opinion, justifies the assessment.

They are more macroscopic in nature and didn't rely on analytical techniques. That is inherent, in part due to the fact that I have aggregated both the engineering judgment data base and the random sample data base for purposes of conducting my review; and classical statistical tests for variability are extremely

difficult to implement where one can't say that the entire data base is randomly selected and, in fact, a probability sample.

Q Well, are you talking there about your analysis of the variations in agreement rates, sir?

A Yes, sir. I use that as an engineering term rather than a statistical term.

Q All right, sir.

On Page 21, in response to Question 18, you state that you did not find any apparent trend attributable to alleged undue pressure, harassment and intimidation.

I would like to get a better feeling for how you made your determination that you did not find any apparent trend.

Was it a visual study of the information contained on your attachments or what else was included in that, sir?

If it was that -- well, what was it? What did you do?

A That's, in part, what I did.

I have also plotted, as a function of time, the specific events that have been identified in this record to attempt to identify correlations between the occurrence of an event and changes in the performance of individuals or the class of inspectors generally.

It has been my view, based on representations made by the Intervenor, that in this case we have a situation wherein production pressure has had a pervasive effect on the performance of QC Inspectors.

For that reason, I have accepted the premise that there has been such pressure, and I have looked for trends in the data macroscopic -- macroscopically to identify such a pervasive effect, and I've been unable to do that.

In the case of the PTL data base, where we have more information on an inspector specific basis, the review has been more microscopic in nature, and one can attempt a correlation between specific events that have occurred where a specific individual has indicated that at a particular point in time he has been harassed or intimidated, whether or not true, to determine whether or not that's had any effect on his performance.

I was unable to identify any correlations in performing that assessment.

Q All right, sir.

Now, with respect to this last point you made, where you did not find any correlation with respect to an individual inspector or any individual inspector, that specific data that you looked at there is not contained in the exhibits except in a combined form, is

it, sir?

A That's correct.

The information with respect to the PTL data base has been introduced as a part of Mr. Marcus' testimony; and both he and I have done a detailed review of the results with respect to specific inspectors as a function of time where the intervals of interest were one month, and I have, in the way that I just described, compared that data base to what I'll call the harassment data base that's been developed in this record, and not identified a correlation between the two.

JUDGE COLE: All right, sir.

Thank you.

JUDGE GROSSMAN: Mr. Steptoe, can you tell me how long you expect to take on redirect?

MR. STEPTOE: Probably half-an-hour to 45 minutes, Judge Grossman.

If I'm allowed overnight to frame my questions and to study some of these new exhibits which have come in, I will go promptly.

I know it won't go more than an hour for sure.

JUDGE GROSSMAN: Okay. I expect --

MR. GUILD: Mr. Chairman --

JUDGE GROSSMAN: Yes.

MR. GUILD: -- before we break, Mr. DelGeorge

has volunteered that he has a new piece of work that's the basis for his testimony.

I would ask that Applicant produce whatever analysis he has done of a time line of harassment that is the foundation for his last answer to Dr. Cole's question.

JUDGE GROSSMAN: Can we have that tomorrow, then, Mr. DelGeorge?

THE WITNESS: I can make one copy of it available today.

JUDGE GROSSMAN: Fine.

I take it, then, Mr. Guild may have another hour or so, then, of recross; but, in any event, we have a witness lined up, if --

MR. STEPTOE: Dr. Frankel will be here tomorrow.

JUDGE GROSSMAN: Oh, he will be?

MR. STEPTOE: Yes.

JUDGE GROSSMAN: Well, okay. I hope we can start with him.

I hope you are going to be prepared for that, Mr. Guild.

MR. GUILD: I will be, Mr. Chairman.

JUDGE GROSSMAN: Okay, fine.

We'll adjourn until 8:00 tomorrow morning.

MR. STEPTOE: Thank you, Judge Grossman.

(WHEREUPON, the hearing of the above-entitled matter was continued to the 7th day of November, 1986, at the hour of 8:00 A. M.)

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceedings before the UNITED STATES NUCLEAR REGULATORY COMMISSION in the matter of:

NAME OF PROCEEDING: BRAIDWOOD STATION
UNITS 1 & 2
COMMONWEALTH EDISON
(HEARING)

DOCKET NO.: 50-456/457/OL

PLACE: CHICAGO, ILLINOIS

DATE: THURSDAY, NOVEMBER 6, 1986

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission.

(sigt) Nancy J Hoppe

(TYPED)

Official Reporter

Reporter's Affiliation