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NUCLEAR REGULATORY COMMISSION

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD
Glenn O. Bright
Dr. James H. Carpenter
James L. Kelley, Chairman

In the Matter of CAROLINA POWER AND LIGHT CO. et al. (Shearon Harris Nuclear Power Plant, Units 1 and 2)	Dockets 50-400 OL 50-401 OL

Wells Eddleman's Response to Applicants'
First Set of Interrogatories and Request
For Production of Documents

Pursuant to an oral order of 2-24-83 from Judge Kelley, I now file this response to Applicants' above referenced questions.

If I may so note here, I still believe that informal discovery is far more efficient and less burdensome than this sort of formal interrogatory proceeding. NRC rules encourage informal discovery but it appears the Applicants are unwilling to consider it. I would think it far less burdensome to answer questions directly than to file over a dozen copies (11, per 3-10-83 order received 3-16) of all questions and responses. It also might make things move faster and more efficiently in this proceeding. Applicants' attorney Jones is looking into this again at my request.

This response is organized as follows:

First appear the general interrogatories with an explanation of how they will be dealt with in these responses.

Then the answers to the specific interrogatories appear.

Objections are noted under the general or specific interrogatory to which each objection applies.

Documents I possess will be made available to Applicants on agreeable terms, as discussed with them at the NCUC load forecast hearing.

D503

RESPONSES TO GENERAL INTERROGATORIES

1(a). State the name, present or last known address, and present or last known employer of each person known to you to have first-hand knowledge of the facts alleged, and upon which you relied in formulating allegations, in each of your contentions which are the subject of this set of interrogatories.

(b). Identify those facts concerning which each such person has first-hand knowledge.

(c). State the specific allegation in each contention which you contend such facts support.

1(a) The requested information known to me about persons with first-hand knowledge of facts alleged and upon which I relied in formulating allegations in a contention will be stated in response to that contention, to the extent it is not in the original contention.

1(b) Facts concerning which each such person has first-hand knowledge will be likewise identified, and

1(c) the allegation these facts support will be identified.

2(a). State the name, present or last known address, and present or last employer of each person, other than affiant, who provided information upon which you relied in answering each interrogatory herein.

(b). Identify all such information which was provided by each such person and the specific interrogatory response in which such information is contained.

2(a). Objection (applies to all requests to answer any interrogatory requesting identity of any persons providing information used in responding to interrogatories):

My understanding of the Federal Rules of Civil Procedure, which govern NRC discovery, is that Rule 26(b)(4)(B) thereof prohibits discovery of facts known or opinions held by an expert not expected to be called as a witness, essentially only if "it is impracticable for the party seeking discovery to obtain facts or opinions on the same subject by other means". Applicants have made no such showing. Indeed, with their resources, it is doubtful if there is any subject related to my contentions on which they could not obtain their own experts, facts and opinions completely independently of me, or of any persons (if any) whom I may have consulted.

I further understand that the above Rule has been interpreted to unconditionally protect the identity of nonwitness experts who have been informally consulted. Ager v. Jane C. Stormont Hospital, 622 F 2d 496 (10th Circuit 1980); see also In re sinking of Barge Ranger I, 92 F.R.D. 486 (S.D. Texas 1981) and Perry v. W.S. Darley&Co. 54 F.R.D. 278 (E.D. Wisc. 1971). Since the Applicants have made no showing of any inability to obtain information on topics on which I may have consulted experts, I maintain that I don't have to reveal even whether I have consulted formally with experts retained for the purpose of answering interrogatories.

Since I am disclosing in response to specific and general interrogatories all the facts on which my contentions are based, I maintain that Applicants will be able to find their own experts to consult on the matters encompassed by my contentions, since I certainly haven't cornered the market on experts, and couldn't. Only if they can't find experts or get information on the subjects and facts in/underlying my contentions would they have any valid reason to attempt to show the Board special circumstances that might

support discovery of the identity, opinions, or information of any non-witness experts I might have retained. 10 CFR 2.740(b)(2) provides that discovery of me or a consultant may be had "only upon a showing that the party seeking discovery has substantial need of the information and that he(sic) is unable without undue hardship to obtain the substantial equivalent of the materials by other means." Federal evidence Rule 26(b)(4) provides likewise, and has been held in Ager v. Stormont Hospital, supra, to apply to both the identity of non-witness consultants and the content of their advice. Ager also holds, at 503, that the case underlying LBP-78-33, 8 NRC 461 (see 465-66), where a licensing board required identification of an intervenor's experts under 2.740(b), was improperly decided.

No "compelling need" under the Federal Rule above (and 2.740(b)) exists when the facts of a party's position are known, other experts are available, and the supplier of the information is not expected to testify. Hoover v. US Dept of Interior, 611 F 2d. 1132, 1142 (5th Circuit, 1980).

In Ager, the Court also addressed the chilling effect that revealing the names of nonwitness experts consulted would have on the ability of persons such as intervenors to have access to informed opinions. "...disclosure of the identities of ... consultative experts would inevitably lessen the number of candid opinions available as well as the number of consultants even willing to discuss a medical malpractice claim with counsel." (p.503).

The identity of the expert needs to be kept secret to prevent such effects. The Court said, "once the identities of retained or specially employed experts are disclosed, the protective provisions of the rule concerning facts known or opinions held by such experts are subverted."

The Court agreed with plaintiffs in Ager that

In medical malpractice actions (perhaps) more than any other type of litigation, the limited availability of consultative experts and the widespread aversion of many health care providers to assist plaintiff's counsel require that, absent special circumstances, discovery of the identity of evaluative consultants be denied.

If one assumes that access to informed opinions is desirable in both prosecuting valide claims and eliminating groundless ones, a discovery practice that would do harm to these objectives should not be condoned. (This quote & those above, p.503)

The circumstances of nuclear intervenors like myself are strikingly similar to that of plaintiffs in Ager. The nuclear industry contains many people hostile to intervenors, and many more unwilling to consult with them openly because of the effect on their employment. In this case, Hawkeye Security was forced to withdraw from consultancy with me, re security plans, due to industry pressure. Judge Kelley commented on this withdrawal in a conference call, "Maybe that's just the way the world works. People who work for one side don't work for the other."

Given the massive resources of Applicants and the nuclear industry, and their tendency to react against whistleblowers (e.g. case of William Smart, cited in transcript of NRC remand hearing on CP&L management capability in 1979, Dockets 50-400 et al), it is clear that the industry controls the employment of virtually all the available expertise. An industry insider providing information is unlikely to be willing to expose herself or himself to possible firing, demotion, harassment, or even the time and expense of being deposed or called as a witness or having to answer interrogatories. Similar problems apply to people outside the industry, with the possible exception of job loss. I say possible because pressure could be brought by the nuclear industry or Applicants to fire a person from a non-industry job. Other fears range higher: a news reporter interviewing a person who had knowledge of problems with the South Texas nuclear project was wounded, and her source killed, by assailant(s) unknown, within the last few years.

To summarize, industry experts (nuclear) may lose jobs or contracts by even being identified with intervenors at all (e.g. Hawkeye Security within the last 6 months in this case). This exerts a clear chilling effect on the willingness of such persons to provide information to any intervenor.

Non-industry experts are also subject to harassment and difficulties which may be imposed on them if their identities are known or discovery, deposition or subpoenaing of them is allowed. This exerts a chilling effect on them. I have heard this said by such persons.

However, both such experts (in a limited pool of experts working for a type of party shunned by most in their field) and nonexperts who are not expected to be called as witnesses are protected from having either their identities or anything else disclosed in connection with them, provided that the facts of a case are available to the other party (e.g. Applicants) along with other experts. Tiger, supra, and the rules and cases cited above.

This is clearly the case here, and Applicants have made no showing as required by 2.740(b) that they can't get the info or expertise by other means. The information underlying my contentions is being disclosed (a lot of it comes from Applicants and NRC), and the idea that Applicants have to have access to experts (if any) I have consulted in responding to their interrogatories, or else they can't obtain information and expertise on the subject of my contentions, is laughable. If in fact Applicants have no expertise on any of my contentions available, they ought to concede it.

The above summarizes my objection to General Interrogatory 2(a) for every case, every person, every contention, to which it may apply, if any. These arguments and cases also apply to my objection to General Interrogatory 2(b), given below, and are incorporated therein by reference as if fully set out in that objection.

2(b). Objection, incorporating the above objection's facts and cases, to all such revelation of who provided information used in response to interrogatories, upon which I relied in making such answers.

The information upon which I rely is being revealed in responses to specific interrogatories. However, to identify the source of such information when provided by nonwitnesses, expert or not, is objected to because it would reveal the identity of the provider, against the protection of Federal Rule 26(b)(4) (Federal Rules of Evidence govern NRC proceedings) and the arguments cited above.

I further object because this interrogatory may be interpeted to encompass revelation of materials or information prepared in anticipation of the hearing in this case, without showing by Applicants that they have a substantial need of such information and cannot obtain it by other means.

I believe that the identity of nonwitness nonexperts I may have consulted is absolutely privileged, and the identity of nonwitness experts I may have consulted is privileged under the above rules and because of the chilling effect identification of such person(s) (if any) and by connecting them with any information they may have provided, will have on availability of information and expertise to me in pressing my case. I would enter both this and the above objection even if the answer to 2(a) and 2(b) of Applicants' general interrogatories were "none", because of the chilling effect it would have on obtaining advice, information and expertise for my case later. I have spoken with experts and nonexperts who are absolutely unwilling to be identified in connection with this case or intervenors in any nuclear licensing proceeding, due to fear of losing jobs (etc), which is that very chilling effect. However, the individuals I have identified in the last sentence did not provide anything used in any contention, except for persons whose names I do not know and could not identify.

I should not be required to provide the identity of any expert known to me who is not expected or intended to be a witness, without the showing of compelling need and no alternative way to get info on the subject of a specific contention, which Applicants have not made. And even if they were to claim such a showing, the chilling effect of identification of experts, which has been shown with respect to one of my experts already in this proceeding (Hawkeye), should be weighed against this consideration.

3(a). State the name, address, title, employer and educational and professional qualifications of each person you intend to call as an expert witness or a witness relating to any contention which is the subject of this set of interrogatories.

(b). Identify the contention(s) regarding which each such person is expected to testify.

(c). State the subject matter to which each such person is expected to testify.

3(a) I have not yet retained experts on my admitted or deferred contentions except in Security, where the 4 security intervenors' experts and qualifications will be identified on March 18th to the extent not previously shown, per the Board's schedule set 2-24-83, to all parties.

3(b) There are no admitted security contentions yet. When I have any experts, I will provide such information, for admitted contentions

3(c) See above answers to3 (a) and 3(b)

4(a). Identify all documents in your possession, custody or control, including all relevant page citations, pertaining to the subject matter of, and upon which you relied in formulating allegations in each contention which is the subject of this set of interrogatories.

(b). Identify the contention(s) to which each such document relates.

(c). State the specific allegation in each contention which you contend each document supports.

RESPONSE:

4(a) This information will be revealed in responses for each contention, to the extent such information is in my possession custody or control and has not been revealed in the contention as filed or amended earlier, except: I have a folder fullx of handwritten notes I used in preparing contentions. Since I have moved right after first filing the contentions, I am not sure all such notes I possess are in that folder, but I object that all such are privileged, as are any notes I may have made in the margin or otherwise on documents I may have used or did use in preparing contentions, since all these documents reflect or include my "mental impressions, conclusions, opinions or legal theories of (a) representative of a party concerning the proceeding" (namely, me, representing myself), which the Board is required to protect under 10 CFR 2.740(b). Rather than identify each such note or writing fully (I'll be glad to if asked), since they are miscellaneous, I simply ask the Board to provide a protective order covering all such notes and writings, tape recordings, etc. which are work product I used in preparing contentions. All facts underlying the contentions have been and will be disclosed.

5(a). Identify all documents in your possession, custody or control, including all relevant page citations, upon which you relied in answering each interrogatory herein.

(b). Identify the specific interrogatory response(s) to which each such document relates.

RESPONSE: The documents in my possession, custody or control upon which I rely in answering each interrogatory will be identified (including page or chapter or section citations) in response to each specific interrogatory response to which each document relates, directly or by reference (e.g. "The documents referenced re XX(c) above are also used in this answer, except for CP&L's salary report").

6(a). Identify any other source of information, not previously identified in response to Interrogatory 2 or 5, which was used in answering the interrogatories set forth herein.

(b). Identify the specific interrogatory response(s) to which each such source of information relates.

RESPONSE: With respect to information requested under general interrogatory 2, or any additional information that would identify a nonwitness consulted or providing information to answer interrogatories, the objections to 2(a) and 2(b) as stated above apply and are incorporated here by reference as if fully set out.

With respect to other information, I will identify the source in the specific response(s) in which it was used.

7(a). Identify all documents which you intend to offer as exhibits during this proceeding to support the contentions which are the subject of this set of interrogatories or which you intend to use during cross-examination of witnesses presented by Applicants and/or the NRC Staff on each contention which is the subject of this set of interrogatories.

(b). Identify the contention(s) to which each document relates and the particular page citations applicable to each contention.

RESPONSE: I have not yet formed intent to offer any particular documents as exhibits or cross-examination exhibits or basis of cross-examination in this proceeding. It is safe to assume that documents referred to in the original, amended and accepted contentions I have made herein, or that was incorporated by reference into a contention superseded or ruled redundant to an admitted Eddleman contention, may be offered as exhibits or used in cross-examination. Applicants already possess this information. In addition, it is safe to assume that information obtained by me upon discovery could be used to cross-examine witnesses, or could be made exhibits. I will only tell Applicants my cross documents for their witnesses, not for Staff's or other parties'. When I plan exhibits and cross-examination, I will then inform Applicants of this information as soon as practicable, including which contention and which pages of a document. In so doing I will object to revealing any part of any such document which would identify or tend to identify a nonwitness nonexpert, or a nonwitness expert with respect to whom Applicants have not shown a compelling need to identify because they cannot get information or expertise on the subject involved elsewhere.

In stating the above, I note that if I see something to use on cross, and decide to use it, Applicants will be informed. But it may, e.g., be another line on a page Applicants have just used.

RESPONSES TO OTHER INTERROGATORIES IN THIS SET (FIRST)

Eddleman 9 and 11: Response time is suspended until after the close of the environmental hearings. I think 19 days thereafter is appropriate.

22A-1. ER Table 8.2.1-1 sets forth components in the fuel cycle costs for the Harris Plant. The four components are as follows:

(1) Enriched uranium costs (which, in turn, includes uranium costs, conversion costs and enrichment costs);

(2) Fabrication costs;

(3) Spent fuel storage and disposal costs; and

(4) Carrying charges.

Do you contend that there are other components of the Harris fuel costs which are not included in ER Table 8.2.1-1? If so, state what other components you believe should be included, the cost associated with each, and explain in detail the basis for your belief.

RESPONSE 22-A-1: Yes. (1) Transportation of the uranium, UF_6, and fabricated fuel are not stated in this table. I have not computed these costs. (2) Transportation of spent fuel to either an AFR site or another reactor site is not included in these costs.

(3) carrying costs of nuclear fuel, at the Company's fixed charge rate, which costs are passed on to ratepayers under, e.g., the NC Utilities Commission's rulings in the last 3 CP&L general rate cases, do not appear to have been included on any realistic basis. The Company's fixed charge rate is around 20% (e.g. Docket E-2 sub 416) and may be computed as follows: Using the capital structure (% common

equity, % preferred stock, % debt, and the embedded costs of debt and preferred stock allowed in a general rate case, along with the allowed rate of return on common equity, multiply each component of the capital structure by its allowed rate of return. Then multiply the debt component so obtained by a tax factor of 1.06383 (NC Gross Receipts Tax), and multiply the equity and preferred components so obtained by the composite federal-state tax factor of 2.0958. Sum the components so obtained with tax factors, and you have the fixed charge rate. I thought I had a copy of the E-2 sub 444 Order, but if so I cannot locate it; Applicants possess this document, however. I believe it includes net nuclear fuel (NC retail, .6114 of total) of $42,447,000. (I think gross nuclear fuel, including that burned, may be more appropriate for costing purposes). Using the E-2 sub 444 capital structure, we derive the fixed charge rate as:

Debt	.495 x 9.97% x 1.06383 = 5.25	
Preferred	.125 x 8.96% x 2.0958 = 2.34	
Equity	.38 x 14.5% x 2.0958 = 11.55	sum of right col 19.14%

Applying 19.14% to ($42.447 million / .6114) gives $13 million.
(system net n-fuel)

Spread this over CP&L's 1981 nuclear generation (9.383 billion KwH, see FERC Form 1, p.401) gives 1.4 mills, with 4 mill fuel. I expect nuclear fuel in the future to cost more than 4 mills.

(4) In making this response I am not saying that the costs listed for the 4 areas identified in ER Amdt 5, Table 8.2.1-1, are accurate; nor do I endorse the use of Applicants' capacity factor estimates in computing these costs in mills/kWh, particularly for carrying charges.

(3A) To continue the explanation, if future nuclear fuel costs more than the 4 mills or so CP&L had in 1981 (see FERC Form 1 for the plants, Brunswick and Robinson, p. 403-C and 403-A respectively) then the cost of nuclear fuel in progress will also be proportionately higher, as will the carrying charges on it, even if CP&L's allowed profit does not increase. CP&L projects 14.5 mills levelized for fuel fabrication and uranium (w/conversion, enrichment), which on the same proportions gives carrying charges of .35 x 14.5 or 5 mills/kWh.

22A-2(a). ER Table 8.2.1-1 sets forth the estimated lifetime levelized costs in mill per kilowatt hour for each component of the fuel cycle cost. State in detail which costs, as set forth in Table ER 8.2.1-1, you contend are erroneously low.

(b). For each cost identified in response to (b) above, state what you believe the estimated cost should be and explain in detail the basis for your allegation that the methodology utilized by Applicants for determining the cost of enriched uranium is flawed.

RESPONSE: Assuming part (b) above refers to part (a), Applicants do not appear to have set forth their methodology in sufficient detail in the ER to determine its flaws in their entirety. I will pursue discovery of Applicants to get more information on their methodology.

A-2(a): There may be other errors biasing Table 8.2.1-1 low (see above) (see also response to 22-A-1, above, re carrying charges), but I can now state that almost every cost in Table 8.2.1-1 is erroneously low. I will conduct discovery of CP&L to find the rates on which the Table 8.2.1-1 numbers are levelized, and the underlying data

With respect to nuclear fuel costs, I am supplying Applicants with a copy of Table 2 from the CP&L Public Staff data request in NCUC Docket E-100 sub 40 (1981). The costs for conversion, enrichment, fabrication (excluding Harris initial core, which I believe is higher), and spent fuel disposal I continue to rely upon. The yellowcake numbers may well be too high after 1987 (left column); note, however, that even recent prices of $17-25/lb U_3O_8 (obtained from rate cases) are above the 11.08 used for 1985, 86 and 87. These numbers cover the period 1985-2004. They cover everything in Table 8.2.1-2

under Fuel Cycle costs, except carrying charges, which I treat under 22A-1(b) above.

The nuclear liability insurance costs are also low. CP&L response 18(a) and (b) to Kudzu Alliance discovery in NCUC Docket no. E-100 sub 40 (1981) gives the out of pocket liability insurance premiums. These amount to nearly $ 1 million per year in 1981, for 3 reactors ($300,000+/reactor-year).

However, as noted below under (b), the cost of risk associated with the non-purchased share of the Price Anderson insurance should also be included, which would quadruple those figures, raising the level to about 0.3 mills per kWh currently. Insurance costs may also escalate by 1985 (they had, see 18(a) of CP&L response above), and will escalate more if there is another serious nuclear accident.

I believe the O&M costs are low also. CP&L's estimate has not been set forth in sufficient detail to specify in what ways it is low, particularly since the interest rate (discount rate) on which these figures were levelized, is not known.

The decommissioning costs are likewise likely low, since decommissioning of a unit the size of Harris 1 or 2 has not been done yet, and the costs of cleanup and waste disposal may rise, particularly if DOE or other authority (e.g. EPA, NRC) insists on immediate dismantlement. Note that ER Table 5.8.2-1 gives these costs in constant 1978 dollars. Constant 1986 dollars would be more appropriate for comparison. The 25% contingency included is low, due to higher waste disposal costs and need for additional protection of radiation-exposed personnel in dismantlement of a Harris unit. Immediate dismantlement in Table 5.8.2-1 is shown with the largest cost, though for some reason that cost isn't added up.1 The assumptions, including (d) and (e) of that table are overoptimistic and subject to large errors. It is totally unclear that entombed radioactive material

ER Amendment 5 makes it the latest

can be released unrestrictedly within 100 years. Many isotopes in the entombed reactor, e.g. Cs-137, Ni-59, Nb-94 have half lives long enough to pose a major risk long beyond 100 years. So do I-129, Sr-90, etc.

To return to C&M briefly, Applicants have not assessed the impact of stricter standards for radiation exposure on O&M costs. It is well known that nuclear C&M costs are higher because of the need to reduce radiation exposure, and the industry has claimed that stricter standards for radiation exposure would greatly increase costs (though I am not able right now to lay hands on documents saying that).

On Carrying costs, the Public Staff 1979 report (pp 204-205) which CP&L possesses, says that the carrying charge for nuclear fuel was taken at 20% by them. This agrees with my statement above that the fixed charge rate for CP&L should be used (it is about 20%)

Using the conversion as stated on p. 204 and Table III.B. 12 of that report (also on p.204, NCUC Docket No. E-100 sub 35, 1979), we have the following equivalencies: $25/lb U_3O_8 is 1.60 to 1.89 mills/kWh; Conversion at $5/kg U ($2.27/lb) is 0.12-0.14 mills. Enrichment at $80/kg SWU is 1.02-1.53 mills. Fabrication at $110/kg U is 0.41 -0.5 mills. Storage, at $6/kg HM (Heavy Metal) (not included in sub 40 estimates -- it should be. $6 is a 1978 price, 1986 price will be higher) 0.22-0.27 mills/kWh; Disposal at $220/kg HM is 0.82-0.99 mills/kWh.

Now, if we use for example the 1990 and 2000 values in Table 2 CP&L PS data requests, NCUC Docket E-100 sub 40, we get (assuming $25/lb U_3O_8 in each of those years) 1.6 to 1.9 mills for yellowcake;) 0.36-0.42 mills (1990) to 0.9-1.05 mills (2000) for conversion; Enrichment (1990) is 3.7 to 5.71 mills; (2000) 7.15 to 10.72 mills; Fabrication (1990) 1.72 to 2.1 mills ; (2000) 5.13 to 6.25 mills; Storage (assuming 5%/yr inflation from 1978) (1990) 0.48-0.48 mills;

(2000) 0.66-0.81 mills; Disposal (1990) (using KgU figure for KgHM) 1.01 to 1.24 mills; (2000) 1.81 to 2.2 mills (these last look low, but it is the reasonableness of the total that is critical here).

Now, a rate levelized 1986 - 2011 will come out between the 1990 and 2000 values, probably closer to the 2000 numbers. Those 2000 numbers sum out at 17.25 to 21.93 mills/kWh per the above referenced data. Add carrying charges at 20% of this (per PS '79 methodology) and you get 20.7 to 26.31 mills in the year 2000. I have not computed a complete levelization on the data, but you get the idea: Applicants underestimate.

Nuclear liability insurance: $120 million/plant costs CP&L about $300,000/yr from private insurers (Kudzu data request E-100 sub 40 items a and b); The full $560 million should be computed at the same cost rate to figure what the ultimate cost of this insurance is, i.e. the cost of providing the $560 million (or more) of nuclear liability insurance for each Harris unit under the Price-Anderson act. Taking the insurance at 9.6×10^5 dollars in 1981 (per 18 b of data request), and using CP&L actual nuclear production in 1981 of about 9×10^9 kWh, we get o.102 mill/kWh for actual production for the first $120 milion of insurance. Conservatively, this should be multiplied by 4 to reflect the realistic cost of the entire $560 million of insurance (4x120 is 480, less than 560, so this is conservative). That gives over 4 mills/kWh in 1981$. I think some escalation of nuclear insurance is also appropriate, and if there is another nuclear accident for which Price-Anderson is invoked, prices for such insurance will rise further. The multiplication of insurance coverage costs up to what insurance would cost for the whole $560 million limit (which cannot be obtained from private insurers for nuclear liability) is a proxy for the realistic cost to society of that insurance. Indeed, the fact that private insurers will not risk even $560 million of their own money on nuclear safety indicates that the insurers, as a group, do not believe Applicants' and NRC's assurances of nuclear safety. If serious nuclear

accidents really had billion-to-one odds against them, the value of the risk of $560 million/yr of insurance for each reactor would be 56 cents per reactor. Yet the insurance companies charge CP&L approximately 500,000 times that amount, for only $120 million of nuclear liability insurance per reactor. That is a 2-million-to-one offset (500000 times the cost for 1/4 the insurance or less). That's pretty good evidence CP&L underestimates nuclear liability costs.

(c) N/A

22A-3: (a) Yes. I also do not agree that Applicants analysis is "based on established indices" since the FR does not identify any such index or indices. I will pursue discovery on this matter. (b) First, if the indices are wrong, or do not project accurately (or have not, if used for parojection in the past), the results will be wrong. I need discovery of Applicants to answer this point in detail.

Second, the Harris initial core comes from CP&L's low-cost uranium contracts, which I understand from the E-100 sub 40 data request referred to under 22-A-1 and -2 above, is about $11/lb yellowcake. The market price is now higher. Thus, CP&L's estimates appear to escalate from an unrealistically low cost, by their own statement. This supply contract appears to run out in 1986 or 87, depending on whether CP&L's disclosure to Kudzu Alliance (E-100 sub 40, 1981, copy supplied to Applicants and all parties with W&E 3-18-83 Response re Eddleman 15) or the CP&L PS disclosure referenced above, is believed. On either basis, this is very early in Harris' operating life of 25 years starting in 1986, as projected now by Applicants.

The fabrication costs set forth in the CP&L PS data request are much higher, andshould be used instead of Applicants' cost estimates.

(c) N/a

22A-4 (a) Yes. (b) In addition to the higher estimates of waste disposal costs, e.g. that by DOE (1977) cited by Komanoff in Power Propaganda (Eddleman Exhibit N-1 or N-2 or N-3 in E-100 sub 40, which Applicantspossess) 1.3 mills in 1978 dollars, the main reason I think this estimate is low is that what it describes hasn't been done yet. If Congress has been unsuccessful in freezing prices (1972, e.g.) and in regulating the price of gasoline (pre-1981) there is no reason to believe Congress can legislate what it will really cost to dispose of nuclear waste any more than to suppose that Congress can modify the law of gravity. Cost-recovery requirements for uranium enrichment have led to great increases in the cost/kgSWU (cost to enrich one kilogram of Uranium to light-water reactor grade). There is no reason to think that nuclear waste disposal will be otherwise. I continue to review documents on this, but cite here the DEIS for 40 CFR 191 at p.4 states that"The disposal standards (subpart B) must deal with a yet unproven technology and with the need to extend public health protection far into the future" (December 1982). Reagan's EPA is not exactly a hotbed of concern to protect the environment, yet it states that the technology of nuclear waste disposal is as yet unproven. Now how can anyone tell the cost of something that's not even proven? I also rely on the statements and references in original contentinn 22-A here, as in all my answers to interrogatories, which simply add to the basis stated in my original contentions. (c) N/A

22-A-5(a) Yes. I don't acknowledge the indices are established, and DRI has a horrible record of forecast inaccuracy (see testimony of Dr. E.R. Weintraub, Prof. Economics, Duke University, E-100 sub 40 before NCUC, 1981, which Applicants possess. (b) See response to 22-A-1 (b) and 22-A-2(b) above, and (a) preceding. (c) N/A.

RESPONSE TO INTERROGATORIES ON 22B:

Answer to general interrogatories: In formulating this contention, I relied solely on the ER and common sense, which indicates that CP&L simply copied the same number for payroll at 2 plants as they had had for 4 plants into the "analysis". This is obviously sloppy, if not incompetent, figuring. I have no other information concerning payroll except CP&L's changes to the ER, which Applicants possess. It will require discovery of Applicants to find additional information.

22B-1. The question includes a statement of probable misleading intent, namely that these salaries are based on Applicants' estimates of all company personnel, both onsite and offsite, and contract labor required for operation of the Harris plant ... but it doesn't say WHEN that estimate was made, or whether it was for 4 units or not. I believe CP&L simply adopted the same number for 2 units as for 4 units. Otherwise the use of the identical number is an unbelievable coincidence.

Additional errors are likely; I am conducting discovery ASAP and will file requests to admit such.

22-B-2 (a) No, and I am conducting discovery on this point. (b) not applicable (c) discovery of Applicants is required to see if this results in an underestimate, overestimate, or what. I need more information to answer to what extent additional NRC requirements have impacted staffing needs and costs for Harris. Applicants appear to not have made any new estimate, and an outdated estimate is very likely inadequate and inaccurate due to changing requirements and changing rates of inflation, wage increases, salary increases, and changed benefits to employees.

RESPONSE to Eddleman 41 interrogatories

GENERAL 1(a) George Maxwell, Senior Resident Inspector for NRC, Shearon Harris Nuclear Power Plant, Apex NC, 362-0601; and others whose (b) the facts identified in ~~this~~ reports thereon, which CP&L has. identification I am filing discovery of Applicants to obtain. ~~(b)~~(c) Eddleman contention 41, the"OK"tagging of defective pipe hanger welds, and failures of Applicants QA/QC program in this regard. Please note that I can't locate the I&E reports this contention was based on, and may have lost them in the process of moving. They are on file with NRC and CP&L gets copies. However, CP&L's own report of 6-11-81 which Applicants provide, has plenty of evidence of their QA failures. P.4, item 4 in the top half of the page (another 4 is in the bottom half) reports 95% defects in 400 pipe hangers reinspected. Yet, all these ~~xxx~~ pipe hangers had been passed by CP&L previously.

Exhibit no. 2 thereof shows 617 of 1786 hanger drawings re-reviewed had problems : unclear symbols, missing symbols and incorrect symbols. Some of the 617 problem reports covered more than one drawing. Clearly, the defect rate on the drawings is above 34%, yet CP&L had not caught these problems previously.

Reinspection (ditto source) yields worse results: of the 1786 ~~x~~pipe hangers issued for QA inspection, 701 were not installed. Of the other 1085, 598, or over 55% were rejected, for a total of 15 reasons (a through o) which are a virtual dictionary of weld defects.

Item 5 of Exhibit 2 thereof says that unstamped welds were accepted based on CP&L's lack of a requirement to stamp such welds and their "confiden(ce) of our welder qualification program's ability to provide us with qualified pipe hanger welders" even though 95% of the welds in a sample of 400 were rejected, and over 55% of a larger group reinspected were rejected for a huge number of types of errors. This assertion of confidence is baloney, as the above failures on reinspection show.

General Interrogatory 3: I'll call Maxwell if Staff doesn't. I don't know his qualifications, but he's evidently better at catching defective welds than CP&L is. Subject matter: CP&L's records and QA/QC failures with regard to pipe hanger welds; CP&L's corrections or fixes thereof; CP&L's attitudes and responses to his findings.

GI 5: I relied principally upon Applicants' own report, 6-11-81, though there is other information upon this. Applicants sent me a copy of that report, so I don't need to give you one.

GI 6- none now; GI 7 none now; GI 2 and 4 objections as stated under General interrogatories.

41-1(a) (b) Yes. First, Applicants failed to discover the problem. the NRC found it. Applicants have not taken all effective corrective action reasonably required, nor have they shown that their corrective action is effective; there are defects in their corrective action beyond the one stated above in x response to a general interrogatory.

Exhibit 4 to the 6-11-81 report shows that of 85 duct hangers inspected, 100% were defective, 81 rejected, 2 with engineering problems, and 2 which were tacked (I presume this means tack welded to hold them properly). Of the 81 rejected, about half were OK'd without clear basis according to the information CP&L supplies.

Exhibit 5 shows that of 298 Exelectrical cable tray and conduit hanges inspected, 281 (95%) had problems, 268 being rejected and 13 with engineering problems. Only 17 out of 298 were OK.

The resolution of the engineering problems is not detailed. However, 239 of these were reaccepted after either a permanent waiver (PW) which means they weren't fixed, or weren't fixed right in rework, but were still OKd , or by a Field Change Request (FCR) which basically appears to be changing the requirements to fit what's there or a partial fix. Only 19 were reworked in the field and accepted by rework.

These rework, permanent waiver and field change requests are not specified in enough detail to see if they were adequate. NRC has not 100% reinspected them, according to their report attached to your 6-11-81 report, so there is no assurance CP&L did things right here. I will shortly file discovery on these matters.

It should be noted that the main focus of this contention is that CP&L, by bungling the inspection of pipe hanger design, weld specifications, welding and installation so badly, shows a deficient QA/QC program. In the words of NRC's counsel, if they're not competent to design and build a plant properly, they're not competent to run it.

CP&L itself, to return to deficiencies in their response, states (p.2 of 6-11 report Rev. 1) that the problem was three-fold:"design drawing(s) with incorrect or unclear weld details were provided by the vender, and passing through all checking stages, were issued to the field uncorrected." (my emphasis) (neither Applicants nor their contractors or subcontractors caught these design/specification errors, even though they appear to have affected 30 to 50 to even 95% of welds in various pipe hangers). Page 2 continues "Field personnelfailed to weld the pipe hangers in accordance with the design drawings and/or made welds when details were missing or unclear." Why didn't they weld correctly? Why, if the drawings were missing or unclear in details, didn't they ask for clarified or corrected drawings? Apparently, this is still a problem for 3 of 37 drawings since 1-1-81 still had problems after getting a second level of review by Bergen-Patterson. (p.2) Who knows how many other bad drawings are still getting by B-P, Ebasco and CP&L?

The failure rate for welds on pipe hangers in one sample after CP&L's welding school was taken by the welders, is shown on Exhibit 1 of the 6-11 letter to be 12.7%.

41-1(b) continued

Page 4 of CP&L's 6-11-81 letter to NRC shows at the bottom, item 4, that improper weld locations and lengths, improper hanger fit-up, welds over holes and gaps, and other problems were "dispositioned" by permanent waivers or field change requests. Yet, it is not clear if any of these problems were fixed. As I understand such engineering evaluations, their purpose is to approve deviating materials and work if at all possible; no explanation of the criteria for such, especially welds over holes and gaps, improper weld locations, and improper hanger fit-up, are given. While the FCRs and PWs are listed, CP&L's letter and its attachments give no indication of the adequacy of the PWs and FCRs. (c) N/A

41-2(a) Yes. (b) That it has been is shown by Exhibit 1 to CP&L's 6-11-81 letter to NRC which was sent with Applicants' interrogatories. It shows a 12.7% failure rate. I am pursuing discovery concerning other defects and deficiencies in the results of this training. (c) N/A.

41-3(a) Yes. (b) See response to 41-1(b) above. I am also pursuing discovery further on this matter. (c) N/A

41-4(a) Yes, by permanent waivers (PW) or by Field Correction Requests (FCRs) or other means, (b) see response to 41-1(b) above. (c) N/A. Note I am pursuing discovery on this also.

41-5 (a) Yes. (b) see responses to 41-1(b) and 41-2(b) above; I also need to pursue discovery of NRC staff on this. I further understand that additional pipe hanger, HVAC hanger, and cable hanger defects at Harris have been found since mid-1981, but I have not located those reports if I have copies of them. (c) N/A

Update re 41-1 (b) and 41-2(b): I also have the following documents re pipe hanger defects at plants Daniel (CP&L's prime contractor for Harris) is building: 12-27-82 article from St Louis Globe-Dembcrat by Allen Levy entitled Pipe Support Problems Hold Up Nuclear Plant re Callaway (contributing to 10 month delay and $750 million cost increase, according to a vice president of Union Electric Co, probably Don Schnell, VP/nuclear of UE. This article states that the Wolf Creek plant in Kansas is "An identical nuclear plant under construction in Kansas (that) is having problems with its pipe hangers. Both plants are being built ... using the same general contractor, Daneil International Corp." and continues that at "Wolf Creek, the braces that hold the pipes suspended from the ceiling were not put up correctly or completely the first time around," said Tom Taylor, spokesman for the Kansas Corporation Commission."

One from Kansas City Times 4/23/82 by Mitchell Benson, Energy/ Environmental writer, entitled "parts made from scrap for plant: hanger could have posed risk at Wolf Creek" stating that an NRC investigation uncovered 10 hangers for pipes "made from scrap materials at the construction site and not with approved steel" and that 10 of these parts were "called counterfeit in an agency (NRC) report and were discovered before they were installed." W.C. Seidle of NRC in Arlington Texas is quoted as saying (though 9 of the hangers were not safety related) "During this investigation, it was found that certain of your activities were not conducted in full compliance with NRC requirements. This violation was documented ... no further response to this notice of violation is necessary." and states further that a spokesman for the utility said Daniel Construction fired a construction foreman last April (1981?).

A further article K. City times 4-20-82 Forged Paperwork Confirmed at Wolf Creek. I am supplying copies of all these to Applicants.

Eddleman 45 - Water Hammer

RESPONSES to General Interrogatories: (1a) I consulted no one in formulating this contention. 1b and 1c N/A. 2. Objection. See general interrogatories above before specific answers ton questions on each interrogatory. 3. None so far. 4a. I relied on NUREG 0606, volume 4, task A-1, and the FSAR. (b) Eddleman 45 (c) NUREG-0582; EGG-CAAP-5133 July 1980; RE-E 79-009 and 79-013; RE-A-78-229; RE-A-78-261 (all from EG&G Inc and used as NRC task 4.4 reports on Water Hammer); RE-A-70-044 State of the Art Literature Review of Water Hammer, CAAP-TR-042; NUREG/CR 1606; CAAP TR-053 Rev 1, July 1980. I have not been able to locate information as to which parts of these studies I relied on, since I moved after making the contentions and have not found the original backup info for Eddleman 45. However, NUREG/CR 2781 of July 1982 is one of the CR reports I anticipated now being prepared by NRC] in Eddleman 45. NUREG/CR 2059 is one completed in May 1982 which was also anticipated. I believe Applicants haven't shown compliance with or ability to avoid the conditions in any of these reports, as evidenced by their one-paragraph cavalier response to Staff question 440.49: Applicants merely assert that the ECCS systems will be full; they do not address the steam generators at all (Task 4.3 report, NUREG/CR 1606, 9/80); they do not reference any analysis of potential water hammer events, what lines or sections of lines or other places (e.g. steam generators) such water hammer events can occur in; they do not refer to collapsed steam voids at all, or the formation of slugs which can become water hammers on system restart after an outage; they give no direct method to assure that any systems, whether pipes, non-pressurized systems interfacing the ECCS, or other systems, remain full of water; they assume operators will see all leaks; they assume operators will know which leaks could lead

to water hammers though they provide no checklist of such systems, or means to separate leaks from such systems from other leaks so that operators will know exactly which leaks could relate to possible water hammers, they provide no indication of how the operator, looking at the outside of a non-leaking pipe, will know if it contains steam, collapsed steam voids, a water slug, or anything else; they do not explain how testing will check for possible water hammers, of how it could prevent water hammers from conditions occurring between tests; they do not explain in any way how the plant leak reduction inspection program will seek to detect water hammer events or conditions that can lead to them; they do not explain how sump level alarms relate to water hammer, or what alarms or what water levels in what tanks would be used by plant operators or personnel as an alert to possible water hammer conditions. In sum, the greatest support of Eddleman 45 at this point is the Applicants' own response, which is not at all responsive to the NRC's above-referenced reports and does not provide a program to assure that water hammer events cannot occur, and that precursors to such events (e.g. formation of voids or slugs, leaks, and sudden valve openings or closings, e.g. as occurred at Duke's McGuire plant in December 1981) will not either damage the primary or ECCES or RHR systems, or damage control systems tied into water supplies affected by the water hammer shock wave.

I will review these above-referenced documents anew and respond to Applicants further; and also when I locate the original Eddleman 45 backup, I will so inform Applicants.

General Interrog 5: See above. CP&L's response to Staff question 440.49 shows that CP&L has not taken the concerns of Eddleman 45 into account.

6 Not Applicable; objection to 2 applies here.
7 Exhibits not planned or finalized yet.

RESPONSE to 45 continued:

45-1(a) FSAR 10.4.7.1 describes Harris feedwater systems; in the original FSAR, water hammer is not addressed in this section. Thus, the FSAR discussion was obviously inadequate then. FSAR Amendment 2 does not change this section. Therefore my answer is Yes, 10.4.7.1 does not describe any way in which this system is adequate against water hammer. (b) The fact is that the analysis required to show adequacy against water hammer isn't in 10.4.7.1 of the FSAR.

(C) Analysis not complete. (d) Not Applicable (N/A)

45-2 (a) Yes, particularly the draft NUREG referred to a page 11 of NUREG-0606, vol 4 #4, 11-19-82, but since that document has not been issued yet, to my knowledge I cannot make further response on it. Other documents still being analyzed or to be analyzed. (b) see (a) (c) N/A.

45-3: a Yes. b: See under General Interrogatory 4(c) above. CP&L's response to Staff question 440.49 is clearly inadequate for the reasons stated there. Further analysis may be done on other matters re (b). (c) N/A

45-4. (a) Yes. (b) The only reference to water hammer in the FSAR 10.4.9 appears to be at page 10.4.9.6 (original FSAR and amendment 2 thereto which adds one sentence); However, possible water hammer initiating events are the automatic isolation of a ruptured supply line (10.4.9.2.2 at page 10-4.9-3, and the piping failures described in section 10.4.9.3 at page 10.4.9-5). There is also a problem here in that, if a steam generator failure initiates the reactor/turbine trip of that latter section, offsite power is assumed unavailable per Branch Technical Position APCSB 3-1 (p. 10.4.9-5) and the steam from that S.G. might be one of the two inputs to the steam driven AFW pumping. Low pressure or overpressure on that input might also lead to valve closure or formation of steam voids that could initiate a water hammer.

The only analysis of the alleged adequacy of the AFW system against water hammer is on p. 10.4.9-6 as amended (Amdt x 2) which states that the system is designed to remain full of water. The possibility of steam being pulled into the AFW due to failure of condensation, or the possibility of a void due to a line leak, are not analyzed.

The third sentence states, the rest of the discharge piping is pressurized to steam generator pressure. If this pressure comes from steam generators themselves, then an SG failure could lead to formation of voids (by raising pressure) or collapse of voids or steam to form a slug or slugs of water (by lowering pressure).

The fourth sentence says that void formation in the area of the steam generator auxiliary feedwater nozzle is prevented by the tempering flow from the feedwater system. But the AFS is diesigned to operate mostly when the feedwater system is NOT working. This problem is not analyzed.

The fifth sentence states that the AFS will be monitored for water hammer during initial testing per FSAR section 3.9.2.1; however, that section both in the original FSAR and in amendment 2, does not address water hammer and does not mention the AFS directly. It seems to be more about vibrations, and the snubber inspection, etc make no reference to water hammer events. At page ~~2~~x 3.9.2.2 there is a reference to observing piping etc durirg transients for excessive motion, based on the judgment of the testers. All this appears to say is that if a water hammer occurs in testing, maybe they'll notice it; but water hammer is not directly mentioned here at all.

The sixth and final sentence (all 6 take up 12 lines on FSAR page 10.4.9-6 in total) re water hammer says that the main steam supply to the AF pump turbine is sloped to avoid collection of condensate.

This should reduce the possibility of slug formation by condensate piling up in the line, but where does the condensate fall to? This sentence does not address that, nor the possibility of formation of a slug in the line due to SG failure or condensation during shutdown. That is the only mention of water slugging effects ~~xxxxix~~ in that part of the FSAR.

Clearly, this "analysis" of 12 lines is inadequate. What CP&L needs to do is first identify all possible conditions of slug formation, based on both experience in the NRC reports/contractor reports listed above under general interrogatory 4, and identify means of assuring that if such slugs form or water builds up in any place, it will be promptly detected. A full analysis of the impace of sudden valve closures and openings due to transients is also required. CP&L hasn't done this, so I maintain their water hammer protection for the AFS is inadequate. They don't even specify how the AF steam supply line is sloped, how this is adequate to remove condensate from the line, where the condensate goes, whether this was a design change or something they forgot to mention before (which, if they did, indicates they're not really aware of water hammer risks), and if it is a change, what other effects it has. And that's just for the steam line, not the valves and steam generators ~~xxx~~ tied in. The contradiction of assuming FW system will prevent ~~voidsxx~~ at AFW injection, when AFW injection will occur with the feedwater system out of service, is not addressed. Applicants' analysis is inadequate for at least these reasons. 45-4(c) see above (d) N/A

45-5 Yes (b) will need to re-review documents cited above to specify. (c) N/A.

45-6 (a) Yes (b) this procedure does not address water hammer at all. See above answer to 45-4 b and c, and general interrog #4 re Eddleman 45.

45-6(C) n/a but I will supply further information when found.

45-6 (d) N/A
Yes (b)
45-7(a) see response to 45.5(b) above, also to 45-4 b and c and general interrogatory 4 re Eddleman 45. (c) N/A

45-8(a) Applicants have not given a design of the ECCS piping which shows adequacy to prevent the effects of water hammer in their response to Question 440.49 (Yes) (b) see 45-8(a) response and response to General Interrogatory 4 re Eddleman 45.

(c) additional inadequacies will be identified. (d) N/A.

45-9 (a) Yes, with reference to response by Applicants to Question 440.49 by staff. (b) in addition to the facts stated above re G.I. 4 on Eddleman 45, and 45-4 b and c and 45-1 a and b, 45-2 above the main steam system does not appear to have been analyzed for water hammer effects resulting from formation of slugs due to steam condensation during shutdown, in isolated lines whether the plant is shut down or not, and the formation of slugs or the initiation of water hammer due to steam generator failure. These are clear inadequacies. An adequate analysis would identify all causes of slug formation or trips that can initiate water hammer due to valve openings or closings (e.g. isolation of S.g. on primary or secondary side, including the case where one isolation valve works, but the one on the other side does not, or the one on the other leg on the same side does not), steam void formation in pipes, and would then specify direct detection of such slugs or voids, analyze all such trips and valve closures or openings, and show a means to assure that slugs or voids had not formed, which would be continuously available to plant operators. Applicants assertions about systems being designed to stay full of water do not appear to apply to steam generators; indeed, it appears Applicantshave not addressed steam generators AT ALL in their response to staff question 440.49 (they do not.).

45-9(c) N/A

Yes (b):

45-10(a) the testing of the main system with respect to water hammer events is not described in Applicants response to Staff question 440.49. From the rest of the FSAR, it appears that only a visual, judgmental inspection will be performed with respect to seeing if a water hammer actually occurs during startup testing. After that, it is not clear if any water hammer tests will be run.

If this question means, has the Harris main steam system been tested and found adequate to withstand possible water hammer events, definitely not.

With respect to inspection, what would be required is a means to identify leaks originating in lines, pumps, or portions of lines, steam generators or ogher main steam system components which specifically have the possibility of water hammer associated with them. These include leaks from isolated lines, sudden ruptures, and other leaks as well as the injection of steam or steam mixed with water into lines under accident conditions (e.g. when the reactor coolant may boil), and water hammer events that can impact air or water-operated controls. There is no such analysis in Applicants response to question 440.49 or any reference to such. Isolating which section is leaking can be done by an appropriate system of valves and drains for each section in which a water hammer can occur. Otherwise, inspection visually may not detect leaks. Automatic indicators of water leaks from each section are required since operators will not be visually inspecting all such lines, particularly those inside containment, at all times the plant is running. For these reasons, Applicants' response is wholly inadequate and so is their inspection and testing re water hammer. (c) N/A.

45-11 See response to General Interrogatory 4 re Eddleman 45. Some additional reports are referenced in the task analysis of A-1, Water Hammer, in NUREG-0606 Volume 4 (earlier number used to prepare contention 45; later one, #4, used in response here) but I do not have numbers on them. See p. 11 of NUREG-0606, Vol 4 #4, 11-19-82 from NRC .

RESPONSE re contention 65 (Eddleman)

GENERAL interrogatories 1. I consulted no one but my memory. 2 and 5, objections as stated above under general interrogatories. 3. see above re general interrogatories 4. Will be detailed below. 6 and 7 None yet.

RESPONSE TO 65-1(a) I don't know yet and will pursue discovery on this, but note that I do not limit contention 65 to deficiencies or nonconformances as defined by Applicants in their questions. b and c, see a above. 65-2 (a),b and c. See 65-1 above responses. 65-3 (a) Yes. (b) Just look at the QA/QC failures re pipe hangers (see response to Eddleman 41-1(b)) where 95% of a group of 400 were defective and got by initial inspection and weren't caught by Applicants until the NRC resident inspector found some of the problems on or about 9/3/1980. Consider also the terrible record of Daniel International with respect to concrete and base mats, as described further in responses below. see also Update re Eddleman 41, re Daniel's record in pipe hangers. (c) N/A.

65-4. In addition to reports I had read of such defects, and the testimony of S. Miner (I believe) on this matter and the firing of general foreman William Smart at Callaway (Harris management capability remand hearings 1979, transcript) I have the following documents relating to these problems:

65-4 response continued:

R, The Ironworker, 9/79, pp 26-28 re "huge voids" in Wolf Creek containment structure and a base mat poured 12-77 which tests out far below strength due to a substandard pour by Daniel reportedly consisting of concrete rejected for highway use. It says NRC gave daneil the go-ahead even though "about 50 percent" of the concrete test containers for the base mat failed to meet specified strength of 5,000 p.s.i. and in spite of the fact that NRC has never made an on-site strength test of the base mat.

Joint Intervenors' Exhibit Q (I believe that's the marking) from Callaway re a crack in concrete at Callaway.

Letter from J.G. Keppler, director NRC region III to Mrs. L. A. Drey, 4-4-80, which states that voids form (ref. NRC regulatory guide 1.55, June 1973), p.2 to which Keppler replies that they are caused by rebar being present in large amounts and numbers, but he says the rebar is generally close to the surface. This is not so obviuosly so for basemats and is false for containment walls in which the rebar goes very deep

Joint Intervenors' Exhibit 5 - Callaway - Daniel International Concrete Placing Report which shows at second page that"concrete placement crews lacked adequate experienced supervision" and references QCP-109, which I don't have but presume is a quality control procedure. Comment above is by Red Johnson, a superintendent of concrete placing.

pp 89-98 of Joint Intervenors proposed findings, section V, honeycombing in the reactor building basemat, Callaway, STN-50-483-OL 3-1-82; and pp 1-14 of Joint Intervenors' 3-2-83 brief in support of exceptions in the same case, re basemat;

Applicant's Exhibit No. 1 in the same docket, Non-Conformance Report NCR 2-0856-C0A; and Joint Intervenors' Exhibit 8 in the same STN-50-483-OL proceeding, Final report on concrete voids in reactor building base mat Callaway plant which refers to the soniscope inspection joint intervenors point out went through steel, not concrete.

65-4 continued. I continue to investigate and collect documents on this, e.g. with respect to Wolf Creek and Farley.

65-5 No, CP&L is a thoroughly incompetent utility as shown by its Brunswick plant, and that as well as Daniel's poor record is a basis for my concern re the base mat at Harris. I understand that the foundation of one of the Brunswick units has a crack in it and that the resident NRC inspector there believes this crack could continue to widen to such an extent that it might force that unit to shut down by approximately 1985. I have not examined the experience of other contractors in any detail, but am aware of problems with concrete at LaSalle, Midland, and some plants constructed by Bechtel, to the best of my recollection. I am also concerned re numerous reports of bad concrete which have come from persons who say they are working or have worked at the Harris plant.

65-6. See letter from Keppler to Drey, cited under 65-4 above, pp 2-3. The fluidity of the conrete mix as poured, the care with which it is poured, and the number and placement of rebar in the area of the pour obviously influence the formation of voids and honeycombing. If the concrete itself is not sufficiently fine and fluid to flow into every crack or grap between rebard, the pour will obviously have voids. If the pour is done too fast, or with too viscous a mix, rebar near the surface may trap it, leaving holes or large voids underneath. If the pour is not adequately supervised and inspected during pouring, the existence of voids may not even be noticed. Where structural steel or embeds or trumplates obstruct the parth of the poured concrete, eg. by being criss-crossed in layers offest under the pour, of by having a main dimension or plate at right angles to the normal to the surface of the eventual mat or wall (i.e. in the plane of the mat or wall being poured), special care and injection of

65-6 continued

concrete will be required to prevent voids. Honeycombing and missing concrete along the structural steel, especially rebar, is another problem that can and does occur, especially if the concrete is too viscous, poured too fast, or includes air from mixing. The honeycomb is gaps and non-adhesion of concrete around the rebar, and good vibration practice combined with careful attention to concrete mix consistency and viscosity is required to prevent formation of large amounts of honeycombing in places, such as the base mat, where rebar is especially thick and multilayered. Another such place is the base of walls, e.g. of the containment and of buildings. Daniel once built a whole wall without rebar at Harris, which is another problem I am concerned about. This interrogatory sounds like an exam question, so if more information is required, please ask, informally first.

65-7 I have not personally examined either the structural steel design or the conrete placement reports for Harris; I have seen the concrete placement reports for Callaway. Otherwise, I have not. CP&L has not in the past provided me access to the Harris rebar on-site so that I might inspect it, and I haven't yet asked them to.

65-8(a) If by intended function you mean having integrity in the face of a design basis earthquake, airliner crash, or tornado missile, I believe Yes. (b) the description of the huge voids and weak concrete in the structure indicate that it is weaker than design basis and thus, embeds, trumplates and other structures which may be strongly stressed during an earthquake, airliner crash into the containment, or tornado missile, one or more may fail, leading to greater stress on the others, additional failures, still further stress on the remaining supports of walls, floors and equipment, and quite possibly equipment, pumps, walls, or other parts of the plant vital to safety or containment

65-8(b) continued

integrity could collapse or rupture or break down, impairing or negating the safety of the plant. This is about as detailed as I can get, except to note that the lower strenth and reserve margins (safety margins) you have in strength of conrete, steel, or both, the closer you come to a cascade of failures if one part is overloaded for its actual strength and fails. Voids in concrete also allow more motion and even possible slippage of rebard and embedded supports and trumplates, potentiating collapses by getting them going. (c) N/A

65-9(a) It is my understanding NRC did not recuire them to modify the structure to correct the deficiencies, but I need to conduct some discovery on this myself. I don't know in any detail. (b), (c) see a above.

65-10(a) Yes. See Joint Intervenors brief excepts 89-98, cited above under 65-4. I am not sure what"properly performing its intended function" means in Applicants' terminology, it seems vague and quite possibly misleading as to the meaning of a response. Therefore I object and request clarification of the meaning of this phrase throughout Applicants' interrogatories on Eddleman 65.

(b)(c) see above.

65-11(a) not known, b,c, see (a); see also 6599 response above

65-12 (a) I have not completed checking into the Farley plant concerning this. I am filing discovery on it. (b) (c) (d) see a. Note re (c) I would not be surprised if NRC had issued a license to operate Farley despite serious flaws in its structure or design. Look at Diablo Canyon, which was well on the way to a full operating license and had a fuel load/low power test license when the horrifying defects (over 100 found so far) in its seismic design were found inadvertently.

65-13(a) not known, see response to 65-12 (a) above. B,c, see a.

Re Eddleman 75: I consulted no one. No experts, yet. Info given below re what supports the contention.

75-1(a) Yes, they may be. See ER 3.4.2.11 on p. 3.4.2-9 see also ER 3.4.4 (b) If the RHR and auxiliary cooling (c) systems are blocked (e.g. by hydrilla, clams corbicula sp. or other corrosion, scale) or rendered inoperable by leaks or equipment failure, then the condenser would be required (and thus the cooling towers) unless CP&L was willing to vent radioactive steam to atmosphere, which in my view is not a safe shutdown. (c) N/A

75-2. This is another quiz type question ("your answer should include"), which I cannot answer in all the detail asked (each and every type of biocide to which each and every type of marine growth will possibly prove resistant). I believe corbicula sp is one such. Corbicula larvae can pass through the screens and enter the Harris cooling system. As to the mechanisms of acquiring genetic resistance to biocides, I cannot specify such. Generally, genetic mutations and interchange of genetic material which itself has considerable variability, would be means of acquiring resistance to biocides. Another possibility is marine algae, though it appears to be dark enough under the cooling towers that such would have difficulty establishing themselves except on the top side of the spray slats and on the piping above it; nonetheless, dead algae could move into the spray or fall into it or be knocked off by it, and could then be transported to the condenser and foul or corrode it, especially as the dead algae decompose

75-3(a) Yes. (b) the ER addresses use of chlorine to kill algae only. No mention is made of corbicula sp. or other forms of marine growth, many of which may be resistant to chlorination because they live in sea water or have the ability to live in even saltier water. Whether the condenser is properly grounded is a matter I have not been able to find yet in the FSAR. Grounding is needed to prevent chemical corrosion, and improper grounding will accelerate chemical corrosion

around the attachment points of any organisms (e.g. corbicula sp or barnacles or mollusks) growing in the condenser or circulating water piping. These organisms can live on algae which the chlorination system has killed, or live algae resistant to chlorine which the system is circulating. It is clear that Applicants have failed to take such appropriate measures at their Brunswick plant (condenser and RHR) as shown by the failures and ruptured heat exchangers found in April and May 1981. These are referred to in FOIA-82-261 (I believe that's the number) from J.M. Felton NRC to R. Udell, Critical Mass; I believe there is more detail in the LERs on these events to NRC, which Applicants possess, and which I think I have copies of, but have not yet located. (c) N/A It is also unclear whether Applicants take due regard of oxygen in the CWS (spraying oxygenates water) and light which can nullify the biocide ability of Cl_2

75-4(a) The measures are insufficient to prevent entry of material that could nourish marine growth, e.g. algae living or dead, decaying bits of organic matter, etc., so I think the answer is Yes. (b) ER section 3.4.2.7.2 states (p. 3.4.2-5) that dredging of the pond (holding pond for cooling tower blowdown) may be required to remove these solids that do accumulate there. Thus, solids accumulate in the cooling tower blowdown; they must have been in the circulating water system to get into the blowdown, and since Applicants claim they are minimizing corrosion, most of these solids must have come from intake. According to ER § 3.4.2.8.3 the traveling screens are full of 3/8 inch square holes (algae and debris of a fine sort that clams, etc, can live on can easily get through that). The fine screens, used only when traveling screens are down for maintenance, have the same size openings (1/8" wire on 1/2 inch centers gives 3/8" gaps). There is no indication the intake water is filtered or processed in any way which would prevent algae and organic debris finer than 3/8" in diameter (and some larger, if flexible)

Chlorine
from entering the CWS. Chlorinte in 30-minute bursts will not necessarily kill clams, but may kill ~~X~~ food for them. Corbicula have lived in condensers at other nuclear plants, but I cannot readily (I've been looking) locate the information used in preparing this contention, or other documents including this fact. (c) N/A.

75 - 5 (a) I am not familiar with Applicants plans, if any, to monitor the Harris reservoir for introduction of Asiatic clams. (b) (c) see (a); I am pursuing discovery on these matters. I note that detecting corbicula, etc, is not the same as preventing them. The spread of corbicula appears inexorable in climates like ours around the Harris site.

75-6(a) Yes, as far as grounding and buildup of marine growth such as corbicula are concerned, I don't believe Applicants' measures can prevent it or hold it within acceptable limits. All the FSAR says is that a cathodic protection system and a coal tar coating are provided. Nothing is said re the grounding of the aluminum bronze in the condenser, the grounding of the other metals and piping of the condenser, whether these metals and piping contact aluminum bronze directly, what aluminum bronze alloy is in the condenser, who conditions it corrodes under, and so on. All there is in the FSAR (the ER appears to be identical) is one statement that the main condenser has "a cathodic protection [illegible] which "is provided". The nature of this system, its capabilities, etc, the expected corrosion rates, monitoring of corrosion in the condenser, and so on, do not appear to be discussed in the FSAR and its first 3 amendments, which I have. (FSAR 10.4; ER 3.4) (sentence noted above re cathodic protection is identical in original FSAR and 3 amendments: p. 10.4.1-3 under section 10.4.1-2 (last sentence, in original FSAR). There is also a claim in the FSAR, naked, section 10.4.5-2 at page 10.4.5-2, that"materials in the cooling water system will resist corrosion."

That's all it says. No figures are referenced, no further info is provided. No types of corrosion are analyzed, no nothing. The amendments don't change this part, as far as I've seen. I am frankly surprised that Applicants have not provided more information on this point. There is no way to tell if their measures are appropriate when they are not described, but I think it is reasonable to assume they are insufficient when they are not described or analyzed. (c) N/A

75-7(a)Applicants' provision for pressure changes in the main condenser does not seem to be specified in the FSAR or ER, except as to limiting back pressure during steam dumps into the condenser, which, according to the FSAR amendments, can handle up to 40% of the full steam output before steam would have to be vented to atmosphere (actually, the table, FSAR 10.4.4-1, shows that 6 of 14 dump valves each allowing 705,000 lb/hr, feed the condenser, and 8 feed to atmosphere. Thus, the percentage is about 42.857% to the condenser if all 6 of these valves are fully opened. This percentage which the condenser can allegedly handle has risen from 35% to 40% in FSAR amendments since the original FSAR, with little or no explanation. I see no indication that Applicants take pressure changes into account other than having instruments to block the steam dump valves, and considering flooding of the condenser. (b) see (a): Applicants don't appear to have taken this into account as stated in the FSAR. (c) N/A. Please note, this question is confusing because Applicants have not provided sufficient info in the FSAR to clearly answer it. I am conducting discovery on these matters ASAP.

RESPONSE RE EDDLEMAN 80

General Interrogatories: I consulted no one beyond info given in original contention. I relied on studies which show incomplete mixing is normal, rather than the nearly complete mixing assumed by models such as the ERCs. However, I cannot as yet locate the materials used to prepare Eddleman 80; I have moved since preparing the contentions (immediately thereafter, within the next 2 weeks and 3 days) and may have lost these materials. At any rate, I have not yet located them, though I have searched my SHNPP files and the boxes containing materials used in preparing contentions.

I have as yet no expert witnesses, and will identify documents when located. My objections to G.I. #2 and #5 are as stated above under General Interrogatories prior to the answers to specific interrogatories.

80-1(a) Yes. These models, according to FR 5.2.2, are actually described in ER 6.1.3. I presume that section is what you meant. (b) In section 6.1.3.2 reference is made to a regulatory guide 1.XXX, which I presume actually has a number, and is dated 9/30/77, re Atmospheric Dispersion models for potential Accident Consequence Assessments at Nuclear Power Plants". This section goes on to say that one of three equations was used, but under nonstable wind conditions it does not specify which of equations (2) and (3) were used. The long-term model (6.1.3.2.2) is even more unclear, saying nothing about how the probabilities f_{ijk} and factors $DEC_i(x)$, $DEPL_{ijk}(x)$ and $RF_k(x)$ are computed for each distance x. Neither of these models take rainout or non-gaussian dispersion, into account.

Further, I understand that there are recent studies of dispersal in the wake of towers and buildings which show that these models do not give actual dispersion as observed in reality. I have not yet identified or obtained such documents. (c) N/A

80.2(a) Yes. See response to 80-1(b) above. (b) the models do not mention rainout at all. It does not enter into the equations given, which are generally Gaussian dispersion equations. (c) N/A.

80-3(a). I am not sure what the most limiting scenario is. I think it would be a radioactive release which is either directly into a rainstorm or snowstorm which carries the particulates released directly to earth in a small area, combined with wind patterns which deliver most or all of the radioactive gases from the release to the same small area, particularly those decaying into non-gaseous forms. Another case which might be the most limiting scenario is a thunderstorm which suddenly creates a downdraft and driving rain into a plume (more like an "invisible balloon") of radioactive gases and particulates released, driving them down onto a small area. The most limiting case for the area would be one in which it contained a large number of persons outside unprotected, e.g. a park full of picnickers, etc, including many small children and infants (for the thunderstorm), or onto a heavily populated area where nuclides will be taken up by foot traffic, air intake of cars or homes or buildings, etc, for example, a drive-in movie parking lot in winter, the storm having arrived after the movie began. I am not confident I can specify TH E most limiting scenario Applicants should have considered; for example, this direct delivery of radionuclides could be to a farm, Dr. Wilson's orchard, a garden or community gardening area, a day care center, a hospital, a prison, a school and so on. I have not computed which of these gives the greatest risk. I think I am not obligated to do Applicants' work for them or carry their burden of proof, though I will assist them in identifying seenarios such as the above.

(b) Obviously. (c) the model of the long-run doesn't look at any such scenarios. The model for the short-run shows no adaptation to such, and does not include rainout. The inadequacy is basically that the model does not treat the situations described above.

(d) N/A.

80-4(a) I don't know what these Reg Guides state. Compliance with a regulatory guide, in and of itself, would not prove anything concerning this contention, since it is not about the Reg. Guides, but about the adequacy of Applicants' modeling to deal with rainout and non-uniform (non-Gaussian) dispersion. (b) N/A, see (a) above (c) ditto to (b).

80-5(a) I do not recall if Reg. Guides 1.109 or 1.113 or both were referred to in formulating my original contention 80. They are not referred to in the contention. I believe I may have had a copy of Reg Guide 1.109 at the time I formulated this contention, but cannot now locate such. In any case, I do not believe these guides were approved by the Commission itself, but by NRC Staff, and I do not know how deficient they may be. If they do not take into account non-dispersed, nonuniform dispersion, and rainout transport of radionuclides, then they are inadecuate under this contention. (b) See response to (a) above and to above interrogatories, particularly 80-1(b), 80-2(a), and 80-3(a)(b) and (c) and 80-4(a). (c) N/A

RESPONSE RE EDDLEMAN 132. General Interrogatories: I consulted no one. I used only the contentions of CESG and Palmetto Alliance in the Catawba case, and my knowledge that NUREG-0737 and other TMI reports point out that their are not unambiguous water level indicators in PWRs and that this was a major cause of the TMI accident since operators didn't know directly what the level of water in the reactor vessel was. No exhibits yet, not witnesses, I have not got copies of these documents, they're in the Raney Library (LPDR Raleigh) and include the Kemeny Commission Report, Rogovin Report, and NUREG-0737. I did not note pages on which I identified this information, and don't know what pages it is on, though it is common knowledge that water level indicators are not in PWRs and Applicants stipulated to this part of Eddleman 132.

132-1. No. I have not yet reviewed the design of the PVLIS. However, I understand that it involves only about 3 pressure tubes, which are not protected against corrosion, blockage, crushing during an accident, and which has an error of several feet and cannot detect water pressure at points away from where it reaches (e.g., water level or pressure in parts of the core where voids or partial melting or flow blockage may have occurred). This seems clearly inadequate. I have ordered NUREG/CR -2628 but it has not yet arrived, so I will have to analyse this further to provide more details. A system unable to tell if the core is covered one foot or uncovered one foot, which cannot tell if part of the core is a void, and which cannot be fully protected from blockage, is clearly inadequate.

132-2. No. I don't trust Applicants or Westinghouse as far as nuclear safety goes. I want to fully review this PVLIS system before making any such decision, as I believe it has at least the inadequacies stated above in response to 132-1. I think a direct reading of water levels in at least 9 parts of the core (spaced out like a tic tac toe grid) would be required to really know the water level inside the reactor vessel and the core well enough to prevent partial or wholescale meltdowns. I don't even know for a fact that Staff has accepted this device.

RESPONSE TO 83/84. I consulted no one. I relied on the EP, basic chemistry, and my memory of an article concerning the interaction of chlorine and urea in swimming pools, leading to formation of $NHCl_2$, NH_2Cl and NCl_3. Since the chlorination level in pools is similar to that specified for Harris discharge (0.5 to 1 ppm) and Harris will use up to 3 to 5 ppm chlorine in its cooling water system, in which hydrazine is expected to be present as well as ammonia, I reasoned that the same or similar reactions could occur when these chemicals

I also relied on the fact that chlorine interacts with organic compounds such as phenols, dioxins, biphenyls, and many others which are present in nature (dioxins nonchlorinated) or discharged into rivers like the Haw and Cape Fear. I have a report of Haw river monitoring from the Corps of Engineers, and I believe another from UNC-CH, but cannot locate either now, though I have searched; these reports identify many heavy metals in the water, as set forth in my contentions 83 and 84. The organic chemicals have not been fully analyzed yet, to my knowledge, in Haw River water or Jordan Dam water. Ammonia and chlorine are known to form complexes with metal ions, which could induce toxic effects in the more soluble form of these complexes; many of these metals are known carcinogens, e.g. Cr, Pb, Cd. To answer (1) on page 39 of Applicants' interrogatories, it appears that Table 3.6.2-1 has been deleted from the ER in Amendment 5. If so, I have no information on what chemicals Applicants will discharge into the Harris cooling lake, and will have to conduct discovery on this matter. However, the above-named table in earlier versions of the ER identified chlorine, hydrazine, ammonia, sulfates, and oil/grease. Chlorinated hydrocarbons (chlorine + oil, grease) are carcinogens. Metals such as those listed above and set out in original contentions 83 and 84 and the revised version presented at the prehearing conference are carcinogens, and can be moved to or into living beings by interaction with chlorine which increases the solubility of such metals in many cases, and can ionize such metals and make them more reactive. (2) See response to (1) above. The formation of carcinogenic compounds may precede discharge, particularly for interaction of chlorine with ammonia and hydrazine forming NH_2Cl, $NHCl_2$, or NCl_3. I have not analyzed all reaction products of such chemicals, and I think it would be silly to list every possible chlorination of every hydrocarbon chain found in diesel fuel, grease, and oils.

These hydrocarbons are known, and their chlorine compounds are known, chlorine replacing one or more hydrogens on a hydrocarbon. I also believe that Harris sewage will release urea into the lake, forming $NClH_2$, $NHCl_2$ (3) the chemical processes in the Harris plant which produce each NCl_3 such chemical are: (a) chlorination (b) use of ammonia and hydrazine to maintain pH or oxygen scavenge, operation of the turbine building (which I am not sure is properly a chemical process, but which will discharge 1 million gallons a year with .05 ppm hydrazine and 0 to 1 ppm ammonia; the sanitary system chlorination, releasing 4.5 million gallons a year, with chlorine up to 0.5 ppm; the secondary system chemical clearing solutions' use, which is said to discharge 20 million gallons per year after(each)plant startup, with 50-90 ppm hydrazine delivered for treatment and an "impossible to predict" concentration of hydrazine thereafter (all from TAble 3.6.2-1 of FR); the cooling water blowdown amount can be calculated variously from the ER. Page 3.4.2-1 seems to imply blowdown of 106 cubic feet per second (cfs) which is about 49000 gallons per minute per unit. Table 3.4.2-3 on page 3.4.2-13 says maximum cooling tower blowdown will be 9600 gpm per unit. If the blowdown averaged 6000 gpm and Harris operated at a 60 to 80 percent availability factor, this would be about 2 to 2.7 billion gallons per year, at chlorine concentrations said to average 0.2 ppm. That is in decent agreement with the 5000 gallons of chlorine that the ER says elsewhere will be discharged yearly.

Another chemical process, which the warmth in the Harris plant CWS would encourage, that produces carcinogens, is the breakdown of organic matter releasing methane which can then react with chlorine to form chloroforms (chloromethanes),which are known carcinogens. (4) Any concentration above 1 ppm chlorine can do this; below 1 ppm, I don't know; I have not determined concentrations of the other chemicals necessary for such reactions to proceed; chlorine will reach 3 to 5 ppm in the CWS twice a day, and to reach that

concentration, it must be injected in a higher concentration, possibly as high as 100%.

83/84 -2(a) I have not analyzed the magnitude of this risk, as asked in (1) or (2) hereunder. (b) none, so far, since I haven't analyzed it.

83/84-3 (1) I have not computed this amount, and am not able to without actual testing of dispersion from the Harris lake into and from down the Cape Fear River, which I do not believe I can afford to undertake. I have not established concentrations of each such chemical in food chains (a) in the river or (b) off the NC coast. The concentration factors can be substantial, however, e.g. 10^5 from water to organism fat for most chlorinated dioxins, and approximately a factor of 10 for each additional step in a food chain or web above the first. This factor of about 10 concentration is common for many chemicals, although I have not analyzed Cape Fear river organisms or shellfish or other organism off the North Carolina coast for such or established myself what the concentrations are.

(2) The risk is greater to a swimmer who swallows water from the lake or has open cuts.

83/84-4. In addition to the above-referenced analysis, the chromatography conducted for Haw River Assembly is believed to show a large number of peaks (approximately 100) showing organic chemicals. The Haw feeds into the Cape Fear. While it is not practical or possible for me to provide a list of every chemical (organic, dye, phenol-based) in the Cape Fear that becomes more carcinogenic after reactions with chlorine, ammonia, and hydrazine, obvious such are non-chlorinated dioxins, chlorinated dioxins with a few exceptions (e.g. 2,3,7,8 TCDD, which is about as carcinogenic as it can get); almost any phenol-based chemical becomes more carcinogenic when chlorinated as chlorination increases its solubility and its ability to interact ionically -- thus, its ability to be carried into living cells and nuclei, and to interact chemically with genetic materials, is increased. I do not know the exact means

of such carcinogenesis. Hydrazine and ammonia can react with phenol-based materials (and many dyes) to form azo compounds, a number of which are carcinogens. (2) Most of these reactions would proceed independently of the joint concentration of chlorine, ammonia, and hydrazine. For example, chlorination depends on the concentration of chlorine. I have not analyzed the cross-effects of the joint concentrations of chlorine, ammonia, and hydrazine on any of the above reactions. (3) I'm not sure how specific one needs to be. Chlorination and ammoniation and reactions with hydrazine such as I am concerned with involve usually the replacement of hydrogen with either Cl, NH_2 or NH. These reactions can also involve oxygen atoms in the ring structures of phenol-based and other organic chemicals. I haven't got a chemistry text in my possession which gives the step by step, radical-by-radical description of these reactions, but they do proceed, which is the key fact. As noted above, it is not practical to list every carcinogen which will result; indeed, some chemicals will likely result which are carcinogens but which have not yet been established to be such; however, in addition to NCl_3, NH_2Cl, and $NHCl_2$, the dioxins noted above, and all other chemicals noted above in responses to this interrogatory, would become more carcinogenic after at least some reactions with Cl or ammonia or hydrazine, with the exception of 2,3,7,8 TCDD which is about as carcinogenic as you can get. Obviously, then, e.g., 2,3,7 tri chloro DD (and 2,3,8 - and 2, 7,8, and 3,7,8- ditto) are such chemicals. A list of all of them just isn't practical to produce, as there are over 70 dioxins alone involved. I will attempt to supplement this response with listings of chemicals when I identify such as compounds that can or will become more carcinogenic after reaction with chlorine, ammonia, or hydrazine.

Decaying organic matter + Cl_2 or Cl ion can yield carcinogenic chloromethanes.

83/84-5. The basic method that would be adequate would be a frequent sampling of water and sediment (sediment will be washed out from the Jordan Dam into the Cape Fear to prevent siltation buildup) after which all such samples would be subjected to both gas and liquid chromatography of sufficient accuracy to identify all such chemicals at concentrations of 10 ppb or up. For dioxins, the testing methods at state of the art are said to be able to detect concentrations in the parts per trillion range, which is appropriate given their extreme toxicity/carcinogenicity. However, I do not know these methods for testing for dioxins in any detail. Obviously the resolution and sensitivity of the chromatography are critical. Where chromatography is not sufficiently sensitive, other techniques, such as infrared absorption analysis, NMR spectroscopy, etc, may be required to achieve identification of each chemical down to the 10 ppb level.

83/84-6. The EP doesn't mention this matter. Nor do Applicants' water quality reports to EIA (Form 767). The State doesn't monitor most of them, nor does the Corps of Engineers. I am not sure what EPA has done about this. I have inquired of EPA by telephone in July 1982 re what analysis of this matter EPA might have done, with respect to the Harris plant, and received several responses (also oral) which stated, None.

83/84-7 (1) By "mobilize" I mean to ionize, change the ionization state of, or free from a complex in such a way as to make the metal more biologically or biochemically active (via increased solubility, increased reactivity, increased chemical activity etc) so that the metal can react with living organisms. (2) chlorine; possibly ammonia and hydrazine; other chemical discharges not analysed yet for this ability. (3) In addition to the metals listed in Eddleman 83/84

and the original Eddleman 83 and Eddleman 84 (possible excention of mercury), we have silver, germanium, gallium, antimony, osmium, and the others listed in the monitoring reports referenced above (I think one version Eddleman 83.84 lists virtually all of them,) but I can't locate it now) (4) cannot list all such chemical reactions, basically Cl_2 or Cl ion plus metal or metal complex yields metal chloride, metal ion, or metal ion in higher charge state (e.g. Cr^{++} + Cl yields Cr^{+++} plus Cl^-). I am not aware of a minimum concentration for these reactions, although the reaction rate depends on concentration. In sediments, the concentration will be higher for metals. Another possible mobilization route is via chloramine which could form complexes with metals. These reactions generally lead to a (metal)$(NH_3)_x$ complex with x from 2 to 6, which can exist as a chloride or as an ion.

(5) This interrogatory is perhaps overly broad, but actually, each and every living creature that uses water in its metabolism (especially those that filter water in feeding, or drink water) will more readily absorb such chemicals (metals) once they are mobilized. That means all of them though I don't have a list. Humans, fish, clams, oysters, algae, plankton, are all included in this. I think it unduly burdensome to require me to list every such species, since these are available from references and research, and there is only one of me, and the information appears to be available to Applicants from sources other than myself. I have specified that every water-using organism would absorb such chemicals more readily; also, anything that eats such organism or ogramisms which have eaten other such organisms will concentrate the metals better because of (1) the larger uptake into the first organism that ingested the mobilized metal and (2) the greater chemical reactivity of the metal as mobilized.

To the extent I am being asked to list information Applicants have available elsewhere on the identity of all species ink the Cape Fear and the ocean off the coast near the Cape Fear, I object simply because (1) Applicants can get this information elsewhere (2) it's unduly burdensome -- I can't spend the time to find all such species and type them out (3) I've answered the substance of their question. I wrote this response about 8 pm 3/21 and therefore will not be able to locate Applicants' attorneys to negotiate it before filing, but I'll askx them about it 3/22.

83/84-8. Applicants don't mention metals in the FR other than those discharged from Harris, to my knowledge. I am pursuing discovery as to any such analysis Applicants have done either prior to 5-14-82, prior to 7-15-82, or to date.

UPDATE re 83/84-4: Table A-2, p.29 of EPA-600/2-77-023k, Chapter 11, gives the following additives used in fiber production: Stiblene; phenyl coumarin derivatives, alkylated phenols, p-cresols, long-chain alkyl derivatives of hydroxy benzo phenones, 2-methyl 5-vinyl pyridine, 2-vinyl pyridine, p-vinyl-benzene sulfonic acid, sulphocinamic acid, polyoxyethylenex attached to aliphatic hydrocarbon chains. These are "Typical Additives used in (synthetic) fiber production. I borrowed this document but will supply Applicants a copy of this table. Table A-1, Fiber raw materials, lists other phenyl chemicals relevant. I will supply Applicants this table also Allied Chemical, Moncure NC, Du Pont at Cape Fear and Kinston NC, Falk Fibers & Fabrics at Yanceyville and Fuquay-Varina NC, Kayser Roth at Creedmoor, NC, Texfi Industries as Asheboro, NC, and Wellington synthetic fibers, Pilot Mtn, NC, as well as Rohm and Haas at Fayetteville NC and The Osterneck Co. or Lumberton NC are listed as producers of fibers which use these additives xx (Table C-1 ibid)

I believe the Governor's Waste Management Board, of which CP&L VP Graham is a member, has data on hazardous waste production in NC

P.341 of EPA-600/2-77-023g Vol 7, Organic Dyes and Pigments Industry, identifies Ciba-Geigy Corp Greensboro NC as a maker of dyes. The description of its products (p.272) is very general. Table A-1 lists the raw materials of dyes, pp 163-68. I am providing Applicants copies of these. The entire document is available from EPA, but since I borrowed the copy I am using, I cannot make it available to Applicants. It describes in some detail the reactions used in making dyes, and lists thousands of them (it appears) in Appendix B. The discharges of dyes into the Haw River are common knowledge.

UPDATE Re Eddleman 65: I have now looked at FSAR 3.8 and figure 3.8.1-2 thereof, describing basemat rebar layout. It is not clear from this layout where in the height of the 12 foot thick mat the radial rebars are. The fit at the base of the walls is not on this diagram in any detail. I have not compared this design with Callaway, Wolf Creek, or Farley.

UPDATE Re Eddleman 22-A response: 22-A-4(b) specifically.

In preparing this response I did not notice a note I had made detailing a computation of nuclear waste disposal costs based on the figures given in the Court of Appeals' (DC Circuit) opinion in NRDC v NRC (1982) at page 67 of the opinion of Judge Bazelon. These figures are (for no plutonium or uranium recycle) per 1000 MWe reactor, $71 million capital cost plus operating cost of 0.4 to 1.4 mills per KWH for high level waste (spent fuel) disposal. Converting this for Harris at 900 MWe, we have a capital cost of $63.9 million which at 20% fixed charge rate is about 12.78 million dollars a year to pay for the capital investment in waste disposal. Dividing this by CP&L's estimate of 4.6×10^9 kWh per year for Harris 1 (6-30-82 PURPA filing, 292.302(b) items 1-24)(with NCUC) which Applicants filed and thus possess, we get right at 3×10^{-3} dollars per kWh, or 3.0 mills. Adding in the 0.4 to 1.4 mills operating cost gives 3.4 to 4.4 mills/kWh. To this we must allow for uncertainties, for example, the capital cost of reprocessing plants are quite high, and Dr. K.Z. Morgan has stated, if my memory serves me correctly, that the Barnwell plant (AGNS) for reprocessing could require $250 to $500 million in additional equipment to prevent unacceptable releases of radioactive gases to the environment during reprocessing of spent nuclear fuel. Thus, x recycle options can be expected to cost more than the option costed out by Judge Bazelon above from the evidence in NRDC v. NRC. The cost of nuclear waste disposal I believe goes to 22-A(4)(b). I believe Applicants have the decision; if they don't I will make available a copy of p.67 of it.

STATE OF NORTH CAROLINA

COUNTY OF ORANGE

Today Wells Eddleman appeared before me and affirmed that the responses he is filing to-day to Carolina Power & Light interrogatories are true to the best of his present knowledge except as to matters therein stated upon information and belief, and he believes those to be true.

Wells Eddleman

This 21st day of March, 1983.

Hilda V. Clapp, Notary
4424 Sunnyset
Durham NC 27705

My Commission Expires 11-13-84

STATE OF NORTH CAROLINA

COUNTY OF ORANGE

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This 21st day of March, 1983.

Hilda V. Chappell, Notary
4424 Sunnyset
Durham NC 27705

My Commission Expires 11-13-84

UNITED STATES OF AMERICA
NUCLEAR REGULATOFY COMMISSION

In the matter of CAROLINA POWER & LIGHT CO. Et al.) Dockets 50-400
Shearon Harris Nuclear Power Plant, Units 1 and 2) and 50401 O.L.

CERTIFICATEOF SERVICE

I hereby certify that copies of WE Response to Applicants Interrogatories (First Set) Including 22A, 22B, 41, 45, 65, 75, 80 + 83/84

HAVE been served this 31st day of March 1983, by deposit in the US Mail, first-class postage prepaid, upon all parties whose names are listed below, except those whose names are marked with an asterisk, for whom service was accomplished by _____

Judge James Kelley
Atomic Safety and Licensing Board
US Nuclear Regulatory Commission
Washington DC 20555

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