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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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 ASLBP No. 82-468-01 OL

JOINT INTERVENORS' RESPONSE TO APPLICANTS'
INTERROGATORIES OF 6-30-83

This response is filed (and will be hand-delivered to CP&L legal dept in Raleigh, H. Carrow or S. Flynn) under an order we are advised by telephone has been issued requiring filing of same 8-31-83. Samantha Flynn was informed of the Wed 8-31-83 pm delivery date 8-29-83.

ANSWERS TO GENERAL INTERROGATORIES of 6-30-83

1(a). Response was prepared by Wells Eddleman and Travis Payne. If other individuals are contacted for purpose of answering these interrogatories (unlikely due to very tight response schedule of 8-24), we will answer or object at the point info provided by such person is used

(b) See (a); (c) See (a) above; absent a showing of Applicants' inability to obtain facts or opinions on the same subject by other means, Joint Intervenors believe this information is irrelevant.

2(a) All known info for such will be supplied. Please note we do not possess most of the documents cited previously or here. Most of this info is NOT in the files of Wells Eddleman (that statement in Travis Payne's letter of 8-16-83 to the Board was a misunderstanding).

(b) See specific responses. We may cite another response which gives all the info we have, rather than retype it all, in view of the fast response required 8-24-83 by the Board.

3(a) UNC Health Sciences Library, Chapel Hill, NC. (b) Specific documents available therefrom are cited where referred to.

SPECIFIC INTERROGATORY RESPONSES

II-51(a) These are in the record of the July 1982 special prehearing conference held in this case. You can look them up as easily as we can; Wells Eddleman has not located a list now. They are the ones Joint II superseded.

(b) Wells Eddleman does not possess the information in the form requested; neither does Travis Payne; as to CCNC and CHANGE/ELP, we don't know now. We presume you mean each intervenor, not Joint Intervenors, since the original contentions were not formulated jointly.

(c) Not applicable. See (a) and (b) abbve. The references cited in Joint II are responsive to this interrogatory but you already possess them; they have been amplified in response to past interrogatories by Applicants which you also x possess.

(d) Not applicable. See (a),(b) and (c) above.

II-52(a). Please read the contention. You ask only about each distinct reason "provided in Joint Contention II".

(b) See II-56,58 and 59 below; see basis of Eddleman 37, 5-14-82; we do not possess this information in the form requested and it is burdensome to dig it out of massess of documents, many of which we do not possess. However, one additional document is Radiation and Human Health, by Gofman, 1981, which we have cited extensively. Others are the MSK studies, Gofman's own analysis of the MSK data published in Health Physics (cite not located now by W.E.) See II-54 below for some of the MSK studies (at least one, Hanford 2, not located yet in libraries or our documents).

II-53(a) Wells Eddleman, Travis Payne, and other persons (no listing of names possible) who have provided information to us over the years of our experience with nuclear issues related to health effects. While it is not possible to tease out a complete list from our memories, one such is John Gofman. Another is "Wes Woe" but this non-witness expert has only been informally consulted and was not consulted with respect to this or any other specific interrogatory response; information provided by "Wes Woe" previously was used, W.E. believes, in answering some previous interrogatories. The identity of a non-witness expert informally consulted is protected under Ager and the Board's 5-27-83 Order. See Wells Eddleman's response to General Interrogatories on 75 and 83/84 of 4 August 1983, which we incorporate in full as if set out here as our statement of objection to providing identity of "Wes Woe" or any other nonwitness expert informally consulted. You specifically do not ask for organizations, so we identify none, though some have provided information which we relied on in our responses. WE does not recall if any organization provided information specifically to answer questions as given in JI May 16, 1983 response. (b) We do not possess the info in the form requested. Eddleman drafted and Payne rewrote or in some cases wrote (in consultation with Eddleman) the May 16 responses. To the best of our recollection, CHANGE/ELP and CCNC made no modifications to the responses (no representative of them contributed changes to the draft Eddleman circulated to Joint Intervenors Where Gofman or "WW" is mentioned, their info contributes.

II-54. M-S-K studies: T.F.Mancuso, A.W.Stewart, G.W.Kneale, Health Physics 33(5):369-385 (1977) and comments (letter) Health Physics 40(2): 257-258; Kneale GW Stewart AM and Mancuso TF, "Hanford Radiation Study 3, British Journal of Industrial Medicine 38(2):156-66 (1981); we have not located the Hanford Study "2" reference. The first cite above is Hanford 1.

See also, by Alice M Stewart: Cancer Effects of Low Level Radiation, NY State Journal of Medicine 80(1) 32-35 (1980) and at 137-145 in Advances in Medical Oncology Research and Education Volume 1: Carcinogenesis. This book is the 12th international cancer congress proceedings edited by GP Margison, published by Pergamon Press, Oxford (England) 1979; and article "On Cancer and Radiation", Bulletin of the Atomic Scientists 36(9):60 (1980).

We also refer you to Gofman's reanalysis of the Mancuso Hanford data, also published in Health Physics (cite not accessible; we believe you can find in the indexes to HP as easily as we can).

There is a note on an unpublished work of Stewart's in an article by GB Hutchinson, Health Physics 37:207 (1979) but we have not examined the unpublished work.

See also KZ Morgan, Cancer and Low-Level Ionizing Radiation, Bull. At. Sci. 34(7):30-41 and J. Rotblat's article immediately following it (34(7):42-) and Morgan's correction Bull.At.Sci. 34 (10) at 58.

See also Kneale, Stewart and Mancuso: IAEA Symposium on the Late Biological Effects of Ionizing Radiation (Vienna 1978) (best reference we have).

II-55(a) We do not have the information in the form requested. One source (found later during checking of sources for these responses) is KZ Morgan, Am Industrial Hygiene Journal, 36(8) at 570 (1975). This information is only tangentially relevant to the definition of latency period given in our response to II-3 on 5-16-83.

(b) The information is not available in the form requested. Wells Eddleman did not make specific notes on it but recalled the information and used it in preparing the draft 5-16 response. See above for cite of a source found later. We believe the answer you

quote on pages 6-7 of your 6-30 interrogatories re latency period is common knowledge in health statistics.

II-56. Please first look at the responses of Wells Eddleman re 37B (1st and second rounds), referenced (as to 1st round) in response to II-2(a). We refer to The Nuclear Worker and Ionizing Radiation , see response to II-8, and to Bertell's article in the Journal of Surgical Oncology, 9:379 (1977), and others as cited in 37B responses. The second round responses on 37B give some fuller cites. We believe you can look up the information as easily as we can, and we are pressed for time.

II-57. The "failure to achieve full potential" is a form of genetic damage as we use the term in response to II-9. We think it was put forward by H. Mullker, Nobel Prize-winner for work on X-ray induced mutations, but can't find the cite. The concept is that due to genetic damage (e.g. from radiation)(for which there is no threshold -- Muller's experiments established this), the organism cannot function as well as if it hadn't been damaged. Since many achievements of organisms are cumulative and depend on interaction of many genes, genetic damage tends to limit these achievements, and thus the full potential for, e.g., intelligence, health, well-being, physical fitness, efficient operation, resisting disease, etc. Damage to genes which, e.g. (following the list in the previous sentence) reduces the ability of the brain to form connections or process or store information, or reduces the ability of the body to fully develop and maintain itself, or reduces the ability to function as well as possible e.g. in digestion, nerve function, hormone balances, bone development, muscle development, or other more subtle aspects, which e.g. through minor damage to shaping of bones or attachment of muscles or reduction of muscle or cardiovascular function or increased allergies or reduced ability to

heal or repair damage (reducing physical fitness, which then makes many other diseases and problems more likely, and reduces the body's overalll capacity), impairs efficient enzyme processes, or orderly and coordinated functioning of the body's many interrelated biological systems (reducing efficiency), or impairs the dvelopment or function of the immune system, reducing the ability to resist disease.

Since these failures to reach full potential are random if caused by radiation (provided exposure to radiation sources were random), their effect is most insidious because it is extremely difficult to detect them. They "look" just like any of the ordinary conditions or minor infirmities many people have, yet they are caused by radiation damage.

We will supplement this answer when we locate the cite. Linus Pauling has also mentioned this effect, we believe, but we likewise have no cite on that accessible.

II-58. Bross, IDJ with Viadana and Pickren, Cascade Theory of Metastases and its Clinical Implications, Proc. Am. Assn. Cancer Research 16(Mar):1, 1975 (see also, same authors, not as related we think, though we have not reviewed: Generalized Metastases Occuring Directly from Primary, J. Chron Diseases 28(3):149-59 ('75), and Metastatic spread of Myelomas and Leukemias in Men, Virchows Archiv Abteilung (German) 365(2):91 (1975).

Bross with Nataraja,N, Genetic Damage from Diagnostic Radiation, JAMA 237 (22) 2399-2401. Same authors, Exposure of either parent to Diagnostic Radiation Prior to Conception Produces Serious Genetic Damage in the Child, Proc. Am. Assn. Cancer Research 18 (March):1, 1977

Bross alone, letter on Health Hazard of Nuclear Power, American Scientist 65(1):16, 1977.

See also letter in Science, 195(4282) 933-934, 1977, by Bross, The Coming Battle.

Bross, Dose Response Relationship in Radiogenci Breast Canc_er, J. Natl Cancer Institute 60(4) 727-728 (letter) 1978. See also B ross, T Nemoto et al (other authors not noted by WE) Differences in Breast Cancer Between Japan and US, J Nat Cancer (Inst) 58(2): 193-197, 1977. See also (ref 1978 letter JNCI above in this paragraph) Viadana, E: Oncology 3 5:87,114 (1978) and Proc. Am. Assn. Cancer Research 19:2 (1978)

Bross IDJ, Ball & Falen, Dosage Response Curve for the One Rad Range -- Adult Risks from Diagnostic Radiation. Am. J. Public Health 69(2) 130-136. See also Proc. Am Assn Cancer Res 20(Mar):4, '79.

Bross alone, Protection of Public Health vs. Radiation Hazards, letter, Am. J. Public Health 69(6) 609-610, 1975; Nuclear Wastes (letter) NY State Journal of Medicine 80:11):144, 1980.

Health Effects of Particulate Pollution: Reappraising the Evidence, Am J. Epidemiol (best cite available), by Bross.

Reassessment of Radiation Hazards: Can Health Physics Keep Up? letter, Health Physics 38(3) 429-430

Bross with Nataraja, N, Cumulative Genetic Damage in Children Exposed to Preconception and Intrauterine Radiation. Inv. Radiology 15(1)52-64 and letter ditto p.67

Bross, Low-Dose Radiat'on & Leukemia, New England J. Med tr. 303(4):815, 1980.

Bross, Background Radiation Paradoxes, letter, Health Physics 40(1):127-128 and 3 refs therein.

Bross, letter, Low Dose Radiation Restudy Challenged, Am J Public Health 72 (11):1300,1301, 1981

Bross & Driscoll, DL, Data on Lung Cancer in Radiation Workers, ltr,

J. Royal Society (Med) 75(10):828, 1982 and 4 references therein.

Bross & Driscoll DL, Yale J. Bio. Med 54(5) 317-328, cited to you already.

See also re statistics, American Statistician 36(3):218, 37:12 and 37:1, and 30:171, all by Bross or referring to him.

Where a single page citation is given above, the entire article is referenced but the last page is not known per notes now available. The last page number can be found in the article cited.

II-59: re II-10 see Morgan's box on genetic damage in the 1978 Bulletin of the Atomic Scientists article cited above (Cancer & Low-level Ionizing Radiation). Morgan has also proposed (we have no cite available) persons past childbearing age or who intend to have no more children should be doing the radation-exposing work in the nuclear industry, e.g. jumping into steam generators for maintenance, inspection & repair.

II-18: See also article cited above; See also "Suggested Reduction of Permissible Exposure to Plutonium and other Transuranium Elements", AM IND HYGIENE JOURNAL 36(8)567-575, 1975 Note page 567's comment "There were times when some of my associates were demoted or lost their jobs because they refused to yield to pressures to lower our standards or compromise"(to allow) "unsafe conditions". Entire article is responsive. See also Reducing Patient Exposure to Ionizing Radiation - Benly,Am. Ind. Hygiene J. 37(11) 665-668 and 13 references therein; Radiation-Induced Health Effects, Science 195 (4.2.76):344, 1977 letter; How Dangerous is Low Level Radiation, New Scientist 82(1149):18-21, 1979; Cancer & Low Level Ionizing Radiation -- What is the Misunderstanding all About? Bull. At. Sci 35(2):56-58; Risk Assessment of Exposure To Ionizing Radiation -- Another View, Trans Am Nuclear Soc 38(Jun):83, 1981

II-60. In addition to Translation 520, the documents and studies referenced therein (which you can look up as easily as we can; much data from them is reproduced in Trans. 520), we cite: Washington Post 11/11/79 page B1 "A New German Study Challenges the NRC's Assurances"; LEAF Minnesota Study by Charles W. Huver, Ph.D. (Land Educational Associates Foundation, 3368 Oak Ave, Stevens Point, WI 54481); LEAF Wisconsin study, Methodologies for the Study of Low-Level Radiation in the Midwest, LEAF, 1979, by G.A. Dixon, Naomi Jacobson and George IJ Dixon PhD, John Gofman MD, PhD, consultant; Morgan, KZ, "Suggested Reduction of Permissible Exposure to Plutonium and other Tansuranium Elements" cited on p.8 in full, pp 567-575; also studies of plutonium uptake around Rocky Flats by Carol Johnson (formerly with Jefferson Co. Health Dept, Lakewood, Colo.) (no better cite now available), Joseph Lyon study of children exposed to nuclear weapons fallot (U. Utah College of Medicine, best cite available); H. Caldicott, Nuclear Madness; E.J. Sternglass, PH.D., Secret Fallout. See also Gofman, Radiation and Human Health, 539-43, 544-46, 42-45.

II-61. We have not yet located these studies in originals. We will supplement when we have. See BEIR-III as referenced in response to II-22.

II-62. ASTM Special Technical Publication 732 (1981) C.Aranyi, DE Gardner, and J. Lewtas Huisingh, Evaluation of Potential Inhalation Hazard of Particulate Silicious (sic) Compounds by in Vitro Rabbit Alveolar Macrophage Tests -- Application to Industrial Particulates Containing Hazrdous Impurities (begins p.48, whole article is cited here). See also cites for Eddleman 8F, 6-20-83, and perhaps 5-14-82 also; C. Aranyi, FJ Miller, S Andres, R Ehrlich, J Fenters, DE Gardner, MD Waters, Environmental Research 20:14-23, 1979

"Cytotoxicity to Rabbit Alveolar Macrophages of Trace Metals Adsorbed on Fly Ash"; NE Garrett, JA Campbell and HF Stack, MD Waters, & J. Lewtas Env. Research 24, 366-376, 1981, "The Utliization of the Rabbit Alveolar Macrophage and Chinese Hamster Ovary Cell for Evaluation of the Toxicity of Particulate Materials: II. Particles from Coal-Related Processes." There may be relevant info in Pulmonary Toxicology of Respirable Particles, ed. Chas. Sanders, FT Cross, G. Dangle, J. Mahaffey, USDOE, 1980. II-63. See NRC translation 520 for a decent summary of the studies. There are such a mass of studies on reactivity of radionuclide forms used in concentration studies (uptake, bio-concentration, absorption, etc) that it is impossible for us to list them without undertaking extensive research. We will supplement to the extent we locate further studies without making a special research effort.

II-64(a) We don't know which other regulatory guides do use radionuclide concentration models using less, rather than more, reactive forms of radionuclides. Our review of other NRC reg. guides is not complete. See response to (b) below: we think they all do

(b) We believe, based on Washington Post 11/11/79 article cited above (see II-60, p.9) that all NRC models involve this fault to some extent, based on NRC's admission in that article that such is the case. However, we have not tracked down all the reg guides and analyzed all of them. Our failure to mention a reg. guide here does not mean that Joint Intervenors fail to challenge it, or agree with it. We will supplement when we get more information.

II-65(a) We are uncertain which specific conclusions you are referring to in those reports. The question is vague. ICRP has published quite a large number of reports. Which UNSCEAR do your mean, e.g. 1972, 1977, 1982, etc?

Where we cite those reports or parts of them, including dissenting comments, we agree with what we cite. We have not

as Joint Intervenors or individually "weighed" all the conclusions of all these bodies, and we object to a question so vague, asking us in effect to examine and weigh every conclusion of all those bodies, BEIR-III, ICRP and UNSCEAR.

(b) It isn't "noneX" Please look at response to (a) and our other responses in this and past response sets, and documents referenced in them.

II-66. Gofman, Radiation and Human Health (1981), see entire book, but most particularly Chapters 21,22,20,17,16,15,13,14,5,4, 1 and 2. Caldicott, specific cite not available, see Nuclear Madness; We also rely on the 11-million-year period for increased radiotoxicity of products of the nuclear fuel cycle (compared to leaving the uranium ore in the ground) cited by TH Pigford in Jan 1982 Nuclear Safety, as calculated by Prof. B.L. Cohen, U. Pittsburgh; and on the studies of C. Kenford as cited and summarized in "Against the Deminimus (sic) Theory and AIAB-509" in the Perkins, Harris, etc, NRC radon proceeding. (Served Mar 5 1979 by FSLABS w docks) No better cite is available now.

II-67. Eddleman 37B includes pain and suffering. Eddleman 37B concentrates on the underestimate "not only of cancer but of a host of other diseases" and causes of death. Joint II may include these latter issues if you read it broadly, since they are somatic and genetic effects. When you ask us to give an accurate estimate of "the health effects" of nuclear radiation, we'll include what we think is the best estimate, not just in terms of Joint II, so that may have confused you. Applicants are not known to us for reading contentions broadly. Even read if both Joint II and Eddleman 37B broadly, the pain and suffering issue does not overlap. Read as they are written, Joint II concentrates more on cancers and genetic effects; 37B on other diseases and causes of death besides cancer, and on pain and suffering associated with

cancer and these other diseases and causes of death. The "elements" of Eddleman 37B, we are not sure what you mean, but have tried to answer as to the extent of overlap of the two contentions, which is what we think you are asking about.

II-68. Yes. Intervenor Eddleman is strongly opposed to such consolidation. Joint Intervenors are satisfied to leave the contentions separate so as not to further complicate the case. We note that Applicants refused to stipulate to 37B when they did stipulate to Joint II, so the issues and basis must be different in your view. We see no useful purpose to be served by consolidating the two contentions now, and Eddleman believes that the complications of having to work through the other Joint Intervenors would be burdensome to him concerning 37B.

I hereby affirm that the above responses were prepared by me and Travis Payne, Atty for Kudzu Alliance, and are true and correct to the best of my present knowledge and belief.

This 31 day of August, 1983

Wells Eddleman

PRODUCTION OF DOCUMENTS: Many of the documents cited above, are not in possession of any of Joint Intervenors to my knowledge. Those we possess, we will produce, if CP&L will call me at 919-383-6602 days or 919-286-3076 before 10 am to arrange a mutually agreeable place to produce them. Others are in the UNC-Chanel Hill Health Sciences Library. Some, as noted, are not located and would be produced if located in our possession.