

RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED
USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD **NOV 12 P5:52**

In the Matter of)
)
UNION ELECTRIC COMPANY)
)
(Callaway Plant, Unit 1))

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Docket No. STN 50-483-OL

JOINT INTERVENORS' SUPPLEMENT TO RESPONSE TO
APPLICANT'S INTERROGATORIES (SET NO. 1) ON CONTENTION TWO

Joint Intervenors hereby supplement their Response to Applicant's Interrogatories
... (Set No. 1) to Joint Intervenors on Their Contention 2 as follows:

1. The attached page 65 was inadvertently omitted from some or all copies of the original response and should be inserted in the appropriate place.

2. A typographical error appears on page 60, the sixth line from the bottom. The male estimated increase in mortality now reads ".4%-10%." It should read "4%-10%" (deleting the decimal before the 4).

3. The following addition is made to the response to interrogatory no. I-3(l), after the end of paragraph (p) on page 62:

(q) "Japanese A-Bomb Data Will be Revised," Science, Vol. 214, October 2, 1981, pp. 31-32 (copy attached hereto).

Respectfully submitted,

CHACKES AND HOARE



Kenneth M. Chackes

Kenneth M. Chackes
Attorneys for Joint Intervenors
314 North Broadway
St. Louis, Missouri 63102
314/241-7961

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Abstract Results: Mice injected with tritium (0.07 mCi/g body wt) before birth (9 days after conception) had offspring showing "a significantly decreased weight of brain and genital tract organs." (Table p. 247).

Four and one-half month old offspring had substantially fewer oocytes (Table 248). Also seminiferous epithelium in state of disintegration (p. 250). At 2 months these offspring were fertile.

"After injection of 0.27 mCi tritium/g neither sex appeared to be fertile at age 2 months." (p. 250).

"At 18 months the ovarian tumor incidence of exposed offspring was increased approximately 5-fold over controls." (p. 251).

0.54 mCi tritium/g caused 100% perinatal mortality. 0.54 mCi tritium/g injected on days 7, 9, 11, stunted fetuses, but malformations were negligible. (p. 251). Treatment of dams on days 7 and 9 led to resorption of embryos. Those injected with more than 0.81 mCi/g all had resorbed embryos, some dams died. (Table p. 244).

- (j) Burki, et al., "Tritiated Uracil, Tritiated Thymidine and Bromodeoxyuridine-Induced Mutations in Eucaryotic Cells," IAEA Vienna 1979, Vol. 1, pp. 255-65.

Abstract Results: Yeast cells growing in tritiated uracil then exposed to very low dose rates: 1.5-27.6 tritium decays/hr. Each decay equivalent to 2.6 rad. Determination of RBE affected by precise experimental conditions employed. "In particular, experiments with mammalian cells will be affected by "hot times" for mutagenesis in the cell cycle and "hot positions" within the

Japanese A-Bomb Data Will Be Revised

DOE conference marks the first step in a general overhaul of dose estimates; Academy of Sciences asked to help

About 120 scientists gathered at a Department of Energy (DOE) auditorium on 15 and 16 September to try to clear up some confusion about the effects of radiation on the people who lived through the atomic blasts at Hiroshima and Nagasaki. The confusion arose earlier this year when two physicists at the Lawrence Livermore National Laboratory—William Loewe and Edgar Mendelsohn—challenged the accuracy of existing radiation data (*Science*, 22 May, p. 900, and 19 June, p. 1364).

The subject is controversial because the Japanese bomb survivors have provided the best data on what happens to humans when they are exposed to low levels of radiation. Revising the dose measurements from Japan, which is now being done, will affect a great body of research, including the radiation hazard estimates published in 1980 by the National Academy of Sciences in a report on the Biological Effects of Ionizing Radiation, known also as BEIR III. About \$100 million has been invested already in the data from Japan, making it the most precious single source of information in this field.

Although the meeting-goers made few recommendations, they agreed that the dose estimates which have been in use since 1965 can no longer be considered accurate and should be revised in the light of research done at Livermore, two other national laboratories, and two private consulting firms.

The chief impact of the new research is to suggest that neutron radiation had little measurable effect on the people of Hiroshima and Nagasaki. The implications are (i) that it may be possible to combine the populations of the two cities for epidemiological purposes and treat them as a single record of the effect of gamma radiation, and (ii) that very little human data will now be available for judging the relative toxicity of neutrons as compared with gamma rays.

Speakers at the meeting warned that it is too early to know how the revisions will affect hazard estimates. However, several people cited a preliminary text of the new data, carried out by Charles Land of the National Cancer Institute. According to this work, using the worst-

case assumptions of BEIR III, it may be necessary to double the risk figures for developing fatal cancer after exposure to the levels of gamma radiation present in the Japanese blasts. (No one spoke about nonfatal cancer.) Using less than worst-case assumptions, the risk for contracting fatal cancer would increase by a factor of 0.5 or less. Several speakers pointed out that revisions of this size fall within the uncertainty limits given for BEIR III, and therefore should surprise no one. Yet there is other evidence, as Land himself agrees, indicating that the revisions in the risk figures could be different, and possibly larger than a factor of 2.

J. W. Thiessen, director of DOE's division of human health and assessments, approved the funding for the meeting. It was held at the old Atomic Energy Commission building in Germantown, Maryland. Thiessen said he had several purposes in mind. One was to bring the debate on dosimetry into the

involving the DOE labs, the Defense Nuclear Agency, the National Academy of Sciences, and others in a coordinated attack on dosimetry revisions.

Thiessen told the throng at Germantown that this research was of "the highest priority" and would not be affected by cutbacks in the budget. Later he estimated privately that "not an awful lot of money will be involved—on the order of \$2 million over 2 years for a complete reassessment" of the Japanese data.

The National Academy of Sciences, according to staffers there, will probably approve the creation of a new oversight committee requested by DOE. It will help the government patch together the disparate pieces of research being done here and in Japan. The Academy serves as the liaison between the U.S. government and the Japanese, who are sensitive about how their bomb data are used. For example, they do not want to contribute to any military endeavor.

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open and make a record of the proceedings for the public. He hoped this would lend credibility to any work that comes later. Thiessen also wanted to bring together everyone involved in this debate to learn where their differences lie. Most important, he wanted to be given a map telling him what kind of research should be funded in the future.

At the end of the session, Thiessen said he had not been given the "complete road map" he wanted, but was pleased to find more agreement than he had expected. "There was much less controversy between different workers than appeared initially," he said. "We have a reasonably good idea about the amount of work to be done now." He will meet with other agency officials in the next 2 months and draw up a plan

The Japanese have already created three scientific committees to review the information. One reason they are concerned, according to Seymour Jablon of the Academy's staff, is that the government allows the bomb survivors certain medical and other benefits based on the extent of injury received. The news that the dose estimates might be changed has created a sensation in Japan.

Several participants in the conference in addition to Thiessen were surprised to find how little the physicists differ on the basic work to be done. The author of the old dose calculations, John Auxier of the Oak Ridge National Laboratory, said that he sensed there was a consensus to move ahead quickly. Even though he occasionally felt an impulse to speak up for his old research, he said, "I have

tried to keep quiet for the last year," because it seemed proper for younger scientists to refine the work he started. "We knew at the time that the answer we had [in 1965] wasn't good enough," he said, "but we had an answer, and the funding dried up." He predicted that the revision could be done in a year or two.

The physicists working on the new estimates seemed to be in general agreement on this point as well. George Kerr of Oak Ridge said: "A couple of years ago there were large discrepancies in the dosimetry" when different blast data were used to estimate effects. "These discrepancies have been worked on. . . . The end is now in sight. We know what the problems are and they can be solved in a timely fashion." He later explained that he meant 2 years. Loewe of Livermore and Dean Kaul of Science Applications, Inc., of Schaumburg, Illinois, who have made independent revisions of the data, both seemed confident that their work would soon be finished.

There was general agreement on which tasks should be undertaken first. Step one is to determine more precisely the radioactive output of the bombs using data which have been kept classified until now. Work on this has begun at the Los Alamos National Laboratory. Computers will be used to "transport" the

radiation through models of the atmosphere at Hiroshima and Nagasaki. Small adjustments may be made to take into account the shielding provided by natural terrain. Then the big problem appears. The effects of shielding provided by buildings will have to be completely reexamined. Last of all, the physicists will have to calculate the shielding effect of human tissue.

No great changes, other than those already mentioned, are expected to come out of most of this work. However, the building factor may produce something unanticipated. For example, Michael Bender, a radiobiologist at the Brookhaven National Laboratory, said he was surprised to learn in conversations at this meeting that a "substantial portion" of the people in one category in Nagasaki may have been tagged with wrong doses because of an arbitrary decision about buildings. When the original calculations were made, it seemed too difficult to estimate the effect of shielding in every case, so that, as in one particular example—a large group of workers in the Mitsubishi steel factory in Nagasaki—people were at times simply assigned the dose they would have received had they been standing outside. The Mitsubishi building was made of steel and concrete and contained some heavy machinery. The people inside received consid-

erably smaller doses in fact than they were assigned. Because so many were in the factory, it is possible that they may have skewed the Nagasaki data, understating the effects of the radiation in the middle range of doses.

In addition, several researchers, including Jess Marcum of R & D Associates, of Marina Del Rey, California, have concluded that the effects of building shielding were generally understated throughout the old dose calculations. A preliminary look, according to Loewe and Marcum, suggests that structures absorbed 1.6 times more gamma radiation than was thought.

It is important to note that the preliminary guesses about the impact of this research do not take into account the errors in building shielding. This applies, for example, to Charles Land's study. He says that he thinks that "they haven't got the shielding done yet," and believes it is too early to make any general statements about the size of the change in overall risk estimates. As shielding factors are reexamined, doses for individual survivors may change dramatically, shifting data points up and down the scale in an unpredictable way. Only after all of these individual cases have been revised will it be possible to get a clear picture of the entire Hiroshima-Nagasaki experience.—ELIOT MARSHALL

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CERTIFICATE OF SERVICE

I hereby certify that copies of Joint Intervenors' Supplement to Response to Applicant's Interrogatories (Set No. 1) on Contention Two have been served on the following by deposit in the United States mail this 9th day of November, 1981.

James P. Gleason, Esq., Chairman
Atomic Safety and Licensing Board
513 Gilmore Drive
Silver Spring, MD 20901

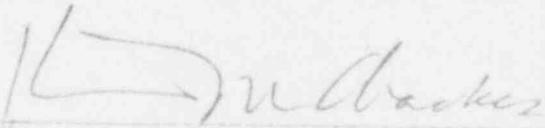
Mr. Glenn O. Bright
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Jerry R. Kline
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Thomas A. Baxter, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N.W.
Washington, D.C. 20036

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Roy P. Lessy, Jr., Esq.
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555


Kenneth M. Chackes
CHACKES AND HOARE