

4/30/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

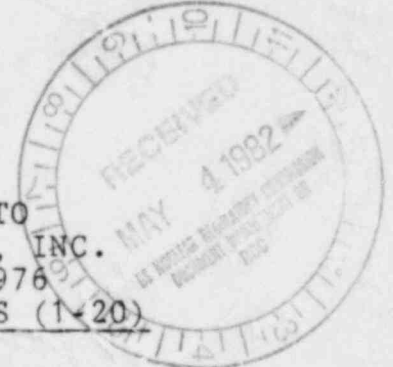


In the Matter of

UNITED STATES DEPARTMENT OF ENERGY
PROJECT MANAGEMENT CORPORATION
TENNESSEE VALLEY AUTHORITY

(Clinch River Breeder Reactor Plant)

Docket No. 50-537



APPLICANTS' UPDATED RESPONSE TO
NATURAL RESOURCES DEFENSE COUNCIL, INC.
AND THE SIERRA CLUB JULY 28, 1976
REQUEST TO APPLICANTS FOR ADMISSIONS (1-20)

Pursuant to 10 C.F.R. § 2.742, and in accordance with the Board's Prehearing Conference Order of February 11, 1982, the Department of Energy, Project Management Corporation, and the Tennessee Valley Authority (the Applicants), hereby submit their Updated Responses to Intervenor, Natural Resources Defense Council, Inc. and the Sierra Club, July 28, 1976 Request to Applicants for Admissions (1-20).^{1/}

ADMISSION.

1. For both occupational and population exposure to radiation from nuclear power reactors and associated

^{1/} Applicants previously responded to Admissions 1-20 on August 10, 1976, and supplemented certain of those responses (5, 6, 7, 10) on January 21, 1977.

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facilities, the NRC regulations contain criterion to maintain radiation exposures at as low as reasonably achievable levels or ALARA.

RESPONSE.

1. The Applicants admit that the NRC Regulations contain criterion to maintain radiation exposures at ALARA levels.

ADMISSION.

2. A concept ALAP has been replaced by ALARA.

RESPONSE.

2. The Applicants admit that the concept of ALAP has been replaced by ALARA in the NRC Regulations.

ADMISSION.

3. Radiation is known to induce cancer in humans.

RESPONSE.

3. The Applicants admit this statement to the extent that radiation, under certain exposure conditions, has been associated with the development of certain types of cancer in human beings.

ADMISSION.

4. Radiation is known to induce genetic changes in human germ cells.

RESPONSE.

4. The Applicants deny this statement. Although it may be reasonable to assume that this can happen because of information obtained from experiments on mice and other organisms, there is no direct proof of transmitted genetic damage resulting from the irradiation of human germ cells.

ADMISSION.

5. The vast majority of the genetic changes induced in human germs cells are deleterious and these altered genetic determinants can be passed on to future generations.

RESPONSE.

5. The Applicants admit this statement to the extent that altered genetic determinants can be passed on to future generations, but deny the remainder of this statement. The evidence on the nature of induced genetic change is based on experimental organisms rather than human beings. Although the majority of the detectable genetic changes induced in such organisms appears to be deleterious, many genetic changes may be neutral in their effects. For example see the following: Neil, Kato, Schull, 1974 "Mortality in the Children of Atomic Bomb Survivors and Controls," Genetics, Vol. 75, pps 311-376 and W.R. Russell,

1972, "The Genetic Effects of Radiation" Peaceful Uses of Atomic Energy, Vol. 13, pps US7-500.

ADMISSION.

6. While there may be other reasons, one of the primary purposes of ALARA is not just to reduce the exposures but to reduce the consequences of such exposure by reducing the number of induced cancers in the extant population and genetic effects in future generations.

RESPONSE.

6. The Applicants admit this statement to the extent that the achievement of ALARA exposure reduces the possibility that consequences might result from low-level exposure. Imposition of the linear-dose-effect hypothesis is believed to provide conservatism in protecting the health and safety of the public. Its use is not a confirmation that consequences will always result for a given radiation exposure.

ADMISSION.

7. Irradiation of workers in the nuclear industry will result in the risk of radiation induced cancers in some of the workers.

RESPONSE.

7. The Applicants admit this statement to the extent that radiation doses at the relatively higher levels of exposure experienced by a few radiation workers may conceivably result in an increased probability of radiation-induced cancer.

ADMISSION.

8. Irradiation of workers in the nuclear industry increases the risk of deleterious alteration in the germs cells of the workers and these deleterious alterations can result in genetic defects in the progeny of these workers.

RESPONSE.

8. The Applicants cannot truthfully admit or deny this statement. See responses to Nos. 4-5 supra. From work on mice it might not be unreasonable to assume that irradiation of male workers might increase the risk of genetic defects in their progeny. However, these animal studies also indicate that any genetic risk to progeny of females irradiated at low levels of exposure will be less than the risk to progeny of irradiated males and may be zero.

ADMISSION.

9. Irradiation of a female worker who is pregnant can, in addition to the two previous statements, result in

the induction of cancer and in deleterious aberration in the germ cells of the developing fetus.

RESPONSE.

9. The Applicants cannot truthfully admit or deny this statement. See responses to Nos. 4, 5, and 8 supra. There is insufficient empirical information available to determine whether or not exposure to low levels of radiation can cause genetic changes in the germ cells of a human fetus. The evidence related to cancer induction in human beings resulting from irradiation at higher dose levels than those permissible under NRC regulations is conflicting.

ADMISSION.

10. The developing fetus has been demonstrated to be far more sensitive to the adverse effects of radiation than are adults.

RESPONSE.

10. The Applicants admit this statement to the extent that the developing fetus has been demonstrated to be more sensitive to some, but not all, of the adverse effects of radiation than adults. For example see Rugh and Jackson, 1958, "Effect of Fetal X-ray Irradiation Upon the Subsequent Fertility of the Offspring," Journal of Experimental Zoology, Vol. 138, pps 209-221 and Russel, Russel, Steele, Phipps, 1959, "Extreme Sensitivity of an Immature Stage of

the Mouse Ovary to Sterilization by Irradiation," Science 129, pps 1228.

ADMISSION.

11. At all times, a worker's (male or female) germ cells are capable of being altered by radiation exposure.

RESPONSE.

11. The Applicants cannot truthfully admit or deny this statement. See responses to Nos. 4, 5, 8, and 9 supra. Extrapolation of the results of experiments with mice indicate that this may be true for the male but not the female under certain exposure conditions. In addition, such a broad, general statement is not meaningful for individuals in their post-reproductive years.

ADMISSION.

12. Any radiation exposure of the gonads of a fertile male or female represents a potential risk for their progeny and future generations.

RESPONSE.

12. The Applicants cannot truthfully admit or deny this statement. See responses to Nos. 4, 5, 8, and 9 supra.

ADMISSION.

13. The present occupational and population exposure limits for genetic dose are the same as those recommended by the ICRP in ICRP Publication 9.

RESPONSE.

13. The Applicants cannot truthfully admit or deny this statement. It is unclear precisely which occupational and population exposure limits NRDC is referring to in this statement. The FRC (now EPA) has issued guidance to Federal agencies regarding such limits and the NCRP has also recommended limits to be used in the United States. While all of these limits are similar, they do sometimes differ with regard to the actual details of such limits. However, NRC is obligated to follow the FRC guidance in situations where such guidance is available.

ADMISSION.

14. Relative to their recommendations for the limits of genetic exposure, the ICRP stated on page 15 of ICRP Publication 9:

"(83) Because of the need for guidance in this regard, the Commission in its 1958 Recommendations suggested a provisional limit of 5 rems per generation for the genetic dose to the whole population from all sources additional to natural background radiation and to medical exposures. The Commission believes that this level provides reasonable latitude for the expansion of

atomic energy programs in the foreseeable future. It should be emphasized that the limit may not in fact represent a proper balance between possible harm and probable benefit, because of the uncertainty in assessing the risks and the benefits that would justify the exposure."

RESPONSE.

14. The Applicants admit this statement.

ADMISSION.

15. There is no special weighting applied in the calculation of the man-rem dose in the NRC Regulations for occupational exposure to account for such exposures with respect to the occupational of pregnant women.

RESPONSE.

15. The Applicants admit this statement.

ADMISSION.

16. The ICRP states on page 15 of ICRP Publication 9:

"The annual genetically significant dose to a population is the average of the individual gonad doses, weighted in each individual for the expected number of children conceived subsequent to the exposure."

This weighting of individual gonad doses is not taken in account when calculating the man-rem dose for occupational exposure in the NRC Regulations.

RESPONSE.

16. The Applicants admit this statement.

ADMISSION.

17. Given the same man-rem exposure to a group of employees 45-50 years of age and to a group 20-35 years of age, the exposure of the 25-30 year old group would result in greater biological consequences relative to genetic effects and the exposure of pregnant women.

RESPONSE.

17. The Applicants cannot truthfully admit or deny this statement since the statement is ambiguous. Given the same level of radiation exposure for each group, one could assume that the risk of genetic effects to the younger group could be higher than that to the older group. However, greater risks are not necessarily associated with greater effects. One can only speak in terms of a greater probability of effect. Actual effects may be observed in neither case. See also Applicants' responses to 4, 5, 7, 8, 11, and 12.

ADMISSION.

18. Given the same man-rem exposure to a group of employees 50 years of age and to a group 30 years of age, the exposure of the 30 year old group could lead to a

greater number of radiation induced cancers. This conclusion is consistent with the relative risk approach toward estimating radiation induced cancers as outlined in the November 1972 BEIR Report.

RESPONSE.

18. The Applicants deny this statement. The statement that the same man-rem exposure of the younger group could lead to a greater number of radiation-induced cancers, is consistent with the theoretical risk predictions-- both absolute and relative--in the BEIR Reports. However, this does not constitute proof that such a greater number of radiation-induced cancers would actually occur. The radiation dose and the dose rate are also important factors to be considered, and it does not follow that exposure to any man-rem level of radiation will itself produce any biological effects. See Applicants' response to No. 7.

ADMISSION.

19. The following statement in Regulatory Guide 8.8 is not strictly correct:

"It would be inappropriate to hold the individual doses to a fraction of the applicable limit if this resulted in the irradiation of more people and increased the total man-rem dose."

because when considering the man-rem dose, it is necessary to consider the age distribution of the exposed population.

RESPONSE.

19. The Applicants deny this statement. The man-rem collective dose equivalent does not depend upon the age distribution of the exposed population.

ADMISSION.

20. One of the primary purposes of ALARA (reduction in the adverse effects of radiation) could be accomplished and the CRBR could be operated by implementation of the following guidelines:

i) For individuals under the age of 45, the whole body radiation exposure limit shall not exceed 0.5 rem in any calendar year and 0.3 rem in any calendar quarter.

ii) For individuals equal to or greater than 45 years of age, an individual may receive up to 3 rem/quarter whole body dose as long as the dose to the whole body shall not exceed $0.5 (45-18) + 1.5 (N-45)$ rem, where N equals the individual's age in years.

RESPONSE.

20. The Applicants deny this statement. There has been no showing that the proposed guidelines are reasonable for the CRBRP. The setting of arbitrary guidelines without regard to operating conditions is totally alien to the ALARA principle.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of

U.S. ENERGY RESEARCH AND DEVELOPMENT
ADMINISTRATION

PROJECT MANAGEMENT CORPORATION and

TENNESSEE VALLEY AUTHORITY

AFFIDAVIT OF JOHN W. HEALY

John W. Healy, being duly sworn, deposes and says as follows:

1. That he is employed as a staff member, Health Division,
Los Alamos National Laboratory, and that he is duly authorized to answer
7/28/76 admissions, contention 7, numbers 6-33; contention 8A, numbers 1-20;
and contention 8C, numbers 1-19.

2. The above mentioned and attached answers are true and correct to
the best of his knowledge and belief.

John W. Healy
John W. Healy

SUBSCRIBED and SWORN to before me
this 10th day of April, 1982.

Charles A. Salmons
Notary Public

My commission expires: Aug 10, 1983

In the Matter of
UNITED STATES DEPARTMENT OF ENERGY
PROJECT MANAGEMENT CORPORATION
TENNESSEE VALLEY AUTHORITY
(Clinch River Breeder Reactor Plant)

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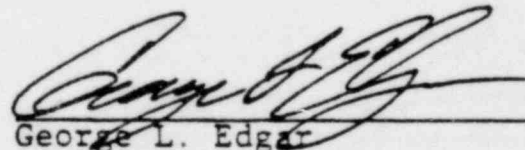
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DATED: April 30, 1982

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