

April 30, 1973

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Atomic Safety and Licensing  
Board Panel  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

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Atomic Safety and Licensing  
Board Panel  
U. S. Atomic Energy Commission  
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Dr. William E. Martin  
Senior Ecologist  
Battelle Memorial Institute  
Columbus, Ohio 43201

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Washington, D. C. 20006

Dr. A. Dixon Callihan  
Union Carbide Company  
P. O. Box Y  
Oak Ridge, Tennessee 37830

In the Matter of Iowa Electric Light and Power Company  
Central Iowa Power Cooperative, and Corn Belt Power Cooperative  
(Duane Arnold Energy Center)  
Docket No. 50-331

Members of the Board:

In accord with our letter dated April 27, 1973, enclosed for your use in the subject proceeding are copies of the following documents:

1. Testimony of Thomas Murphy concerning staff expected dose to a child's thyroid from radioiodine received from the air-grass-cow-milk pathway.
2. Revised affidavit of Bernard Mann concerning liquid and gaseous source terms.

In addition to offering the evidence indicated in our letters of April 26 and April 27, 1973, the staff intends to offer as part of its direct case, a letter dated April 16, 1973, from the U. S. Department of Interior of which a copy

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SURNAME ▶							
DATE ▶							

*Waring*

is enclosed. The staff's testimony concerning water quality matters is not yet completed, but will be presented at the evidentiary hearing on May 3, 1973.

Finally, please note the following correction of the errata and addenda enclosed in our letter of April 27, 1973:

Item 2. Change page 3-7 to page 3-36.

Sincerely,

/s/

Robert Newton  
Counsel for AEC Regulatory Staff

/s/

Mark R. Haflich  
Counsel for AEC Regulatory Staff

Enclosures:  
As stated

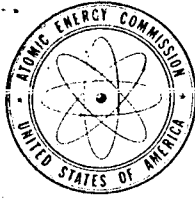
cc w/enclosures:

~~John B. Farmakides, Esq.~~  
~~Dr. Marvin M. Mann~~  
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Jack R. Newman, Esq.  
Atomic Safety and Licensing  
Board Panel  
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Appeal Board  
Mr. Frank W. Karas

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UNITED STATES  
ATOMIC ENERGY COMMISSION  
WASHINGTON, D.C. 20545

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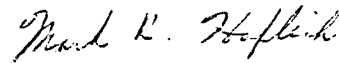
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Mr. Frank W. Karas



BERNARD MANN, BEING ON OATH, DEPOSES AND SAYS AS FOLLOWS:

1. I am Bernard Mann, Nuclear Engineer, Directorate of Licensing, U.S. Atomic Energy Commission, Washington, D.C. Attached hereto and marked RS-1-1 is a statement of my professional qualifications and experience. As appears from that statement I am responsible for Sections 3.5 through 3.5.3 of the FES for the DAEC (which deal with the radioactive waste systems and source terms), for the Staff review of the sections of the FSAR dealing with radioactive waste systems, and for the preparation of the Staff's safety evaluation of the DAEC radioactive waste systems.
2. I have reviewed the portions of the testimony of Thomas Broad and David Flanagan submitted by the Applicant in response to questions asked by Dr. Martin at the Duane Arnold pre-hearing conference (Tr. 33-34), which deal with the calculation of liquid and gaseous radioactive releases and the differences between the assumptions used by the Applicant and the Staff regarding liquid and gaseous releases.
3. The liquid and gaseous radioactive source terms utilized by the Staff and the assumptions used to calculate those source terms are as described in FES, §3.5 through §3.5.3.
4. Mr. Flanagan is correct in stating that the Staff's gaseous radioactive waste system analysis (FES, §3.5.2) was based upon an annual average off-gas source term equivalent to 100,000  $\mu\text{Ci/sec}$  measured after a 30 minute delay for a reactor rated at 3,400 mwt. This value was calculated by averaging the measured off-gas releases for BWR's operating during 1971 and 1972 corrected for a 30 minute delay and for 3,400 mwt. power. For Duane Arnold, the 50,000  $\mu\text{Ci/sec}$  source term utilized by the Staff was arrived at by normalizing the 100,000  $\mu\text{Ci/sec}$  source term for a reactor rated at 3,400 mwt. to the Duane Arnold ultimate thermal power rating of 1,658 mwt.  $(100,000 \mu\text{Ci/sec} \times 1,658 \text{ mwt.} / 3,400 \text{ mwt.} \approx 50,000 \mu\text{Ci/sec})$ .
5. Mr. Flanagan is correct in stating that the dominant factor leading to the difference between the Staff's and the Applicant's calculations for annual noble gas activity releases is related to the Staff's use of a 50,000  $\mu\text{Ci/sec}$  annual average off-gas source term versus the Applicant's use of a 25,000  $\mu\text{Ci/sec}$  annual average off-gas source term.

6. Although, as correctly stated in Mr. Flanagan's testimony, the Applicant and the Staff utilized slightly different assumptions for Krypton and Xenon holdup times in the 12 bed charcoal delay system as well as slightly different empirical relationships to calculate isotopic release rates, these differences are insignificant and would cause only negligible differences between the Applicant's and the Staff's calculations for annual noble gas activity releases.
7. Mr. Flanagan is correct in stating that the Staff's calculation of the annual release of I-131 from the ventilating system was 0.6 Ci/yr. By far, the largest contribution to this release was the 0.55 Ci/yr attributable to the turbine building vents. This value was based on a I-131 concentration of  $5 \times 10^{-3} \mu\text{Ci/sec}$  in the primary coolant water, a partition factor of 0.01 in the reactor, and a turbine building leakage rate of 5 gpm.
8. With respect to the liquid radioactive source terms utilized by the Staff:
  - a. The Staff assumed a high purity (low conductivity) liquid waste flow rate of 21,000 gpd. The Staff assumed that such wastes would have a concentration equivalent to 28% of the activity present in the primary coolant. This was based on the Staff's assumption that the 21,000 gpd of high purity wastes would consist of 5,800 gpd from the drywell equipment drains at approximately 100% of the activity present in the primary coolant and 15,200 gpd from other equipment drains, including those in the reactor, radwaste, and turbine buildings, and from the decantate from the condensate demineralizers, all at a concentration equivalent to 1% or less of the activity present in the primary coolant. The Staff also assumed a decontamination factor of 100 for iodine processed in the waste demineralizer. Furthermore, the Staff assumed that most but not all of the high purity wastes would be reused in the plant with 10% of such wastes ultimately being discharged.
  - b. The Staff assumed a low purity (moderate conductivity) liquid waste flow rate of 8,500 gpd at a concentration equivalent to 34% of the activity present in the primary coolant. This was based on the Staff's assumption that

the 8,500 gpd of low purity wastes would consist of 2,900 gpd from the drywell floor drains at a concentration equivalent to approximately 100% of the activity present in the primary coolant and 5,600 gpd from other floor drains, including those in the reactor, radwaste and turbine buildings, all at a concentration equivalent to 1% or less of the activity present in the primary coolant. The Staff also assumed a decontamination factor of 100 for iodine processed by the floor drain demineralizer. Furthermore, the Staff assumed that 30 % of the low purity wastes would ultimately be discharged.

- c. The Staff assumed a chemical waste flow rate of 500 gpd with 100% ultimate discharge. The Staff assumed that such wastes would have a concentration equivalent to 10% of the activity present in the primary coolant. The Staff also assumed a decontamination factor of 100 for iodine processed in the evaporator. This decontamination factor was based on utilization of one vertical evaporator for both chemical and detergent wastes.
- d. The Staff assumed a detergent waste flow rate of 300 gpd. The Staff assumed that such wastes would have a negligible activity and therefore combined the detergent wastes with the chemical wastes when calculating annual releases.
- e. The Staff calculated that the total yearly liquid release excluding tritium would be approximately 4.0 Ci. This value was arrived at by summing the calculated annual liquid releases excluding tritium from all sources (i.e.,  $\approx 1.6$  Ci) and normalizing to compensate for equipment downtime and expected operational



occurrences. Based on operating experience with other BWR's, the Staff estimated that annual tritium releases would be approximately 20 Ci.

Bernard Mann  
Bernard Mann

Then appeared before me the above - subscribed Bernard Mann and made oath that he was the author of the foregoing affidavit and that the statements set forth therein are true to the best of his knowledge.

Subscribed and sworn to before  
me this 30 day of April 1973.

Michael M. Goff  
Notary Public  
STATE OF MARYLAND, COUNTY OF  
MONTGOMERY

My Commission expires: July 1, 1974

PROFESSIONAL QUALIFICATIONS  
BERNARD MANN

I am a Nuclear Engineer with the Directorate of Licensing, USAEC, Bethesda, Maryland. I was responsible for the preparation of source terms and the Radioactive Waste Systems description contained in the DAEC FES, and also for the review of the DAEC FSAR Radioactive Waste Systems and preparation of the DAEC SE.

In September 1948 I received a Bachelor of Chemical Engineering degree from the University of Louisville. In August 1949 I received a Master of Science degree in Chemical Engineering from the University of Cincinnati. I am also a licensed professional engineer, registered in Pennsylvania.

From 1949 to 1955 I worked in the process industry in the areas of process engineering, plant engineering and process control.

From 1955 to 1960 I was associated with Westinghouse Electric Corporation, Bettis Atomic Laboratory. The areas of work performed included fluid systems design, process engineering, and systems analysis, for pressurized water reactors utilized in Naval Propulsion.

From 1960 to 1968 I was associated with Aerojet-General Corporation. The areas of work performed included project engineering, systems engineering, and test engineering on the NERVA (Nuclear rocket) project and SNAP 8 (space nuclear auxiliary power unit) project.

From 1968 to 1969 I was associated with Battelle-Northwest as resident engineer in their Canoga Park, California, office. I was responsible for monitoring and liaison of the Atomics International subcontracts on the FFTF program.

From 1970 to 1972 I was associated with C.F. Braun & Company, Alhambra, California as Senior Engineer. I was responsible for the design of nuclear power and process systems. The projects I was associated with included the liquid Metal Fast Breeder Reactor, Boiling Water Reactor Balance-of-Plant Area, and Plutonium Recovery Facility. Typical designs included liquid metals, gaseous radwaste, steam, condensate, ion exchange and auxiliary systems.

In April 1972, I joined the AEC regulatory staff, as a Nuclear Engineer with the Effluents Treatment Branch and continued with this branch until January 1973. In this capacity I was responsible for the preparation of source terms and Effluent Treatment Systems descriptions for various FES's, and also for the review of SAR's and the preparation of SE's of Effluent Treatment Systems on a number of nuclear stations. Since January 1973 I have been associated with the Auxiliary and Power Conversion Systems Branch.

TESTIMONY OF THOMAS D. MURPHY

SUBJECT: STAFF EXPECTED DOSE TO A CHILD'S THYROID  
FROM RADIOIODINE RECEIVED FROM THE  
AIR-GRASS-COW-MILK PATHWAY

1. My name is Thomas D. Murphy. I am a Senior Health Physicist, employed by the Radiological Assessment Branch, Directorate of Licensing, United States Atomic Energy Commission, Washington, D.C. A resume of my educational and professional qualifications has been previously received in evidence in this proceeding.
2. The purpose of my testimony is to respond to questions asked by Dr. Martin at the Duane Arnold pre-hearing conference (Tr. 33-34) concerning the staff's proposal that iodine releases from DAEC be limited so that they do not result in a thyroid dose to a child in excess of 5 mrem/yr.
3. As stated on page 5-25 of the FES, the staff has calculated that the thyroid dose to a child from the DAEC via the air-grass-cow-milk iodine pathway will be 6.5 mrem/yr. The cost-benefit analysis performed by the staff (FES, §11) is based on a 6.5 mrem/yr dose rather than the lower dose of 0.85 mrem/yr calculated by the applicant or the 5 mrem/yr limitation proposed by the staff. No significant environmental costs or radiological safety concerns are associated with a thyroid dose to a child of 6.5 mrem/yr.
4. The monitoring condition in paragraph 7.b (p. v) of the FES, is recommended by the staff for inclusion only in the facility operating license which may be issued.
5. That proposed operating license condition (which requires monitoring to assure that the actual thyroid dose to a child via the air-grass-cow-milk pathway does not exceed 5 mrem/yr) is designed to insure compliance with 10 CFR §20.1(c) which requires that all licensees maintain releases "as low ... as practicable". The term "as low ... as practicable" is defined by 10 CFR §20.1(c) as meaning "as low as is practicably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of atomic energy in the public interest." After taking into account all factors mentioned for consideration in 10 CFR §20.1(c), and mindful that the staff's thyroid dose calculation

of 6.5 mrem/yr may be proven to be quite conservative by the results of the recommended monitoring program, the staff concluded that 5 mrem/yr is "as low ... as practicable" for DAEC.



# United States Department of the Interior

50-331

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

In reply refer to:  
PEP ER-72/1342

APR 16 1973



Dear Mr. Muller:

This is in response to your letter of March 12, 1973, which transmitted the Atomic Energy Commission's final statement, dated March 1973, on environmental considerations for Duane Arnold Energy Center, Linn County, Iowa.

There are several significant concerns which we expressed in our comments of February 5, 1973, on the draft statement which were not adequately addressed in the final statement. These major concerns are presented again for your information and appropriate action.

## Effect on Land Use

Our comments on the draft environmental impact statement expressed concern for the lack of a land use plan which would enhance the indigenous wildlife populations and aesthetic appeal of the site. We suggested that the applicant contact State and local planning authorities to determine the type of facilities that could be developed to serve the recreational needs of the area.

The Iowa Conservation Commission in its letter of December 22, 1972, offered the services of its wildlife managers to the applicant for the purposes of maximizing the overall land use benefits in the interest of wildlife, recreation, and other uses. However, the final statement indicates on page 11-1 that access to the river at the site was restricted by private ownership in the past and will remain so. Further, the final impact statement does not reflect any comprehensive land use planning for the approximately 500 acres withdrawn from its previous uses.

We suggest that, since only about 40 of the 500 acres will be occupied by buildings and roads, the operating license should contain a condition that the applicant will prepare a land use plan in consultation with appropriate State and local agencies that would provide public benefits on the remaining 460 acres.

### Pleasant Creek Reservoir

We are extremely concerned with the final impact statement's treatment of the proposed Pleasant Creek Reservoir makeup water storage system in that the reservoir is not treated as an integral part of the licensing action of the plant. Instead, as indicated on page 12-2, AEC assumes the reservoir will be built and managed by the Iowa State Conservation Commission and is justified primarily as a recreation resource. Also, the Iowa State Conservation Commission has commented, by letter dated December 22, 1972, that the Pleasant Creek Project will be covered by a separate Environmental Impact Statement to be prepared the Bureau of Outdoor Recreation of this Department.

We want to make it clear that we have not received a formal project proposal from the State or any communications from the applicant in regard to the reservoir.

As we understand the project, the reservoir would be located and operated to benefit the applicant who would have first right to water drawdown. If this is the case and recreation is a secondary use of the reservoir, our policy will not permit use of Land and Water Conservation Funds for reservoir construction.

The first paragraph on page 10-3 is somewhat misleading. It is stated that the cost of the reservoir is the same as that of the deep wells, since the applicant is giving a sum equal to the cost of deep wells to the State Conservation Commission. Perhaps the cost to the applicant would be the same, but we have been informed by the Iowa Conservation Commission that the land acquisition and pumping station, would cost approximately \$2,800,000. This does not include recreation developments. It appears unlikely that the project would have been conceived and constructed without the applicant's participation.

It is our opinion that the applicant is responsible for the makeup water system since it is an integral part of the proposed project. Therefore, we feel that the final environmental impact statement is grossly lacking in its description of the impacts of the reservoir portion of the project.