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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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Office of the Secretary
Docketing & Service
Section

ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf, Chairman
A. Dixon Callihan, Member
Richard F. Cole, Member

In the Matter of CAROLINA POWER & LIGHT COMPANY (H. B. Robinson, Unit 2)	Docket No. 50-261 (OL Modification)

MEMORANDUM AND ORDER

For good cause shown and without objection by the NRC Staff, the Applicant's motion to receive in evidence the exhibits identified as follows is granted:

Applicant's Exhibit 20. This exhibit consists of two tables. Table No. 1 shows the result of Carolina Power & Light Company's 1977 Energy and Load Forecasts; Table No. 2 shows projected resources, load and reserves with and without H. B. Robinson, Unit No. 2.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

by: John F. Wolf
John F. Wolf, Chairman

Issued and entered
this 31st day of May 1978
at Bethesda, Maryland

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
CAROLINA POWER AND LIGHT COMPANY) Docket No.(s) 50-261
)
(H. B. Robinson, Unit No. 2))

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
1st day of June 1978.

Peggy T. Dawning
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H.B. Robinson, Unit No. 2)	Docket No.(s) 50-261 50-261 OL (Modification)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED USNRC MAY 16 1978 Office of the Secretary Docketing & Service Branch

ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf, Chairman
A. Dixon Callihan, Member
Richard F. Cole, Member

In the Matter of CAROLINA POWER & LIGHT COMPANY (H. B. Robinson, Unit No. 2	Docket Nos. 50-261 50-261 (OL Modification)

MEMORANDUM AND ORDER

For good cause shown and without objection by the Applicant, NRC Staff's motion to receive in evidence the exhibits identified as follows is granted:

1. Staff's Ex. 8, entitled Table S-3 Summary of environmental considerations for uranium fuel cycle (Revised Interim Table S-3)

2. Staff's Ex. 9, entitled Title 10 - Energy, CHAPTER 1 - NUCLEAR REGULATORY COMMISSION, PART 51 - LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION, Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management

3. Staff's Ex. 10, NUREG-0332, Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives (Draft)

4. Staff's Ex. 11, Affidavit of Homer Lowenberg on the Radon Value in Table S-3

5. Staff's Ex. 12, Affidavit of Jack E. Rothfleisch on the Radon Value in Table S-3

6. Staff's Ex. 13, Affidavit of R. L. Gotchy

7. Staff's Ex. 14, Affidavit of R. M. Wilde

8. Staff's Ex. 15, Affidavit of Paul J. Magno

IT IS SO ORDERED

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

by: John F. Wolf
John F. Wolf, Chairman

Issued and entered
this 15th day of May, 1978
Bethesda, Maryland

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
16th day of May 1978.

Peggy T. Downing
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H.B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261 50-261 OL (Modification)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

MEMORANDUM AND ORDER

The Board proposes to issue a decision on all matters in these consolidated proceedings including an overall NEPA cost/benefit balance and the issues listed in the Board's Memorandum and Order of March 23, 1976. Applicant and Staff may file proposed findings on all matters including outstanding considerations of health and safety. These filings may include also necessary modifications cr conditions to be applied to the current operating license. The parties will have until May 1, 1978, to submit these findings.

Because the Board has chosen the above course of action, Applicant's Motion of December 29, 1977, to dismiss the proceeding is denied.

IT IS SO ORDERED.

THE ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf
John F. Wolf, Chairman

Dated at Bethesda, Maryland,
this 19th day of April, 1978.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

CAROLINA POWER AND LIGHT COMPANY

(H. B. Robinson, Unit No. 2)

Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
20th day of April 1978.

Peggy T. Lawring
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H.B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261 50-261 OL (Modification)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf, Chairman
Richard F. Cole, Member
A. Dixon Callihan, Member

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	Docket Nos. 50-261 50-261 (OL Modification)

ERRATUM

In our Memorandum and Order dated May 9, 1977, George A. Ferguson was incorrectly listed as a member of the Board in this proceeding. Dr. Ferguson's name should be deleted from the listing of the Board and the name of Dr. A. Dixon Callihan inserted.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

John F. Wolf

John F. Wolf, Chairman

Dated at Bethesda, Maryland,
this 17th day of May, 1977.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
18th day of May 1977.

Eugenia M Pleasant
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf, Chairman
Richard F. Cole, Member
George A. Ferguson, Member

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2	Docket Nos. 50-261 50-261 (OL Modification)

MEMORANDUM AND ORDER

5-9-77

The Intervenor, John D. Whisenhunt, Esquire, has advised this Board that he has disposed of the property, by negotiation, which gave rise to his knowledge and interest in this matter. Accordingly, he has filed a motion requesting an order permitting him to withdraw as a party to any further proceeding which may take place in this case.

The Intervenor's Motion to withdraw is granted.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

John F. Wolf.

John F. Wolf, Chairman

Dated at Bethesda, Maryland,
this 9th day of May, 1977.

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GD

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
17th day of May 1977.

[signature]
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No.(s) 50-261
	)	
(H. B. Robinson, Unit No. 2)	)	
	)	
	)	
	)	
	)	

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket No. 50-261
CAROLINA POWER & LIGHT COMPANY	)	50-261 (OL Modification)
	)	
(H. B. Robinson, Unit No. 2)	)	

MEMORANDUM AND ORDER

The Board is in receipt of proposed transcript corrections in the above indicated case. They were received from the Applicant and the NRC Staff. The Intervenor submitted none. The Applicant has stated it has no objections to the NRC Staff's proposed corrections and the Staff has indicated it has no objections to the Applicant's proposed corrections.

Accordingly, the Board incorporates the proposed corrections in the record. They are set out in the attached schedules marked "A" and "B".

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

John F. Wolf

John F. Wolf, Chairman

Issued at Bethesda, Maryland
this 24th day of March 1976.

APPLICANT'S TRANSCRIPT CORRECTIONS

SCHEDULE "A"

Page(s)	Line(s)	Corrections
62	20	Change "303(d)" to "303(g)"
113	8	Change "302(g)" to "303(g)"
119	1	Change "permanent issue" to "permit issued"
228, 229		Pages 228 and 229 should be reversed
267	19	Change "North Carolina" to "South Carolina"
343	9	Change "depend" to "be met"
344	7	Change "September 20" to "December 20"
349	18	Change "North" to "South"
467	12, 18	Change "Cardile" to "Carter"
468	1	" " " "
469	7	" " " "
470	17, 23	" " " "
471	1	" " " "
554	10	Change "steam" to "system"
556	19	Change "provision" to "petition"
558	17	Change "318" to "3 of 18"
1160	5	Change "Maine" to "Mink,"
1647	14	Change "April 15, 1975" to "April 18, 1973"

NRC STAFF TRANSCRIPT CORRECTIONS

SCHEDULE "B"

Page	Line	Correction
62	2	Change "NPDF" to "NPDES".
64	15	Change "NPDS" to "NPDES".
101	16	Change 'NPDF" to "NPDES".
115	8	Change "te" to "the".
119	16	Change "appropriate" to "inappropriate".
753	9	Change "Wilxoc" to "Wilcox".
760	12	Change "weriters" to "writers".
776-777	24	Change "Rivan" to "Ravan".
800	23	Change "Ferse" to "Ferst".
813	19	Change "walter" to "water".
818	23	Change "420" to "402".
851	24	Change "10" to "20".
1496	25	Change "plum" to Plume".
1517	8	Change "explanator" to "explanatory".

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
26th day of March 1976.

Peggy A. Dawning
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)))))))))	Docket No.(s) 50-261

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD Reg. Files

John F. Wolf, Chairman
A. Dixon Callihan, Member
Richard F. Cole, Member

In the Matter of

CAROLINA POWER AND LIGHT COMPANY

(Robinson Unit No. 2)
Section B Appendix D Environmental Review

Docket Nos. ~~50-261~~
50-261 OL
Modificatio

3/23/76

MEMORANDUM AND ORDER

After a review of the record and in consideration of the Board's obligations and responsibilities under the National Environmental Policy Act of 1969; the Water Pollution Control Act Amendments of 1972; and the Rules of Practice and Regulations of the Nuclear Regulatory Commission, the Board has determined to reopen the record of the Section B Appendix D environmental review hearing and hold in abeyance any action on the application for increased power until such time as the deficiencies in the record are corrected.

The principal reasons for this action are as follows:

1. Insufficient data are provided to assess the impact of thermal discharges which the Applicant predicts might be sustained. (Predicted is a maximum discharge temperature of 114°F for combined operation of Units 1

and 2). [Staff Exhibit 3, twelfth page; Tr. 235-237; Tr. 498] 1/

2. Neither Applicant nor Staff evaluated the impact on aquatic life of the predicted maximum temperatures of the cooling water discharge by comparison with established temperature preferenda and tolerance limits which appear in the record. (ER Tables 3.6-1 through 3.6-4; Tr. 1520-1527; Applicant's testimony ff. Tr. 494).

3. No data were presented on entrainment or on the consequences of probable planktonic shifts resulting from heat death of organisms passing through the condenser system. (FES §5.5.2.2, Tr. 1094, 1095, 1411, 1412)

4. Applicant's witness indicated spawning in Lake Robinson occurs during March and April when water temperatures are in the range of 78°F to 82°F (Tr. 1117) whereas

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1/ Temperatures above 99°F were first mentioned in these proceedings during the evidentiary hearing when documentation of the Applicant's request to EPA for a 316(a) exemption was introduced. (Tr. 237) Applicant's Environmental Report contains no mention of temperatures of 100°F or above although there is reference on page ER 3.6-6 to "90°F or above" and ER Figure 3.6-2 shows a discharge surface temperature of 99°F. The highest discharge temperature appearing in the FES is 97°F at the exit of the discharge canal, Figure 3.12. The highest temperature in the text of the FES is 94°F (p. 3-15). In the FES Section 5.2, however, the following statement does appear: "During the summer, water temperatures may become high enough (over 90°F) to make swimming unpleasant in the region of the lake near the discharge."

data in the record indicate spawning temperatures for most fish are in the range of 55-69°F. (Tr. 1526-1528)

5. As of the time of the evidentiary hearing, Applicant's study of the terrestrial ecosystem had not progressed to a point where any definitive conclusions could be reached as to the effect of Unit 2 operation. (Tr. 1166)

6. The differences between the observed and predicted temperatures in the Lake which were presented are sufficiently large to raise serious questions as to the validity of the Applicant's thermal model. (Applicant's testimony ff. Tr. 650, Tr. 705-722, Applicant's Exhibit 6)

In addition, no preoperational monitoring of aquatic or terrestrial biota was carried out (FES §6.1.3). This places a further burden on the Applicant to provide additional operational data. No lake isotherm data were presented for any discharge temperature in excess of 104°F. 2/

The Board finds that the Applicant has failed to estimate or to describe adequately the environmental consequences of the operation of Robinson Unit No. 2 during what the Applicant himself describes as typical summer

---

2/ Applicant testified to a 21°F rise across the condenser (Tr. 501) which, with a discharge temperature of 114°F, establishes an intake water temperature of 93°F. This indicates that virtually the entire lake would be at temperatures between 93°F and 114°F.

conditions. Also lacking is an adequate description or estimate of the lake conditions and resultant impact during what might be described as "worst case" conditions (i.e., the 7-day or 10-day annual "worst" or the 7-day or 10-day "worst" period that occurs, on the average, once every 10 years).

Applicant has requested authority to discharge cooling water at temperatures considerably higher than previously described in Applicant's submittals in this proceeding. Information necessary to properly assess the impact of such higher temperature discharges is totally lacking. Without such additional information, the balancing of benefits against environmental costs is not possible and therefore the Board cannot judge whether Robinson's Unit No. 2 license should be continued, modified, or terminated in order to protect environmental values.

Accordingly, the record will be opened to receive additional evidence to correct these deficiencies.

IT IS SO ORDERED

FOR THE ATOMIC SAFETY AND LICENSING BOARD

Richard F. Cole, Member

A. Dixon Callihan, Member

John F. Wolf, Chairman

Dated at Bethesda, Maryland
this 23rd day of March 1976

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s) upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
24th day of March 1976.

for Eugenia Pleasant /pnd
Office of the Secretary of the Commission

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	Docket No.(s) 50-261

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12-10-75

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

John F. Wolf, Chairman
Dixon Callihan, Member
Richard Cole, Member

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	Docket No. 50-261

ORDER

The request of the Nuclear Regulatory Commission Staff contained in a letter dated December 1, 1975, for leave to file, not later than December 5, 1975, a response to "Applicant's Reply to that Portion of the NRC Staff's Proposed Findings of Fact and Conclusions of Law Which Propose Conditions to the Operating License" is granted.

It is so Ordered

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

John F. Wolf

John F. Wolf
Chairman

Issued at Bethesda, Maryland

this 10th day of December, 1975.

11-13-75

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	
(H. B. Robinson, Unit No. 2)	)	

ERRATA TO NRC STAFF'S PROPOSED FINDINGS OF FACT

In line 20 on page 21 of the Staff's Findings of Fact, the temperatures of 113°F and 117°F were transposed. That line should be changed to read "117°F for Unit 1 operating alone and 113°F for Unit 2 operating alone."

Respectfully submitted,

L Dow Davis

L. Dow Davis, IV
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 13th day of November, 1975

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "ERRATA TO NRC STAFF'S PROPOSED FINDINGS OF FACT", dated November 13, 1975 in the above-captioned proceeding, have been served on the following by deposit in the United States mail, first class or air mail, this 13th day of November, 1975:

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Atomic Safety and Licensing
Appeal Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

L Dow Davis

L. Dow Davis
Counsel for NRC Staff

Reg. Files 11-17-75

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	Docket No. 50-261
	)	
CAROLINA POWER AND LIGHT COMPANY	)	
	)	
(H. B. Robinson, Unit No. 2)	)	

ORDER

The Staff's Motion to Receive Proposed Findings of Fact and Conclusions of Law, NUNC PRO TUNC, dated November 4, 1975, is granted.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD

John F. Wolf

John F. Wolf
Chairman

Dated at Bethesda, Maryland
this 17th day of November,
1975.

DOCKETED
USNRC
NOV 17 1975
Office of the Secretary
Docketing & Service
Section

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER & LIGHT COMPANY (H. B. Robinson, Unit No. 2)	Docket Nos. 50-261 50-261 (OL Modification)

ORDER

Applicant's motion for an extension of time to and including Friday, November 21, 1975 in which to submit its reply to the license conditions proposed by the Staff is granted.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD

John F. Wolf

John F. Wolf, Chairman

Dated at Bethesda, Maryland
this 17th day of November 1975.

DOCKETED
USNRC
NOV 17 1975
Office of the Secretary
Docketing & Service
Section

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)	Docket No.(s) 50-261

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document(s)* upon each person designated on the official service list compiled by the Office of the Secretary of the Commission in this proceeding in accordance with the requirements of Section 2.712 of 10 CFR Part 2 - Rules of Practice, of the Nuclear Regulatory Commission's Rules and Regulations.

Dated at Washington, D.C. this
17th day of Nov 1975.

Peggy A. Downing
Office of the Secretary of the Commission

*@ Bd's Order dtd 11/17/75 re Stay
@ Bd's Order dtd 11/17/75 w Applicants

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER AND LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)))))))))	Docket No.(s) 50-261

SERVICE LIST

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11-17-75

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of CAROLINA POWER & LIGHT COMPANY (H. B. Robinson, Unit No. 2)	)))))) Docket ~~Nos.~~ ~~50-261~~ 50-261 (OL Modification)

ORDER

Applicant's motion for an extension of time to and including Friday, November 21, 1975 in which to submit its reply to the license conditions proposed by the Staff is granted.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD

John F. Wolf

John F. Wolf, Chairman

Dated at Bethesda, Maryland

this 17th day of November 1975.

DOCKETED
USNRC
NOV 17 1975
Office of the Secretary
Docketing & Service
Section

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of) Docket Nos. 50- 261

CAROLINA POWER & LIGHT COMPANY) ~~50- 261~~
(H. B. Robinson, Unit #2)) (O.L. Modification)

ORDER RECONVENING EVIDENTIARY HEARING

It is ordered that the evidentiary hearing which was convened on Tuesday August 12, 1975 at 10:00 a.m. local time at the Coker College Music Hall, Hartsville, South Carolina 29550, and which ran in daily sessions through Friday August 15, 1975, shall be reconvened at 9:00 a.m. local time, Tuesday, September 23, 1975, at Coker College Music Hall, Hartsville, South Carolina, 29550.

Sessions will also be held in the hearing room described above on Wednesday, September 24, 1975 on Thursday, September 25, 1975 and on Friday, September 26, 1975, if required to complete the record. If hearing sessions in addition to the four ordered herein, are required, the Board, in cooperation with the parties, will arrange the time for additional sessions at the close of the hearing on September 26, 1975.

The Public is invited to attend each of the evidentiary hearing sessions ordered herein.

The agenda set out below will be followed at the hearing sessions:

1. Introduction of the balance of the licensee-applicant's case and questions by the parties and members of the Board.

2. Introduction of the Staff's case and questions by the partics and Board.

3. Introduction of the Intervenor's case and questions by the parties and Board.

4. Closing matters.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

John F. Wolf

John F. Wolf, Chairman

Dated at Bethesda, Maryland
this 2nd day of September, 1975.

May 26, 1978

Mr. Chase R. Stephens, Chief
Docketing & Services Branch
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, ~~Unit No. 2~~)
Docket No. 50-261 and
50-261 (~~OL Modification~~)

Dear Mr. Stephens:

Attached are three sets of the NRC Staff's exhibits numbered 8 through 15, as admitted into evidence by the Licensing Board's May 15, 1978 Order in the captioned proceeding.

Sincerely,

David A. Kubichek
Counsel for NRC Staff

Attachments: As Stated

cc: (w/o attachments)
John F. Wolf, Esq.
Dr. A. Dixon Callihan
Dr. Richard F. Cole
George F. Trowbridge, Esq.
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board

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NRC FORM 318 (9-76) NRCM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1976 — 626-624

FORM 21-50M

CP&L
Carolina Power & Light Company
Raleigh, N. C. 27602

COPY

RELATED CORRESPONDENCE

DOCKETED USNRC MAY 24 1978 Office of the Secretary Docketing & Service Section

May 22, 1978

Dr. A. Dixon Callihan
Union Carbide Corporation
Post Office Box Y
Oak Ridge, Tennessee 37830

Dr. Richard F. Cole
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

In the Matter of
Carolina Power & Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261, 50-261 (OL Modification)

Gentlemen:

Enclosed as agreed during a conference call among the parties and the Board on Friday, May 12, 1978, is CP&L Exhibit No. 20. The exhibit shows the results of Carolina Power & Light Company's most current energy and load forecasts and projected reserves with and without H. B. Robinson Unit No. 1.

Very truly yours,

Original Signed By
Richard E. Jones
Richard E. Jones
Associate General Counsel

REJ/gmc

Enclosure

cc: David A. Kubichek, Esq.
Docketing and Service Section

CP&L Exhibit 20

RELATED CORRESPONDENCE

TABLE 1

1977 ENERGY AND LOAD FORECAST

Year	Energy Forecast (MWH)	Load Forecast (MW)
1978	28,586,688	5829
1979	30,301,864	6205
1980	32,209,533	6614
1981	34,208,255	7034
1982	36,329,294	7480
1983	38,470,979	7929
1984	40,779,364	8427
1985	43,064,739	8914
1986	45,475,140	9424
1987	47,884,926	9933
1988	50,376,243	10463
1989	52,945,431	10983
1990	55,751,539	11549
1991	58,594,868	12122
1992	61,524,611	12732
1993	64,539,317	13337
1994	67,637,204	13959
1995	70,816,153	14593
1996	74,286,144	15286
1997	77,777,593	15981

5/16/78

TABLE 2

CAROLINA POWER & LIGHT COMPANY
RESOURCES, LOAD, & RESERVES

CURRENT CONSTRUCTION SCHEDULE

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Previous Year Capability	7,328	7,433	7,433	8,153	8,153	8,873	8,873	9,773	10,493	11,393	11,393	12,293	13,443
Unit Uprates	105												
Roxboro 4			720										
Mayo 1					720								
Harris 1							900						
Mayo 2								720					
Harris 2									900				
Harris 4											900		
Undesignated Unit												1,150	
Harris 3													900
Total Capability	7,433	7,433	8,153	8,153	8,873	8,873	9,773	10,493	11,393	11,393	12,293	13,443	14,343
Net Purchases	127.5	127.5	127.5	75	75	75	75	75	75	75	75	75	75
Contracted Reserve	40	40	40	60	60	60	60	60	60	60	60	60	60
Total Power Resources	7,600.5	7,600.5	8,320.5	8,288	9,008	9,008	9,908	10,628	11,528	11,528	12,428	13,578	14,478
Load	5,829	6,205	6,614	7,034	7,480	7,929	8,427	8,914	9,424	9,933	10,463	10,983	11,549
Reserves	1,771.5	1,395.5	1,706.5	1,254	1,528	1,079	1,481	1,714	2,104	1,595	1,965	2,595	2,929
% Reserves	30.4	22.5	25.8	17.8	20.4	13.6	17.6	19.2	22.3	16.1	18.8	23.6	25.4

WITHOUT H. B. ROBINSON #2**

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Previous Year Capability	6,663	6,768	6,768	7,488	7,488	8,208	8,208	9,108	9,828	10,728	10,728	11,628	12,778
Unit Uprates	105												
Roxboro 4			720										
Mayo 1					720								
Harris 1							900						
Mayo 2								720					
Harris 2									900				
Harris 4											900		
Undesignated Unit												1,150	
Harris 3													900
Total Capability	6,768	6,768	7,488	7,488	8,208	8,208	9,108	9,828	10,728	10,728	11,628	12,778	13,678
Net Purchases	127.5	127.5	127.5	75	75	75	75	75	75	75	75	75	75
Contracted Reserve	40	40	40	60	60	60	60	60	60	60	60	60	60
Total Power Resources	6,935.5	6,935.5	7,655.5	7,623	8,343	8,343	9,243	9,963	10,863	10,863	11,763	12,913	13,813
Load	5,829	6,205	6,614	7,034	7,480	7,929	8,427	8,914	9,424	9,933	10,463	10,983	11,549
Reserves	1,106.5	730.5	1,041.5	589	863	414	816	1,049	1,439	930	1,300	1,930	2,264
% Reserves*	19.0	11.8	15.7	8.4	11.5	5.2	9.7	11.8	15.3	9.4	12.4	17.6	19.6

*It is CP&L's objective to have a minimum of 15-20% reserves.

**H. B. Robinson summer capability rating is 665 MW. This figure does not include the MW that would be available from the requested uprating.

5/17/78

NRC Central

May 8, 1978

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

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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3409 Shepherd Street
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In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261, 50-261 (OL Modification)

Gentlemen:

On April 28, 1978, the undersigned, via letter, represented that the Staff's Safety Evaluation of the proposed license amendment in the captioned proceeding would be completed and made available to the Board and the parties some time around May 15, 1978.

However, because of recent developments in the Staff's analysis of meteorological conditions at the Robinson site, it appears that the Staff may not be able to complete its Safety Evaluation by May 15. Specifically, the Staff is currently considering new meteorological data supplied by the Applicant, and is also reconsidering the meteorological model presently applicable to the Robinson facility.

The effects of the Staff's consideration of these issues on the Robinson plant are as yet unknown. We shall, of course, keep the Board and the parties fully posted with respect to any further developments in this regard.

Sincerely,

David A. Kubichek
Counsel for NRC Staff

cc: George F. Trowbridge, Esq.
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board
Docketing and Service Section

OFFICE➤	OELD	OELD				
SURNAME➤	Kubichek/dmr	Reis				
DATE➤	5/8/78	5/8/78				

5/1/78 May 1, 1978 NRC Central

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

NRC STAFF'S RESPONSE TO THE APPLICANT'S PROPOSED FINDINGS AND CONCLUSIONS IN THE FORM OF A PROPOSED INITIAL DECISION

1. On April 19, 1978, the Atomic Safety and Licensing Board issued a Memorandum and Order whereby it announced its intent to issue a decision on all matters in the captioned consolidated proceedings.[1/] Specifically, the Board determined that its decision would encompass both an overall NEPA cost/benefit balance for the Robinson facility and those particular issues delineated the Board's Memorandum and Order of March 23, 1976. Additionally, the Board invited the Applicant and the Staff to file proposed findings on all matters, including outstanding considerations of health and safety.

[1/] This case involves a consolidation of two previously distinct proceedings. The first of these proceedings was brought pursuant to the provisions of Section 13 of Appendix D to 10 CFR Part 50, and is concerned with whether, under NEPA, the operating license for this facility should be continued, modified, terminated or appropriately conditioned to protect environmental values. The second of the two proceedings is concerned with the Applicant's pending application to the Commission for an amendment to the Robinson operating license increasing the authorized power level of the facility from 2200 MWT to 2300 MWT.

2. In response to the Board's invitation, the Applicant filed on April 19, 1978, a document entitled "Applicant's Proposed Findings and Conclusions in the Form of a Proposed Initial Decision." Because these proceedings actually represent a consolidation of two separate proceedings, the Applicant's Proposed Decision attempts to resolve all issues with respect to both the Appendix D proceeding and the proceeding concerned with the Applicant's request for an amendment to the Robinson operating license.

3. With respect to the pending Appendix D environmental review of the Robinson facilities' operating license, the Staff concurs in and fully adopts the proposed findings submitted by the Applicant, subject, however, to the qualifications and/or exceptions noted below.

4. In paragraph 10 of its proposed findings, the Applicant describes the scope of the Staff's Final Environmental Statement and, with the exception of the environmental impacts associated with the plant's once-through cooling system, would have the Board adopt fully the Staff's findings in the FES as the basis for its NEPA evaluation. While generally concurring in the Applicant's proposal, the Staff proposes that an additional exception be taken with respect to the findings on the environmental effects of the uranium fuel cycle, as described in Section 5.4.7 and Table 5.8 of the FES (pp. 5-16, 17, respectively).

5. The Robinson FES was published in April, 1978, and incorporated the Commission's original Table S-3 which was based on a document entitled Environmental Survey of the Uranium Fuel Cycle.[2/] That Table S-3, also incorporated in the Commission's regulations at 10 CFR Part 51, was intended to set forth a full and candid assessment of the [environmental] costs and benefits associated with the uranium fuel cycle. Further, since Table S-3 was promulgated as a formal Commission Rule, the values and resulting environmental impacts described by the Table were not subject to challenge in individual licensing cases. See 10 CFR §51.20(E) and §2.758. However, since the time that the original Table S-3 was incorporated into the Commission's regulations and the Robinson FES was published, three events have transpired that should be accounted for by the Board in making its final NEPA cost-benefit balance for this facility.

6. First of all, on July 21, 1976, the United States Court of Appeals for District of Columbia Circuit issued its opinion in Natural Resources Defense Council v. NRC, 547 F.2d 633 (1976), rev. on other grounds, sub nom. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, No. 76-419, 46, U.S.L.W. 4301 (April 3, 1978), wherein the Court determined that the fuel cycle rule represented by Table S-3 was

[2/] WASH-1248 (November, 1972).

inadequately supported by the record insofar as it treated two particular aspects of the uranium fuel cycle--the impacts from reprocessing of spent fuel and the impacts associated with radioactive waste management.[3/] In response to the Court of Appeal's decision, the Commission undertook (1) to prepare and issue a document supplementing the original WASH 1248 Survey, in which a basis would be established for identifying the environmental impacts associated with waste management and fuel reprocessing activities;[4/] and (2) to promulgate a new interim Table S-3 incorporating some revisions in those portions of the original Table relating to the spent fuel reprocessing and waste disposal phases of the fuel cycle.[5/]

7. On March 14, 1977, the Commission officially promulgated the new interim Table S-3.[6/] While, as noted above, the interim table does contain some

---

3/ NRDC v. NRC, *supra*., at 646-654.

4/ Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle, NUREG-0116 (Supp. 1 to WASH-1248; and NUREG-0216 (Supp. 2 to WASH-1248) (Public Comments and Task Force Responses Regarding the above-cited document).

5/ *See* Uranium Fuel Cycle Impacts From Spent Fuel Reprocessing and Radioactive Waste Management, 42 Fed. Reg. 13803 (March 14, 1977).

6/ *Id*.

values different from those set forth in the original Table S-3, the Commission itself has determined that those differences are not substantial.[7] Therefore, as of the publication of the interim Table, the environmental impacts associated with the uranium fuel cycle were not considered significant, especially where, as here, they were evaluated in the context of striking a cost-benefit balance for a facility already fully constructed and operating.[8]

8. However, on April 3, 1978, the Commission, in response to a petition for rulemaking filed by the New England Coalition on Nuclear Pollution, again promulgated amendments to Table S-3. First of all, the entry for radon-222 under "Effluents--radiological (curies)" and the accompanying textual material which now reads:

> "rn-222 . . . 74.5 principally from milling operations and excludes contributions from mining."

was revised to read as follows:

> "rn-222 . . . Presently under reconsideration by the Commission." [9]

7/ See Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), CLI-77-10, 5 NRC 717,717b (1977).

8/ See, e.g., Vermont Yankee Nuclear Power Corporation (Vermont Yankee Nuclear Power Station), ALAB-421, 6 NRC 25, 29 (1977). A similar conclusion was reached by the Staff on the basis of the original Table S-3, at Section 5.4.7, p. 5-16 of the FES.

9/ 43 Fed. Reg. 15613.

9. Additionally, footnotes 5 and 6 were deleted from the Table, and footnote 1 was amended to reflect that Table S-3 does not include health effects from the effluents described in the Table, or estimates of releases of radon-222 from the uranium fuel cycle. That footnote also provides that issues not addressed at all by the Table may be the subject of litigation in individual license proceedings. Finally, the Commission directed that, in proceedings pending before licensing boards, the licensing boards "reopen the record on NEPA issues for the limited purpose of receiving new evidence on radon releases and on health effects resulting from radon releases."[10/]

10. As a result of all of the above-cited developments, the Staff now proposes to fully update the record in this proceeding with respect to the environmental impacts of the uranium fuel cycle. Accordingly, the Staff proposes to submit new evidence on the environmental impacts of the fuel cycle associated with releases of radon-222.

[10/] Id. The Commission has discussed health effects in individual license proceedings, in connection with comparisons of the uranium and fossil fuel cycles, since the Appeal Board's decision in Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), 5 NRC 92, 103 (1977). See Infra.

11. In addition, because of the Appeal Board's decision in Hartsville[11/] requiring, in the context of a NEPA cost-benefit determination, an evaluation of the relative health effects of the uranium and fossil fuel cycles, the Staff now proposes to submit evidence in the form of affidavits and supplemental testimony on this issue also, which evidence will fully account for health effects associated with the Staff's new values for releases of radon-222.

12. Therefore, the Staff now moves the Licensing Board to receive into evidence the following, attached items:

(1) the Revised, Interim Table S-3;

(2) the Commission's April 14, 1978, Clarifying Amendments to Revised Interim Table S-3;

(3) Gotchy, R. L., NUREG-0332, Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives (1977);

(4) the Affidavit of Homer Lowenberg, dated January 20, 1978;

11/ Id. See Potomac Electric Power Corp. (Douglas Point Nuclear Generating Station, Units 1 and 2), ALAB-218, 8 AEC 79, 82 (1974) for the proposition, arguably applicable, in the Staff's view, to both the environmental impacts of the fuel cycle and health effects comparison, that a change in the law must be applied to pending cases "unless doing so would result in manifest injustice or there is statutory direction or legislative history to the contrary." Quoting Bradley v. Richmond School Board, 416 U.S. ___, 40 L.ed.2d 476 (1974). See also, United States v. Schooner Peggy, 5 U.S. (1 Cranch) 103 (1801) (Marshall, C.J.).

(5) the Affidavit of Jack E. Rothfleisch, dated January 18, 1978;

(6) the Affidavit of Reginald L. Gotchy, dated March 28, 1978;

(7) the Affidavit of R. M. Wilde, dated March 28, 1978; and

(8) the Affidavit of Paul J. Magno, dated January 16, 1978.

13. On the basis of the evidence submitted above, it is first of all clear that the environmental impacts associated with the uranium fuel cycle remain insignificant. This conclusion was first reached by the Staff in the Robinson FES, utilizing WASH-1248 and the environmental impacts set forth in the original Table S-3.[12/] As noted earlier, the Commission's adoption in 1977 of the interim Table S-3, with its new values for impacts associated with certain aspects of the fuel cycle, did not result in substantial changes to the magnitude of the overall environmental impacts attributable to the uranium fuel cycle.[13/] Thus, as of the adoption of the interim Table, the Staff's original conclusion that the impacts from the fuel fuel cycle were sufficiently small as to have little effect on the overall cost-benefit balance for the Robinson plant remained valid.[14/]

12/ Robinson FES, Section 5.4.7 and Table 5.8, at pp. 5-16 - 5-17.

13/ 42 Fed. Reg. 13803, et seq. See supra., at p. 5, and n. 7.

14/ Id. See also Vermont Yankee; ALAB-421, supra., at 29.

14. However, on the basis of the affidavits submitted by the Staff at this time, it is clear that neither the original Table S-3 nor the revised Table S-3 adequately reflected the actual releases of radon-222 attributable to the uranium fuel cycle. These affidavits demonstrate that the value for radon-222 in Table S-3 does not include releases from either mining or from mill tailings after the active life of the mill,[15] and that, when these sources are included, the actual value for radon-222 is substantially higher than that given in Table S-3.[16]

15. Nevertheless, the Staff has concluded that the environmental impacts associated with these higher radon values are still "'insignificant compared to those due to radon contamination in material background; and that the authors of WASH-1248 were correct in their belief that 'population doses from this source cannot be distinguished from background.'"[17]

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[15] Affidavit of Jack E. Rothfleisch, p. 3; Affidavit of Homer Lowenberg.

[16] Affidavit of R. M. Wilde, with respect to mining; Affidavit of Paul J. Magno, with respect to milling. The Staff's new values for radon-222 releases, taking into account releases from both mining and mill tailings, are summarized in the Affidavit of Reginald L. Gotchy, Table 1, at pp. 1-2.

[17] Affidavit of Reginald L. Gotchy, p. 16. <u>See also</u>, WASH-1248, p. 8-23 (November, 1972).

16. Therefore, in the absence of any proffered controvening evidence or any questions raised sua sponte by this Board, it is the Staff's view that the attached affidavits and the conclusions reached therein provide an adequate basis to support a finding by this Board that the environmental impacts associated with radon releases in the uranium fuel cycle are not significant, and do not adversely affect the cost-benefit balance for the Robinson facility.

17. With respect to health effects, we note that the record in this proceeding does not include a detailed analysis of the comparative health effects associated with the uranium and fossil fuel cycles, respectively. The Robinson FES was published and, with the exception of the Applicant's and Staff's responses to the Board's March 23, 1976, Memorandum and Order, the Appendix D hearings were completed prior to the Appeal Board's decision in Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), ALAB-367, 5 NRC 92, 103 (1977), which suggested such as assessment in the context of the Staff's analysis of alternative forms of electrical generation. Nevertheless, because the Board has determined to strike a full NEPA cost-benefit balance for this facility, the Staff is submitting evidence of comparative health effects of the uranium and fossil fuel

cycles,[18/] which evidence takes into account health effects attributable to the new radon-222 values contained in Staff affidavits submitted into evidence above.[19/]

18. In making its assessments of health effects resulting from the coal and nuclear fuel cycles, the Staff considered the entire fuel cycle of each, not just the power generation phases. For coal, the cycle consists of mining, fuel transportation, processing, power generation, and waste disposal.[20/] Likewise, the nuclear fuel cycle includes mining, milling, uranium enrichment, fuel preparation, fuel transportation, power generation, spent fuel transportation and reprocessing, and waste disposal.[21/]

19. Disregarding the Staff's new values for radon-222 for the moment, it is clear, based on the evidence here submitted by the Staff, that the uranium

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18/ See n. 11, *supra*., at p. 7.

19/ See n. 17, *supra*., and the respective affidavits of Wilde, Magno and Gotchy.

20/ R. L. Gotchy, NUREG-0332, *Health Effects Attributable to Coal and Nuclear Fuel Cycle Alternatives* (Draft), p. 3 (1977)(hereinafter NUREG-0332).

21/ *Id*.

fuel cycle is considerably less harmful to man than the coal fuel cycle.[22/] This is so despite the fact that the Staff's analysis conservatively understates the impacts of the coal cycle relative to the uranium cycle.

20. For example, the analysis of the uranium fuel cycle includes a consideration of the possible effects of accidents on radioactive releases, and also accounts for long-term exposure effects.[23/] However, due to the lack of an adequate data base, these factors have not been considered with respect to the coal fuel cycle.[24/] In addition, the Staff's assessment of health effects from a nuclear plant is done on the basis of the entire U.S. population, whereas the assessment of the effects from a coal plant is conservatively done only for an 80 kilometer radius.[25/] It is the Staff's view that a coal plant would cause health effects beyond that radius, but these have not yet been quantified.[26/]

21. Notwithstanding these conservatisms, however, it is clear that the coal fuel alternative may be more harmful to man by factors of 4 to 250, depending on the effect being considered, than on all nuclear economy,[27/] or

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22/ Id., at 13. See also, Id., at 19, Table 1.
23/ Id., at 5-6, and 15-22.
24/ Id., at 7-9.
25/ Id., at 15-16.
26/ Id., at 16, n.
27/ Id., at 13.

by factors of 3 to 22, assuming that all of the electricity consumed in the uranium fuel cycle comes from coal powered plants.[28/]

22. The advantage enjoyed by the nuclear fuel cycle may be most graphically illustrated via reference to one fact, i.e., although there are large uncertainties in the estimates of most of the potential health effects of the coal cycle, the impact of the transportation of coal is based on firm statistics. This impact alone is greater than the conservative estimates of health effects for the entire uranium fuel cycle (assuming an all nuclear economy), and can reasonably be expected to worsen as more coal is shipped over greater distances.[29/] Moreover, in the case where coal-generated electricity is assumed to power the uranium fuel cycle (primarily for uranium enrichment and auxiliary reactor systems), the impacts on health attributable to that coal power accounts for essentially all of the health effects of the entire uranium fuel cycle.[30/]

28/ Id.

29/ Id.

30/ Id.

23. Therefore, disregarding the Staff's new values for radon-222 for the moment, it is clear that the uranium fuel cycle enjoys significant health effect advantages over the fuel cycle.

24. Moreover, as is clear from the affidavits here submitted by the Staff, this advantage in favor of the nuclear fuel cycle is not significantly narrowed by the inclusion of the Staff's new values for radon-222 releases attributable to mining and mill tailings. The affidavit of Reginald L. Gotchy, particularly Table 8 on p. 18, demonstrates that the estimated population doses and health effects attributable to mining and milling would represent only a very small increase in doses and health effects from radon in the natural background.[31/]

25. On the basis of the newly submitted Staff evidence, therefore, the Board should find that the nuclear fuel cycle continues to enjoy advantages over the coal fuel cycle with respect to health effects. In addition,

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31/ See also, Washington Public Power Supply System (WPPSS Nuclear Project No. 4) Docket No. 50-513, Supplemental Initial Decision (Construction Permit), Slip Op. at 27 (Feb. 17, 1978) (An Errata to this opinion was issued by the Board on Feb. 23, 1978, wherein the Board expressly concurred with the Staff's findings that, even with the newly adjusted radon-222 values, the nuclear fuel cycle has fewer health effects than does the coal cycle. Nevertheless, based on the Appeal Board's decision in Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit No. 2), ALAB-456, 7 NRC ___ (January 27, 1978), that Board based its decision on the lower radon-222 source term set forth in the Revised Table S-3).

because of this advantage, the Staff's original conclusion in the Robinson FES that continued operation of the Robinson nuclear power plant is an environmentally preferable alternative to the abandonment of Robinson II in favor of a coal-fired generator therefore also should retain validity.[32/] The Staff would thus urge the Board to make appropriate findings to these effects.

26. Finally, with respect to the Applicant's proposed findings in response to the Licensing Board's Comment 7,[33/] the Staff concurs in and adopts Applicant's proposal to the extent that it would have this Board determine that "the status of the fish and fisheries [in Lake Robinson] is not likely to change as a result of the thermal discharge [from the plant] if the conditions of the NPDES permit are observed.[34/] However, the Staff does not join in the Applicant's characterization of the Commission's recent decision in Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), CLI-74-__, 7 NRC ___(January 6, 1978), as it applies to these proceedings. In Seabrook, the Commission determined that it should not attempt to go behind EPA's determinations with respect to the severity of aquatic impacts in cases where, as in Seabrook, EPA reached those determinations after enviro-mentally sensitive, full adjudicatory hearings.[35/] However, in proceedings such as the instant

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32/ See Section 9.1.2, pp. 9-1 to 9-3, of the Robinson FES.

33/ Applicant's Proposed Findings at paragraph 26, p. 15.

34/ I.e., an upper limit of 111.2°F on the maximum daily summer discharge temperature, and a roving thirty-day average limit of 108.7°F.

35/ Seabrook, Slip Op. at 38-40.

one, where EPA's determinations are not arrived at after full administrative proceedings, the NRC is presumably not so bound. As the Commission itself noted in a footnote in the Seabrook opinion:

> Our action in this case rests on the nature and extent of the EPA proceedings. In future cases where EPA has made the necessary factual findings for approval of a specific once-through cooling system for a facility after full administrative proceedings, we expect our adjudicatory boards to do as we have done today. There is no question before us as to how to treat other EPA actions reached through other proceedings, and we express no view in that regard. 36/

27. With the above-noted exceptions and/or qualifications, the Staff fully concurs in and adopts the findings and conclusions proposed by the Applicant. The extensive record developed in these proceedings provides ample basis for a conclusion by the Board that the impact of the Robinson facility on the aquatic and terrestrial life in Lake Robinson and on the recreational use of the lake is acceptable and that the benefits to be derived from the continued operation of this facility outweigh those environmental impacts associated with it.

Respectfully submitted,

David A. Kubichek

David A. Kubichek
Counsel for NRC Staff

Dated at Bethesda, Maryland,
this 1st day of May, 1978.

36/ Seabrook, Slip Op. at p. 40, n. 42.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S RESPONSE TO THE APPLICANT'S PROPOSED FINDINGS AND CONCLUSIONS IN THE FORM OF A PROPOSED INITIAL DECISION" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission internal mail system, this 1st day of May, 1978:

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Title 10 - Energy

CHAPTER 1 - NUCLEAR REGULATORY COMMISSION

PART 51- LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management

AGENCY: Nuclear Regulatory Commission

ACTION: Effective clarifying amendment to Table S-3 and Response to Petition for Rulemaking filed on behalf of the New England Coalition on Nuclear Pollution (Docket No. PRM-51-1).

SUMMARY: The Commission has previously published Table S-3 of 10 CFR Part 51 which identified environmental effects for the uranium fuel cycle which are to be included in environmental reports and environmental impact statements for individual light water nuclear power reactors. This action amends the prior regulations to remove the value contained in Table S-3 for releases of radon and to clarify that Table S-3 does not include health effects from the effluents described. The rule as amended states that the fuel cycle rule does not preclude consideration of these impacts in individual cases. This action also responds to the NECNP rulemaking petition.

EFFECTIVE DATE: April 14, 1978

FOR FURTHER INFORMATION CONTACT: Ms. Jane A. Axelrad, Office of the Executive Legal Director, U.S. Nuclear Regulatory Commission, Washington, D. C. 20555 (phone: 301-492-7437).

SUPPLEMENTARY INFORMATION: Notice is hereby given that the Nuclear Regulatory Commission (hereinafter "NRC" or "Commission") has decided to amend Table S-3 of 10 CFR Part 51 "Summary of Environmental Considerations for Uranium Fuel Cycle" in the Commission's regulations "Licensing and Regulatory Policy and Procedures for Environmental Protection," 10 CFR Part 51. Specifically, the Commission has decided to clarify that certain environmental effects from the uranium fuel cycle are not included in the Table and may be litigated in individual cases.

In conjunction with this notice of rulemaking, the Commission hereby gives notice that the petition for rulemaking submitted by letter dated November 19, 1975 by Roisman, Kessler, and Cashdan, 1025 15th Street, N.W., Washington, D.C., on behalf of the New England Coalition on Nuclear Pollution is being denied in part. However, the issues raised in the petition relating to Radon-222 will be addressed in a future rulemaking proceeding to amend the value for Radon in Table S-3. Accordingly, action on this part of the petition is being deferred.

Description of the Petition

The New England Coalition on Nuclear Pollution petitioned the Commission to amend Table S-3 of 10 CFR Part 51, "Summary of Environmental Considerations for Uranium Fuel Cycle" in the Commission's regulations "Licensing and Regulatory Policy and Procedures for Environmental Protection," 10 CFR Part 51. A notice of the filing of the petition, Docket No. PRM-51-1, was published in the FEDERAL REGISTER on January 16, 1976 (41 FR 2448).

The petition for rulemaking was accompanied by two technical documents authored by Professor Robert O. Pohl, Professor of Physics, Cornell University, entitled "Nuclear Energy: Health Impact of Carbon-14" and "Health Effects of Thorium-230." These technical papers provided the technical bases for the claims presented in the petition. On December 23, 1976, the NRC received a final draft of Professor Pohl's paper "Nuclear Energy: Health Impact of Carbon-14" that replaced the draft previously sent to the NRC on November 19, 1975 as part of the original petition.

The notice of petition filing invited interested persons to submit written comments or suggestions on the petition by March 16, 1976. Because of public interest about the concerns expressed by the petition, the public comment period was extended to April 26, 1976 (41 FR 12365). The following responded to the requests for written comments: Atomic Industrial Forum, Inc.; Commonwealth Edison Company; U.S. Environmental Protection Agency (EPA); General Electric Company; Nuclear Fuel Services, Inc.; Ranchers Exploration and Development Corporation; Tennessee Valley Authority; Union Carbide Corporation; United Nuclear Corporation; and Westinghouse Electric Corporation. All commentors, except EPA, recommended that NRC should deny the petition because, in their opinion, the petitioners have provided insufficient bases and rationale to support their claims for reassessing Table S-3 and existing licenses and for the postponement of pending applications. EPA only supplied correspondence between EPA and Dr. Pohl because of references made in the petition to EPA's dose estimate methods presented in the EPA Uranium Fuel Cycle report, EPA-520/9-73-003-B, October 1973.

In the petition, the petitioners state that (1) the current Table S-3 seriously underestimates the impact on human health and safety by disregarding the long-term effects of certain long-lived radionuclides, particularly Thorium-230 which decays into radon gas, and that the health effects of uranium mining and milling, presently listed in Table S-3 as a total of 0.06 man-rems within five miles of the plant per annual fuel requirement, fails to disclose the long-term and long-range health effects of radon-222 gas released from tailings piles; (2) the health effects of Krypton-85 and Tritium releases from fuel reprocessing plants are underestimated in Table S-3; (3) releases of Carbon-14 from the fuel cycle should be included in Table S-3; (4) that Table S-3, by the exclusive use of the term "man-rems", does not provide a meaningful representation of these health effects, at least in the case of those radionuclides involved in this petition, and that human deaths from man-rem exposures provide a more easily comprehended consequence of the fuel cycle activities; and (5) the magnitude of the potential death toll from mill tailings alone is so great as to alter the previous judgments on these matters and to require as a minimum a reassessment of previous conclusions to authorize construction or operation of nuclear reactors and a postponement of resolution of all pending applications for construction or operation authority until final resolution of this issue by the Commission.

The petitioners requested certain numerical changes and additions as well as a narrative text to be incorporated into Table S-3 of 10 CFR Part 51 under the subheading entitled "Effluents - Radiological (curies), Gases (including entrainment)."

Disposition of Issues Raised in the Petition

With regard to the first issue raised by the petition, the current Table S-3 value for Radon-222 is incorrect and does not include:

- estimates of radon released from mining operations.
- estimates of releases of radon from interim tailings piles after the mill has shut down and during the ensuing period while the tailings pond is evaporating and before stabilization programs are completed.
- estimates of releases of radon from stabilized mill tailings piles.

At the time the Staff developed the Table S-3 value for radon, the Staff did not have sufficient data to quantify the releases from radon involved in the mining of uranium. The Staff was unable to find any field data for radon emissions but field measurements taken by the Bureau of Mines for radon concentrations in open pit mines revealed no significant alpha concentrations.

Even though there was no meaningful field data for estimating a specific radon release quantity, the Staff was able to conclude that radon concentrations away from the immediate vicinity of the mine would not be

detectable against natural background. This Staff conclusion was supported by conclusions reached in the BEIR report */ and the U.S. Environmental Protection Agency report, "Estimates of Ionizing Radiation Doses in the United States 1960-2000," **/ both of which are cited in WASH-1248.

With regard to milling, estimates of releases from interim tailings piles were not included because it was assumed that these piles remained wet until stabilized and therefore did not permit significant releases of radon. The Staff considered available information, particularly the report of the U.S. Environmental Protection Agency entitled, "Estimates of Ionizing Radiation Doses in the United States 1960-2000" to determine releases from stabilized piles. This document reported the results of studies made at active and inactive mill sites with covered and uncovered tailings which showed no significant radiation exposure to the public. Based on these studies, the Staff concluded in WASH-1248, B-23, that population doses attributable to the uranium milling industry would not be distinguishable from natural background radiation.

However, since the original Table S-3 was promulgated, new estimates of releases have been devised that require upward revision of the value for radon in Table S-3. Therefore, the Commission is amending Table S-3 to

*/ "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," Report of the Advisory Committee on the Biological Effects of Ionizing Radiation (BEIR), Nat'l. Ac. Sci., Nat'l Res. Council, Washington, D.C., (Nov. 1972), p. 15. (Cited in WASH-1248 at p. A-4).

**/ ORP/CSD 72-1, Estimates of Ionizing Radiation Doses in the United States 1960-2000, U.S. Env. Prot. Agency (Aug. 1972), p. 27. (Cited in WASH-1248 at p. A-4).

eliminate the value for radon releases. This issue may henceforth be litigated in individual licensing proceedings since it is not now covered by the rule. A clarifying amendment to Table S-3 to this effect is set forth below.

The Commission intends to evaluate data that is being collected in a series of ongoing programs described below and will determine when the Generic Environmental Impact Statement (GEIS) on uranium milling is issued whether to initiate a limited rulemaking proceeding to include a revised value for Radon-222 in an updated Table S-3. In determining whether to initiate such a rulemaking, the Commission will evaluate the arguments of the NECNP petition. It will also consider statements made in a memorandum written by Walter H. Jordan, a member of the Atomic Safety and Licensing Board Panel, to James R. Yore, Chairman of the Atomic Safety and Licensing Board Panel. A copy of that memorandum, which raised issues similar to those raised in the petition, is on file in the NRC public document room. In any event, the Commission plans a general long-term effort to update the rule and the radon issue will be addressed then.

The second and third issues raised by the petition were specifically addressed when the Commission published a revised interim Table S-3 in March of 1977 (42 FR 13803, March 14, 1977). Interim Table S-3 contains upward revisions of releases for both Krypton-85 and Tritium. The differences between the petitioner's estimates of releases and the NRC estimates are due to differences in the models. The basis for the NRC models is described in detail in NUREG-0116 and 0216.

Carbon-14 has been added to the interim Table S-3. The differences between petitioner's estimates of releases and the NRC estimates are due to differences in models. The basis for the Carbon-14 model is described in NUREG-0116 and NUREG-0216.

The petitioner's fourth issue is that Table S-3 does not provide a meaningful representation of health effects. Health effects were addressed in NUREG-0216 in response to comments that the Commission should have considered them. However, the Commission decided to pattern the interim rule after the original S-3 Table which did not include such effects in the actual table. The Commission implicitly addressed fuel cycle health effects in the Statement of Considerations accompanying Table S-3 when the Commission noted that "the environmental impacts of the uranium fuel cycle have been shown to be relatively insignificant." */ Accordingly, health effects were not discussed in individual licensing proceedings until after the decision in Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B and 2B), 5 NRC 92, 103 (1977) where the Appeal Board required that they be considered in connection with comparison of the uranium and fossil fuel cycles. The Commission believes that, for the present, the purposes of NEPA are advanced by discussing health effects in individual cases. To clarify this point, the Commission has removed all dose estimates attributable to gaseous effluents from the

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*/ 39 F.R. 14188.

Footnotes in the Table and has amended Footnote 1 to indicate that health effects are not covered by the Table and may be litigated in individual cases.

To summarize the Commission's position on the NECNP petition:

1. The portion of the petition that recommends that Table S-3 be amended to include upward revisions of the values for Krypton-85, Tritium and Carbon-14 was in effect granted, although the specific values suggested by the petitioner were not adopted. These values were revised upward when the Commission promulgated the Interim Table S-3 on March 14, 1977 and are being reexamined during the final rulemaking proceeding on waste management and reprocessing.

2. The portion of the petition that recommends that Table S-3 be amended to include health effects is denied. The Commission has determined for the present that these effects should be dealt with in individual licensing proceedings rather than by rule. The effluent release data set forth in the revised Table shall provide the basis for derivation of population doses and resultant health effects in individual licensing proceedings. The Commission will, at a later date, reexamine whether doses and health effects should be included in Table S-3. It will also address the question of what period of time should be used to calculate doses and health effects. These issues have been raised in the final rulemaking proceeding on waste management and reprocessing mentioned above and will be addressed in the overall revision of Table S-3 described below.

3. The Commission agrees with that portion of the petition that recommends that the values for Radon-222 in Table S-3 be amended. The Commission, however, is deferring instituting a rulemaking on this issue. The Commission recognizes that radon releases from the fuel cycle must be considered in licensing decisions. Pending generic consideration of this issue, radon released from the fuel cycle can be considered in individual proceedings.

Petitioner has asserted that the NRC should halt licensing until the issues raised by the petition are resolved. The Commission believes that the clarifying amendment now issued removes any need for a blanket postponement of licensing. Some issues raised by the petition have already been resolved by the Commission. Other issues, particularly those relating to Radon-222 and health effects, may be considered in individual cases. The Commission believes that the information that is presently available should enable individual licensing boards to evaluate the significance of fuel cycle radon releases in striking the environmental cost-benefit balance for a nuclear power reactor. */ The Commission has chosen to leave these issues open for litigation in individual proceedings, rather than freeze by an immediate rulemaking the form such an evaluation should take, in order that experience with varying approaches may be gathered as a possible basis for a generic rule later on. Also, much new information relevant to the environmental

*/ It remains up to the licensing board, however, to determine in the first instance whether the evidence actually presented to it by the parties and the NRC staff is sufficient to support an environmental analysis that meets NEPA standards.

impacts of radon will soon become available. When the Commission considers environmental impacts in individual licensing actions, it need not also consider them generically. NRDC v. NRC, 547 F.2d 633, 641 (D.C. Cir. 1976) *cert.* granted. 429 U.S. 1090 (1977) (No. 76-419). Accordingly, the Commission denies petitioner's request to halt licensing of reactors.

The Commission does not believe it is necessary to now reopen all proceedings where licenses have already been issued. With regard to the most serious issue, radon releases, as discussed below, a number of programs are in progress to gather additional information on the environmental impacts of mining and milling. Upon completion of these programs, the Commission may reassess its conclusions as to the acceptability of the environmental impacts from mining and milling. Existing licenses may be reevaluated at that time if the data warrants it. It does not seem likely that any radon hazard associated with continued construction or continued operation of reactors in the interim will be

significant. The short term releases of radon from mill tailings will be small, and steps can be taken in the future to reduce long-term releases.*/ If, however, anyone believes that the

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*/ The NRC Staff is currently requiring applicants for uranium mill licenses to commit to plans for tailings disposal in accordance with interim criteria developed by the Staff for tailings waste management and disposal. Key features of these interim criteria include requirements to (a) locate the tailings isolation area such that disruption and dispersion by natural forces are minimized, (b) reduce the release of radon from the tailings disposal area to about twice the release rate in the surrounding environs, and (c) eliminate the need for routine long-term monitoring and maintenance programs.

Licensees have proposed various methods to meet the performance objectives. One is a surface burial method whereby radon control and isolation is achieved through placement of a clay cap over the tailings covered by an overburden of several feet of soil with appropriate consideration given to minimizing effects of wind and soil erosion.

A more recent method that has been proposed consists of below grade burial of the tailings to provide increased assurance that tailings will remain isolated for long periods of time. This kind of disposal virtually eliminates potential for disturbance by natural erosion forces and makes possible increased attenuation of radon releases. Return of the tailings to open minepits has been selected as the tailings disposal method for one of our applicants. Below grade disposal is being evaluated as the prime option for other mills currently undergoing license review.

The generic environmental impact statement on uranium milling presently being prepared by the Commission is considering a wide range of alternatives similar to those previously evaluated by Oak Ridge National Laboratory (ORNL-4903). For example, it will evaluate alternatives which entail removing radioactivity from the tailings.

On the basis of the Staff's reviews of reclamation plans employing surface burial or below grade burial methods, the Staff has advised the Commission that steps such as those described above, can be taken in the future to reduce long-term releases from tailings disposal sites.

circumstances of a particular case dictate that a license should be reexamined to take into account new information on radon or on the other subjects on which the amendments set forth below would now permit case-by-case adjudication, then an appropriate request for enforcement action can be filed under 10 CFR § 2.206.

Where limited work authorizations, construction permits, or operating licenses have been issued but proceedings are still pending before Licensing or Appeal Boards, evidence on radon releases shall be received as follows: In proceedings pending before Licensing Boards, the Commission hereby directs the Licensing Boards to reopen the record on NEPA issues for the limited purpose of receiving new evidence on radon releases and on health effects resulting from radon releases. Where cases are pending before Appeal Boards, the Appeal Boards are also directed to reopen the records to receive new evidence on radon releases and on health effects resulting from radon releases.

LWA's, construction permits, or operating licenses already issued shall remain effective unless a stay of the decision issuing the license or LWA is granted upon request of a party pursuant to the criteria set forth in 10 CFR § 2.788.

Ongoing Programs

The Commission has a number of programs in progress, some of which will supply data necessary for a generic resolution of issues not now covered in Table S-3:

Waste Management and Reprocessing: The Commission recently published a revised interim Table S-3 (42 FR 13803, March 14, 1977) along with supporting documents, NUREG-0116 and NUREG-0216. The Commission has already begun to conduct rulemaking proceedings to replace the interim Table S-3 with an updated rule in the areas of fuel reprocessing and waste management. */

Milling: Preparation of a draft Generic Environmental Statement (GEIS) on mill tailings is underway and is expected to be made available for public comment in September, 1978. In conjunction with preparation of this statement, an extensive multi-year field measurement program was initiated in early 1977 to develop data to estimate effluent release rates from mills and stacks, from ore piles and from tailings piles. These studies will also measure offsite concentrations to evaluate transport information and the significance of food ingestion pathways. Specific laboratory studies are also being conducted to estimate radon emissions from tailings piles both during operation and following stabilization. More recently, a general study was initiated as part of the GEIS to evaluate the long term stability of mill tailings disposal alternatives. Data from these studies is expected to become available in the summer of 1978. As a result of these studies the Commission will evaluate whether levels of radon releases should be further reduced.

*/ Nothing in this Notice should be construed as affecting in any way the scope of the final rulemaking proceeding on waste management and reprocessing.

The Commission will explore several alternatives to determine what level of reduction of releases is environmentally acceptable including reduction of radon releases to natural background levels and reduction of releases to amounts equal to releases had no mining or milling taken place.

Mining: A two year research program was initiated in the fall of 1977 to obtain measurements of radon-222 at underground and open pit mines. The initial measurements from underground mines are expected early in 1978. Information from this program and from research on uranium mills might provide a basis for the limited rulemaking proceeding on radon described above. As was stated previously, the Commission will make the determination whether to initiate such a limited proceeding after the draft GEIS on milling is issued.

Overall Update of Table S-3: In addition to the aforementioned programs, the Commission has announced its intention to initiate a long-term effort to completely update the rule in all areas of the fuel cycle. (42 FR 26987, May 26, 1977). Specific efforts to produce a completely updated and revised Table S-3 and supporting document for the entire fuel cycle have begun. A technical assistance contractor to work with the NRC Staff is now being selected. The contractor will first analyze the format and content of Table S-3 to determine the method for most effectively characterizing environmental impacts. The contractor will collect,

evaluate and synthesize the results from a wide range of applicable NRC research and study programs. The major research programs include field measurements of radon releases from mining and the GEIS on milling, as discussed above. In addition, emphasis will be given to NRC studies of occupational exposure, decommissioning and non-radiological effluents. The importance of new concepts and technologies, such as centrifuge enrichment, mining by in-situ leaching, spent fuel storage and disposal will be evaluated.

Immediate Clarifying Changes

The amendments to Table S-3 set forth below clarify that the Table does not cover:

- estimates of radon released;
- health effects.

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, the National Environmental Policy Act of 1969, as amended, and section 553 of Title 5 of the United States Code, the following amendments to 10 CFR Part 51 are published as a document subject to codification. Since the

amendments are of a clarifying nature, serve to relieve a restriction, and are necessary to enable correct information regarding fuel cycle environmental impacts to be utilized in ongoing and future licensing proceedings, the Commission has found that good cause exists for omitting notice of proposed rulemaking and public procedure thereon, and that the amendments may be made effective upon publication.

In Table S-3 - Summary of environmental considerations for uranium fuel cycle, of 10 CFR Part 51, (a) the entry for Radon-222 under "Effluents - radiological (curies)" and the accompanying textual material which now reads:

"Rn-222	74.5	Principally from milling operations and excludes contributions from mining."

is revised to read as follows:

"Rn-222	-	Presently under reconsideration by the Commission."

and (b) footnotes 5 and 6 accompanying the Table are deleted and footnote 1 is amended to read as follows:

"1 In some cases where no entry appears it is clear from the background documents that the matter was addressed and that, in effect, the Table should be read as if a specific zero entry had been made. However, there are other areas that are not addressed at all in the Table. Table S-3 does not include health effects from the effluents described in the Table, or estimates of releases of Radon-222 from the uranium fuel cycle.

These issues which are not addressed at all by the Table may be the subject of litigation in individual licensing proceedings. Data supporting this Table are given in the 'Environmental Survey of the Uranium Fuel Cycle,' WASH-1248, April 1974; the 'Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle,' NUREG-0116 (Supp. 1 to WASH-1248); and the "Discussion of Comments Regarding the Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0216 (Supp. 2 to WASH-1248). The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the 2 fuel cycles (uranium only and no-recycle). The contribution from transportation excludes transportation of cold fuel to a reactor and of irradiated fuel and radioactive wastes from a reactor which are considered in Table S-4 of sec. 51.20(g). The contributions from the other steps of the fuel cycle are given in columns A-E of Table S-3A of WASH-1248."

3. The second sentence of 10 CFR § 51.20(e) is amended to read as follows:

"No further discussion of the environmental effects addressed by the Table shall be required."

Effective date: The foregoing amendments take effect on April 14, 1978

(Sec. 102, Pub. L. 91-190, 83 Stat. 853, as amended, Pub. L. 94-83, 89 Stat. 424 (42 U.S.C. 4332); Sec. 161, as amended, Pub. L. 83-703, 68 Stat. 948 (42 U.S.C. 2201); Sec. 202, Pub. L. 93-438, 88 Stat. 1244 (42 U.S.C. 5842); Pub. L. 89-554, 80 Stat. 383 (5 U.S.C. 553).

Copies of the petition for rulemaking, the associated public comments, and the Commission's letter to the petitioner are available for inspection or publication in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D. C. 20555

Dated at Washington, D. C. this 11th day of April, 1978.

FOR THE NUCLEAR REGULATORY COMMISSION

Samuel J. Chilk
Secretary of the Commission

NUREG-0332

HEALTH EFFECTS ATTRIBUTABLE TO COAL AND NUCLEAR FUEL CYCLE ALTERNATIVES

Draft

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

NUREG-0332

HEALTH EFFECTS ATTRIBUTABLE TO COAL AND NUCLEAR FUEL CYCLE ALTERNATIVES

Draft

R. L. Gotchy

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Division of Site Safety and Environmental Analysis
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ABSTRACT

Estimates of mortality and morbidity are presented based on present-day knowledge of health effects resulting from current component designs and operations of the fuel cycles, and anticipated emission rates and occupational exposure for the various fuel cycle facilities expected to go into operation in approximately the 1975-1985 period. It was concluded that, although there are large uncertainties in the estimates of potential health effects, the coal fuel cycle alternative has a greater health impact on man than the uranium fuel cycle. However, the increased risk of health effects for either fuel cycle represents a very small incremental risk to the average individual in the public.

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I. INTRODUCTION

The National Environmental Policy Act of 1969 (NEPA) requires the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to assure, among other things, that the Nation may:

> Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
>
> Assure for all Americans safe, healthful, and productive and pleasing surroundings.
>
> Attain the widest range of beneficial uses of the environment without degradation, risk to health and safety, or other undesirable and unintended consequences.

Further, with respect to major Federal actions significantly affecting the quality of the human environment, Section 102(2)(c) of the NEPA calls for consideration of, among other things:

> The environmental impact of the proposed action.
>
> Alternatives to the proposed action.

As a result of recent decisions by the Administration regarding the Nation's energy policy, it is clear that the major alternative to nuclear power for meeting the Nation's baseload electrical needs for the rest of this century is coal power.

NRC environmental statements have discussed the impacts of the coal fuel cycle in terms of economics, and generically address those impacts in terms of land and water use. However, on January 25, 1977, an Atomic Safety and Licensing Appeal Board rendered a decision which stated:

> A disproportionately large part of the analyses comparing the coal and nuclear fuel cycles is focused on costs rather than environmental considerations.
>
> While the effect on human and animal life of the emissions from the proposed nuclear plant are discussed in detail, there is no corresponding discussion with respect to the postulated coal plant.
>
> No mention is made of the environmental effects of the coal fuel cycle.

> Although exact identity in treatment with respect to every aspect of environmental comparison of alternatives may not be required, this kind of comparison goes to the heart of NRC's duty under NEPA, where coal and nuclear power are shown to be the only two feasible alternatives. (Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 2A, 1B, 2B), ALAB-367, 5 NRC 92).

As a result of the Hartsville decision, the NRC staff prepared testimony for ongoing hearings, and similar input for current environmental statements where such considerations were lacking.

That testimony, which has now been presented in numerous public hearings, is the basis for this draft NUREG report.

Following receipt of comments from Federal and State agencies, industry, and concerned members of the public, and review of a forthcoming report by the National Research Council Committee (National Academy of Sciences) on Nuclear and Alternative Energy Systems, the NRC staff will prepare a final NUREG report, incorporating as many of the comments and new NAS data as appropriate.

II. RESULTS OF THE HEALTH EFFECTS ASSESSMENTS

In making these assessments, the entire fuel cycle rather than just the power-generation phase was considered in order to compare the total impacts of each cycle. For coal, the cycle consists of mining, processing, fuel transportation, power generation, and waste disposal. The nuclear fuel cycle includes mining, milling, uranium enrichment, fuel preparation, fuel transportation, power generation, irradiated fuel transportation and reprocessing*, and waste disposal.

In preparing this assessment it has been recognized that there are large uncertainties due to the lack of an adequate data base in certain areas of each fuel cycle alternative. The overall uncertainty in the nuclear fuel cycle is probably about an order of magnitude, while there may be as much as two orders of magnitude uncertainty in the assessments of the coal fuel cycle based on the range of published values. The much greater uncertainty associated with the coal fuel cycle results from the relatively sparse and equivocal data regarding cause effect relationships for most of the principal pollutants in the coal fuel cycle, and the effect of Federal laws on future performance of coal fired power plants, mine safety, and culm bank stabilization.

Health effects, as it is used here, is intended to mean excess** mortality, morbidity (disease and illness) and injury among occupational workers and the general public. The most recent and detailed assessments of health effects of the coal fuel cycle have been prepared by the Brookhaven (Refs. 1,2,3,4) and Argonne (Refs. 5,6) National Laboratories. The most complete and recent assessment of the radiological health effects of the uranium fuel cycle for normal operations was prepared for the "Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors (GESMO I) (Ref. 7)."

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* Although the Administrations's announced energy policy opposes the implementation of commercial fuel reprocessing technology at this time, Table S-3 (10 CFR Part 51) assumes reprocessing. This tends to upper-bound the radiological impacts since the recycle of uranium after reprocessing results in more radiological effects than no recycle of uranium from irradiated fuel.

** "Excess" is used here to mean effects occuring at a higher than normal rate. In the case of death it is used synonymously with premature mortality.

***Consistent with the Commission's announced intention to reexamine the rule from time to time to accomodate new information, (39 F.R. 14188, April 22, 1974, and 42 F.R. 13803, March 14, 1977), staff studies are underway to determine what areas, in addition to waste management and reprocessing, may require updating in Table S-3 (Notice of Proposed Rulemaking, Docket No. RM 50-3, Environmental Effects of the Uranium Fuel Cycle, 41, F.R. 45849, October 18, 1976).

However, in accordance with 10 CFR Part 51.20(e), the current impact of the uranium fuel cycle (excluding reactors and mines) is defined by the March 14, 1977 revision of Table S-3, 10 CFR Part 51.*** Using the Table S-3 effluents and the models developed for GESMO I, it was possible to estimate the impact of the uranium fuel cycle on the general public for routine operations. These values are shown in Tables 1 and 2, and some critical assumptions related to estimates are shown in Appendix A.

Since Table S-3 excludes radon releases from uranium mines, the health effects of such releases on the general public are not included in Tables 1 and 2. The effects of such releases would result in some small increases in the total risks of mortality and morbidity as discussed below under "Other Considerations."

In addition, Table S-3 does not generically address releases for light water cooled power reactors. The estimated total body population dose commitments for both occupational workers and the general public were taken from GESMO I (U recycle only option)*. In addition, the occupational dose commitments to workers in uranium mines, mills, uranium hexaflouride plants, uranium fuel plants and uranium enrichment plants were taken from GESMO I, since they are not considered in Table S-3. However, these dose commitments are comparable to those which would result from the radiological releases in NUREG-0216, which provides background support for Table S-3.

The dose commitments to the public and occupational workers in the March 1977 Table S-3 were used for estimating health effects from the reprocessing and waste management aspects of the uranium fuel cycle. The risk estimators used to estimate health effects from radiation dose commitments were taken from GESMO I and WASH-1400 (Ref. 8).

The impact of accidents in fuel cycle facilities (Ref. 9) and reactors (Ref. 8) generally does not markedly increase the impact of normal operations for the uranium fuel cycle, but has been included in this assessment for completeness. No comparable analysis of health effects resulting from accidents in coal-fired plants is available at this time.

Estimates of death, disease and injury from non-radiological causes for the uranium fuel cycle are from the Brookhaven (Refs. 1,2,3) evaluations, with the exception of transportation accident related deaths and injuries, which were taken from Table S-4, 10 CFR Part 51. The results of these assessments are shown in Tables 1 and 2. It should be noted that there are two lines under the nuclear fuel cycle: the first assumes all of the electricity used within the uranium fuel cycle is generated by nuclear power (i.e., all nuclear economy); the second line assumes, as shown in Table S-3,

*See footnote * on page 1.

(10 CFR Part 51), that 100% of the electricity used within the nuclear fuel cycle comes from coal power. This is equivalent to a 45 MWe coal-fired plant, or 4.5% of the power produced.

A. Health Effects of The Uranium Fuel Cycle

Currently the NRC estimates that the excess deaths per 0.8 gigawatt-year electric (GWy(e)) (i.e., per 1,000 MWe power plant operating at 80% of capacity for one year) will be about 0.47 for an all nuclear economy. This is probably somewhat high due to the conservatism* required in evaluations of generic plants and sites. However, it is not greatly different from estimates by others such as Comar and Sagan (Ref. 10) (0.11 to 1.0), Hamilton (Ref. 1) (0.7 to 1.6), and Rose et al (Ref. 11) (0.50). The uncertainty in the estimate is about an order of magnitude.** If, as shown in Table S-3, 100% of the electrical power used by the uranium fuel cycle comes from coal-fired power plants, the NRC would estimate there would be about 1.1 to 5.4 excess deaths per 0.8 GWy(e). Of this total, about 0.63 to 4.9 excess deaths per 0.8 GWy(e) would be attributable to coal power. The uncertainty in the estimate is about one order of magnitude.

The total number of injuries and diseases which might occur among workers and the entire U.S. population as a result of normal operations and accidents in the uranium fuel cycle was estimated to be about 14 per 0.8 GWy(e) for an all nuclear economy. Injuries among uranium miners from accidents such as falls, cave-ins and explosions account for 10 of the 14 cases (see Table 2). If 100% of the electrical power used by the uranium fuel cycle comes from coal-fired power plants, the NRC would estimate there would be about 17-24 injuries and diseases per 0.8 GWy(e). Of this total, about 3 to 10 excess effects per 0.8 GWy(e) would be attributable to coal power (See Table 2a). The uncertainty in the estimate is also about one order of magnitude.

Although anticipated somatic*** effects associated with normal releases of radioactive effluents from the nuclear fuel cycle are limited to potential cancers and leukemias, for the higher doses associated with serious nuclear accidents there is some small risk of various non-fatal somatic effects (see footnote c, Table 2). At this time only light water cooled power reactors (Ref. 8) have been thoroughly evaluated. However, it should

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* Conservative is used here to mean that assumptions regarding atmospheric dispersion, deposition of particulates, bioaccumulation, and so forth generally result in estimates of impact that are typically "upper bound" estimates, and in most cases, the estimates would be lower for real plants.

** "Order of magnitude" uncertainty means the estimate could be as much as ten times higher or ten times lower.

*** Health effects of a non-reproductive nature (i.e.; non-genetic).

be noted that power reactors probably account for most of the potential health effects associated with nuclear accidents in the uranium fuel cycle. This results from the fact that they represent 80 percent of all the fuel cycle facilities expected to be operating for the balance of this century (Ref. 7) and the majority of occupationally exposed individuals. In addition, although the probability of serious accidents is extremely small, if one were to occur, the health effects would be larger than for any other type of fuel cycle facility. Serious nuclear accidents in power reactors might also contribute about 0.04 excess deaths per 0.8 GWy(e). There is some controversy over the probabilities of occurrence of serious accidents, such as discussed in WASH-1400 (Ref. 8). However, even if the risks were, for example, twenty times greater than estimated in WASH-1400, the excess mortality for the uranium fuel cycle would only increase from 0.47 to 0.87 per 0.8 GWy(e).

Transportation related accidents are estimated to contribute about 0.01 excess deaths per 0.8 GWY(e) (see Table 1a, footnote d).

Early and latent non-fatal somatic effects which might be expected after high radiation dose effects include a variety of effects (see footnote c, Table 2). It is possible that non-fatal somatic effects could be an order of magnitude greater than excess deaths resulting from accidents (Ref. 8), thus, the total number per 0.8 GWy(e) would be about 0.4. This accounts for about one-third of the morbidity shown for the general public and an all nuclear economy in Table 2. The number of non-fatal thyroid cancers (5-10% mortality rate) and benign thyroid nodules would be about 0.6 per 0.8 GWy(e) from routine releases to the public and occupational exposures (primarily external irradiation), while other non-fatal cancers would be less than or equal in number to fatal cancers (about 0.2 per 0.8 GWy(e)) (see footnote c, Table 2 and footnotes ** and ***, Table 2a).

It is believed (Refs. 6,12) that genetically related diseases* and abnormalities in the descendants of workers and the general public from both normal operations and accidents would be perhaps twice the number of excess deaths due to cancer from total body irradiation; this could add another 0.3 health effects per 0.8 GWy(e) among workers and 0.1-0.2 health effects per 0.8 GWy(e) among the general public (see footnote c, Table 2).

In assessing the impact of coal power used in the uranium fuel cycle, Table S-3 was the basis for the assumption that 100% of the electricity used in the uranium fuel cycle, primarily for uranium enrichment and reactor

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*Includes diseases such as cystic fibrosis, hemophelia, certain anemias, and congenital abnormalities such as mental retardation, short-limbed dwarfism and extra digits. (See footnote c, Table 2)

operation, came from coal fired plants. Adding 4.5% of the health effects from the coal fuel cycle per 0.8GWy(e) significantly increases the health effects for the uranium fuel cycle per 0.8 GWy(e), as shown on the second lines of Tables 1 and 2.

B. Health Effects of The Coal Fuel Cycle

Current estimates of mortality and morbidity resulting from the coal fuel cycle are quite uncertain; this is the principal reason for the wide range of values reported in the literature. These uncertainties, as discussed in more detail below, result from the limited number of epidemiological studies and differences in interpretation of the results of such studies. There is additional uncertainty regarding the effects of new Federal laws on coal cycle facilities in the next decade. Current estimates of excess deaths for the entire coal cycle range from 15 to 120 per 0.8 GWy(e), while disease and injury estimates range from 57 to 210 per 0.8 GWy(e).

In the case of occupational effects, there is considerable uncertainty because of anticipated reductions in health effects resulting from the implementation of the Federal Coal Mine Health and Safety Act of 1969 (PL 91-173). The provisions of this act should result in significant improvement of the underground work environment, particularly regarding coal dust. Coal dust is both a cause of underground explosions and fires, and a cause of coal workers pneumoconiosis (CWP), commonly called black lung disease, and subsequent progressive massive fibrosis (PMF) (Refs.1,5). In addition, more coal in the years ahead is expected to be produced by strip mining which results in lower mortality rates (Ref. 1). As a result, the frequencies of both types of events is anticipated to decline in the years ahead, on a per GWy(e) basis. On the other hand, statistics show new coal miners experience higher mortality and injury rates than experienced miners (Ref. 5). As a result of expected increases in coal production, an influx of inexperienced miners will tend to increase the mortality and injury rates for miners as a group.

In the case of the general public*, there is also considerable uncertainty in the estimation of health effects. For example, although there are estimates of health effects related to burning culm banks (waste banks from coal screening), recent efforts by mine operators have greatly reduced such fires, and future processing activities are expected to avoid fires as a result of new methods of stabilizing such banks to prevent slides. (Ref. 13). Current estimates of excess deaths in the public from sulfates from such fires range from 1 to 10 per 0.8 GWy(e) (see footnote g,

* In the case of coal plant effluents, considerations of health effects was limited to the population within 80 km of such plants.

Table 1). Power generation is estimated to result in 3 to 100 excess deaths per 0.8 GWy(e) (see footnote g, Table 1), while excess morbidity ranges from about 10-100 per 0.8 GWy(e) (see footnote g, Table 2).

The uncertainties are even greater in the power generation phase of the coal cycle, where estimates of health effects range over several orders of magnitude. (Ref. 10) This is largely due to the lack of a reliable data base for predicting health effects from the various pollutants emitted from coal plants, and the effect of the EPA New Source Performance Standards for coal plants regarding particulate and sulfur emissions in future years on a long-term basis. There is some uncertainty as to whether these standards can be met in large coal-fired power plants over the life of the plant. The major pollutants emitted include:

1. Particulates: Contain large amounts of toxic trace metals in respirable particle size (Ref. 14) such as arsenic, antimony, cadmium, lead, selenium, manganese, and thallium, (Ref. 5) significant quantities of berylium, chromium, nickel, titanium, zinc, molybdenum, and cobalt (Ref. 15), and traces of radium-226, 228 and thorium-228, 232. (Ref. 16).

2. Hydrocarbons: Includes very potent carcinogens (cancer causing substances) such as benzo(a)pyrene.

3. Sulfur oxides

4. Nitrogen oxides

5. Other gases: Includes ozone ,carbon monoxide, carbon dioxide, mercury vapor, and radon-222.

Of the preceeding list of pollutants, there are no well established epidemiologic cause-effect relationships which can be used to accurately estimate total health effects either from acute exposures during air pollution episodes or from chronic long-term exposures.

Although definitive cause-effect relationships are lacking, tentative cause-effect relationships for sulfur emissions have been used by numerous groups to estimate health effects from sulfur emissions from coal plants. They are described by the National Academy of Sciences in a recent report to the U.S. Senate. (Ref. 17) The most widely quoted studies are those by Lave and Seskin (Ref. 18), Winkelstein et al (Ref. 19), and an unpublished study by EPA which was used in the NAS/NRC study for the U.S. Senate (1975). (Ref. 17)

In general, the effects range from excess deaths from cardiovascular failure and increases in asthma attacks during severe air pollution to excess respiratory disease from long-term chronic exposures. Most of the acute deaths are among the elderly and the severely ill, while morbidity from long-term exposure also includes children. Although widely accepted cause-effect relationships were not derived from acute air pollution episodes in London (1952) (Ref. 20), Donora, Pennsylvania (1948), (Ref. 21), and New York (Ref. 22), these studies definitely support the conclusions regarding excess death and disease associated with emissions from combustion of coal.

There are no estimates of possible long-term carcinogenic effects by sulfur oxides or associated pollutants. In addition, the recently completed (1976)* large scale EPA Community Health and Environmental Surveillance System (CHESS) study has failed to provide any new or definitive cause-effect relationships for any of the pollutants from coal-fired plants which can be used to provide better estimates of health effects than are currently available (see for example Ref. 23).

Assuming that new coal-fired plants in the 1980's can meet EPA New Source Performance Standards (which could require on the order of 99% particulate removal, and 90% sulfur removal for high sulfur coal), and other Federal laws regarding mine safety and culm bank stabilization, the number of deaths should be reduced. Thus, current estimates of 15 to 120 per 0.8 GWy(e), due largely to sulfates from combustion coal may be reduced by about half to 8 to 60 per 0.8 GWy(e).

Recently, Argonne National Laboratory has developed a predictive model for total deaths from emission of benzo(a)pyrene, which indicates about 1 to 4 deaths per 0.8 GWy(e) depending on use of conventional combustion or fluidized bed combustion. (Ref. 6) Such effects, while greater than the expected deaths from the entire uranium fuel cycle (all nuclear economy), do not significantly change the total impact of the coal fuel cycle and were not included in the effects listed in Table 1.

Probably the most reliable estimates of deaths associated with the coal fuel cycle are those associated with transporation accidents. Since a 1000 MWe coal-fired plant consumes about 3 million tons of coal per year,

* This $22 million study attempted to correlate air pollution data collected from six U.S. cities with a variety of health problems.

there are literally thousands of carloads of coal being transported by rail from mines to plants. It has been estimated that about one out of every 10 trains in the U.S. is a coal train going to a coal-fired power plant. (Ref. 24) These trains are estimated to travel an average distance of about 300 miles from the mines to the plants. (Ref. 13) As a result, there are about 1.2 deaths per 0.8 GWy(e) among workers and the general public. Further, since most of these deaths occur at railroad crossings, the numbers can be expected to increase as more automobiles are operated and driven greater distances, and as rail transportation distances increase when hauling low sulfur western coals to eastern markets.

Sickness among coal miners and the general public accounts for most of the non-fatal occurrences in the coal fuel cycle, with most of the remainder due to injuries among coal miners. As a result of implementation of Federal laws, it is probable that future rates among underground miners will be substantially reduced. It is not unreasonable to assume that the current estimates of about 57 to 210 cases of sickness and injury among workers and the general public could be reduced in the years ahead, since occupational sickness and injury currently account for about half of the total non-fatal health effects.

The Brookhaven estimates, which form the basis of this testimony, show a range of uncertainty of about one order of magnitude. They are well within the range of values reported in the literature which range over about two orders of magnitude for the coal fuel cycle.

C. Other Considerations

Although the Reactor Safety Study (Ref. 8) has helped to provide a perspective of the risk of mortality or morbidity from potential power reactor accidents (the current experience for serious accidents is zero), there is the additional problem associated with individual perception of risk. Thus, while the Reactor Safety Study concluded that "All non-nuclear accidents examined in this study, including fires, explosions, toxic chemical releases, dam failures, airplane crashes, earthquakes, hurricanes and tornadoes, are much more likely to occur and can have consequences comparable to, or larger than, those of nuclear accidents," there will continue to be uncertainty associated with such evaluations. Furthermore, there may be a problem of public acceptance of potential accidents, since the consequences can be severe. In fact, it appears that some people (Ref. 25) more readily accept, for example, having 55,000 people actually killed each year in violent highway accidents, one or two at a time, than would consider acceptable the unlikely occurrence of perhaps several thousand possible deaths from a single catastrophic accident during their lifetime.

As noted in footnote 5 to the March 1977 revision of Table S-3 (10 CFR Part 51), the GESMO I radon-222 release increases from 74.5 Ci to about 4,800 Ci when releases from mines are included. This increase would result in a small increase in the total number of excess deaths shown in Table 1, although the moratality per 0.8 GWy(e) for the general public would increase by about 30%.

With regard to the coal fuel cycle, it is a well established fact that the use of coal results in numerous other costs to society which have not yet been adequately quantified. These include:

1. The short and long-term impacts of sulfur and nitrogen oxides on biota and materials. Acid rain, for example, is known to be severely damaging to terrestrial and aquatic habitats. Reference 5 provides a detailed discussion of these and other effects of sulfur and nitrogen oxide emissions. However, as more coal plants come on line, these effects can be expected to expand to surrounding areas.

2. Damage of materials, such as paints, building surfaces, statuary, and metals, from sulfur oxides, ozone and nitrogen oxide emissions. A 1976 review of such effects indicates that the costs could range into billions of dollars per year in the U.S. alone. (Ref. 26)

3. Contamination of soil and vegetation to toxic levels by such mechanisms as deposition and bioaccumulation of trace elements present in gaseous emissions.

4. Destruction of entire ecosystems in streams and rivers by acid mine drainage, and the potential for public health effects from downstream use of such water for domestic or agricultural purposes.

5. In addition to the occurrence of excess mortalities, injuries, and morbidities, the costs to society in terms of medical costs, lost productivity, and other social losses represent a significant consideration which has not been completely evaluated at this time. Some recent studies have attempted to deal with these extremely complex issues, (Refs. 27,28) and concluded social costs from one coal fired plant may currently be about $50 million per year, not considering the rest of the costs for the coal fuel cycle.

6. The possibility of the so-called "Greenhouse Effect;" this phenomenon is expected by some (Ref. 29) to result sometime early in the next century at the present and future anticipated production rates of carbon dioxide from the combustion of fossil fuels. Since each 1000 MWe coal plant produces about 7.5 to 10.5 million tons of carbon dioxide per year (Ref. 1) it is believed these emissions from hundreds of fossil fuel fired power plants may result in greater releases of carbon dioxide than the atmosphere and oceans can cycle. As a result, the carbon dioxide concentrations would be expected to increase in the atmosphere. Since carbon dioxide strongly absorbs infrared, it is postulated that the mean atmospheric temperature will rise several degrees. This may cause all or part of the polar ice caps to melt resulting in inundation of many inhabited areas of the world. At the same time drought would be expected to prevail in many of the agricultural areas of the temperate zones resulting in huge crop losses. It is possible that the particulates emitted by fossil plants will counteract some of the Greenhouse Effect by reducing the amount of sunlight reaching the surface of the earth.

   However, another effect from carbon dioxide released by coal combustion occurs since coal has essentially no carbon-14. The stable carbon in effect dilutes the carbon-14 in the biosphere, resulting in a reduction in the radiological impact of both naturally occuring and man-made carbon-14.

7. An additional consideration which has not been evaluated for the coal cycle is the radiological impact of mining and burning coal. Of interest is the release of radon-222 from the decay of radium-226 in coal. Not only is the radon released during mining and combustion, but it will continue to emanate from flyash for millions of years after the coal has been burned. While Pohl (Ref. 30) has shown that this is not a problem with some eastern coal (generally of high sulfur content but with 1-3 ppm uranium content), the average uranium and radium content of some reserves of low sulfur western coal is about 50 times higher than most eastern coal (Refs. 31,32). Combustion of the coal and disposal of the remaining ash leads to approximately the same health effects calculated by Pohl from radon-222 emissions as uranium mill tailings piles per GWy(e).

   These releases would account less than 0.01 excess deaths per 0.8 GWy(e) from fuel cycle activities during the rest of this century. As a result, such releases do not significantly affect the conclusions reached with regard to a comparison of the two alternative fuel cycles.

In addition, some believe (Ref. 33) that when the physical and biological properties of the radium released from conventional coal powered plants burning coal (with 1-2 ppm uranium-238 and Th-232) are considered, such plants discharge relatively greater quantities of radioactive materials into the atmosphere than nuclear powered plants of comparable size. EPA has estimated radiation doses from coal and nuclear powered plants of early designs and reached similar conclusions (Ref. 16). Even if the health effects from radioactivity released by the coal fuel cycle are greater than the health effects from radioactivity released in the nuclear fuel cycle, the total health effects from coal would not change significantly since these effects would be only a small percentage of the total health effects from the coal cycle.

III. SUMMARY AND CONCLUSIONS

For the reasons discussed above, it is extremely difficult to provide precise quantitative values for excess mortality and morbidity, particularly for the coal fuel cycle. Nevertheless, estimates of mortality and morbidity have been prepared based on present day knowledge of health effects, and present day plant design and anticipated emission rates, occupational experience and other data. These are summarized in Tables 1 and 2, with some important assumptions inherent in the calculations of health effects listed in Appendix A.

While future technological improvements in both fuel cycles may result in significant reductions in health effects, based on current estimates for present day technology, it must be concluded that the nuclear fuel cycle is considerably less harmful to man than the coal fuel cycle. (Refs. 1,2,3, 4,5,10,11,27,28,33,34,35,36) As shown in Tables 1 and 2, the coal fuel cycle alternative may be more harmful to man by factors of 4 to 260 depending on the effect being considered, for an all nuclear economy, or factors of 3 to 22 with the assumption that all of the electricity used by the uranium fuel cycle comes from coal powered plants.

It should be noted that although there are large uncertainties in the estimates of most of the potential health effects of the coal cycle, the impact of transportation of coal is based on firm statistics; this impact alone is greater than the conservative estimates of health effects for the entire uranium fuel cycle (all nuclear economy), and can reasonably be expected to worsen as more coal is shipped over greater distances. In the case where coal generated electricity is used in the nuclear fuel cycle, primarily for uranium enrichment and auxiliary reactor systems, the impact of the coal power accounts for essentially all of the impact of the uranium fuel cycle.

However, lest the results of this analysis be misunderstood, it should be emphasized that the increased risk of health effects for either fuel cycle represents a very small incremental risk to the average individual in the public. For example, Comar and Sagan (Ref. 10) have shown that such increases in risk of health effects represent minute increases in the normal expectation of mortality from other causes.

A more comprehensive assessment of these two alternatives and others is anticipated from the National Research Council Committee on Nuclear and Alternative Energy Systems in 1977 (Ref. 37). This study may assist substantially in reducing much of the uncertainty in the analysis presented.

APPENDIX A

Some Important Assumptions Affecting the Fuel Cycle Health Effects Evaluations:

1. The Uranium Fuel Cycle (Ref. 7)

   a. For mine and mill emissions it was assumed there was a population density from 7.5 persons/sq.mi. in the west, to 160 persons/sq.mi. in the east, all uniformly distributed. For all other facilities, assumed 160 persons/sq.mi. density.*

   b. Used "box" atmospheric dispersion model with vertical dispersion limited to 1,000 m, 2 m/sec windspeed, and 1 cm/sec deposition velocity for particulates.

   c. Calculated the dose commitment from one year of operation for each type of fuel cycle facility. This dose commitment represents the sum of the 50 year dose commitments from the year of operation and each of the subsequent 39 years (i.e., a 40 year environmental dose commitment). The total impact of the fuel cycle to the U.S. population for the years 1975-2000 was calculated using the needs for all types of facilities in order to meet current projections of power plants.

   d. Radioactive materials were not considered to be removed from food chains except by radioactive decay. Only in the case of carbon-14 was an environmental sink assumed to be acting upon biological availability.

   e. Krypton-85 and carbon-14 not removed from the plume in the U.S. was assumed to mix uniformly in the world's atmosphere. Tritium is assumed to be mixed uniformly in the world's circulating water volume after depletion of the plume on its first pass over the U.S.

   f. Resuspension of deposited particulates was considered.

   g. Bioaccumulation of radioactivity in food chains was considered (generally upper bound estimates).

   h.. Assumed an 80% capacity factor.

2. The Coal Fuel Cycle (Refs. 1,2,3)

   Since the major impact of the coal fuel cycle results from power plant emissions, only those critical assumptions will be discussed:

* It should be noted that most of the calculated health effects would occur outside the 80 km radius of the plant. The mortality rate for the U.S. population is about 2,000,000 per year from all causes.

APPENDIX A (continued)

a. Used actual population distributions within 80 km of several nuclear plant sites; the average population was 3.8 million people.*

b. Used actual meteorology data from the same plants to calculate inhalation exposures to sulfates out to 80 km.

c. Assumed a 1,000 foot stack for emissions.

d. Assumed use of 3% sulfur coal with 12% ash and 12 thousand BTU per lb (eastern coal) for an upper bound estimate of health effects; assumed 0.4% sulfur coal with 3% ash and 12 thousand BTU per lb (eastern coal) for a lower bound estimate (approximately the same sulfur emission as would result from use of high sulfur coal with flue gas desulfurization).

e. Assumed 99% particulate removal from plant emissions.

f. Assumed a 10% per hour oxidation rate for conversion of sulfur oxides to sulfates.

g. The dose-response relationships of Lave and Seskin (Ref. 18), Winklestein et al (Ref. 19) and others(as discussed in Refs. 1,2,3) were used to calculate excess mortality and morbidity; adjustments were made for fractions of sulfates in the total suspended particulates.

h. Resuspension of deposited particulates was not directly considered, although deposition was.

i. Assumed a 75% capacity factor.

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* Experiences about 36,000 per year mortality rate from all causes. Additional health effects from coal combustion are expected to occur outside this area, but have not yet been estimated.

Table 1. Current Energy Source Excess Mortality Summary per Year per 0.8 GWy(e)

	Occupational		General Public		Totals
	Accident	Disease	Accident	Disease	
Nuclear Fuel Cycle (all nuclear)	0.22 [a]	0.14 [b]	0.05 [c]	0.06 [b]	0.47
(with 100% of electricity used in the fuel cycle produced by coal power (U.S. population for nuclear effects; regional population for coal effects)	0.24-0.25 [a,d]	0.14-0.46 [b,e]	0.10 [c,f]	0.64-4.6 [g]	1.1-5.4
Coal Fuel Cycle (Regional Population)	0.35-0.65 [d]	0-7 [e]	1.2 [f]	13-110 [g]	15-120

Ratio of Coal to Nuclear: 32-260 (all nuclear)

14-22 (with coal power)[h]

(a) Primarily fatal non-radiological accidents such as falls, explosions, etc.
(b) Primarily fatal radiogenic cancers and leukemias from normal operations at mines, mills, power plants and reprocessing plants.
(c) Primarily fatal transportation accidents (Table S-4, 10 CFR 51) and serious nuclear accidents.
(d) Primarily fatal mining accidents such as cave-ins, fires, explosions, etc.
(e) Primarily coal workers pneumoconiosis (CWP) and related respiratory diseases leading to respiratory failure..
(f) Primarily members of the general public killed at rail crossings by coal trains.
(g) Primarily respiratory failure among the sick and elderly from combustion products from power plants, but includes deaths from waste coal bank fires.
(h) 100% of all electricity consumed by the nuclear fuel cycle produced by coal power; amounts to 45 MWe per 0.8 GWy(e).

Table 1a
(Breakdown of Table 1)

NUCLEAR

EXCESS MORTALITY per 0.8 GWy(e)

FUEL CYCLE COMPONENT	OCCUPATIONAL		GENERAL PUBLIC		TOTAL
	ACCIDENT (a)	DISEASE (b,c,d,)	ACCIDENT (d,e,)	DISEASE (b)	
RESOURCE RECOVERY (Mining, Drilling, etc.)	0.2	0.038	~0	+	
PROCESSING (f)	0.005**	0.042	*	0.002	
POWER GENERATION	0.01	0.061	0.04	0.011	
FUEL STORAGE	*	~0	*	~0	
TRANSPORTATION	~0	~0	0.01	~0	
REPROCESSING	*	0.003	*	0.050	
WASTE MANAGEMENT	*	~0	*	0.001	
TOTAL	0.22	0.14	0.05	0.064	0.47

+These effects are not included in Table S-3, 10 CFR 51. Ref. 7 would indicate about 0.023 excess deaths per 0.8 GWy(e) due to radon-222 emission.

*The effects associated with these activities are not known at this time. While such effects are generally believed to be small, they would increase the totals in this column.

**Corrected for factor of 10 error based on referenced value (WASH-1250)

(a) Ref. 1
(b) Ref. 7
(c) 10 CFR 51, Table S-3
(d) 10 CFR 51, Table S-4
(e) Ref. 8
(f) Includes milling, uranium hexaflouride production, uranium enrichment, and fuel fabrication.

Table 1b
(Breakdown of Table 1)

COAL FUEL CYCLE COMPONENT	EXCESS MORTALITY per 0.8 GWy(e) OCCUPATIONAL ACCIDENT	 OCCUPATIONAL DISEASE	 GENERAL PUBLIC ACCIDENT	 GENERAL PUBLIC DISEASE	 TOTAL
RESOURCE RECOVERY (Mining, Drilling, etc.)	0.3-0.6	0-7	*	*	
PROCESSING	0.04	*	*	10	
POWER GENERATION	0.01	*	*	3-100	
FUEL STORAGE	*	*	*	*	
TRANSPORTATION	*	*	1.2	*	
WASTE MANAGEMENT	*	*	*	*	
TOTAL	0.35-0.65	0-7	1.2	13-110	15-120

Ref. 1

*The effects associated with these activities are not known at this time. While such effects are generally believed to be small, they would increase the totals in this column.

Table 2. Current Energy Source Summary of Excess Morbidity and Injury per 0.8 GWy(e) Power Plant

	Occupational		General Public		Totals
	Morbidity	Injury	Morbidity	Injury	
Nuclear Fuel Cycle (all nuclear)	0.84 [a]	12 [b]	0.78 [c]	0.1 [d]	14
(with 100% of electricity used by the fuel cycle produced by coal power) (U.S. population for nuclear effects; regional population for coal effects)	1.7-4.1 [e]	13-14 [b]	1.3-5.3 [g]	0.55 [h]	17-24
Coal Fuel Cycle (Regional population)	20-70 [e]	17-34 [f]	10-100 [g]	10 [h]	57-210

Ratio of Coal to Nuclear: 4.1-15 (all nuclear)

3.4-8.8 (with coal power)[i]

(a) Primarily non-fatal cancers and thyroid nodules.
(b) Primarily non-fatal injuries associated with accidents in uranium mines such as rock falls, explosions, etc.
(c) Primarily non-fatal cancers, thyroid nodules, genetically related diseases, and non-fatal illnesses following high radiation doses such as radiation thyroiditis, prodromal vomiting, and temporary sterility.
(d) Transportation related injuries from Table S-4, 10 CFR Part 51.
(e) Primarily non-fatal diseases associated with coal mining such as CWP, bronchitis, emphysema,etc.
(f) Primarily injuries to coal miners from cave-ins, fires, explosions, etc.
(g) Primarily respiratory diseases among adults and children from sulfur emissions from coal-fired power plants, but includes waste coal bank fires.
(h) Primarily non-fatal injuries among members of the general public from collisions with coal trains at railroad crossings.
(i) 100% of all electricity consumed by the nuclear fuel cycle produced by coal power; amounts to 45 MWe per 0.8 GWy(e).

Table 2a
(Breakdown of Table 2)

NUCLEAR

MORBIDITY AND INJURY per 0.8 GWy(e)

FUEL CYCLE COMPONENT	OCCUPATIONAL		GENERAL PUBLIC		TOTAL
	MORBIDITY	INJURY (a)	MORBIDITY	INJURY (b)	
RESOURCE RECOVERY (Mining, Drilling, etc.)	**	10	***	~0	
PROCESSING (c)	**	0.6	***	~0	
POWER GENERATION	**	1.3	***	~0	
FUEL STORAGE	**	*	***	~0	
TRANSPORTATION	**	<1	***	0.1	
REPROCESSING	**	*	***	*	
WASTE MANAGEMENT	**	*	***	~0	
TOTAL	0.84	12	0.78	0.1	14

(a) Ref. 1
(b) Table S-4, 10 CFR 51
(c) Includes milling, uranium hexaflouride production, uranium enrichment, and fuel fabication.

*The effects associated with these activities are not known at this time. While such effects are generally believed to be small, they would increase the totals in this column.

**Non-fatal cancers $\leq$ fatal cancers (excluding thyroid) = 0.14
Non-fatal thyroid cancers and benign nodules = 3X fatal cancers = 0.42
Genetic defects 2X fatal cancers = 0.28

***Reactor accidents 10X fatalities = 0.40 non-fatal cases
Normal operations: Non-fatal cancers $\leq$ fatal cancers = 0.064
Non-fatal thyroid cancers and nodules = 3X fatal cancers = 0.19
Genetic effects = 2X fatal cancers = 0.13

Table 2b
(Breakdown of Table 2)

COAL	MORBIDITY per 0.8 GWy(e)				
FUEL CYCLE COMPONENT	OCCUPATIONAL		GENERAL PUBLIC		TOTAL
	MORBIDITY	INJURY	MORBIDITY	INJURY	
RESOURCE RECOVERY (Mining, Drilling, etc.)	20-70	13-30	*	*	
PROCESSING	*	3	*	*	
POWER GENERATION	*	1.2	10-100	*	
FUEL STORAGE	*	*	*	*	
TRANSPORTATION	*	*	*	10	
WASTE MANAGEMENT	*	*	*	*	
TOTAL	20-70	17-34	10-100	10	57-210

Ref. 1

*The effects associated with these activities are not known at this time. While such effects are generally believed to be small, they would increase the totals in this column.

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AFFIDAVIT OF HOMER LOWENBERG ON THE RADON VALUE IN TABLE S-3

Homer Lowenberg, being duly sworn, states as follows:

1. I am Assistant Director for Operations and Technology, Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission. A statement of my professional qualifications is attached.

2. The numerical values found in Table S-3 of 10 CFR Part 51 (for values other than reprocessing and waste management) are derived from a document published by the U.S. Atomic Energy Commission entitled, "Environmental Survey of the Uranium Fuel Cycle," WASH-1248, dated April, 1974, and its predecessor, "Environmental Survey of the Nuclear Fuel Cycle," dated November, 1972. The value for radon-222 which appears in WASH-1248 and in Table S-3 was calculated under my supervision. The Rothfleisch affidavit shows the basis for this value.

3. As Mr. Rothfleisch states, the radon value in Table S-3 of 74.5 curies per annual fuel requirement (AFR)[1] represents only releases from mill tailings during active mill operation and does not include releases from either the mining of uranium or from stabilized tailings piles after the period of active mill operation. At the time WASH-1248 was in preparation, adequate information to estimate radon release from mining and long-term releases from stabilized tailings piles were not available and, for the reasons discussed below, the Staff felt it was unnecessary to prepare speculative estimates of the radon releases from these sources.

MINING

4. At the time the Staff developed the Table S-3 value for radon, the Staff did not have sufficient data to quantify the releases from radon involved in the mining of uranium. We were unable to find any field data for radon emissions but, as WASH-1248 indicates at p. A-5, field measurements taken by the Bureau of Mines for radon concentrations in open pit mines revealed no significant alpha concentrations.

[1] All values in Table S-3 are for a model 1,000-megawatt reactor operated at 80-percent capacity.

5. Even though there were no meaningful field data for estimating a specific radon release quantity, the Staff felt that it was able to conclude that radon concentrations away from the immediate vicinity of the mine would not be detectable against natural background.[2/] This Staff conclusion is supported by the following conclusion reached in the BEIR report[3/] and the U.S. Environmental Protection Agency report, "Estimates of Ionizing Radiation Doses in the United States 1960-2000,"[4/] both of which are cited in WASH-1248:

> "[W]hile uranium mining activities increase the amount of surface uranium and its decay products, it does not cause measurable increases in environmental radioactivity outside the immediate vicinity of the mines." (WASH-1248, pp. A-4 and A-5).

2/ See WASH-1248 at pp. A-4, A-5, A-14 and A-16.

3/ "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation," Report of the Advisory Committee on the Biological Effects of Ionizing Radiation (BEIR), Nat'l. Ac. Sci., Nat'l Res. Council, Washington, D. C., (Nov. 1972), p. 15. (Cited in WASH-1248 at p. A-4).

4/ ORP/CSD 72-1, Estimates of Ionizing Radiation Doses in the United States 1960-2000, U.S. Env. Prot. Agency (Aug. 1972), p. 27. (Cited in WASH-1248 at p. A-4).

MILLING

6. The liquid and solid effluents (tailings) from uranium milling are combined in the mill, and the slurry is pumped to the tailings area. The tailings are often dumped inside dikes or dams, thus forming a pile which can grow to 30 or 40 feet high and as much as half a mile long. The liquid and solid effluents are discharged inside the dam, with the larger particles of solids depositing near the dam and smaller particles and liquid phase flow away from the dam, forming a pond.

7. The area of exposed dry tailings is variable, depending on the volume of liquid effluents from the mill, the natural evaporation rate, and the design of the retention system. In the spring of 1973, all tailings at the new Exxon and Rio Algom mills were submerged in water. In contrast, New Mexico mills have many areas of dry tailings.

RADON VALUE FOR PERIOD OF ACTIVE MILLING

8. As indicated in the Rothfleisch affidavit, the radon value in WASH-1248 represents only the releases associated with the tailings piles during the period of active milling. These calculations were

based on a model which assumed that the tailings piles were completely wet during the period of active milling. At the time of preparation of WASH-1248, data available to the Staff on new or planned milling operations indicated that during active milling the tailings would be wet.

9. Although some mills may have a very small dry "beach" area, a recent survey indicates that most mills are characterized by tailings ponds with large (approximately 20-30 percent of the total beach and pond area) dry beach areas. It has been calculated that more radon is released from these dry areas than from the pond surface or from wet beach areas.[5/]

10. The calculations for radon releases in the affidavit of Paul J. Magno use a more recent model which is based on tailings piles which are partly dry and partly wet. This may be more representative and is more conservative than the model used in WASH-1248. In addition, Mr. Magno presents an estimate of 350 curies/AFR of radon release during an interim period of some two to three years after active milling, before stabilization of the mill tailings, during which period the tailings dry out.

5/ Sears, M. B., et al, "Correlation of Radioactive Waste Treatment Costs and the Environmental Impact of Waste Effluents in the Nuclear Fuel Cycle for Use in Establishing 'as Low as Practicable' Guides - Milling of Uranium Ores," ORNL-TM-4903, Vol. 1, Oak Ridge National Laboratory Oak Ridge, Tennessee, (May 1975).

RELEASES FROM MILL TAILINGS PILES AFTER PERIOD OF ACTIVE MILLING

11. At the time WASH-1248 was in preparation, the release rates associated with the radon in the tailings piles after the period of active milling were considered by the Staff to be quite speculative.

12. Because of the relatively short half-life of radon-222 (3.8 days), the amount of radon released from a tailings pile, after it is generated from decay of thorium in the pile, is dependent on the physical characteristics of the pile (e.g., size, shape, overburden, soil characteristics). Thus, the long-term characteristics of the pile are factors which must be considered in radon releases.
In 1972, the Staff did not have adequate information on which to base estimates of long-term characteristics. There had been abandoned mills whose tailings piles had not been properly stabilized and cared for which had caused problems in the vicinity of the mills. On the other hand, there were mills that had given adequate care to the problem of stabilization of tailings piles which had resulted in little effects on the environment and few problems in the vicinity of these mills. In addition, in 1972, while the

Commission (USAEC) was considering this matter, but had not yet developed a policy with respect to goals to be achieved in stabilization of tailings piles after the period of active mill operation had ceased. Thus, the degree of stabilization, and therefore the radon release rate, could not be predicted with any reasonable degree of certainty.

13. Nevertheless, the Staff considered available information, particularly the report of the U.S. Environmental Protection Agency entitled, "Estimates of Ionizing Radiation Doses in the United States 1960-2000."[6/] This document reported the results of studies made at active and inactive mill sites with covered and uncovered tailings which showed no significant radiation exposure to the public. Based on these studies, the Staff concluded in WASH-1248, B-23, that population doses attributable to the uranium milling industry would not be distinguishable from natural background radiation.

CONCLUSIONS

14. The radon value of 74.5 curies found in Table S-3 may be somewhat misleading; however, the background information contained in

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6/ See note 4, p. 3.

WASH-1248 shows that this value was intended to address only the release attributable to an annual fuel requirement from the tailings pond during active mill operations. The value does not include radon releases from mining or long-term releases from tailings piles after active milling has ceased.

15. The Staff's current estimate for releases from mining is 4060 Ci/AFR, as shown in the Wilde affidavit. The Staff's current estimate for releases from stabilized tailings piles is 1-10 Ci per year/AFR as shown by the Magno affidavit. In addition, Mr. Magno estimates a radon release of 350 Ci/AFR for the interim period after active milling has ceased and before the tailings pile is stabilized. Mr. Magno's affidavit also contains the Staff's more recent and more representative estimate of radon release during the active mill operation of 780 Ci/AFR.

16. The radon value for releases from all phases of the uranium fuel cycle, including releases from mining and long-term releases from the tailings piles, would be substantially higher than the value shown in Table S-3. This does not detract, however, from the overall Staff conclusion on the environmental impact of the uranium fuel cycle. This is clear from the affidavit of Dr. Gotchy,

which shows that, when radon releases from the sources not included in the Table S-3 value are considered, the population dose is not distinguishable from the normal and expected variations in natural background.

Homer Lowenberg

Homer Lowenberg

Subscribed and sworn to before me
this 20th day of January, 1978.

Carol J. Durham
Notary Public

My Commission Expires July 1, 1978.

PROFESSIONAL QUALIFICATIONS

HOMER LOWENBERG

U.S. NUCLEAR REGULATORY COMMISSION

Education: In 1942 I received a Degree of Mechanical Engineering with distinction in Chemical Engineering from Stevens Institute of Technology. In 1965 I attended the Cornell University Graduate School of Business and Public Administration Executive Development Program.

Work Experience: 1942-1946 - I was with the Hercules Powder Company as a Development and Production Engineer, involved in the design of equipment andprocesses for manufacture of Propellants and High Explosives.

1946-1947 - I was project engineer for Pacific Airmotive Corp. handling the design and installation of plant and equipment for the overhaul of aircraft.

1947-1967 - Employment with Vitro Engineering Company (formerly Kellex Corporation) as Project Engineer, Project Manager, Manager Design and Special Facilities, Manager of New York Operations. Projects included a wide variety of nuclear installations. Some typical facilities were: Redox, Waste Metal Recovery and Purex Reprocessing Plants, Richland, Washington; High Level Radiation Analytical and Examination Laboratories, Reprocessing Pilot Plant and Alloy Development Plants, Oak Ridge, Tennessee; Inpile

Reactor Test Loops, ETR, Idaho Falls, Idaho; Indian Point No. 1 Nuclear Power Plant, Consolidated Edison, New York; Mobile Gamma, Bulk Grain, Cesium, Shipboard and Wood-Plastic Irradiators; Nuclear Rocket E-MAD facilities, Jackass Flats, Nevada; and various plutonium and radiological laboratories. Major publication efforts included: Reactor Handbook - First Edition, Vol. IV; Reactor Handbook - Second Edition, Vol. II; Atomic Energy Fact Book.

1967-1971 - I accepted the position of Manager of Central Engineering with Atlantic Richfield Company at their NUMEC subsidiary. Responsibilities included planning, design and construction of facilities for ARCO's projected entry into the nuclear fuel cycle, i.e., fuel fabrication, plutonium fuels manufacture, spent fuel reprocessing.

1972-1974 - I accepted a position with the U.S. Atomic Energy Commission as an Assistant Director for Technical Support and Transportation; Licensing Fuels and Materials which included responsibilities for the licensing of transportation containers and environmental and special reviews of fuel cycle facilities.

1975-to date - With the U.S. Nuclear Regulatory Commission since its inception. I am presently Assistant Director for Operations and Technology, Office of Nuclear Material Safety and Safeguards. In this position, I am responsible for NRC assessment of generic issues, special studies, related research planning and coordination and the licensing regulatory base related to the fuel cycle licensing functions. Some of the major activities performed under my supervision included:

- the analysis of the use of plutonium recycle in light water reactors and the related proceedings
- the analysis of the environmental effects from the uranium fuel cycle
- the review of alternative fuel cycles

Major publications included: Environmental Survey of the Nuclear Fuel Cycle; Environmental Survey of the Uranium Fuel Cycle, WASH-1248; Generic Environmental Statement on Mixed Oxide Use (GESMO), draft WASH-1327 and final NUREG-0002.

HOMER LOWENBERG

BIOGRAPHICAL INFORMATION

Present Occupation

U. S. Nuclear Regulatory Commission - since its inception in 1975

Assistant Director for Operations and Technology, Office of Nuclear Material Safety and Safeguards. Responsible for NRC assessment of generic fuel cycle issues and planning and coordination of related research and rulemaking activities.

Education

Stevens Institute of Technology, 1942, Degree of Mechanical Engineering with distinction in Chemical Engineering.

Cornell University, 1965, Graduate School of Business and Public Administration - Executive Development Program.

Occupational Experience

Hercules Powder Company, 1942-1947, Development and Production Engineering Propellants and High Explosives.

Vitro Engineering Company (formerly Kellex Corp.), 1974-1967 Project Engineer, Project Manager, Manager Design and Special Facilities, Manager of New York Operations. Responsibilities include:

- Redox, Waste Metal Recovery and Purex Reprocessing Plants - Richland, Washington
- High Level Radiation Laboratories, Reprocessing Pilot Plant and Alloy Development Plants - Oak Ridge, Tennessee
- Inpile Test Loops, ETR - Idaho Falls, Idaho
- Indian Point No. 1, Consolidated Edison, New York
- Mobile Gamma, Bulk Grain, Cesium, Shipboard and Wood-Plastic Irradiators
- Nuclear Rocket E-MAD facilities - Jackass Flats, Nevada
- Various Plutonium and Radiological Laboratories

Atlantic Richfield Company, 1967-1971 - Manager of Central Engineering, Commercial Nuclear Activities

U.S. Atomic Energy Commission, 1971-1974 - Assistant Director for Technical Support and Transportation; Licensing Fuels and Materials

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Assistant Director for Operations and Technology, Office of Nuclear Material Safety and Safeguards. Responsible for NRC assessment of generic fuel cycle issues and planning and coordination of related research and rulemaking activities.

Education

Stevens Institute of Technology, 1942, Degree of Mechanical Engineering with distinction in Chemical Engineering.

Cornell University, 1965, Graduate School of Business and Public Administration - Executive Development Program.

Occupational Experience

Hercules Powder Company, 1942-1947, Development and Production Engineering Propellants and High Explosives.

Vitro Engineering Company (formerly Kellex Corp.), 1974-1967 - Project Engineer, Project Manager, Manager Design and Special Facilities, Manager of New York Operations. Responsibilities include:

- Redox, Waste Metal Recovery and Purex Reprocessing Plants - Richland, Washington
- High Level Radiation Laboratories, Reprocessing Pilot Plant and Alloy Development Plants - Oak Ridge, Tennessee
- Inpile Test Loops, ETR - Idaho Falls, Idaho
- Indian Point No. 1, Consolidated Edison, New York
- Mobile Gamma, Bulk Grain, Cesium, Shipboard and Wood-Plastic Irradiators
- Nuclear Rocket E-MAD facilities - Jackass Flats, Nevada
- Various Plutonium and Radiological Laboratories

Atlantic Richfield Company, 1967-1971 - Manager of Central Engineering, Commercial Nuclear Activities

U.S. Atomic Energy Commission, 1971-1974 - Assistant Director for Technical Support and Transportation; Licensing Fuels and Materials

Publications

Reactor Handbook - First Edition, Vol. IV

Reactor Handbook - Second Edition, Vol. II

Atomic Energy Fact Book

Environmental Survey - Uranium Fuel Cycle, WASH-1248

Generic Environmental Statement on Mixed Oxide Use (GESMO), WASH-1327 and NUREG-0002

Professional Affiliations

Member of American Nuclear Society since its founding.

Licensed Professional Engineer - States of New York and Pennsylvania

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

AFFIDAVIT OF JACK E. ROTHFLEISCH
ON THE RADON VALUE IN TABLE S-3

Jack E. Rothfleisch, being duly sworn, states as follows:

1. I am a Senior Chemical Engineer with the Fuel Processing and Fabrication Branch, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, and my professional qualifications are attached hereto.

2. I participated in the preparation of the value of radon release from the uranium milling operations set forth in Appendix B of WASH-1248. This affidavit describes the method by which the value of 74.5 curies per annual fuel requirement was derived.

3. For the WASH-1248 study a combined open pit mine - acid leach mill was selected as the model depicting the front end of the uranium fuel cycle since this concept represented a significant portion of

the then existing industry and was consistent with the industry trend. (WASH-1248, p. A-1 and B-6). The model mine-mill complex was assumed to have the capacity to produce and process 1600 metric tons of ore per day to yield 960 metric tons of U_3O_8 per year or 3.2 metric tons of U_3O_8 per day based on an assumed average on-stream time of 300 days per year. Based on a lifetime average annual fuel requirement (AFR) of 182 metric tons for the model 1000 MWe LWR, the model mine-mill complex would require

$\frac{182\ MT\ U_3O_8/AFR}{3.2\ MT\ U_3O_8/day}$ or about 57 days of operation to produce one annual fuel requirement of U_3O_8.

3. Estimates by Humble Oil and Refining Company in their Environmental Report dated July, 1971, covering a 2000 ST per day open pit mine-acid leach mill complex (WASH-1248, p. B-24; Reference 4) indicated an Rn-222 release from the ore crusher dust collectors of of 308 uCi/day. Additional estimates presented by Humble Oil in their "Applicant's Response to Agency Comments on Draft Statement Highland Uranium Mill Docket No. 40-8102" dated August, 1972 (WASH-1248, p. B-24, Reference 5), indicated the total Rn-222 generated by the 125-acre tailing pond to be 8.56 uCi/sec which is scaled up to 17.12 uCi/sec from the 250-acre tailing pond assumed for the WASH-1248 model mill.

Then, assuming releases from the model mill to be proportional to those estimated for the Highland Mill, the total radon release from the model mill during the production of one AFR of U_3O_8 was calculated as follows:

$$\frac{\text{Total Curies of Rn-222}}{\text{AFR (57 days)}} = \frac{\text{1600 MT/day x 1.1 ST/MT}}{\text{2000 ST/day}} \times \frac{\text{57 days}}{10^6 \text{ uCi/Ci}}$$

or 5.02×10^{-5} times the daily release in uCi from the Highland Mill.

4. Therefore, Rn-222 per AFR:

(a) From Dust Collectors = (308 uCi/day) (5.02×10^{-5}) = .02 Ci/AFR.

(b) From Tailings Pond = 17.12 uCi/sec.

(17.12 uCi/sec) (8.64×10^4 sec/day) (5.02×10^{-5}) $\cong$ 74.5 Ci/AFR

(This corresponds to the value of 13×10^5 uCi/day in Table B-3 at p. B-12 of WASH-1248).

Total Rn-222 Release = 74.5 Ci/AFR.

5. In short, the value of 74.5 Ci/AFR set forth in Table S-3 of WASH-1248 reflects only releases from the tailings pond of the model mill described in WASH-1248 during operation of the mill. It does not include contributions that may result from stabilized piles after active milling operations cease. It also does not include estimates for radon release from mining.

6. The BEIR Report [1] and the USEPA report, "Estimates of Ionizing Radiation Doses in the United States 1960-2000" [2] both concluded that while uranium mining activities increase the amount of surface uranium and its decay products, these activities do not cause measurable increases in environmental radioactivity outside the immediate vicinity of the mines. On the basis of these conclusions, radon releases resulting from mining activities were not included in the WASH-1248 S-3 Table.

7. Similarly, radon releases from stabilized tailings piles were not included on the basis of the EPA Report [2] which indicated that studies at active and inactive mill sites with covered and uncovered tailings showed no significant radon exposure to the public from these sources (WASH-1248, p. B-23).

Jack E. Rothfleisch

Jack E. Rothfleisch

Subscribed and sworn to before me
this 18 day of January 1978.

Muriel M. Groff

Notary Public

My Commission Expires July 1, 1978

References:

(1) National Academy of Sciences, National Research Council; "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation"; Report of the Advisory Committee on the Biological Effects of Ionizing Radiations (BEIR), Washington, D. C. 20006; November, 1972; page 15.

(2) USEPA Office of Radiation Programs; "Estimates of Ionizing Radiation Doses in the United States 1960-2000"; ORP/CSD 72-1; August, 1972; page 27.

PROFESSIONAL QUALIFICATIONS

Jack E. Rothfleisch

U. S. Nuclear Regulatory Commission

<u>Education</u>: In 1941 I received a Bachelor of Chemical Engineering degree from the College of the City of New York. During the period 1956-1960, I attended night classes at the University of Tennessee and completed most of the course work leading to a Masters degree in Industrial Management.

<u>Work Experience</u>: In 1941 I accepted a position as Chemical Engineer with the Tennessee Valley Authority Department of Chemical Engineering, working on projects associated with the development of nitrate and phosphate fertilizer materials including the manufacture of water gas conversion and ammonia synthesis catelysts and startup of a synthetic ammonia plant.

In 1943 I volunteered for service in the U. S. Navy where I served as Communications Officer, then Executive Officer, and finally, as Commanding Officer of USS LST 544.

In 1946 I returned to a position in chemical engineering with TVA where I designed, followed construction, and operated pilot scale facilities in support of the production of phosphatic fertilizers, ammonia, nitric acid, ammonium nitrate and elemental phosphorus. I supervised the details of the experimental work, evaluated and correlated data on projects including control of emissions from phosphate and nitric acid plants.

In 1950 I was recalled to active duty with the U. S. Navy, assigned as Joint Communications Center Officer aboard the USS Eldorado (AGC-11), in Korean waters, where my primary responsibility was the performance of the Coding Board in processing all incoming and outgoing dispatches, responsible

for all external communications as well as operation and maintenance of the communication system.

In October 1952 I accepted a position with Union Carbide Nuclear Company at the Oak Ridge Gaseous Diffusion Plant where I was engaged in engineering development studies directed toward improving various processes associated with the enrichment of the ^{235}U isotope by gaseous diffusion, outlining the objections, scope and method of attack for fluorine generation, gaseous diffusion feed plant operations, byproduct recovery and manufacture of barrier.

In 1960 I was transferred to position as Chief Metallurgist with Union Carbide at their Uranium Mill in Rifle, Colorado. In this position, I planned and supervised studies of process operations in the production of uranium and vanadium from carnotite ore. Investigations included process improvement proposals, cost studies of proposed circuits, definition of plant operational trends, preparation of technical reports, and pollution monitoring and abatement programs.

In 1962 I was transferred to position of Senior Development Engineer with Union Carbide Corporation Electronics Division and was engaged in the development and optimization of compact systems for the production of pure hydrogen from alcohols and hydrocarbons for use in fuel cells.

In 1968, I became Technical Superintendent with Union Carbide Corporation, Mining and Metals Division at their vanadium mill, where I supervised the Technical Department operations, prepared the departmental budgets and established process conditions for the optimum recovery of vanadium from various plant feeds. Additional responsibilities included setting up and directing air, water and noise pollution abatement programs and establishing working relationships with local, state, and federal regulatory agencies.

In 1972 I accepted a position with the U. S. AEC as a Senior Materials Licensing Engineer processing license applications for uranium milling and UF_6 production facilities including preparing environmental impact statements for proposed or existing installations. I assisted in the preparation of WASH-1248, "Environmental Survey of the Uranium Fuel Cycle" and contributed to the sections on uranium mining, uranium milling, uranium hexafluoride production and uranium enrichment.

In 1974 I was promoted to position of Senior Process Licensing Engineer with the primary function of acting as project manager and principal technical reviewer of license applications for the construction, modification and operation of non-reactor fuel cycle facilities. Subsequently the title of my position was changed to Senior Chemical Engineer.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

AFFIDAVIT OF R. L. GOTCHY

Reginald L. Gotchy, being duly sworn, states as follows:

1. I am a Senior Radiobiologist with the Radiological Assessment Branch, Office of Nuclear Reactor Regulation. A statement of my professional qualifications is attached.

2. I have prepared estimates of the radiological impact associated with current staff estimates of radon releases from the uranium fuel cycle. These are set forth in the attached report, "Radiological Impact From Radon Releases." The statements contained therein are true and correct to the best of my knowledge and belief.

Reginald L. Gotchy

Reginald L. Gotchy

Subscribed and sworn to before me
this 28th day of March, 1978.

Notary Public

My Commission Expires: July 1, 1978

RADIOLOGICAL IMPACT OF RADON-222 RELEASES

In a September 21, 1977 memorandum to James Yore, Chairman, Atomic Safety and Licensing Board Panel (ASLBP), Dr. Walter H. Jordan, ASLBP, pointed out that the value in Table S-3 of 74.5 curies per RRY* of Radon-222 release to the atmosphere does not accurately represent all sources of radon releases from the uranium fuel cycle.

A number of other affidavits have been prepared which identify the basis for the value of 74.5 curies per RRY set forth in Table S-3 and which provide current staff assessments of radon release, including releases from mining and from stabilized mill tailings piles, two sources not covered by the 74.5 curies per RRY entry set forth in Table S-3.

I have estimated the radiological impact associated with the current staff radon source estimates shown in Table 1.

Table 1. ESTIMATES OF RADON-222 FROM MINING AND MILLING OPERATIONS OF THE URANIUM FUEL CYCLE

Estimate of Radon-222 Releases	Source Document	Operations Included
74.5 (Ci/RRY)	WASH-1248	Milling Only
4,060 (Ci/RRY)	R. Wilde Affidavit	Mining
780 (Ci/RRY)	P. Magno Affidavit	Milling and active tailings pile
350 (Ci/RRY)	P. Magno Affidavit	Interim tailings pile (inactive mills; drying prior to stabilization)

*RRY -- Reference Reactor Year (a 1000 MWe light water reactor operating at 80% capacity factor for one year). Synonymous with one annual fuel requirement (AFR) with the same capacity factor.

Table 1. --Cont'd

Estimate of Radon-222 Releases	Source Document	Operations Included
1-10 (Ci/yr/RRY)	P. Magno Affidavit	Stabilized tailings pile (for several hundred years)
110 (Ci/yr/RRY)	P. Magno Affidavit	Stabilized tailings pile (beyond several hundred years)

Thus, our current estimates of projected population doses attributable to Rn-222 releases associated with the uranium fuel cycle to support the operation of one RRY considers the 4,100 Ci/RRY from mining, the 1,100 Ci/RRY from mill operations at an active pile and subsequent drying of the pile prior to stabilization, and the 1-110 Ci/yr/RRY from the stabilized pile.

1. Calculation of Projected Population Dose Commitments

Using the RABGAD computer code developed for the GESMO proceeding,[1] the staff has reevaluated population dose commitments for these sources of Rn-222. The calculations have been corrected for the following:

(a) An error in ICRP-Publication 2 which resulted in about a factor of 10 overestimate of the total body dose commitment from the ingestion of the long-lived Rn-222 daughters (Pb-210, Bi-210, Po-210).[2]

(b) Conversion of the Rn-222 "smeared lung" dose from the short-lived Rn-222 daughters (Po-218, Pb-214, Bi-214, Po-214) to a bronchial epithelium dose (about a factor of 20 increase over the GESMO "smeared lung" dose from the short-lived daughters).

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[1] GESMO, NUREG-0002, Section IV.J, Appendix A (1976).

[2] Letter to GESMO Hearing Board, Docket No. RN 50-5, April 8, 1977.

(c) A conservative revision upwards of the GESMO population densities to reflect the assumption that a stable U.S. population of 300 million will be reached in the year 2020 (about a 50% increase over the population assumed in GESMO).

This was done by increasing the population density assumptions in GESMO (7.5 persons/mi^2 in the west, rising exponentially to 160 persons/mi^2 in the east along a 2000 mile path length) to 11 persons/mi^2 and 235 persons/mi^2 in the west and east, respectively.

The calculations indicate that the long-lived radon daughters account for about 40% of the smeared lung dose. Thus, the dose commitment to the bronchial epithelium would be approximately 10 times the total (short-lived plus long-lived daughters) GESMO "smeared lung" dose. The results are summarized below for the estimated releases and release rates in the preceding table.

Table 2. ESTIMATES OF RADON-222 POPULATION DOSES AND DOSE RATES FROM MINING AND MILLING OPERATIONS

Estimate of Rn-222 Releases	Environmental Dose Commitments* (Man-rem) Total Body	Lung	Bone
74.5 Ci/RRY	1.9	42	51
Mining (4,100 Ci/RRY)	110	2,300	2,800
Most Recent Milling Estimate (1100 Ci/RRY)	29	620	750
Current Mining & Milling Subtotals:	140	2,900	3,600
1 Ci/RRY	0.026	0.56	0.68

*The environmental dose commitment (EDC) is the sum of the 50 year integrated population doses for each year of the environmental period being considered In this affidavit 100 year EDC's are used, although as shown later, there is little difference between 40 year and 100 year EDC's.

From this table, the staff's current best estimate of mining and milling doses (prior to stabilization) would be about 140 man-rem (total body), 2,900 man-lung-rem, and 3,600 man-bone-rem per RRY.

The 1-110 Ci/yr per RRY release rate from stabilized piles reflects the current uncertainty of long-term stability of mill tailings: Current stabilization requirements for new mill applicants (for NRC licenses) would result in about 1-10 curies of Rn-222/yr per RRY for periods of perhaps several hundred years. In order to respond quantitatively to Dr. Jordan's concerns, it was assumed that the stabilized tailings pile would emit 1 Ci/yr/RRY for 100 years, 10 Ci/yr/RRY for the next 400 years, then 100 curies/yr/RRY for periods beyond 500 years, corrected for radioactive decay. This is consistent with P. Magno's affidavit.

For periods significantly beyond a few hundred years, there are questions concerning whether one can rely on maintenance of overburden to limit radon release to the atmosphere, how soil moisture or other soil characteristics may change, etc., as well as very serious questions as to the ability to project health effects over very long time periods, which are discussed in the following section.

Using the time varying release rates assumed above, the cumulative release and associated population dose commitments would be as shown in Table 3. (For discussion of long-term releases, see p. 12.)

Table 3. ESTIMATE OF RADON-222 POPULATION DOSES FROM STABILIZED PILES PER RRY

Time (yrs)	Curies Released*	Environmental Dose Commitments (Man-Rem) Total Body	Lung**	Bone
1	1	0.026	0.56	0.68
10	10	0.26	5.6	6.8
50	50	1.3	28	34
100	100	2.6	56	68
500[1]	4,090	110	2,300	2,800
1,000[1]	53,800	1,400	30,000	37,000

*Based on the decay of Thorium-230 and Ra-226 to Rn-222.
**All lung doses here refer to the bronchial epithelium.
[1] Assumes rate remains 100 Ci/yr/RRY and is unaffected by any large changes in stabilization due to severe weather changes and increased erosion due to the "greenhouse effect."

It should be noted that because most of the radon lung dose is given almost immediately by the short-lived radon daughters (Po-218, Pb-214, Bi-214, Po-214), the environmental dose commitment (EDC) per curie release is essentially the same for a year, 100-year, or 1,000-year integration time. The total-body and bone dose commitments from long-lived radon daughters (Pb-210, Bi-210, Po-210) are somewhat more sensitive to the time selected for the EDC; however, there is only about a 12-14% difference between 40 year and 100 year EDCs.

2. Calculations of Potential Health Effects

The question of estimating health effects over long periods of time into the future is subject to very large uncertainties due to several factors which, so far, are uncontrolled by man. Risks estimates of health effects are based on past and present demographic and environmental statistics which are likely to change within the next few centuries. Some important factors affecting health effects estimates are:

(a) Life expectancies which are dependent on other environmental pollutants, both natural and man-made, standard of living, and other social and technical factors.

(b) Age distributions of populations at risk are certain to change which will cause shifts in risk estimators with time.

(c) Impacts of man-made and natural events (e.g., wars, plagues, widespread starvation due to crop failures, ice ages, etc.) will almost certainly cause significant variations in (a) and (b), thereby effecting the estimates of risks.

(d) Impacts of technological changes (e.g., prevention of and cures for cancers, and genetic modifications in people carrying serious genetic defects) can be expected to cause significant changes in the level of risk per Ci of radon released.

However, if one ignores these uncertainties, and assumes that the risk of health effects per Ci of Rn-222 released to the atmosphere remains as it is today, it is possible to calculate potential health effects into the future. It must be understood, however, that such exercises are philosophical in nature and may have no real meaning.

a. Calculation of Potential Cancer Risks

The cancer risk estimators used were taken from WASH-1400 and GESMO and are so-called absolute risk estimators that are based on estimated latent periods followed by periods of increased risk (plateaus). Those risk estimators of cancer mortality for total-body exposure, lung exposure, and bone exposure are 135,22.2, and 6.9 deaths per million man-rem, respectively. Current EPA risk estimates for lung cancer mortality are based on the exposure to radon daughters per Ci per year. Using the population densities assumed by the NRC Staff, EPA estimates about 2 to 3 excess lung cancer deaths per 100,000 Ci of radon released per year. Estimates of lung cancer risk using this methodology are 1.6 to 2.5 times greater than estimated by NRC for the radon releases assumed in this affidavit.[3] For illustrative purposes, I have prepared estimates of cancers per RRY based on the cumulative releases and dose commitments shown in Table 3. These are set out in Table 4.

[3]Personal communication, Dr. W. H. Ellett, U.S. Environmental Protection Agency, March 10, 1978.

Table 4. ESTIMATES OF POTENTIAL RISK OF CANCER MORTALITY FROM MINING AND MILLING PER RRY

Activity	Lung Cancers*	Bone Cancers	All Others
Mining:	0.051	0.019	0.015
Active Milling & Interim Piles:	0.014	0.0052	0.0039
Stabilized Piles:			
(a) 100 yrs	0.0012	0.00047	0.00035
(b) 500 yrs[1]	0.051	0.019	0.015
(c) 1,000 yrs[1]	0.67	0.26	0.19
Milling Totals:			
(a) 100 yrs	0.015	0.0057	0.0043
(b) 500 yrs[1]	0.065	0.024	0.019
(c) 1,000 yrs[1]	0.68	0.27	0.19

Totals for All Cancers:	Milling	Mining	Mining & Milling Totals
(a) 100 yrs	0.025	0.085	0.11
(b) 500 yrs[1]	0.11	0.085	0.19
(c) 1,000 yrs[1]	1.1	0.085	1.2

*As noted in the text, use of EPA estimates would increase the risk of lung cancer shown by factors of about 1.6 to 2.5 depending on the assumptions used. EPA lung cancer estimates are based on use of a relative risk model and an assumed lifetime plateau, with allowances for competing causes of death.

[1]See footnote 1, Table 3.

b. Calculation of Potential Genetically Determined Health Effects

Similar calculations can be carried out for potential genetic effects using the GESMO risk estimators. These risk estimators represent a mixture of fatal and non-fatal but damaging genetic effects expressed in future generations when the mutations have been distributed throughout the gene pool and are occurring at a nearly constant rate (i.e., equilibrium). The numerical values assumed are the geometric means of the ranges listed in the National Academy of Sciences report by the Committee on the Biological Effects of Ionizing Radiation (BEIR Report-1972). The Environmental Protection Agency has contracted with the National Academy of Sciences to update its 1972 report. However, until that report is completed, the staff feels the 1972 BEIR Report is the best reference to employ for genetic risk assessments.

The numerical values of the risk of dominant and complex genetic diseases are 158 and 100 per million man-rem, respectively. The total of 258 health effects per million man-rem can be applied to the total-body EDC's listed in Tables 2 and 3 to provide estimates of potential genetic health effects as shown in Table 5.

Table 5. ESTIMATES OF POTENTIAL HEALTH EFFECTS OF GENETIC ORIGIN FROM MINING AND MILLING PER RRY

Activity	Potential Health Effects of Genetic Origin per RRY	
Mining:	0.028	
Active Milling & Interim Piles:	0.0075	
Stabilized Piles:		
(a) 100 yrs	0.00067	
(b) 500 yrs[1]	0.028	
(c) 1,000 yrs[1]	0.36	
Milling Totals:		Mining & Milling Totals
(a) 100 yrs	0.0082	0.036
(b) 500 yrs[1]	0.036	0.064
(c) 1,000 yrs[1]	0.37	0.40

[1] See footnote 1, Table 3.

3. Conclusions

Examination of Tables 4 and 5 indicates that:

(a) The risk of cancer mortality is about 3 times greater than the risk of all genetically related health effects.

(b) Over the short-term (e.g., 100 years), the risk of potential health effects from radon-222 results principally from releases from mining and active milling operations.

(c) At times of about 1,000 years and beyond the risk of potential health effects from radon-222 is dominated by releases from tailings piles which were stabilized at the end of milling operations.

Allowing for the possibility that the relative risk method with a lifetime plateau is more correct than the absolute risk method with a 30 year plateau, we believe that the estimates of potential health effects over the next 100 years are accurate to within about one order-of-magnitude. On the other hand, we agree with the BEIR Report's conclusion that the possibility of health effects from additional radiation exposures which represent a small fraction of background radiation exposures may indeed be zero. If the latter case is correct, we have overestimated the health effects. In any event, if the former is true, our estimate would still be within an order-of magnitude, and would not result in a measurable increase in health effects over those due to background radiation.

For time periods in excess of about 500 to 1,000 years, there may be 2 or more orders-of-magnitude uncertainty in estimates of health effects. The uncertainty bounds balloon when the possible differences in relative vs. absolute risk assessments are added to the larger uncertainties regarding demographic variables of future populations such as population density (could vary by factors of 1 to 2 orders-of-magnitude) and years at risk per person (could easily vary by factors of 2 to 5 depending on population age distributions, life expectancies, and medical treatments for prevention and cure of somatic and genetically related diseases). In addition, doses could change by one or more orders-of-magnitude since the stability of tailings pile and transport pathways could be considerably altered by natural and man-made events over geologic time periods. So large is this uncertainty that the staff feels such speculation is meaningless, and obscures the important fact (as will be shown) that the potential health effects in <u>any</u> population living now or in the distant and uncertain future as a result of radon-222 emissions from the uranium fuel cycle will <u>always</u> represent an immeasurably small increase in those health effects occurring as a result of background radiation and other naturally occurring and man-made environmental pollutants. In addition, decisions made by man could alter radon release rates in the future (i.e., decisions made today with respect to stabilization

of tailings would not be irreversible, either from the standpoint of technology or costs in the foreseeable future). As a result, it is the Staff's position that health effect estimates should be limited to those periods of time for which reasonably credible estimates can be made. For purposes of this assessment, the Staff believes that the 100 to 1,000 year period considered in Tables 3, 4, and 5 is appropriate.

Although estimates of potential health effects over very long periods of time are meaningless for the reasons given above, for perspective, I have provided projected doses from radon releases from mining and milling (for the conditions assumed on p. 4 of this testimony) to permit comparisons with doses attributable to radon in natural background. These are set out in Table 6.

Periods beyond 10,000 years were not considered since current evidence[4,5,6] indicates periodic glacial periods will cause significant reshaping of

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[4] Jim Norwine, "A Question of Climate," Environment, 19, No. 8, p. 6 (November 1977).

[5] Nigel Calder, "Head South With All Deliberate Speed: Ice May Return in a Few Thousand Years," Smithsonian, 8, No. 10 (January 1978).

[6] H. H. Lamb, Climate: Present, Past and Future, Vol. 2, Barnes and Noble, New York (1977).

the surface along the continental divide during the next 10,000 years where most of the tailings piles would be located. Thus Rn-222 releases would be expected to decrease to zero when covered with an ice sheet then resume at an unpredictable rate when the ice sheet recedes (i.e., the piles could be spread out on the surface or covered by additional overburden). Using a constant release rate of 100 Ci/yr/RRY beyond 500 years, the cumulative release and associated population dose commitments would be as shown in Table 6.

At the present time, estimates[7,8] of radon emanation from soil indicate that about 1 to 2.4 X 10^8 Ci of Radon-222 are released per year in the contiguous U.S. NCRP also states that the average Rn-222 concentration in the U.S. is about 150 pci/m^2, which they estimate will result in a dose of 450 mrem/year to the bronchial epithelium of the average person.[9]

[7] Publication, 45, National Council on Radiation Protection and Measurements (NCRP), p. 80 (1975).

[8] "National Environmental Radiactivity from Radon-222," U.S. Department of HEW, PHS Pub. No. 999-RH-26 (May 1967).

[9] NCRP-45, p. 87.

Table 6. ESTIMATE OF LONG-TERM RADON-222 POPULATION DOSES FROM STABILIZED PILES PER RRY

Environmental Dose Commitments
(Man Rem)

Time (yrs)	Curies Released*	Total Body	Lung**	Bone
1	1	0.026	0.56	0.68
10	10	0.26	5.6	6.8
50	50	1.3	28	34
100	100	2.6	56	68
500	4,090[1]	110	2,300	2,800
1,000	53,800[1]	1,400	30,000	37,000
5,000	443,000[2]	12,000	250,000	300,000
10,000	912,000[2]	24,000	510,000	620,000

*Based on the decay of Thorium-230 and Ra-226 to Rn-222.
**All lung doses here refer to the bronchial epithelium.

1 See footnote 1, Table 3.

2 Assumes rate remains 100 Ci/yr/RRY and is unaffected by any large changes in tailings stability or overburden as a result of glaciation expected to occur during this time period.

If one makes the same assumptions with regard to future populations as was made for the mining and milling releases, it is possible to calculate potential future long-term population doses from background Radon-222 as shown in Table 7. These calculations use the same dose per Ci released as used in Tables 2 and 3 (i.e., 0.026, 0.56, and 0.68 man-rem per Ci for total-body, lung and bone, respectively). The estimated maximum percentage increase in long-term population doses and health effects per RRY are shown in Table 8. Table 8 demonstrates that regardless of the period selected, Dr. Jordan was correct when he concluded (p. 7 of his memorandum) that "the number is insignificant compared to those due to radon contamination in natural background," and that the authors of WASH-1248 were correct in their belief that "population doses from this source cannot be distinguished from background."[10]

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[10] WASH-1248, Environmental Survey of the Nuclear Fuel Cycle, p. 8-23 (April 1974).

TABLE 7. ESTIMATED LONG-TERM POPULATION DOSES FROM BACKGROUND RADON-222 COMPARED TO MINING AND MILLING ONE RRY

Environmental Dose Commitment (man-rem)

Time (yrs)	Mining & Milling			Background Rn-222*		
	TB	Lung	Bone	TB	Lung	Bone
100	1.4E2	3.0E3	3.7E3	2.6E8	5.6E9	6.8E9
500[1]	2.5E2	5.2E3	6.4E3	1.3E9	2.8E10	3.4E10
1,000[1]	1.5E3	3.3E4	4.1E4	2.6E9	5.6E10	6.8E10
5,000[2]	1.2E4	2.5E5	3.0E5	1.3E10	2.8E11	3.4E11
10,000[2]	2.4E4	5.1E5	6.2E5	2.6E10	5.6E11	6.8E11

*Assumes Th-230 is always in secular equilibrium with U-238 in nature.

[1]See footnote 1, Table 3.

[2]See footnote 2, Table 6.

TABLE 8. ESTIMATED LONG-TERM MAXIMUM PERCENTAGE IN BACKGROUND RADON-222 POPULATION DOSES AND HEALTH EFFECTS DUE TO MINING AND MILLING ONE RRY

Time (yrs)	Percent of Background
100	5.3E-5
500[1]	1.9E-5
1,000[1]	5.8E-5
5,000[2]	9.2E-5
10,000[2]	9.2E-5

[1] See footnote 1, Table 3.

[2] See footnote 2, Table 6.

In summary, the staff has reevaluated the Rn-222 releases and subsequent population dose commitments, and potential health effects questioned by Dr. Jordan in his September 21, 1977 memorandum, and concluded the following:

(a) The mining and milling releases for a 100 to 1,000 year period per RRY are:

Mining: 4,100 Ci

Milling:

(1) Active milling and drying of tailings pile prior to stabilization: 1,100 Ci.

(2) Releases from stabilized tailings piles for 100 to 1,000 years: 100 to 53,800 Ci.

Total: 5,300 to 59,000 Ci

(b) The population dose commitments (man-rem) for a 100 to 1,000 year period per RRY are:

	Total Body	Lung	Bone
Mining:	110	2,300	2,800
Active milling & drying:	29	600	750
Stabilized tailings pile:	2.6-1,400	56-30,000	68-37,000
Totals:	140-1,500	3,000-33,000	3,600-41,000

(c) The potential health effects for a 100 to 1,000 year period per RRY are:

	Cancers	Genetic Effects
Mining:	0.085	0.028
Active milling & drying:	0.023	0.0075
Stabilized tailings pile:	0.0020-1.1	0.00067-0.36
Totals:	0.11-1.2	0.036-0.40

DR. R. L. GOTCHY

Professional Qualifications

My name is Reginald L. Gotchy. I am a Senior Radiobiologist on assignment with the Radiological Assessment Branch in the Office of Nuclear Reactor Regulation. In this capacity, I am responsible for coordinating the technical review and evaluation of the environmental radiological impact of nuclear facility operations.

I received a B.S. in Zoology from the University of Washington in 1958, an M.S. in Radiation Health from the Colorado State University in 1966, a Ph.D. in Radiation Biology from the Colorado State University in 1968, and attended the University of Washington Graduate School 1958-1959 as an AEC Radiological Physics Fellow.

I have 16 years of professional experience in Health Physics, Industrial Hygiene, Radiation Physics, Radiation Biology, Environmental Sciences, Project Coordination of research and development programs, and development of AEC and NRC standards. This experience has included operational and safety responsibilities, and review and coordination of facility operations under contract to the AEC. I have been employed by the Lawrence Radiation Laboratory, the U.S. Public Health Service, Reynolds and Electrical Engineering Company, the AEC Nevada Operations Office, and the NRC Office of Standards Development prior to my assignment in the Office of Nuclear Reactor Regulation in 1975. I was an adjunct professor of Radiation Health Technology at the University of Nevada, Las Vegas (1969-1972).

I am a member of Sigma Xi (Research Society of North America), the American Nuclear Society, the Health Physics Society, and the International Radiation Protection Association.

I am certified by the American Board of Health Physics, and served as a member of the Panel of Examiners (1972-1976).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

AFFIDAVIT OF R. M. WILDE

Ralph M. Wilde, being duly sworn, states as follows:

1. I am Program Assistant to the Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards. A statement of my professional qualifications is attached.

2. I have prepared estimates of the radon released as a result of mining of uranium as part of the uranium fuel cycle. These are set forth in the attached document, "Radon-222 Release From Uranium Mines." The statements contained therein are true and correct to the best of my knowledge and belief.

Ralph M. Wilde

Ralph M. Wilde

Subscribed and sworn to before me
this 28th day of March, 1978.

Carol J. Durham

Notary Public

My Commission Expires: July 1, 1978

Historical Background

The release of radioactive material to the atmosphere during mining operations is briefly discussed in two documents issued by the Nuclear Regulatory Commission prior to the publication of NUREG-0002, Final Generic Environmental Statement on the Use of Recycled Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors (GESMO)[1]. Both of these documents discuss: (1) The release of uranium bearing dusts, as well as Radon and its daughters, during mining operations; (2) the unavailability of data on the amount of radioactivity released during mining; (3) the unsuccessful attempts by the Bureau of Mines[2] to measure significant concentrations of airborne alpha radioactivity in open-pit mines; (4) and the insignificant concentrations of airborne alpha radioactivity in areas adjacent to these mines.[3]

The final GESMO was developed as a more comprehensive generic assessment than either of its predecessors, WASH-1248 and WASH-1327. Thus the environmental impacts were addressed more completely and accurately. It was my opinion, based on my experience in the uranium mining and milling industry, despite the unavailability of confirming data, that mines

[1] Environmental Survey of the Uranium Fuel Cycle, WASH-1248, USAEC, (April 1974). Draft GESMO, WASH-1327, USNRC, (August 1974)

[2] U.S. Department of the Interior, Bureau of Mines, District E, Memorandum File 437.2 (1968)

[3] Klement, A.W., Jr. et. al., "Estimates of Ionizing Radiation Doses in the United States 1960-2000", ORP/CSD 72-1, USEPA, (August 1972).

contributed the major portion of the radon released to the environment during the operating life of a mine-mill complex. Thus, in late 1974, the staff decided that we should attempt to provide a quantitative estimate of the source term for radon released from mining operations for the Final GESMO.

DEVELOPMENT OF THE GESMO SOURCE TERM FOR MINING EFFLUENTS

The data which provided the basis for the source term were obtained by personal telephone communications from two sources: James Cleveland, Kerr-McGee Nuclear Corporation, Grants, New Mexico (January 30, 1975); and Edward Kaufman, New Mexico Environmental Improvement Agency, Santa Fe, New Mexico (February 3, 1975). I had been associated professionally with both of these men for several years while I was employed with Anaconda in New Mexico and I knew that they were both knowledgeable of conditions which existed in uranium mining operations. Both of these individuals supplied me with their estimates of radon concentrations in the ventilation air discharged from underground uranium mines (based on limited sampling data) together with additional pertinent information. This information included data on: ore production rates, ventilation flow rates, number of ventilation shafts, etc., such as was necessary to calculate the amount of radon discharged per ton of ore mined. A summary of the data supplied follows.

A. Data Supplied by E. Kaufman

These data represent Mr. Kaufman's estimates of the typical characteristics of all of the underground uranium mines which were operating in New Mexico

(Ambrosia Lake area) in late 1974 and early 1975. At that time, underground mines in New Mexico produced approximately 75% of the total U.S. production of uranium ore from underground uranium mines.

- Estimated radon concentration in ventilation air — 1,200-1,500 pCi/l
- Ore production (Ambrosia Lake) — 7,500 ST/day
- Number of ventilation shafts (Ambrosia Lake) — 60 Shafts
- Air volume per ventilation shaft — 40,000-50,000 CFM
- Mines operate in an ore production mode approximately — 300 days/year
- Ore grade approximately — 0.2% U_3O_8

B. Data Supplied by J. Cleveland

These data represent Mr. Cleveland's estimates of the typical characteristics of the underground mine operated by Kerr-McGee in New Mexico in late 1974 and early 1975 and are thus a subset of the Kaufman data.

- Estimated radon concentration in ventilation air — 1,000-1,500 pCi/l
- Ore production (Kerr-McGee) — 5,000 ST/day
- Number of ventilation shafts (Kerr-McGee) — 35-40 Shafts
- Air volume per ventilation shaft — 45,000 CFM
- Ventilation shaft fans operate 24 hours per day 365 days per year

From my experience in the industry the data supplied appeared to be reasonable and, therefore, was used as the data base from which the source term for radon release from uranium mining was calculated.

From the preceding data, the release of Radon-222 per metric ton of ore mined may be estimated.

- Annual Ore Production (0.2% U_3O_8 ore)

$$\left(7500\ \frac{ST}{Day}\right)\ \left(300\ \frac{Day}{Yr}\right)\ \left(\frac{0.907\ MT}{1\ ST}\right) = 2.04 \times 10^6\ \frac{MT}{Yr}$$

- Annual Radon Discharged from Mines Producing 2.04×10^6 MT/year

$$(60\ \text{vents})\ (45{,}000\ \text{CFM/vent})\ (28.32\ \text{l/CF})\ (5.256 \times 10^5\ \text{min/year})\ (1.5 \times 10^{-9} Ci^{222}Rn/l) = 6.03 \times 10^4\ Ci^{222}Rn/\text{year}$$

- Release per metric ton of 0.2% U_3O_8 Ore

$$\frac{6.03 \times 10^4\ Ci^{222}\ Rn/\text{year}}{2.04 \times 10^6\ MT/\text{year}} = 2.96 \times 10^{-2} Ci^{222}Rn/MT\ \text{Ore}$$

In GESMO it was assumed the average ore grade processed during the period 1975-2000 would be 0.1% U_3O_8, not 0.2% as above. The rationale for this assumption is that the ore reserves and resources which contain the required amount of uranium (1.6×10^6 short tons of U_3O_8) are projected to have an average grade of approximately 0.1% U_3O_8. The additional assumption was made that the amount of radon released would be directly proportional to the grade (uranium content) of the ore. The rationale for this assumption is that radon would be in secular equilibrium with the parent uranium and, therefore, directly proportional to the uranium content of the ore. The corrected value of radon release for the lower grade ore used in the GESMO model may be calculated as follows.

- Release per metric ton of 0.1% U_3O_8 Ore (GESMO)

$$\frac{0.1\%\ U_3O_8}{0.2\%\ U_3O_8}\ (2.96 \times 10^{-4} Ci^{223}Rn/MT) = 1.48 \times 10^{-2} Ci^{222}Rn/MT\ \text{Ore}$$

This calculation gave me what I considered to be a reasonable estimate for the radon release from underground mines.

In the printing of GESMO, due to a typographical error, this value appeared as 1.5 Ci ^{222}Rn per metric ton of ore mined (second footnote to Table IV F-5, page IV F-22). A correction was made in the GESMO errata.

The radon release from mining per AFR (Annual Fuel Requirement) was calculated from this release rate (1.5×10^{-2} Ci ^{222}Rn/MT) and the amount of ore required to supply the uranium for one AFR (2.71×10^{5} MT).

- Radon release per AFR

  (1.5×10^{-2} Ci ^{222}Rn/MT) (2.71×10^{5} MT/AFR) = 4060 Ci ^{222}Rn/AFR

INDEPENDENT CONFIRMATION OF GESMO SOURCE TERM

As a result of the erroneous value (typo) which appeared in GESMO, representatives of the uranium mining industry questioned the validity of the source term for radon release from mining. Subsequently, in October 1976, Kerr-McGee conducted an independent investigation of radon released from their underground uranium mine ventilation systems in the Ambrosia Lake area of New Mexico. The results of this investigation were sent to me by a letter dated December 9, 1976, from W. J. Shelley, Director, Regulation and Control, Kerr-McGee Nuclear Corporation. The unit release value obtained by Kerr-McGee in their independent investigation was 1.5×10^{-2} Ci ^{222}Rn/Mt of ore mined. This value is numerically equal to the

GESMO value. However, the agreement between the two values is not quite as good as it appears on the surface, since the grade of ore produced by Kerr-McGee during the sampling period was probably closer to 0.2% U_3O_8 than to the 0.1% U_3O_8 ore grade assumed for GESMO.

SUMMARY

The source term in GESMO for radon from uranium mining operations was calculated from estimates provided by experts who were knowledgeable of the conditions which existed in uranium mining operations. The independent investigation made by Kerr-McGee, which was based on actual measurements, confirmed the GESMO source term within a factor of about 2. It is of interest to note that the mines which were sampled by Kerr-McGee in their investigation produce approximately a third of the U.S. production of uranium ore from underground uranium mines and thus should provide an adequate sampling base.

I consider the agreement between the source term estimated for GESMO and from Kerr-McGee's investigation to be good. We now have underway a study to determine actual radon releases from underground and open pit uranium mines. The early results of this study, which should be available in mid-1978, will provide a better basis for review of this matter and a more accurate estimate of this source term. I believe that such additional data will show that the estimates contained herein for radon releases from underground mines are reasonable. For open pit mines, until such study is completed, there is just no reliable information available upon which to base estimates of radon release.

PROFESSIONAL QUALIFICATIONS

R. M. Wilde

U. S. Nuclear Regulatory Commission

I received my Bachelor of Science Degree in Chemistry from Brigham Young University in 1955. In March 1955, I started to work as an analytical chemist at the uranium ore processing pilot plant which was operated by National Lead Company in Grand Junction, Colorado under contract with the Atomic Energy Commission. From March 1956 to December 1956 I was employed as assistant chief chemist at the Rare Metals Corporation uranium ore processing mill in Tuba City, Arizona.

In January 1957, I accepted the position of Assistant Metallurgist in The Anaconda Company's uranium ore processing mill in Grants, New Mexico. In this position I performed metallurgical research and testing for both an acid-leach and an alkaline leach mill circuit. My primary duties included development, testing and evaluation of ion-exchange processes for the acid-leach curcuit. I was also involved with testing and evaluation of various leaching methods for sandstone and limestone uranium ores. The objectives of these investigations were to reduce process losses and to determine the most economical methods of operation of the mill. In December 1958, I became Radiation Safety Director for Anaconda's New Mexico Operations. In this position I was responsible for surveillance

and control of occupational and environmental radiation hazards in Anaconda's uranium mines and mill. I was employed by Anaconda for 16 years.

I came to the Nuclear Regulatory Commission in January of 1973, and currently I am Program Assistant to the Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards.

AFFIDAVIT OF PAUL J. MAGNO

Paul J. Magno, of Rockville, Maryland, being duly sworn, states as follows:

1. I am a Health Physicist with the Division of Fuel Cycle and Material Safety of the U.S. Nuclear Regulatory Commission and my professional qualifications are attached hereto.

2. Mr. Rothfleisch has indicated the basis for the staff's estimate in WASH-1248 of the radon-222 releases from uranium milling during active operations. Since this estimate was made, the staff has carried out additional assessments of the radon-222 releases from uranium mill tailings and has also developed a series of performance objectives for the waste management of these tailings. Using this additional information, I have estimated the release rates of radon-222 from uranium milling operations. These estimates include releases from the tailings areas following cessation of active milling which as indicated by Mr. Rothfleisch were not included in the radon-222 release estimates presented in WASH-1248.

3. These radon-222 release rates are expressed in curies per annual fuel requirement (AFR) for a 1000 Mwe reactor operating at an 80% capacity factor. These estimates which are presented below were developed taking into consideration radon-222 releases from (a) milling of the

ore, (b) tailings areas during active milling, (c) tailings areas during the interval between the end of active milling operations and final stabilization and (d) stabilized tailings areas.

Radon-222 Releases from Milling Operations

Source of Release	Curies per AFR
Milling of Ore	30
Tailings During Active Milling	750
Tailings During Inactive Period	350
Subtotal	1130
Tailings Following Stabilization	1 - 10 (curies per year per AFR)

The detailed basis and calculations for these radon-222 release estimates are presented in the following sections.

4. ESTIMATE OF RADON-222 RELEASES DURING MILLING PROCESS

Radon-222 releases during ore storage and processing were estimated (a) assuming that the radon-222 is in secular equilibrium with the uranium-238 in the ore and (b) using an escape fraction (emanating power) of 0.4. The emanating power (E) is the fraction of radon-222 formed which escapes the source particles. For both natural soils and uranium mill tailings, E was found to be about 0.2 (1). A value of E = 0.4 has been used in this estimate in order to take into account the potential effect that various steps in the milling processes (i.e., grinding and leaching) may have on the emanating power of the ore particles.

Calculation of AFR Ore Equivalent

$1 \text{ AFR} = 245 \text{ MT } U_3O_8$ (*)

$$1 \text{ MT ore} = 0.001 \frac{\text{MT } U_3O_8}{\text{MT ore}} \times 0.9 \frac{\text{recovery}}{\text{factor}} = 9 \times 10^{-4} \frac{\text{MT } U_3O_8}{\text{MT ore}}$$

$$1 \text{ AFR} = \frac{245 \text{ MT } U_3O_8}{9 \times 10^{-4} \frac{\text{MT } U_3O_8}{\text{MT ore}}} = 2.72 \times 10^5 \text{ MT ore}$$

Calculation of Equilibrium Radon-222 Activity in Ore

$$^{222}\text{Rn}, \frac{\text{Ci}}{\text{MT ore}} = 0.001 \frac{\text{MT } U_3O_8}{\text{MT ore}} \times 0.848 \frac{U}{U_3O_8} \times \frac{0.33 \text{ Ci}}{\text{MT U}} = \frac{2.8 \times 10^{-4} \text{ Ci}}{\text{MT ore}}$$

Calculation of Radon-222 Release per AFR

$$^{222}\text{Rn}, \frac{\text{curies}}{\text{ARF}} = 2.8 \times 10^{-4} \frac{\text{Ci}}{\text{MT ore}} \times 2.72 \times 10^5 \frac{\text{MT ore}}{\text{AFR}} \times 0.4 = 30$$

5. ESTIMATE OF RADON-222 RELEASES FROM TAILINGS AREA DURING MILLING

Estimates of the radon-222 releases from the tailings area during active milling were made based on a composite model tailings pile developed

(*) U_3O_8 requirement for no recycle option from GESMO, Table IVJ(E)-17[2]. This is the most conservative option since it requires the largest quantity of U_3O_8 per AFR.

from information presented in ORNL-TM-4903, Vol. 1 (Table 4.13).(3) Using this model, one AFR (2.72×10^5 MT tailings) would cover 2.9 acres of tailings area to a depth of 38 ft. For a mill processing ore containing 0.1% U_3O_8 and having a 26 year life, this would result in a release of about 750 curies per AFR. The basis for this estimate is as follows:

Calculation of Tailings Area per AFR

Table I shows the method used to arrive at the composite model tailings pile. This pile contains 1.33×10^7 MT of tailings and near the end of mill life covers 140 acres (106 acres of pond and wet beach and 34 acres of dry beach). A conversion factor of 0.0205 ($2.72 \times 10^5 \div 1.33 \times 10^7$) is used to normalize the area of the composite tailings pile into area per AFR.

Area of Composite Tailings Area, Acres		Conversion Factor		Area per AFR Acres
Pond and Wet Beach 106	x	0.0205	=	2.17
Dry Beach 34	x	0.0205	=	0.70
Total Tailings Area 140	x	0.0205	=	2.87

Calculation of Radon-222 Release per AFR

Source of Release	Acres/AFR	Release Rate curies/acre-yr	Release Rate curies/AFR-yr	Years of Release		Curies/AFR
Pond and Wet Beach	2.17	1.04	2.25	26	=	59
Dry Beach	0.70	38.2	26.7	26	=	695
Total Tailings Area						754

This calculation was made using the conservative assumption that the release rate during the 26 year mill life was equivalent to the release rate near the end of mill life. The release rate per acre-year for the pond and wet beach area was calculated from data presented in ORNL-TM-4902, Vol. 1 (Table 4.20). The release rate from the dry beach areas was calculated using the following formula which has been derived from simple one-dimensional diffusion theory (ORNL-TM-4903, Vol. 1, p. 146):

$$J_o = D_e C_v \left[\frac{\lambda}{D_e/v}\right]^{1/2} \times 4.05 \times 10^7 \frac{cm^2}{acre} \times 3.15 \times 10^7 \frac{sec.}{year}$$

where:

J_o = radon flux in Ci/acre-year

D_e/v = effective diffusion coefficient = 0.054 cm^2/sec (ORNL-TM-4902, Vol. 1, Table 9.29)

λ = decay constant of radon-222 = 2.1 x 10^{-6} sec^{-1}

v = void fraction = 0.37

C_v = concentration of radon in voids

$C_v = \frac{E\ C_t}{v}$

where:

E = emanating power = 0.2

v = void fraction = 0.37

C_t = activity of radium-226 in tailings per unit volume (2.8 x 10^{-10} Ci/g x 1.6 g/cm^3 = 4.48 x 10^{-10} Ci/cm^3)

6. ESTIMATE OF RADON-222 RELEASES DURING INTERVAL BETWEEN END OF MILLING AND COMPLETION OF STABILIZATION OF TAILINGS AREA

The release of radon-222 per AFR from the tailings area for the interval between the end of milling and completion of stabilization was calculated assuming a five-year period to dry out the tailings and complete the stabilization. The release rate of radon-222 for this period was estimated to be 350 curies per AFR. Table II shows the details of these calculations. These calculations were made assuming that the pond and wet beaches dry out linearly over the five year period and using the same release rates (curies per acre-year) as were used for calculation of release rates during active milling.

7. ESTIMATES OF RADON-222 RELEASES FROM STABILIZED TAILINGS AREAS

The staff of the Division of Fuel Cycle and Material Safety has recently developed a series of performance objectives for an acceptable tailings management program for use in uranium mill licensing actions[(4)]. To meet these performance objectives, all NRC licensed uranium mills (including license renewal actions) are required to develop a tailings stabilization and reclamation program which will reduce the radon-222 release rate (flux) from the tailings area to about twice the release rate from natural soils in the surrounding environs.**

** The NRC staff is working closely with the Agreement States in order to have similar performance objectives incorporated into the States' licensing actions for uranium mills.

The release rate of radon-222 from uranium mill tailings areas stabilized to meet these performance objectives is estimated to be less than one curie per year per AFR. This value was calculated as follows:

The radon-222 flux from the tailings area is comprised of two components: the flux from natural soils (cover materials) and the flux from the tailings. Therefore, to meet the performance objective that the radon-222 flux from the tailings disposal area should not exceed about twice the flux from natural soils in the area, the radon-222 flux from the tailings themselves should not exceed a value about equal to the flux from the natural soils (i.e., background flux).

Calculation of Background Radon-222 Flux

$$J_b = J_o\, C_s \times 4.05 \times 10^3 \frac{m^2}{acre} \times 3.15 \times 10^7 \frac{sec}{year}$$

where:

J_b = background radon flux in curies/acre-year

J_o = radon flux in Ci/m^2-sec per pCi/g of radium-226 in soil = 1×10^{-12} (1.0 pCi/m^2-sec)

C_s = radium-226 concentration in soil = 2.5 pCi/g

J_b = 0.32 curies/acre-year

This calculation is based on a radium-226 soil concentration of 2.5 pCi/g which is a value at the upper range of concentrations of radium-226 measured in natural soils in the Western States(5). The radon flux value of 1.0 pCi/m^2-sec per pCi/g of radium-226 in soil was calculated using an effective diffusion coefficient (D_e/v) of 5.4×10^{-2} cm^2/sec which is a value applicable to sandy soils (ORNL-TM-4903, Vol 1, Table 9.29).

$$\text{Curies per AFR per year} = 2.9 \frac{\text{acres}}{\text{AFR}} \times 0.32 \frac{\text{curies}}{\text{acre-year}} = 0.93$$

Although the tailings disposal area will be designed for a radon-222 release rate not to exceed about 1 curie per year per AFR, the estimated radon-222 release rate from the tailings has been expressed as a range from 1 - 10 curies per year per AFR to take into account uncertainty about the integrity of the stabilized tailings areas over long periods of time.

Siting and engineering design features required to assure long-term stability are incorporated into final stabilization design. There are numerous specific methods for stabilizing the mill tailings. One attractive alternative presently being evaluated is placing the tailings below grade in mined out areas to provide maximum assurance of long-term stability.

To reduce the radon release rate to the level specified in the staff's performance objectives will require between 6 and 20 feet

of cover material over the tailings. The amount of cover required will depend upon the specific characteristics of the soil with respect to the rate of diffusion of radon-222 through the material. We believe such a stabilized pile will maintain its integrity over an extended period of time like at least several hundreds of years and that any degradation, if it takes place, will be small and not catastrophic.

8. With respect to Dr. Walter Jordan's memorandum of September 21, 1977 to James R. Yore, Chairman of the Atomic Safety and Licensing Board, concerning errors in the radon-222 release estimates in Table S-3 of CFR § 51.20, I agree with Dr. Jordan that Table S-3 does not represent all sources of radon from uranium milling activities. Furthermore, I agree with Dr. Jordan that releases of radon-222 from tailings areas during time periods following cessessation of active milling operations should be included in estimates of radon-222 releases from uranium milling operations. I have included such releases in the radon-222 release estimates presented in this affidavit.

Dr. Jordan has estimated a radon-222 release rate of 71 curies per year per AFR for a tailings area stabilized with 2 feet of earth cover. I would agree with this estimate for the conditions specified. The 2 feet of earth cover would result in about a 25 percent reduction in the radon flux from the bare tailings. I have estimated the radon-222 release rate from stabilized tailings areas based on the

the staff's new performance objectives for tailings management. These performance objectives require a reduction of the radon flux by a factor of about 100 (i.e., to about 1 curies per year per AFR).

As suggested by Dr. Jordan, I have presented the radon-222 release rates from stabilized tailings areas in curies per year per AFR.

9. In order to provide additional perspective, I have also estimated the release rate of radon-222 which would occur from a tailings area if all of its cover material were removed as a result of erosion processes over some long period of time such as a thousand years. This complete erosion of cover material (all other factors remaining the same) would result in a release rate of about 110 curies per year per AFR. This is a factor of about 10 - 100 greater than the estimates I have presented for the covered tailings areas.

10. The Commission is now in process of preparing a generic environmental impact statement on uranium milling. The information developed during preparation of this statement and research program associated with that effort should provide a much improved data base for making future estimates of radon-222 release.

Paul J. Magno

Paul J. Magno

Subscribed and sworn to before
me this 16th day of January, 1978.

Carol A. Dunham

Notary Public

My commission expires July 1, 1978.

References

(1) Haywood, F. F., et al, "Assessment of Radiological Impact of the Inactive Uranium-Mill Tailings Pile at Salt Lake City, Utah" ORNL/TM-5251, p. 14, Oak Ridge National Laboratory, Oak Ridge, Tennessee (1977)

(2) "Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors (GESMO)," NUREG-0002, Vol. 3, U.S. Nuclear Regulatory Commission, Washington, D.C., (August 1976)

(3) Sears, M. B., et al, "Correlation of Radioactive Waste Treatment Costs and the Environmental Impact of Waste Effluents in the Nuclear Fuel Cycle for Use in Establishing 'as Low as Practicable' Guides - Milling of Uranium Ores," ORNL-TM-4903, Vol. 1, Oak Ridge National Laboratory Oak Ridge, Tennessee, (May 1975)

(4) Branch Position - Uranium Mill Tailings Management, Fuel Processing and Fabrication Branch, U.S. Nuclear Regulatory Commission, Washington, D.C.

(5) "Phase II-Title 1 Engineering Assessments of Inactive Uranium Mill Tailings," GJT-1 through GJT-12S, U.S. Department of Energy, Grand Junction, Colorado. (Issued April 1976 through November 1977)

TABLE I

CALCULATION OF AREA OF COMPOSITE TAILINGS IMPOUNDMENT

Location-Type Mill[(a)]	Tailings area for Individual Mill Types[(b)] (Acres) Pond and Wet Beach	Tailings area for Individual Mill Types[(b)] (Acres) Dry Beach	Fraction of contribution to composite Tailings Area[(c)]	Contribution to Composite Tailings Area (Acres) Pond and Wet Beach	Contribution to Composite Tailings Area (Acres) Dry Beach	Total
Wyoming-Sx	145	12	0.425	61.6	5.1	66.7
Wyoming-Alk	91	37	0.075	6.8	2.8	9.6
New Mexico-Sx	80	48	0.425	34.0	20.4	54.4
New Mexico-Alk	50	78	0.075	3.8	5.9	9.7
			Composite Tailings Area	106	34	140

Footnotes:

(a) Sx = solvent extraction mill, Alk = alkaline leach mill

(b) Data from ORNL-TM-4902 (Table 4.13). Areas are representative of conditions near end of mill life. Tailings areas contain 1.33×10^7 MT of tailings.

(c) Based on assumption of 85% of production from solvent extraction mills and 15% from alkaline mills (GESMO page IV F-25) and assuming 50% U_3O_8 production in New Mexico and 50% in Wyoming.

TABLE II

CALCULATION OF RADON-222 RELEASES DURING INTERIM PERIOD FOLLOWING CESSATION OF MILLING AND PRIOR TO STABILIZATION

Time after Milling Ends[a]	Model Tailing Area Acres/AFR[b]		Curies released per AFR	
	Pond and Wet Beach	Dry Beach	Pond and Wet Beach	Dry Beach
0-1	1.95	0.92	2.01	35.1
1-2	1.52	1.35	1.57	51.6
2-3	1.08	1.79	1.12	68.4
3-4	0.65	2.22	0.67	84.8
4-5	0.22	2.65	0.23	101.2
TOTAL FOR PERIOD			5.60	341

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(a) Based on assumption that a five-year interval will take place between end of active milling and completion of stabilization of tailings area.

(b) Average area for the time interval and based on the assumption that the ponds dry out linearly with time over a 5-year period.

Paul J. Magno

Professional Qualifications

I have been employed as a health physicist by the Nuclear Regulatory Commission since 1975. I am presently assigned to the Division of Fuel Cycle and Material Safety where I am involved in the assessment of the radiological impact of uranium milling operations.

I received a B.S. degree in chemistry from Boston College in 1952 and have over 24 years professional experience in the nuclear field. Prior to joining the Commission, I was involved in the assessment and monitoring of environmental radioactivity serving in various capacities with the U.S. Public Health Service and the Environmental Protection Agency. From 1968-1973, I served as Chief of the Field Operations Branch at the Northeastern Radiological Health Laboratory. From 1952-1958, I was employed at the AEC's Raw Materials Development Laboratory in Winchester, Massachusetts where I worked on metallurgical extraction processes for the recovery of uranium. From 1958-1959, I was associated with the Radiochemical Analysis Group at Brookhaven National Laboratory. I then served as a staff health physicist at the Massachusetts Institute of Technology from 1959-1962. I have published over 30 technical papers and reports in the field of environmental radioactivity.

I am a member of the Health Physics Society, the American Chemical Society and have served on ASTM Committee D 19.04, and ANSI Committee N-46.

NRC Central

April 28, 1978

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. A. Dixon Callihan
Days Inn, Buford Highway
2461 Old Stone Mt. Road
Chamblee, Georgia 30341

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261, 50-261 (OL Modification)

Gentlemen:

Because of an additional, unanticipated delay in the completion of the Staff's review of the proposed license amendment in the captioned proceeding, the Staff will not be able to make its Safety Evaluation available to the Board and to the parties until some time around May 15, 1978. Accordingly, the Staff's proposed findings in these consolidated proceedings with regard to the proposed amendment to the Robinson operating license will be forwarded to the Board and to the parties with the Safety Evaluation, and thus will not be incorporated in the Staff's proposed findings with respect to the Robinson Appendix D, 10 CFR Part 50 proceedings.

Sincerely,

David A. Kubichek
Counsel for NRC Staff

cc: George F. Trowbridge, Esq.
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board
Docketing and Service Section

Dist
NRC Central
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HSmith
Kubichek
Bajwa

OFFICE	OELD	OELD				
SURNAME	Kubichek/dmr	Reis				
DATE	4/28/78	4/28/78				

TABLE S-3.—*Summary of environmental considerations for uranium fuel cycle*[1]

[Normalized to model LWR annual fuel requirement (WASH-1248) or reference reactor year (NUREG-0116)]

Natural resource use	Total	Maximum effect per annual fuel requirement or reference reactor year of model 1,000 MWe LWR
Land (acres):		
Temporarily committed [2]	94	
Undisturbed area	73	
Disturbed area	22	Equivalent to 110 MWe coal-fired powerplant.
Permanently committed	7.1	
Overburden moved (millions of MT).	2.8	Equivalent to 95 MWe coal-fired powerplant.
Water (millions of gallons):		
Discharged to air	159	=2 pct of model 1,000 MWe LWR with cooling tower.
Discharged to water bodies	11,090	
Discharged to ground	124	
Total	11,373	<4 pct of model 1,000 MWe LWR with once-through cooling.
Fossil fuel:		
Electrical energy (thousands of megawatt hours).	321	<5 pct of model 1,000 MWe LWR output.
Equivalent coal (thousands of MT).	117	Equivalent to the consumption of a 45 MWe coal-fired powerplant.
Natural gas (millions of scf)	124	<0.3 pct of model 1,000 MWe energy output.
Effluents—chemical (MT):		
Gases (including entrainment): [3]		
SO_x	4,400	
NO_x [4]	1,190	Equivalent to emissions from 45 MWe coal-fired plant for a year.
Hydrocarbons	14	
CO	29.6	
Particulates	1,154	
Other gases:		
F^-	.67	Principally from UF_6 production, enrichment, and reprocessing. Concentration within range of state standards—below level that has effects on human health.
HCl	.014	
Liquids:		
SO_4^-	9.9	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constituents that require dilution and the flow of dilution water are:
NO_3^-	25.8	
Fluoride	12.9	
Ca^{++}	5.4	
Cl^-	8.5	
Na^+	12.1	
NH_3	10.0	NH_3—600 ft³/s.
Fe	.4	NO_3—20 ft³/s. Fluoride—70 ft³/s.
Tailings solutions (thousands of MT).	240	From mills only—no significant effluents to environment.
Solids	91,000	Principally from mills—no significant effluents to environment.
Effluents—radiological (curies):		
Gases (including entrainment): [4]		
Rn-222	74.5	Principally from milling operations and excludes contributions from mining.
Ra-226	.02	
Th-230	.02	
Uranium	.034	
Tritium (thousands)	18.1	
C-14	24	
Kr-85 (thousands)	400	Principally from fuel reprocessing plants.
Ru-106	.14	
I-129	1.3	
I-131	.83	
Fission products and transuranics.	.203 *	
Liquids:[4]		
Uranium and daughters	2.1	Principally from milling—included in tailings liquor and returned to ground=no effluents; therefore, no effect on environment.
Ra-226	.0034	From UF_6 production.
Th-230	.0015	
Th-234	.01	From fuel fabrication plants—concentration 10 pct of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR.
Fission and activation products.	5.9×10^{-6}	
Solids (buried on site):		
Other than high level (shallow).	11,300	9,100 Ci comes from low-level reactor wastes and 1,500 Ci comes from reactor decontamination and decommissioning—buried at land burial facilities. 600 Ci comes from mills—included in tailings returned to ground ~60 Ci comes from conversion and spent fuel storge. No significant effluent to the environment.
TRU and HLW (deep)	1.1×10^7	Buried at Federal repository.
Effluents—thermal (billions of British thermal units).	3,462	<4 pct of model 1,000 MWe LWR.
Transportation (person-rem): Exposure of workers and general public.	2.5	
Occupational exposure (person-rem).	22.6	From reprocessing and waste management.

[1] Data supporting this table are given in the "Environmental Survey of the Uranium Fuel Cycle," WASH-1248, April 1974; the "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0116 (Supp. 1 to WASH-1248); and the "Discussion of Comments Regarding the Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0216 (Supp. 2 to WASH-1248). The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the 2 fuel cycles (uranium only and no recycle). The contribution from transportation excludes transportation of cold fuel to a reactor and of irradiated fuel and radioactive wastes from a reactor which are considered in table S-4 of sec. 51.20(g). The contributions from the other steps of the fuel cycle are given in columns A-E of table S-3A of WASH-1248.

[2] The contributions to temporarily committed land from reprocessing are not prorated over 30 years, since the complete temporary impact accrues regardless of whether the plant services 1 reactor for 1 yr or 57 reactors for 30 yr.

[3] Estimated effluents based upon combustion of equivalent coal for power generation.

[4] 1.2 pct from natural gas use and process.

*Amended 42 FR 18387.

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(next page is 51-4)

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[3] Gaseous effluents from waste management contribute about 9 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year for the uranium only recycle option. This contribution for the no recycle option is 170 person-rem. For comparison, all radiological gaseous effluents from fuel cycle operations contribute about 370 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. This dose is <0.002 pct of the average natural background radiation dose to this population. Fuel re-processing contributes about 330 person-rem (total body) of the total of 370 person-rem to offsite U.S. population. Person-rem is an expression for the summation of whole body doses to individuals in a group. Thus, if each member of a population group of 1,000 people were to receive a dose of 0.001 rem (1 millirem), or if 2 people were to receive a dose of 0.5 rem (500 millirem) each, the total person-rem dose in each case would be 1 person-rem. The dose to the offsite U.S. population due to average natural background radiation is about 2×10^{7} person-rem per year. The Commission's final environmental statement on use of mixed-oxide fuel in LWR's (NUREG-0002) indicates a maximum release of about 4800 Ci of Rn-222 when contributions from mining are included. NUREG-0002 also indicates that mining contributes about 500 person-rem (total body) and that milling contributes about 100 person-rem (total body) of a total of about 610 person-rem (total body) to offsite U.S. population per annual fuel requirement.

[4] Liquid radiological effluents from reprocessing and waste management activities in the fuel cycle contribute 1.4×10^{-4} person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. For comparison all radiological liquid effluents from fuel cycle operations contribute about 100 person-rem (total body) to offsite U.S. population per annual fuel requirement or reference reactor year. This dose is <0.0005 pct of the average natural background radiation dose to this population.

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construction and operation with environmental quality standards and requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection, including applicable zoning and land-use regulations and water pollution limitations or requirements promulgated or imposed pursuant to the Federal Water Pollution Control Act. The environmental impact of the facility will be considered in the cost-benefit analysis with respect to matters covered by such standards and requirements irrespective of whether a certification or license from the appropriate authority has been obtained, including any certification obtained pursuant to section 401 of the Federal Water Pollution Control Act. While satisfaction of Commission standards and criteria pertaining to radiological effects will be necessary to meet the licensing requirements of the Atomic Energy Act, the cost-benefit analysis will, for the purposes of NEPA, consider the radiological effects of the facility and alternatives.

(d) In determining the contents of an environmental impact statement, the Commission shall be guided by the Council on Environmental Quality Guidelines on Preparation of Environmental Impact Statements, 40 CFR 1500.8.

(e) Other considerations. A draft environmental impact statement prepared in connection with the issuance of an operating license will cover only matters which differ from, or which reflect new information in addition to, those matters discussed in the final environmental impact statement prepared in connection with the issuance of the construction permit. The draft statement may incorporate by reference any information contained in that final environmental statement. With respect to the operation of nuclear reactors, unless otherwise determined by the Commission, the draft statement will be prepared only in connection with the first licensing action that authorizes full power operation of the facility.

(f) The draft environmental impact statement normally will include a preliminary conclusion by the Director of Nuclear Reactor Regulation or Director of Nuclear Material Safety and Safeguards or their designee, as appropriate, on the basis of the information and analysis described in paragraphs (a)-(e), as to whether, after weighing the costs and benefits of the proposed action and considering available alternatives, the action called for is issuance of the proposed permit or license with or without conditions, or denial of the permit or license. In appropriate circumstances the Director of Nuclear Reactor Regulation or Director of Nuclear Material Safety and Safeguards or their designee, as appropriate, may, in lieu of such preliminary conclusion, indicate in the draft statement that two or more alternatives are under consideration.

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(g) The draft environmental impact statement will also contain a summary sheet prepared in accordance with Appendix I, 40 CFR Part 1500.

§ 51.24 Distribution of draft environmental impact statement; news releases.

43 FR 7209

Draft environmental impact statements will be distributed as follows:

(a) Five (5) copies of the draft environmental impact statement, the Applicant's Environmental Report, and any comments received on the statement or report will be provided to the Environmental Protection Agency.

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(b) One (1) copy of the draft environmental impact statement will be provided to the license or permit applicant;

(c) Copies of the draft statement and the applicant's environmental report will be provided to:

(1) Those Federal agencies that have special expertise or jurisdiction by law with respect to any environmental impacts involved and which are authorized to develop and enforce relevant environmental standards;

(2) [Deleted 43 FR 7209.]

(3) The appropriate State and local

ronmental impact values for a "model" light-water reactor. The impact values contained in the Summary Table represent the application of that methodology to 84 reactors either under construction or in operation at 53 different sites. Impact values were derived for each individual reactor and values encompassing 90 percent of the 84 reactors studied were then calculated for insertion into the Rule. In view of the fact that the Staff intends to issue a Supplement to the Survey showing how these values were derived, the Commission believes that this matter has been resolved.

Finally, the Board mentioned three matters raised by comments of the participants which the Staff contended were beyond the scope of the proceeding. These were: (i) regulatory standards for packaging covered by other Commission regulations; (ii) methods of transportation, types of fuel, and materials not covered by the Survey; and (iii) transportation from other than a single nuclear power reactor (i.e., transportation from 1000 reactors as opposed to a single "model" reactor). While these matters may be of interest, the Commission agrees with the Staff's position that they are beyond the scope of this proceeding.

The purpose of this proceeding was not to consider the adequacy or inadequacy of the Commission's regulations governing packaging of nuclear material and wastes found in 10 CFR Part 71, but rather, in part, was to assess the environmental impact of transportation of fuel and waste packaged in accordance with those regulations. Likewise, the purpose of this proceeding was not to assess or speculate as to the environmental impact of differing modes of transportation or differing types of fuel, but rather was to assess the environmental impact associated with currently used methods of transportation of fuel and waste. As to transportation from 1000 reactors as opposed to a single "model" reactor, the purpose of this proceeding was to develop environmental impact values for transportation of fuel and waste that could be factored into cost-benefit analyses for individual reactors, not to assess the cumulative environmental impact of transportation of fuel and wastes for all reactors contemplated to be in operation at some future date.

On the basis of the foregoing, the record of the rulemaking hearing, consideration of the comments received, and other factors involved, the Commission has adopted the amendment set forth below. The amendment is in substance essentially the same as the amendment proposed in the notice of proposed rulemaking published February 5, 1973 (38 FR 3334) except for the addition of a scope definition, and changes in certain values to reflect EPA comments and clarifying and editorial changes to make it conform with the format of 10 CFR Part 51.

Pursuant to the Atomic Energy Act of 1954, as amended, and sections 552 and 553 of title 5 of the United States Code, the following amendment to 10 CFR Part 51 is published as a document subject to codification.

40 FR 2978
Published 1/17/75
Effective 1/17/75

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Environmental Effects of Transportation of Radioactive Materials to and From Nuclear Power Plants; Correction

In FR Doc. 75-125, appearing at page 1005, in the issue for Monday, January 6, 1975, the following corrections are made.

40 FR 8774
Published 3/3/75
Effective 3/3/75

Energy Reorganization Act; Revisions to Chapter 1 to Reflect Organizational and Procedural Changes

See Part 2 Statements of Consideration.

40 FR 31953
Published 7/28/75
Effective 7/28/75

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Amendments of Table S-3 and Summary Table S-4

Table S-3—Summary of environmental considerations for uranium fuel cycle, of 10 CFR Part 51 contains a typographical error which was carried over from the original Table S-3 in the "Environmental Survey of the Uranium Fuel Cycle." The amendments set forth below correct the words now reading "Thermal (billions)" in the first column of Table S-3 to read "Effluents—Thermal (billions of Btu):".

The Commission's Office of Standards Development has prepared "NUREG-75/038, Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants Supplement I" dated April 1975 which presents the data and identifies the methods used in deriving the values in Summary Table S-4—Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. The amendments of 10 CFR Part 51 set forth below amend footnote 1 of Summary Table S-4 to reflect the availability of "NUREG-75/038" which may be obtained from the National Technical Information Service, Springfield, Virginia 22161. A copy of "NUREG-75/038" is available for inspection and copying at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C.

The amendments also correct the line in the body of Summary Table S-4 beginning with "Transportation workers" to show that the range of doses is 0.01 to 300 millirem rather than 0.0 to 300 millirem.

Because these amendments relate solely to corrections and minor matters, the Commission has found that good cause exists for omitting notice of proposed rule making, and public procedure thereon, as unnecessary, and for making the amendments effective on July 28, 1975.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, and sections 552 and 553 of Title 5 of the United States Code, the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 51, are published as a document subject to codification.

41 FR 15832
Published 4/15/76
Effective 5/17/76

Construction Permit or Operating License: Initial Treatment of Application

See Part 50 Statements of Consideration.

42 FR 13803
Published 3/14/77
Effective 3/14/77

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Uranium Fuel Cycle Impacts From Spent Fuel Reprocessing and Radioactive Waste Management

AGENCY: Nuclear Regulatory Commission

ACTION: Effective interim rule.

SUMMARY: The Commission has previously identified environmental impact values for the uranium fuel cycle which are to be included in environmental reports and environmental impact statements for individual light water nuclear power reactors. This rule amends the prior regulations so as to incorporate revised values, based on a new study of the available information, for the nuclear waste management and nuclear fuel reprocessing portions of the fuel cycle.

EFFECTIVE DATE: March 14, 1977.

FOR FURTHER INFORMATION CONTACT:

William P. Bishop, Chief, Waste Management Program, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission, Washington, D.C. 20555 (301-427-4240)

SUPPLEMENTARY INFORMATION: On October 18, 1976, the Nuclear Regulatory Commission (hereafter Commission or NRC) gave notice in the FEDERAL REGISTER (41 FR 45849) that it contemplated promulgating an interim rule which would revise Table S-3 of 10 CFR Part 51 to include new specific impact values derived in light of its "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle" NUREG-0116 (Supplement 1 to WASH-1248) (hereinafter referred to as "Supplement"). Interested persons were invited to submit written comments on the Supplement and proposed interim rule by December 2, 1976, copies of which are available for public inspection at the Commission's Public Document Room at 20555. After careful consideration of the 1717 H Street, N.W., Washington, D.C. comments received and within the context of the following discussion, the Commission has adopted the values set forth in the interim rule which will remain effective for eighteen months unless good cause is shown to extend the period of effectiveness.

BACKGROUND

Pursuant to the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement must be prepared by the Commission in connection with issuance of a construction permit or operating license for each light water nuclear power reactor. These statements should contain a detailed evaluation of the environmental impacts of construction and operation of the plant and a discussion of reasonable alternatives, as well as an overall assessment of the costs and benefits of the licensing action.

In November 1972, a document entitled "Environmental Survey of the Nuclear Fuel Cycle" (hereinafter referred to as "Survey") was published by the Directorate of Licensing of the Atomic Energy Commission (AEC). Comments on the Survey were solicited, and an informal rulemaking hearing was held on February 1 and 2, 1973. The purpose of the hearing was to consider possible amendments to Appendix D of 10 CFR Part 50 which would, by rule, specify the environmental effects of the uranium fuel cycle to be factored into the assessment of costs and benefits in environmental impact statements for individual light water nuclear power reactors (LWR's). Written comments were received in response to the FEDERAL REGISTER notice, and recommendations for improvement were offered during the hearings. After consideration of the written comments and the hearing record, the AEC promulgated the final fuel cycle rule (the so-called Table S-3) on April 22, 1974 (39 FR 14188). It was intended that, with the inclusion of environmental impacts from Table S-3, the environmental impact statements for individual LWR's would set forth a full and candid assessment of costs and benefits consistent with the legal requirements and spirit of NEPA. The AEC indicated in its decision that the rule and Survey would be reexamined from time to time to accommodate new information. The same Table S-3 was included in 10 CFR Part 51.

On January 19, 1975, the Atomic Energy Commission was abolished and its licensing and regulatory responsibilities transferred to the Nuclear Regulatory Commission. On July 21, 1976, the United States Court of Appeals for the District of Columbia Circuit decided *Natural Resources Defense Council* v. *NRC*,[1] a case involving judicial review of the fuel-cycle rule, and *Aeschliman* v. *NRC*,[2] a related case involving the exclusion of fuel cycle issues from an individual power reactor licensing proceeding. The court approved the overall approach and methodology of the fuel cycle rule and found that, regarding most phases of the fuel cycle, the underlying Environmental Survey represented an adequate job of describing the impacts involved.[3] However, the court found that the rule was inadequately supported by the record insofar as it treated two particular aspects of the fuel cycle—the impacts from reprocessing of spent fuel and the impacts from radioactive waste management.

In response to the court decision, the Commission issued a General Statement of Policy (41 FR 34707, August 16, 1976) announcing its intention to reopen the rulmaking proceeding on the environmental effects of the fuel cycle to supplement the existing record on waste management and reprocessing impacts to determine whether the rule should be amended and, if so, in what respect.[4] The Commission thus indicated its intent to handle the question of the environmental impacts of waste management and reprocessing generically rather than in individual licensing proceedings, a decision supported by language of the court in the *Vermont Yankee* case.[5] The Commission directed the Staff to prepare on an expedited basis a well-documented supplement (NUREG-0116) to the Survey (WASH-1248) to establish a basis for identifying environmental impacts associated with fuel reprocessing and waste management activities that are attributable to the licensing of a model light-water reactor.

The revised survey was completed in October, 1976, and the Commission issued the October 18, 1976 notice regarding the proposed interim rule. The comments received in response to that notice and the Commission's responses to those comments comprise NUREG-0216, Supplement 2 to WASH-1248 (hereinafter "Supplement 2").

The Commission indicated in that notice that the values proposed therein were to be considered as a proposed interim substitute for the values originally set forth in Table S-3A of WASH-1248. After receipt and analysis of comments received, a final interim rule was to be promulagated for use in LWR licensing. The interim rule was to be made permanent only after a public hearing had been held to further facilitate effective public participation. Under a Supplemental Statement of Policy published in the FEDERAL REGISTER on November 11, 1976 (41 FR 49898) licensing of individual LWR's was resumed on a conditional basis pending promulgation of the final interim rule provided that the old values for reprocessing and waste management contained in Table S-3A were compared with the values in the proposed interim rule to determine if application of the new values would tilt the cost/benefit balance in individual cases. All values in the table except those relating to waste management and reprocessing were to remain the same.

The Commission has decided to pattern the final interim rule after the original Table S-3. Supplements 1 and 2 provide detailed narrative explanation of the new values in Table S-3 and give greater illumination to the background and context of the revised values.

SCOPE AND PURPOSE OF SUPPLEMENTS AND RULE

At the outset the Commission wishes to make clear that its purpose in preparing Supplements 1 and 2 and the interim rule was quite limited. The sole purpose of preparation of Supplement 1 and the rule was to identify and quantify environmental impacts attributable to the reprocessing and waste management portions of the LWR fuel cycle. The environmental impacts so identified are to be used only in the preparation of environmental impact statements for individual light water reactors. Supplement 1 and the rule have fulfilled this purpose. It was not the purpose of this proceeding to decide which of the various waste management alternatives should or will be employed in practice, or to develop site selection criteria or to define parameters for licensing of any of the Energy Research and Development Administration's (ERDA) waste management facilities. A separate and comprehensive series of programs has been undertaken to serve these broader purposes. ERDA has several programs in progress including a program for the preparation of a generic environmental impact statement on high-level waste management, a program to evaluate geologic formations and specific sites for repositories, programs in research and development of waste solidification methods and development of interim storage sites. NRC's ongoing programs include the preparation of regulations for the licensing of ERDA waste management facilities and activities, the development of performance criteria for solidified high-level waste and the development of site suitablity criteria for

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[1] ____ F. 2d ____ (D.C. Cir. 1976), 9 ERC 1149, *cert. granted sub nom., Vermont Yankee Nuclear Power Corp.* v. *Natural Resources Defense Council*, 45 U.S.L.W. 3570 (U.S. Feb. 22, 1977) (No. 76-419). No action has as yet been taken by the Supreme Court on a related petition for certiorari filed in *Baltimore Gas and Electric Co.* v. *Natural Resources Defense Council*, No. 76-458.

[2] ____ F. 2d ____ (D.C. Cir. 1976), 9 ERC 1289, cert granted, 45 U.S.L.W. 3570 (U.S. Feb. 22, 1977) (No. 76-528).

[3] Note 1, supra, at 1159.

[4] The Court of Appeals stayed its mandate in the proceedings which gave rise to the General Statement of Policy, and the Supreme Court's grant of certiorari has the legal effect of continuing the stay of mandate in effect.

[5] Note 1, supra, n. 17, at 1154-1155.

high-level waste repositories.

These programs are described in greater detail in Appendices B and C to Supplement 1 and other agency programs are described in Appendix F to Supplement 2. Supplement 1 itself and the S-3 rule are only a very small part of these ongoing activities.

In addition to these ongoing programs the Commission has undertaken the preparation of two generic environmental impact statements on fuel cycle issues. One, the Generic Environmental Statement on Mixed Oxide Fuels, "GESMO," is in the legislative hearing stage of a rulemaking proceeding. Work has commenced on the other, the Generic Environmental Impact Statement on Uranium Milling, and a draft statement is expected in mid-1978.

The Commission has used some of the information in the GESMO document, NUREG-0002, in its preparation of Supplement 1 and the interim rule in much the same manner as it has used other available literature. While the Commission realizes that additional information may be generated during the GESMO proceeding, all of the information used in the Supplement, including the relevant information from NUREG-0002, will be re-examined during preparation of the final fuel cycle rule and will be subjected to close scrutiny during public hearings on the final rule along with other available information. To the extent that comments in this proceeding have raised issues related to the material in the GESMO document, the Commission has independently evaluated the comments and taken them into account in this proceeding.

SUFFICIENCY OF INFORMATION AND ASSESSMENT

In order to fulfill its purpose of identifying in a generic proceeding the environmental impacts attributable to the reprocessing and waste management portions of the LWR fuel cycle, the Commission had to decide whether the information produced by Supplements 1 and 2 provided a sufficient basis for proceeding with an interim rule. The Commission addressed the question whether the risks of proceeding on the basis of information which may later be called into question in a final rulemaking proceeding outweigh the costs which would certainly flow from a hiatus in LWR licensing. See *National Air Carrier Association* v. *CAB*, 436 F. 2d 185, 191 (D.C. Cir. 1970). The costs attributable to a hiatus in licensing were explored by the Commission's Staff in a paper entitled "Impacts of Adopting or Not Adopting an Interim Rule Permitting Construction or Operation of Nuclear Power Plants" which was cited by the Commission in its Supplemental Statement of Policy (41 FR 49898) and placed in the Public Document Room along with NUREG-0116. The paper concluded that the environmental and economic costs attributable to a twelve-month delay in the licensing of reactors were substantial.

A number of comments on the Supplement and the proposed interim rule also dealt with the adequacy of this study. These comments are dicussed in detail in the document entitled "Response to Comments on a Staff paper entitled 'Impacts of Adopting or Not Adopting an Interim Rule Permitting Construction or Operation of Nuclear Power Plants' ". In the Commission's view, the study was adequate to fulfill its limited purpose of highlighting for the Commission and others the costs of a hiatus in licensing that would be caused by the failure to promulgate an interim rule. Even if environmental costs of a delay in licensing were excluded from consideration, the economic costs of a twelve-month delay would be high. Thus, the costs which would flow from a hiatus in licensing were explored by the Commission and the Commission has concluded that they would be substantial. However, as was noted above, costs alone could not determine the Commission's resolution of the question whether to proceed by interim rule. Against these costs must be weighed the risks of proceeding by interim rule where the sufficiency of the information supporting the rule might be later called into question during the final rulemaking proceeding on the permanent rule. Accordingly, the Commission critically examined the Supplement and, in light of some comments questioning its adequacy attempted to judge its quality.

The Supplement supporting the new interim rule (NUREG-0116) was the product of extensive effort by a Task Force comprised of a number of highly qualified individuals with years of experience in the field. Since a great deal of work in the field had already been completed when the Task Force began its analysis, the Task Force was not required to start completely fresh in its consideration of the issues. Supplement 1 is not merely an uncritical description of the available literature on the subject of reprocessing and waste management. Rather, the Task Force carefully examined voluminous amounts of information in the field, selected from those sources the best possible information available and then critically analyzed the information and, where warranted, rechecked calculations and performed independent analysis. Further, the Staff performed a detailed analysis of the comments received on the Supplement. The responses to every substantive comment received are contained in Supplement 2, NUREG-0216. Supplements 1 and 2 contain a detailed analysis of the impacts of waste management and reprocessing and provide a sufficient informational basis for the interim rule promulgated herein.

The Commission has observed that there are gaps in the information needed for detailed assessment of waste management and disposal technology. While there is the need to obtain additional data and to consider from time to time any new findings that would have a bearing upon the values set forth in Table S-3, the lack of some relevant data in certain areas by no means excuses the Commission from making an informed and reasoned judgment now regarding the environmental impacts which may flow from waste management and reprocessing activities.

The situation is analogous to the Atomic Energy Commission's issuance of interim acceptance criteria for emergency core cooling systems, as reviewed in *Union of Concerned Scientists* v. *AEC*, 499 F. 2d 1069 (D.C. Cir. 1974). As the AEC did in that instance, the Commission recognizes that "analytical methods capable of realistic prediction of all phenomena known or suspected to occur" in the course of waste management and disposal are not available and agrees that definitive experiments have not been carried out. However, the Commission's position, which is reflected in the Task Force Report as revised, is the same as the one that was given judicial acceptance in Union of Concerned Scientists:

> In the absence of such perfection, adequate assurance of safety can be obtained from an appropriately conservative analysis based on available experimental information. In areas of incomplete knowledge, conservative assumptions or procedures must be applied. When further experimental information or improved calculational techniques become available, the conservatisms presently imposed will be reevaluated and a more realistic approach will be taken. 499 F. 2d 1069, at 1086.

It should be noted that the interim rule does not deal with a safety question as did the emergency core cooling system but rather attempts to quantify the environmental impacts of reprocessing and waste management. "[C]onservative analysis based on available experimental information" is even more appropriate in such a case where the goal is not to reach a conclusion whether a level of safety has been met, but rather to develop values for use in environmental cost benefit analyses.

The Task Force Report (NUREG-0116) and the Comments and Responses (NUREG-0216) contain and document numerous conservatisms applied to the analysis of environmental impacts from waste management and reprocessing activities. In those few cases where detailed estimates could not be made, the Task Force exercised its expert judgment to reach a best estimate. Since a calculation could not be made, the conservatism of these few judgments cannot absolutely be established. However, it is the Commission's view that the impacts estimated on expert judgments are quite small in any case and that adequate conservatism has been applied.

The Commission would be reluctant to proceed if it believed the values in Table S-3, and the information from which they are derived, were called into question to any significant degree by substantial evidence, but this is not the case. *Union of Concerned Scientists*, 499 F. 2d at 1085. To some extent, as noted above, the setting of values in Table S-3 involved making "policy judgments where no factual certainties exist or where facts alone do not provide the answer." *Industrial Union Department, AFL-CIO* v. *Hodgson*, 499 F. 2d 467, 476 (D.C. Cir. 1974). In such cases—especially where the evidence is "difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge"—it is appropriate for the Commission to proceed to apply its expertise; its conclusions must be rationally justified, not based on hunches or wild guesses, but conclusions may be drawn "from theoretical projections from imperfect data, from probative preliminary data not yet

certifiable as 'fact', and the like." *Ethyl Corp.* v. *EPA*, 541 F. 2d 1, 28 (D.C. Cir. 1976); see also *Amoco Oil Co.* v. *EPA*, 501 F. 2d 722 (D.C. Cir. 1974). The Commission may, as to some extent it has done here, make probabilistic assessments that must suffice until data becomes "sufficiently quantifiable to yield to meaningful analysis." *Union of Concerned Scientists, supra*, 499 F. 2d at 1093.

The Commission has also been mindful of its obligation to identify the particular findings in the literature that it deems significant, *Portland Cement Association* v. *Ruckelshaus*, 486 F. 2d 375, 400 (D.C. Cir. 1973), cert. denied 417 U.S. 921 (1974), and to examine the reasons for mistakes in prior assessments in order that its assessment may be complete. In this regard, the Commission has examined past experiences in the waste management field. There, in several instances, past scientific judgments were shown to have been in error. However, one cannot look at those mistakes without recognizing that developments in technology have since occurred which make repetition of past mistakes less likely. Past experience has provided an indication of the types of impacts that are possible. Furthermore, the Supplement is based on very conservative assumptions regarding levels of releases. The Supplement has included in its model only technologies which are presently available and the Commission has made every effort to make the most thorough evaluation of the associated environmental impacts that the present state of available knowledge will permit.

In summary, the Commission has decided to proceed with promulgation of the interim rule. It has looked at the uncertainties and unknowns identified in the Supplement. It has weighed the risks of proceeding with licensing on the basis of the interim rule against the costs of not proceeding. The Commission has found that the costs of not proceeding outweigh the risks of proceeding by interim rule especially given the fact that a relatively short period of time, eighteen months, may pass before a more thorough discussion of the issues will be completed in the final rulemaking proceeding. There is no perceived need for the Commission to wait for site specific information or to wait for ERDA's generic environmental impact statement on high-level waste management. In some areas—including critical areas where a substantial measure of expert judgment had to be applied—it is unlikely that substantial new information of a quantitative nature will be available for years. As the Court said in *Citizens for Safe Power* v. *NRC*, 524 F. 2d 1291, 1297 (D.C. Cir. 1975):

> Absolute or perfect assurances are not required by (the Atomic Energy Act), and neither present technology nor public policy admit of such a standard. It was for the Commission to arrive at a rational, practical and principled conclusion upon the basis of reasonably available evidence.

Interim Rulemaking

Some of the comments have raised the question whether an interim rule, without the benefit of oral hearings, is an appropriate mechanism for establishing the impacts presented in Table S-3. The Commission continues to believe that such action is fully warranted, in the light of the competing factors identified above.

The fixing of values under an interim rule is consistent with the opinion of the court in *NRDC* v. *NRC*, as well as settled case and statutory law. Indeed, interim rules may be adopted without any prior notice and opportunity for public comment if public procedures would be impracticable, unnecessary, or contrary to the public interest. 5 U.S.C. § 553(b). The AEC's adoption of interim acceptance criteria for emergency core cooling systems was found to be a valid exercise of this authority, for example, in Union of Concerned Scientists, supra, 499 F. 2d at 1085.

Furthermore, the quality of the comments and of the Task Force responses to those comments as well as the additional information provided in the course of this interchange give the Commission confidence that no major issues lie hidden as a result of this procedure. While the Commission has chosen to use notice and comment procedures for this interim rulemaking, it intends to hold public hearings in connection with the final rulemaking to facilitate additional effective public participation. The time, place, and format for the hearing will be set forth in a separate Federal Register notice. Such public hearings are, however, not required to satisfy any constitutional or statutory mandate and, therefore, the use of notice and comment procedures will suffice for interim rulemaking. In *NRDC* v. *NRC*, supra, the Court of Appeals for the District of Columbia Circuit referred neither to the Constitution nor to the Administrative Procedure Act when it set for itself the task "to decide whether the procedures provided by the agency were sufficient to ventilate the issues." 9 ERC at 1156. Rather, the court's analysis of asserted procedural inadequacies in the earlier S-3 proceedings apparently rests on judicial notions, fundamentally common-law in character, concerning what is required to produce a record that will facilitate judicial review.[6] The same court has stated, "Although we have recognized that provision of oral hearings may be wise in some instances, we have never held that due process requires oral presentation of views as a matter of course," *Pickus* v. *U.S. Board of Parole*, 543 F. 2d 240, 246 (D.C. Cir. 1976). In circumstances calling for prompt action it follows that use of notice and comment procedures for interim rulemaking is sufficient. The Commission has made every effort to present a full statement of available information, and to explain the reasons which persuade it to adopt, for a relatively short period, the values set forth in revised Table S-3.

In order to reflect its interim character, the rule that is presently being adopted will be made effective for the limited period of eighteen months. The Commission believes that final rulemaking proceedings can be completed within this period and wishes to stress that the present rule is only a temporary measure pending completion of the final rulemaking proceedings which will reflect additional public participation. However, if good cause is shown, the period of effectiveness of the interim rule can be extended.

The amended rule incorporating revised Table S-3 is being made effective immediately because the Commission has determined that it has good cause for doing so: the revised Table S-3 provides a more current and comprehensive basis for evaluation than does the original Table S-3; there is a need to base licensing decisions on the best available information; and the values in the interim rule are not substantially different from the values in the proposed interim rule upon which interested persons had the opportunity to comment. (Supplemental General Statement of Policy, 41 FR 49898, November 11, 1976; see also 5 U.S.C. 553(d)(3)).

Accordingly, any operating license, construction permit, or limited work authorization (LWA) that may hereafter be issued must take into account the revised values contained in this rule. Licenses, permits, or limited work authorizations issued before July 21, 1976 in which the originally effective chemical reprocessing and waste storage values of Table S-3 were utilized will remain effective, principally because the values in the new interim rule are not sufficiently different from the values in the original Table S-3 to warrant revocation or suspension on cost-benefit grounds. Any show cause or similar proceedings initiated in these cases pursuant to the August 16, 1976 General Statement of Policy will be terminated.

Operating licenses, construction permits, or limited work authorizations granted after July 21, 1976 and which therefore were subject to the outcome of the proceedings in *NRDC* v. *NRC*, will also remain in effect, and any show cause or similar proceedings initiated in response to the August 16, 1976 General Statement of Policy in these cases are also to be terminated. The values in the interim rule are not substantially different from those which, under the Commission's Supplemental General Statement of Policy, were required to be considered by Atomic Safety and Licensing Boards in connection with the issuance of such licenses. Where the Boards have found that the cost-benefit balance would not be tilted by the values in the proposed interim rule, no further proceedings are necessary since the values in the final interim rule are not substantially different from the values in the proposed rule. Similarly, cases now pending before the Boards in which the evidentiary record on fuel cycle impact issues has been compiled are to be decided on the basis of the existing record; since the interim rule values are not substantially different from those in the previously proposed rule, the reopening of the record to receive additional testimony would not appear to be justified.

Pursuant to the Atomic Energy Act of

[6] As earlier indicated in note 1, supra, the Supreme Court has granted certiorari in *NRDC* v. *NRC*.

1954, as amended, the Energy Reorganization Act of 1974, as amended, the National Environmental Policy Act of 1969, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendment to 10 CFR Part 51 is published as a document subject to codification, to be effective on March 14, 1977.

42 FR 18387
Published 4/7/77
Effective 4/7/77

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Minor Corrective Amendment

AGENCY: Nuclear Regulatory Commission.

ACTION: Correction.

SUMMARY: The amendment makes a minor correction in the entry to Table R-3 for gaseous radiological effluents in the column entitled "Natural resource use." The reference in the Table read as published ".023" and is hereby corrected to read ".203."

EFFECTIVE DATE: The amendment is effective on April 7, 1977.

FOR FURTHER INFORMATION CONTACT:

Martin Weinstein, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 (301) 443-6907.

SUPPLEMENTARY INFORMATION: Because these amendments relate solely to corrections and minor amendments, the Commission has found that good cause exists for omitting notice of proposed rulemaking, and public procedure thereon, as unnecessary, and for making the amendments effective on April 7, 1977. Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendment to Title 10, Chapter I, Code of Federal Regulations, Part 51, Table S-3 is published as a document subject to codification.

42 FR 34276
Published 7/5/77
Effective 8/4/77

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Environmental Reports by Certain Applicants for Licenses

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Final Rule.

SUMMARY: The Nuclear Regulatory Commission is amending its regulation "Licensing and Regulatory Policy and Procedures for Environmental Protection" to require that 15 copies of the environmental reports applicable to materials licenses be submitted to the NRC and that an additional 85 copies of the environmental report be retained by the applicant for distribution to Federal, State and local officials in accordance with written instructions issued by the Director of Nuclear Material Safety and Safeguards. The amendments reduce the number of copies of environmental reports applicable to materials licenses from 150 to 100 copies. The amendments will materially expedite the distribution of environmental reports by eliminating duplicate handling of them by the applicant and the NRC staff, and will alleviate problems of the NRC staff with regard to the receipt, storage, assembly, and remailing of large volumes of environmental reports.

DATE: This rule becomes effective on August 4, 1977.

FOR FURTHER INFORMATION CONTACT:

Gerald L. Hutton, Division of Rules and Records, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 (phone (301) 492-7211).

SUPPLEMENTARY INFORMATION: On March 3, 1977, the Commission published in the FEDERAL REGISTER (42 FR 12186) for comment proposed amendments of 10 CFR 51.40 which would reduce the number of copies of environmental reports applicable to Parts 30, 40, and 70 licenses from 150 to 100 copies.

The amendment of § 51.40 also would require that 15 copies of the environmental reports applicable to Parts 30, 40, and 70 licenses be submitted to the NRC and that an additional 85 copies of the environmental report be retained by the applicant for distribution to Federal, State, and local officials in accordance with written instructions issued by the Director of Nuclear Material Safety and Safeguards.

Only one comment was received in response to the notice of proposed rule making. The commenter concurred with the adoption of the proposed amendment, but also suggested that a reasonable time limit be added for applicant's storage of copies of the reports in order to alleviate storage, assembly, and document control problems by applicants. It is the Commission's view that the suggested time limit for storage of copies of the reports is unnecessary. Of the 85 copies of the report to be retained by the applicant, 60 to 65 copies will be distributed initially in accordance with written instructions by the Director of Nuclear Material Safety and Safeguards. Retention or disposition of the 20 to 25 copies of the environmental report which remain following issuance of the Final Environmental Statement and the licensing action requested by the applicant will be a matter of written instructions to the applicant by the Director of Nuclear Material Safety and Safeguards.

Direct distribution by the applicant of the additional copies of the environmental report will materially expedite the distribution of such copies by eliminating duplicate handling of them by the applicant and the NRC staff. This procedure also will alleviate problems of the NRC staff with regard to the receipt, storage, assembly, and remailing of large volumes of environmental reports.

The text of the rule set forth below is identical with the text of the proposed amendments published on March 3, 1977.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of title 5 of the United States Code, the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 51, are published as a document subject to codification.

43 FR 7209
Published 2/21/78
Effective 2/21/78

PART 2—RULES OF PRACTICE

PART 51—LICENSING AND REGULATORY POLICY AND PROCEDURES FOR ENVIRONMENTAL PROTECTION

Distribution of Environmental Impact Statements

AGENCY: Nuclear Regulatory Commission.

ACTION: Effective rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is amending its regulations relating to the distribution of environmental impact statements to reflect the transfer to the Environmental Protection Agency from the Council on Environmental Quality of certain responsibilities for the receipt and filing of such statements and to change certain statutory citations to make them conform to the citations provided for by present law.

EFFECTIVE DATE: February 21, 1978.

FOR FURTHER INFORMATION CONTACT:

Bennett L. Harless, Division of Site Safety and Environmental Analysis, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, telephone: 301-492-8421.

SUPPLEMENTARY INFORMATION: Pursuant to the President's reorganization plan for the Executive Office of the President (Reorganization Plan No. 1 of 1977, July 15, 1977) the functions of the Council on Environmental Quality (CEQ) relating to the receipt and filing of environmental impact statements were transferred to the Environmental Protection Agency (EPA). Effective December 5, 1977, Federal agencies, including NRC, are required to deliver five (5) copies of all draft, final, or supplemental environmental impact statements filed pursuant to section 102(2)(C) of the National Envi-

ronmental Policy Act of 1969 directly to the Environmental Protection Agency and to discontinue sending such statements to the Council on Environmental Quality (42 FR 62183). The following amendments to 10 CFR part 51 of the Commission's regulations entitled "Licensing and Regulatory Policy and Procedures for Environmental Protection," implement this change.

Paragraph 2.104(b)(3)(i) of 10 CFR Part 2, and §§ V(f)(3), VI(c)(1)(v), VI(c)(3)(i), and VIII(b)(7) of Appendix A of Part 2, and §§ 51.20(a)(5) and 51.52(c)(1) of 10 CFR Part 51 cite "section 102(2)(D)" of the National Environmental Policy Act (NEPA). Public Law 94-83, 89 Stat. 424 (42 U.S.C. 4332), amended NEPA so as to redesignate section 102(2)(D) as section 102(2)(E). The following amendments change the citations to conform them to the redesignation.

Since these amendments relate solely to minor procedural matters, notice of proposed rulemaking and public procedure thereon are unnecessary and good cause exists to make the amendments effective on February 21, 1978.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of Title 5 of the United States Code, the following amendments to Title 10, Chapter I, Code of Federal Regulations, Parts 2 and 51, are published as a document subject to codification.

≫43 FR 6915
Published 2/17/78
Effective 5/3/78

Export and Import of Nuclear Facilities and Materials

See Part 110 Statements of Considerations.

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April 21, 1978

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In the Matter of
CAROLINA POWER & LIGHT COMPANY
(H. B. Robinson, Unit No. 2)
Docket No. 50-261
(50-261 OL Modification)

Gentlemen:

By Memorandum and Order, dated April 19, 1978, the Board advised the Applicant and NRC Staff that the Board had decided to deny Applicant's motion to dismiss the proceeding and that the Board proposes instead to issue a decision on the continued operation of the Robinson facility based on its independent NEPA evaluation and cost-benefit determination.

Accordingly, Applicant submits herewith proposed findings and conclusions appropriate to the scope of the Board's proposed decision.

Applicant's proposed findings and conclusions assume that the Staff will have issued an update to its safety evaluation report prior to the issuance of the Board's initial decision and that the Board will not have identified any serious safety matter requiring its further attention.

Respectfully submitted,

George F. Trowbridge

George F. Trowbridge

Encl.

April 19, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

APPLICANT'S PROPOSED FINDINGS AND CONCLUSIONS IN THE FORM OF A PROPOSED INITIAL DECISION

I. PRELIMINARY STATEMENT

1. This Initial Decision follows a consolidated hearing in two proceedings concerning Operating License No. DPR-23, issued to Carolina Power & Light Company ("Applicant"[1/]) on July 31, 1970, by the Atomic Energy Commission[2/] authorizing the operation of the H. B. Robinson Steam Electric Plant, Unit No. 2, at Applicant's site in Darlington County, South Carolina. The first proceeding involves the Commission's review and determination pursuant to NEPA as to whether the operating license should be continued, modified, terminated or

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1/ The Company is, technically, the "licensee" in one proceeding and an "applicant" in the other. The term "Applicant," however, was commonly used at the hearing by all of the parties and will therefore be employed throughout the decision.

2/ The Energy Reorganization Act of 1974, 42 U.S.C. § 5801, *et seq.*, abolished the Atomic Energy Commission and transferred its licensing functions to the Nuclear Regulatory Commission. The term "Commission" is used in this decision to refer to both the AEC and the NRC.

appropriately conditioned to protect environmental values. The second involves Applicant's pending application to the Commission for an amendment to the operating license increasing the authorized power level of the Robinson plant from 2200 MWT to 2300 MWT.

2. We are terminating that portion of the consolidated hearing relating to the operating license amendment because the only intervenor requesting a hearing has withdrawn from the proceeding and because the Board has identified no serious safety problem which requires its further attention. Thus the Director of Nuclear Reactor Regulation will now make the necessary findings and decision on the amendment request, just as he would have done under normal NRC practice had no request for a hearing been made. The Board has concluded, however, that the NEPA portion of the hearing should not be terminated and that the Board should proceed to render a decision, based on its NEPA evaluation, as to whether the Robinson operating license should be continued, modified, terminated or appropriately conditioned to protect environmental values. Further, since the Staff's Final Environmental Statement and other testimony assessed the environmental impact of the plant at a power level of 2300 MWT, the Board has performed its environmental evaluation at the same power level.

3. The Robinson facility is subject to the provisions of Section B of Appendix D to 10 C.F.R. Part 50, which

sets forth procedures for the environmental review of production and utilization facilities for which construction permits or operating licenses were issued in the period January 1, 1970, to September 9, 1971.[3/] On July 6, 1973, the Commission issued "Notice of Opportunity for Hearing Pursuant to 10 CFR Part 50 Appendix D, Section B."[4/] Notice was given therein that the Commission was providing an opportunity for hearing with respect to whether, considering the matters covered by Appendix D to 10 C.F.R. Part 50, the existing full term operating license should be continued, modified, terminated or appropriately conditioned to protect environmental values.

4. On September 6, 1973, an Atomic Safety and Licensing Board designated to rule on petitions for leave to intervene issued a Memorandum and Order in which it granted the August 16, 1973, petition of John D. Whisenhunt ("Intervenor") of Florence, South Carolina. On September 28, 1973, that Board issued "Notice of Hearing Pursuant to 10 CFR Part 50, Appendix D, Section B," which gave notice that a hearing would be held and that this Atomic Safety and Licensing Board ("the Board") had been designated to conduct the hearing.[5/]

3/ Pursuant to 10 C.F.R. § 51.56, Appendix D to Part 50, rather than Part 51, remains applicable to these proceedings.

4/ 38 Fed. Reg. 19148 (July 18, 1973).

5/ 38 Fed. Reg. 27433 (October 3, 1973).

5. In a notice issued on November 13, 1973, the Board scheduled a prehearing conference to be held in Hartsville, South Carolina, on November 30, 1973. In a Prehearing Conference Order of January 2, 1974, the Board set forth the actions taken at the conference, which included the approval of stipulations by the parties concerning the scheduling of discovery and the commencement of the evidentiary hearing, the order of appearance of witnesses at the hearing, and the matters in controversy.

6. On April 24, 1974, the Commission issued "Notice of Proposed Issuance of Amendment of Facility License," which gave notice that the Commission was considering the issuance of an amendment to the license which would authorize an increase in maximum steady-state power levels from 2200 to 2300 MWT, in response to Carolina Power & Light Company's application of February 4, 1974.6/ Notice was given therein that petitions for leave to intervene might be filed in accordance with the Rules of Practice. On May 24, 1974, Mr. Whisenhunt petitioned to intervene in the operating license amendment proceeding and his petition was granted on July 22, 1974. On the same day the Board issued "Notice of Hearing on Modification of Facility Operating License," which gave notice that a hearing would be held by the Board concerning the license amendment application.7/

6/ 39 Fed. Reg. 15061 (April 30, 1974).

7/ 30 Fed. Reg. 27748 (July 31, 1974).

7. Intervenor's contentions were identical in both proceedings and were concerned with the effect of thermal discharges on the recreational use of Lake Robinson and the fish and wildlife therein.

8. On July 22, 1974, the Board referred to the Commission the question of consolidating, pursuant to 10 C.F.R. § 2.716, the proceeding pursuant to Section B of Appendix D to 10 C.F.R. Part 50, with the proceeding on the issuance of an amendment to the license. The Board noted that the two proceedings involved the same parties and the same matters in controversy. On September 9, 1974, the Commission ordered the subject proceedings consolidated for hearing and all other purposes. CLI-74-34, RAI-74-9, 373.

II. COMPLIANCE WITH SECTION 102(2)(C)(E) OF NEPA AND APPENDIX D OF 10 C.F.R. Part 50

9. On November 4, 1971, Applicant submitted to the Commission, and subsequently amended on three occasions, an Environmental Report on the Robinson Facility.[8/] The Staff's Draft Environmental Statement was issued in April, 1973. The Notice of Availability and request for comments was published in the Federal Register on April 23, 1973.[9/] After receipt

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8/ Applicant's Exhibit No. 3.

9/ 38 Fed. Reg. 10035.

and consideration of the comments submitted on the Draft Environmental Statement, the Staff prepared and issued a Final Environmental Statement.[10/] The Final Environmental Statement, including a discussion of comments received was issued in April, 1975, and published in the Federal Register on April 25, 1975.[11/] The Board finds that both the Applicant's Environmental Report and the Staff's Environmental Statements comply with the procedural requirements of NEPA and Appendix D of 10 C.F.R. Part 50.

10. The Final Environmental Statement covered the environmental effects of facility operation, environmental measurements and monitoring program, environmental impact of postulated accidents, the need for power generating capacity and alternatives to the project. Except for the impacts associated with the once-through cooling system, we find the Staff's findings in the Final Environmental Statement to be satisfactory and adopt them as the basis for our NEPA evaluation. We rest our evaluation of the impacts associated with the cooling system, however, primarily on the testimony and other materials presented in the course of hearings. The balance of this initial decision is principally concerned with these latter impacts.

10/ Staff's Exhibit No. 5.

11/ 40 Fed. Reg. 17647.

III. THE 1975 HEARINGS

11. Pursuant to Notices issued by the Board on July 22, 1975,[12/] and on September 2, 1975,[13/] sessions of the evidentiary hearing were held in Hartsville, South Carolina, on August 12 through 15, and September 23 through 26, 1975. The Board invited the presentation of limited appearance statements pursuant to 10 C.F.R. § 2.715(a), but none were presented.[14/] The record of the hearing includes the testimony of witnesses for Applicant, the Staff, and Intervenor, the testimony of officials from the State of South Carolina and from Region IV of the U.S. Environmental Protection Agency called by the Board, and exhibits. The testimony includes responses by the Applicant and Staff to numerous questions posed by the Board in the course of the proceeding.

12. The 1975 hearings were primarily concerned with the environmental impacts on Lake Robinson associated with the Robinson plant's once-through cooling system. Lake Robinson is an impounded lake built by Applicant to supply cooling water to Robinson Unit No. 1 (a small coal-fired plant) as well as to Robinson Unit No. 2. Cooling water flows to the plants through an intake structure located near the dam

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12/ 40 Fed. Reg. 31671 (July 28, 1975).

13/ 40 Fed. Reg. 42248 (September 11, 1975).

14/ Tr. 70.

of the lake and is discharged through a discharge canal at the upper end of the lake. The principal environmental impacts which were of concern to the Board were the impacts of thermal discharges on aquatic life in the lake, entrainment and possible planktonic shifts resulting from heat death of organisms passing through the condenser, and the impact of thermal discharges on the recreational value of Lake Robinson.

13. The parties to the 1975 hearings presented extensive testimony on the circulating water system, the resulting temperature regime and effects on the aquatic and terrestrial ecosystem, Applicant's environmental monitoring program, and recreational use of the Lake Robinson impoundment. Although in some areas the 1975 testimony was not adequate to enable the Board to make the necessary NEPA determinations, in other areas it was adequate. Thus the record supports a finding, and the Board so finds, that while the thermal discharges from the plant have somewhat diminished the recreational value of Lake Robinson, the lake as a whole is fit for recreation and is, in fact, being used by the public for a variety of recreational activities.[15/] The Board concluded, however, that there were several deficiencies in the record pertaining principally

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15/ Stephenson Testimony at pp. 9-11, ff Tr. 1146; Creel Survey ff Tr. 1149; Tr. 1150-1173; Applicant's Exhibits Nos. 5-1 through 5-10, consisting of photographs of recreational activities on Lake Robinson.

to the impact of thermal discharges on the aquatic and terrestrial life of Lake Robinson which made it impossible for the Board to judge whether the Robinson operating license should be continued, modified or terminated in order to protect environmental values and that the record should be reopened to correct the deficiencies. The Board so advised all parties by Memorandum and Order dated March 23, 1976. The specific deficiencies found by the Board are enumerated and discussed below in connection with the resumption of the evidentiary hearings in January, 1978.

14. Following the issuance of the Board's March 23, 1976, order, both the Applicant and the Staff proposed that supplementation of the hearing record be postponed until after the completion by Applicant of its 316 demonstration report to the EPA in support of its request for an NPDES permit authorizing continued use of Robinson's once-through cooling system and until after EPA's review and determination of the request. Applicant explained that the 316 report would cover extensive studies, which had not been completed at the time of the 1975 hearings and which would directly address the matters as to which the Board had found deficiencies in the record. Accordingly no further hearings were scheduled by the Board until after issuance of EPA's 316 determination late in 1977.

IV. INTERVENOR'S WITHDRAWAL

15. On March 24, 1977, Mr. Whisenhunt advised the Board that he had disposed of the property which gave rise to his knowledge and interest in this matter, and on April 17, 1977, formally moved the Board for an order dismissing him as a party from the proceeding. The Board granted Mr. Whisenhunt's motion to withdraw by Memorandum and Order dated May 9, 1977.

16. Following Mr. Whisenhunt's withdrawal, both the Applicant and the Staff proposed that the Board continue to await the outcome of the EPA 316(a) proceeding before considering the appropriate disposition of this proceeding,

V. THE EPA 316 FINDINGS AND DETERMINATION

17. On November 15, 1977, the Regional Administrator of EPA Region IV acted favorably on Applicant's 316 request, by issuing formal findings and a determination that the protection and propagation of a balanced, indigenous population of fish, shellfish, and other acquatic organisms in and on Lake Robinson will be assured by the continued operation of the H. B. Robinson Steam Plant in its present once-through mode and by re-issuing an NPDES permit to Applicant authorizing such operation. Copies of the EPA findings and determination[16/] and of the

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16/ Applicant's Exhibit 17.

reissued NPDES permit[17/] were furnished to the Board, along with copies of Applicant's 316 demonstration report and supplements thereto submitted by Applicant to EPA.[18/] Applicant also filed with the Board written responses to the deficiencies in the evidentiary record identified by the Board in its March 23, 1976, order.[19/] The Staff presented its responses at the January, 1978, hearing discussed below.[20/] The NPDES permit sets forth detailed thermal discharge limitations during various seasons of the year and expressly authorizes operation at 2300 MWT. The maximum daily discharge temperature permitted is 111.2°F. in June through September and a roving thirty day average limitation of 108.7°F. is also imposed for that period.

VI. THE JANUARY, 1978, HEARING

18. By notice[21/] published in the Federal Register for December 28, 1977, the Board scheduled a resumption of the hearing on January 9, 1978, to receive in evidence the EPA and other materials supplied to the Board, and to respond

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17/ Applicant's Exhibit 16.

18/ Applicant's Exhibits 12-13.

19/ Applicant's Exhibit 19.

20/ Following Tr. 1915.

21/ 42 Fed. Reg. 64749.

to Board questions with respect to these materials.

19. Both the Applicant and the Staff presented responses to seven numbered comments contained in the Board's order of March 23, 1976, describing the deficiencies which the Board had found in the 1975 evidentiary record. The Board's comments and the responses it received are briefly summarized below.

20. Comment 1. The Board was concerned that insufficient data had been provided to assess the impact of maximum thermal discharges predicted by the Applicant under worst case conditions (114°F.). The Board's concern has become largely academic by reason of the conditions of the NPDES permit which limit the summer maximum daily discharge temperature to 111.2°F. and the thirty-day summer average temperature to 108.7°F.[22/]

21. Comment 2. Neither the Applicant nor the Staff had evaluated the impact on aquatic life of the predicted maximum temperatures of the cooling water discharge by comparison with established temperature and tolerance limits which appear in the record of the 1975 hearings. Applicant's 316 report to EPA contained an extensive discussion of this subject. In addition the Applicant testified that caution must be used in evaluating the applicability of published tolerance limits to

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22/ References in paragraphs 21 through 26 are principally to the Applicant's and Staff's responses to the Board's March 23, 1976, comments. Applicant's responses are contained in Applicant's Exhibit 19 and the Staff responses follow Tr. 1915.

the location, type of study (laboratory vs. field) and acclimation history of the species involved. The Staff also testified that actual field observations provide a better means for assessing impacts than the literature values based on laboratory experiments carried out in other geographical locations. Applicant's 316 report supports the conclusion that from a fish population standpoint Lake Robinson stacks up well with other blackwater lakes in the area.

22. Comment 3. The Board found no data in the 1975 hearings on entrainment or on the consequences of probable planktonic shifts resulting from heat death of organisms passing through the condenser system. Applicant's 316 report on planktonic sampling demonstrates to the satisfaction of the Board that ichthyoplankton entrainment is low and that phytoplankton samples have not shown any significant shifts in species either in the lake as a whole or in samples taken from different locations in the lake.

23. Comment 4. The Board was concerned that spawning occurs in Lake Robinson during periods when lake temperatures significantly exceed the spawning temperatures listed in the "EPA Blue Book" for most fish. Both the Applicant and the Staff have responded that those temperatures are not applicable to conditions in Lake Robinson, where the upper impoundment and springs in the main reservoir can provide suitable thermal regime for spawning regardless of unfavorable

temperatures in the main body of the reservoir. The field data collected by Applicant in the course of its 316 demonstration program shows that reproduction adequate for the maintenance of a balanced, indigenous aquatic population is occurring in Lake Robinson.

24. Comment 5. At the time of the 1975 hearing Applicant's studies of the terrestrial ecosystem had not progressed to the point when definitive conclusions could be reached as to the effect of plant operation. These studies were completed in the 316 program and the operation of the plant appears not to have had any noticeable impact on the terrestrial ecosystem, except for some reduction in vegetation and suitable habitat for amphibians in the area of the discharge canal.

25. Comment 6. The Board felt that differences between the observed temperatures in the lake and those predicted by Applicant's model were sufficiently large to raise serious questions about the validity of the model. Applicant testified that its model predictions, which are only for the lake surface, were generally in good agreement with measured temperatures at the points of intake and discharge, although less so at the middle of the lake. In any event the Board agrees with the Staff observation that since actual temperature surveys on Lake Robinson have been performed, these rather than model predictions should be used as the basis for environmental assessments.

26. Comment 7. The Board observed that no lake isotherm temperature data were provided in the 1975 hearings for any discharge temperature in excess of 104° and that Applicant had failed to describe adequately the environmental conditions during either typical or worst case conditions. As previously noted, the NPDES permit now establishes an upper limit of 111.2°F. on the maximum daily summer discharge temperature and a roving thirty day average limit of 108.7°F. These limits are based on maximum measured temperatures observed during the 316 program. We conclude, therefore, that the status of the fish and fisheries is not likely to change as a result of the thermal discharge if the conditions of the NPDES permit are observed. Further, EPA has concluded that with operation at 2300 MWT and thermal discharges as high as 111.2°F., a balanced indigenous population of fish will exist in Lake Robinson. In a recent Seabrook decision, the Nuclear Regulatory Commission decided that in NRC licensing proceedings such EPA determinations may and should be relied upon. Public Service Company of New Hampshire, Et Al. (Seabrook Station, Units 1 and 2, CLI-78-__, 7 NRC __ (Slip Op. at 33-40) (January 6, 1978)).

27. The Board's concerns expressed in its March 23, 1976, order have been satisfactorily resolved by the materials and evidence presented at the January 9, 1978, hearing. We conclude that the impact of the Robinson facility on the aquatic and terrestrial life in Lake Robinson and on the recreational

use of the lake is acceptable and that the benefits to be derived from the continued operation of the facility outweigh the environmental impacts associated therewith.

VII. CONCLUSIONS

28. The Board concludes:

a. The requirements of Section 102(2)(C) and (E) of NEPA and of Appendix D of 10 C.F.R. Part 50 have been complied with in this proceeding; and

b. Having independently considered the final balance among conflicting environmental factors in the record of the proceeding with a view to determining the appropriate action to be taken, the Board has determined, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the operating license for H. B. Robinson Unit 2 should be continued in effect.

VIII. ORDER

29. Based on the Board's findings and conclusions it is ordered that the Director of Nuclear Reactor Regulation is authorized to continue in effect the operating license for H. B. Robinson Unit 2, subject to such license conditions for the protection of environmental values as the Director may, consistent with this Initial Decision, determine to be appropriate.

30. It is further ordered, in accordance with 10 C.F.R. Section 2.760, 2.762, 2.764, 2.785 and 2.786 that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission 45 days after the date of issuance hereof, subject to any review pursuant to the above cited rules.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge

Dated: April 19, 1978

April 21, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicant's Proposed Findings and Conclusions in the Form of a Proposed Initial Decision," dated April 19, 1978, were served upon the following persons by deposit in the United States mail, postage prepaid, this 21st day of April, 1978.

John F. Wolf, Esquire
Chairman
Atomic Safety and Licensing Board
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. Richard F. Cole
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Office of the Secretary
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

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APPLICANT'S PROPOSED FINDINGS AND CONCLUSIONS IN THE FORM OF A PROPOSED INITIAL DECISION

I. PRELIMINARY STATEMENT

1. This Initial Decision follows a consolidated hearing in two proceedings concerning Operating License No. DPR-23, issued to Carolina Power & Light Company ("Applicant"[1/]) on July 31, 1970, by the Atomic Energy Commission[2/] authorizing the operation of the H. B. Robinson Steam Electric Plant, Unit No. 2, at Applicant's site in Darlington County, South Carolina. The first proceeding involves the Commission's review and determination pursuant to NEPA as to whether the operating license should be continued, modified, terminated or

1/ The Company is, technically, the "licensee" in one proceeding and an "applicant" in the other. The term "Applicant," however, was commonly used at the hearing by all of the parties and will therefore be employed throughout the decision.

2/ The Energy Reorganization Act of 1974, 42 U.S.C. § 5801, *et seq.*, abolished the Atomic Energy Commission and transferred its licensing functions to the Nuclear Regulatory Commission. The term "Commission" is used in this decision to refer to both the AEC and the NRC.

appropriately conditioned to protect environmental values. The second involves Applicant's pending application to the Commission for an amendment to the operating license increasing the authorized power level of the Robinson plant from 2200 MWT to 2300 MWT.

2. We are terminating that portion of the consolidated hearing relating to the operating license amendment because the only intervenor requesting a hearing has withdrawn from the proceeding and because the Board has identified no serious safety problem which requires its further attention. Thus the Director of Nuclear Reactor Regulation will now make the necessary findings and decision on the amendment request, just as he would have done under normal NRC practice had no request for a hearing been made. The Board has concluded, however, that the NEPA portion of the hearing should not be terminated and that the Board should proceed to render a decision, based on its NEPA evaluation, as to whether the Robinson operating license should be continued, modified, terminated or appropriately conditioned to protect environmental values. Further, since the Staff's Final Environmental Statement and other testimony assessed the environmental impact of the plant at a power level of 2300 MWT, the Board has performed its environmental evaluation at the same power level.

3. The Robinson facility is subject to the provisions of Section B of Appendix D to 10 C.F.R. Part 50, which

sets forth procedures for the environmental review of production and utilization facilities for which construction permits or operating licenses were issued in the period January 1, 1970, to September 9, 1971.[3/] On July 6, 1973, the Commission issued "Notice of Opportunity for Hearing Pursuant to 10 CFR Part 50 Appendix D, Section B."[4/] Notice was given therein that the Commission was providing an opportunity for hearing with respect to whether, considering the matters covered by Appendix D to 10 C.F.R. Part 50, the existing full term operating license should be continued, modified, terminated or appropriately conditioned to protect environmental values.

4. On September 6, 1973, an Atomic Safety and Licensing Board designated to rule on petitions for leave to intervene issued a Memorandum and Order in which it granted the August 16, 1973, petition of John D. Whisenhunt ("Intervenor") of Florence, South Carolina. On September 28, 1973, that Board issued "Notice of Hearing Pursuant to 10 CFR Part 50, Appendix D, Section B," which gave notice that a hearing would be held and that this Atomic Safety and Licensing Board ("the Board") had been designated to conduct the hearing.[5/]

3/ Pursuant to 10 C.F.R. § 51.56, Appendix D to Part 50, rather than Part 51, remains applicable to these proceedings.

4/ 38 Fed. Reg. 19148 (July 18, 1973).

5/ 38 Fed. Reg. 27433 (October 3, 1973).

5. In a notice issued on November 13, 1973, the Board scheduled a prehearing conference to be held in Hartsville, South Carolina, on November 30, 1973. In a Prehearing Conference Order of January 2, 1974, the Board set forth the actions taken at the conference, which included the approval of stipulations by the parties concerning the scheduling of discovery and the commencement of the evidentiary hearing, the order of appearance of witnesses at the hearing, and the matters in controversy.

6. On April 24, 1974, the Commission issued "Notice of Proposed Issuance of Amendment of Facility License," which gave notice that the Commission was considering the issuance of an amendment to the license which would authorize an increase in maximum steady-state power levels from 2200 to 2300 MWT, in response to Carolina Power & Light Company's application of February 4, 1974.[6/] Notice was given therein that petitions for leave to intervene might be filed in accordance with the Rules of Practice. On May 24, 1974, Mr. Whisenhunt petitioned to intervene in the operating license amendment proceeding and his petition was granted on July 22, 1974. On the same day the Board issued "Notice of Hearing on Modification of Facility Operating License," which gave notice that a hearing would be held by the Board concerning the license amendment application.[7/]

6/ 39 Fed. Reg. 15061 (April 30, 1974).

7/ 30 Fed. Reg. 27748 (July 31, 1974).

7. Intervenor's contentions were identical in both proceedings and were concerned with the effect of thermal discharges on the recreational use of Lake Robinson and the fish and wildlife therein.

8. On July 22, 1974, the Board referred to the Commission the question of consolidating, pursuant to 10 C.F.R. § 2.716, the proceeding pursuant to Section B of Appendix D to 10 C.F.R. Part 50, with the proceeding on the issuance of an amendment to the license. The Board noted that the two proceedings involved the same parties and the same matters in controversy. On September 9, 1974, the Commission ordered the subject proceedings consolidated for hearing and all other purposes. CLI-74-34, RAI-74-9, 373.

II. COMPLIANCE WITH SECTION 102(2)(C)(E) OF NEPA AND APPENDIX D OF 10 C.F.R. Part 50

9. On November 4, 1971, Applicant submitted to the Commission, and subsequently amended on three occasions, an Environmental Report on the Robinson Facility.[8/] The Staff's Draft Environmental Statement was issued in April, 1973. The Notice of Availability and request for comments was published in the Federal Register on April 23, 1973.[9/] After receipt

8/ Applicant's Exhibit No. 3.

9/ 38 Fed. Reg. 10035.

and consideration of the comments submitted on the Draft Environmental Statement, the Staff prepared and issued a Final Environmental Statement.[10/] The Final Environmental Statement, including a discussion of comments received was issued in April, 1975, and published in the Federal Register on April 25, 1975.[11/] The Board finds that both the Applicant's Environmental Report and the Staff's Environmental Statements comply with the procedural requirements of NEPA and Appendix D of 10 C.F.R. Part 50.

10. The Final Environmental Statement covered the environmental effects of facility operation, environmental measurements and monitoring program, environmental impact of postulated accidents, the need for power generating capacity and alternatives to the project. Except for the impacts associated with the once-through cooling system, we find the Staff's findings in the Final Environmental Statement to be satisfactory and adopt them as the basis for our NEPA evaluation. We rest our evaluation of the impacts associated with the cooling system, however, primarily on the testimony and other materials presented in the course of hearings. The balance of this initial decision is principally concerned with these latter impacts.

10/ Staff's Exhibit No. 5.

11/ 40 Fed. Reg. 17647.

III. THE 1975 HEARINGS

11. Pursuant to Notices issued by the Board on July 22, 1975,[12/] and on September 2, 1975,[13/] sessions of the evidentiary hearing were held in Hartsville, South Carolina, on August 12 through 15, and September 23 through 26, 1975. The Board invited the presentation of limited appearance statements pursuant to 10 C.F.R. § 2.715(a), but none were presented.[14/] The record of the hearing includes the testimony of witnesses for Applicant, the Staff, and Intervenor, the testimony of officials from the State of South Carolina and from Region IV of the U.S. Environmental Protection Agency called by the Board, and exhibits. The testimony includes responses by the Applicant and Staff to numerous questions posed by the Board in the course of the proceeding.

12. The 1975 hearings were primarily concerned with the environmental impacts on Lake Robinson associated with the Robinson plant's once-through cooling system. Lake Robinson is an impounded lake built by Applicant to supply cooling water to Robinson Unit No. 1 (a small coal-fired plant) as well as to Robinson Unit No. 2. Cooling water flows to the plants through an intake structure located near the dam

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12/ 40 Fed. Reg. 31671 (July 28, 1975).

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of the lake and is discharged through a discharge canal at the upper end of the lake. The principal environmental impacts which were of concern to the Board were the impacts of thermal discharges on aquatic life in the lake, entrainment and possible planktonic shifts resulting from heat death of organisms passing through the condenser, and the impact of thermal discharges on the recreational value of Lake Robinson.

13. The parties to the 1975 hearings presented extensive testimony on the circulating water system, the resulting temperature regime and effects on the aquatic and terrestrial ecosystem, Applicant's environmental monitoring program, and recreational use of the Lake Robinson impoundment. Although in some areas the 1975 testimony was not adequate to enable the Board to make the necessary NEPA determinations, in other areas it was adequate. Thus the record supports a finding, and the Board so finds, that while the thermal discharges from the plant have somewhat diminished the recreational value of Lake Robinson, the lake as a whole is fit for recreation and is, in fact, being used by the public for a variety of recreational activities.[15/] The Board concluded, however, that there were several deficiencies in the record pertaining principally

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14. Following the issuance of the Board's March 23, 1976, order, both the Applicant and the Staff proposed that supplementation of the hearing record be postponed until after the completion by Applicant of its 316 demonstration report to the EPA in support of its request for an NPDES permit authorizing continued use of Robinson's once-through cooling system and until after EPA's review and determination of the request. Applicant explained that the 316 report would cover extensive studies, which had not been completed at the time of the 1975 hearings and which would directly address the matters as to which the Board had found deficiencies in the record. Accordingly no further hearings were scheduled by the Board until after issuance of EPA's 316 determination late in 1977.

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V. THE EPA 316 FINDINGS AND DETERMINATION

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temperatures in the main body of the reservoir. The field data collected by Applicant in the course of its 316 demonstration program shows that reproduction adequate for the maintenance of a balanced, indigenous aquatic population is occurring in Lake Robinson.

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27. The Board's concerns expressed in its March 23, 1976, order have been satisfactorily resolved by the materials and evidence presented at the January 9, 1978, hearing. We conclude that the impact of the Robinson facility on the aquatic and terrestrial life in Lake Robinson and on the recreational

use of the lake is acceptable and that the benefits to be derived from the continued operation of the facility outweigh the environmental impacts associated therewith.

VII. CONCLUSIONS

28. The Board concludes:

a. The requirements of Section 102(2)(C) and (E) of NEPA and of Appendix D of 10 C.F.R. Part 50 have been complied with in this proceeding; and

b. Having independently considered the final balance among conflicting environmental factors in the record of the proceeding with a view to determining the appropriate action to be taken, the Board has determined, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the operating license for H. B. Robinson Unit 2 should be continued in effect.

VIII. ORDER

29. Based on the Board's findings and conclusions it is ordered that the Director of Nuclear Reactor Regulation is authorized to continue in effect the operating license for H. B. Robinson Unit 2, subject to such license conditions for the protection of environmental values as the Director may, consistent with this Initial Decision, determine to be appropriate.

30. It is further ordered, in accordance with 10 C.F.R. Section 2.760, 2.762, 2.764, 2.785 and 2.786 that this Initial Decision shall be effective immediately and shall constitute the final action of the Commission 45 days after the date of issuance hereof, subject to any review pursuant to the above cited rules.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge

Dated: April 19, 1978

April 21, 1978

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Reg Central

4/18/78

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Dr. A. Dixon Callihan
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Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261 and
50-261 (OL Modification)

Gentlemen:

During the course of the NRC Staff's continuing studies of ECCS performance characteristics for pressurized water reactors, the Staff has identified certain aspects of accumulator delivery which should be considered further. This matter is discussed in the enclosure to this letter (and in the NRC Staff memorandum attached to the enclosure).

For reasons outlined in the enclosure, the Staff does not believe that this matter has an adverse effect on this proceeding.

Sincerely,

David A. Kubichek
Counsel for NRC Staff

Enclosure
"Accumulator Delivery," and attached memo fm
D. F. Ross, Jr., to U.S. Standard Problem Participants

cc: (See Page 2)

cc: (w/enclosure)
George F. Trowbridge, Esq.
Docketing and Service Section
Richard Jones, Esq.
Atomic Safety and Licensing
Board Panel
Atomic Safety and Licensing
Appeal Board

OFFICE ➤	OELD					
SURNAME ➤	DKubichek EReis					
DATE ➤	4/18/78					

NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MEMORANDUM TO: U.S. Standard Problem Participants

FROM: Denwood F. Ross, Jr., Assistant Director for Reactor Safety,

SUBJECT: ACCUMULATOR DELIVERY COMPARISONS

RELAP-4 comparisons of LOFT tests L1-3A and L1-4 (U.S. Standard Problem #7) have highlighted certain aspects of accumulator delivery which should be considered in the standard problem program. The RELAP-4 program through version 2 of MOD-6 used an isothermal gas expansion model for nitrogen in the accumulators. Post test analysis of L1-3A by INEL indicated that the actual gas expansion is somewhere between isothermal and isentropic ($\gamma \cong 1.2$ L1-4 RELAP analysis used an intermediate value for γ and after correcting loss coefficients was able to match pressure and delivery driving the early portion of accumulator delivery. After 35 seconds of injection the data shows flow spikes which are not predicted by RELAP. It has been suggested that this is related to nitrogen in the delivery lines and may cause exhaustion of the accumulators sooner than predicted.

We believe that accumulator delivery behavior can have an important effect on ECCS performance. The U.S. Standard Problem suggested list of comparisc includes accumulator delivery. In the past this information has not been provided by all participants. Please provide pressure and flow comparisons for all past and future standard problems where applicable. For L1-4 disc the comparisons, including the following:

a.) Gas expansion model

b.) Heat transfer

c.) Loss coefficients

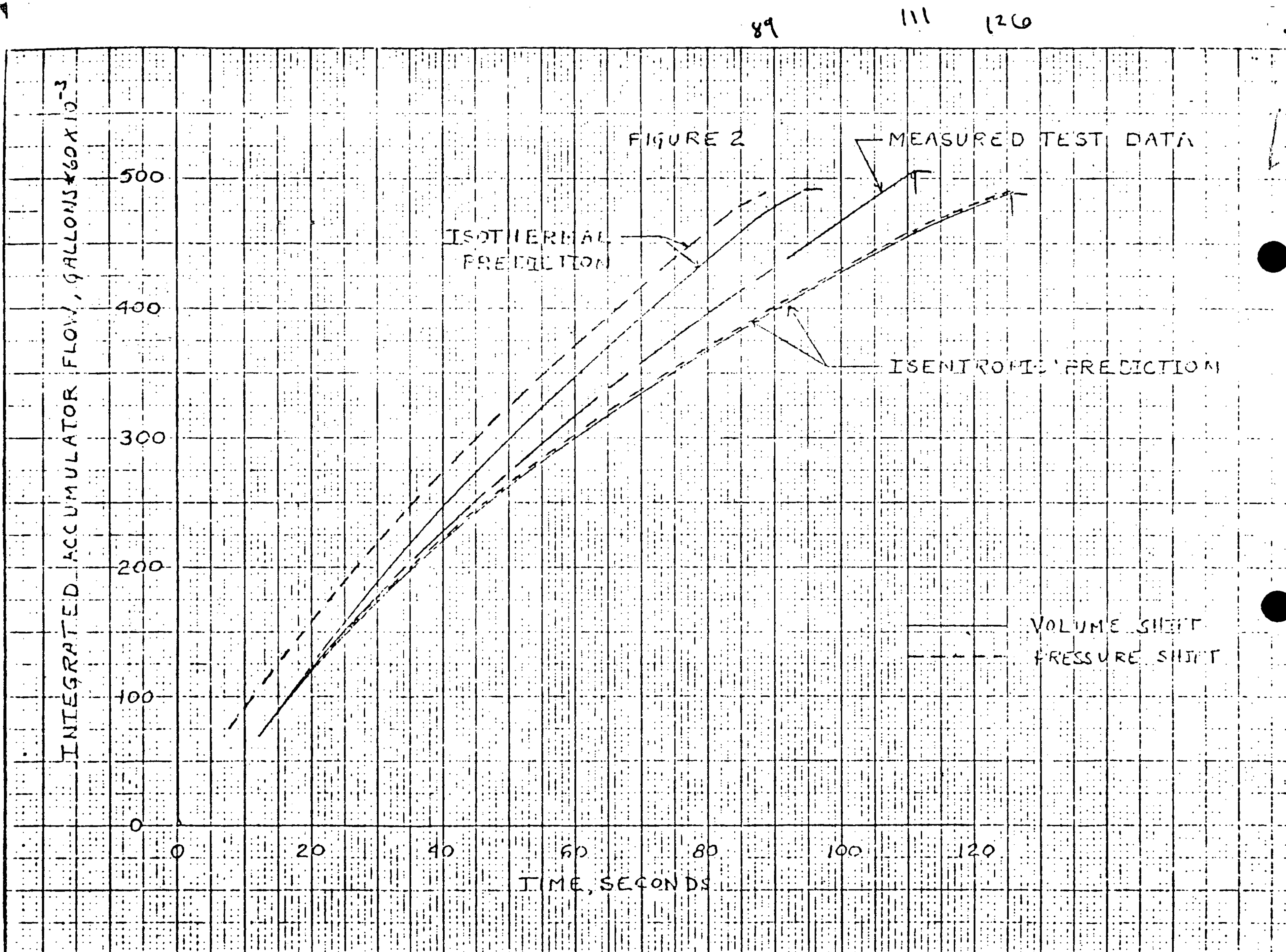
d.) Nitrogen ingestion

e.) LOFT typicality compared to large scale accumulator data

Participants having approved licensing models are requested to provide any additional compa to experiment or other information pertinent to assessing the validity of accumulator delivery models.

Sincerely,

Denwood F. Ross, Jr., Assistant Direct
for Reactor Safety
Division of Systems Safety
Office of Nuclear Reactor Regulation


89
111
126
FIGURE 2
MEASURED TEST DATA
ISOTHERMAL PREDICTION
ISENTROPIC PREDICTION
VOLUME SHIFT
PRESSURE SHIFT
INTEGRATED ACCUMULATOR FLOW, GALLONS*60X10^-3
500
400
300
200
100
0
0
20
40
60
80
100
120
TIME, SECONDS

ACCUMULATOR DELIVERY

1. Concern: Actual accumulators may deliver ECCS water to the reactor coolant system faster than is predicted by some computer programs used to predict ECCS performance. This could mean that sufficient accumulator water would not be available at the time it is needed. Attention was focused on this problem when comparisons of accumulator delivery calculations were made between RELAP4 (NRC) and SATAN VI (Westinghouse) as part of the Upper Head Injection (UHI) review. Comparisons to the LOFT experimental data indicated that the Westinghouse model might be underpredicting accumulator delivery flow water. The key factors influencing delivery rates are the gas expansion model and the effective delivery line resistance.

2. Safety Significance: There is no specific reference to our current licensing position. Each reactor vendor proposed a different model in 1974 for compliance with Appendix K. These models are described in the appropriate topical reports. We did not consider this an issue at that time so implicitly accepted each model for accumulator delivery. We do not believe that this issue poses a significant safety problem and can ultimately be handled within the scope of present ECCS design capability. An example of the influence that the gas model can make on integrated accumulator delivery is shown on Figure 2 enclosed. Test data are from full-scale accumulator discharge.

3. Evaluation: We are asking our consultants (Sandia Laboratories) to continue their analytical evaluation of this issue. We have requested Westinghouse to provide comparisons of their model with prototypic accumulator delivery data for UHI plants. As part of the Standard Problem Program we have requested all participants to provide analytic comparisons to available data (see memo Ross to Standard Problem Participants, enclosed).

   It is conceivable that after our review of this issue is complete, changes in some vendor models for some plants may be required. The effect of these changes on calculated ECCS performance is not likely to be large for any plant except UHI plants. In any case, simple adjustments in accumulator water volume could most likely compensate for any model change. This issue should be completely resolved by August of this year.

4. Interim Accounting: It is recommended that no change is required until our evaluation is complete. Since we have notified reactor vendors by mail of the need to do additional calculations, we should consider informing sitting boards in the post-SER space. It is applicable to all such PWRs.

Reg Cen

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

4/18/78

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261 and
50-261 (OL Modification)

Gentlemen:

Enclosed for the information of the Licensing Board is an NRC Staff memorandum which discusses certain information concerning behavior of iodine during postulated steam generator tube rupture accidents.

Sincerely,

David A. Kubichek
Counsel for NRC Staff

Enclosure

Memorandum fm R. H. Vollmer to D. B. Vassallo
dtd February 22, 1978

cc: (w/enclosure)
George F. Trowbridge, Esq.
Docketing and Service Section
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board

OFFICE	OELD					
SURNAME	DKubichek/dkw EReis					
DATE	4/18/78					

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 22 1978

NOTE TO: Domenic B. Vassallo, Assistant Director for Light Water Reactors, DPM

FROM: Richard H. Vollmer, Assistant Director for Site Analysis, DSE

SUBJECT: CONSULTANT REPORT REGARDING NON-CONSERVATISM IN STAFF MODEL

As a result of a technical assistance contract with a staff consultant, a technical report (NUREG-0409) on "Iodine Behavior in a PWR Cooling System Following a Postulated Steam Generator Tube Rupture Accident," by A. K. Postma and P. S. Tam, was published in January 1978.

The report is a theoretical study of the iodine behavior in the primary and secondary coolant systems of a PWR following a postulated steam generator tube rupture. The report concludes that, as a result of such a rupture, primary coolant water containing iodine would be atomized by hydrodynamic forces as it flashed through the leak path into the steam system. The removal of iodine by the secondary water was predicted to be highly dependent upon the primary-to-secondary pressure difference and upon the water depth. Calculations made in the report, and which the report emphasized were designed to yield conservative predictions, indicated that in the early part of the accident less than 50% of the iodine might be removed by the secondary water, whereas in the later phases of the accident, about 99% of the iodine would be removed. Although the report attempted to assess the iodine removal by steam separators it did not examine possible iodine removal due to the proximity of neighboring tubes and other submerged structures in the steam generator.

The present staff model, as outlined in Standard Review Plan 15.6.3, assumes that a constant value of 90% of the iodine transferred to the secondary water is removed and retained in it. Therefore, NUREG-0409 implies that the present staff model may be non-conservative in the early phases of the accident, but may be overly conservative in the later phases.

The overall degree of conservatism or non-conservatism of the staff's present model cannot easily be assessed without a much more detailed examination. However, some perspective regarding the implications may

be gained by observing that the present staff model predicts the radiological consequences of a steam generator tube rupture coincident with a large iodine spike to be about 75 rem to the thyroid for a typical PWR at a site with poor ($X/Q = 1 \times 10^{-3}$ sec/m^3) meteorology. We can conclude from this that even if the staff's model was less conservative throughout the accident by as much as a factor of four, that our conclusions regarding the acceptability of this event would not likely change.

The staff is currently taking action in this matter in two ways. First, the staff is preparing and evaluating a more detailed model to be incorporated in its revised Standard Review Plan in this area which will allow for a time-dependent iodine retention fraction in the secondary water. Second, the staff is planning to have experiments performed, as suggested by NUREG-0409, that will confirm or refute the values indicated by the report.

We believe, in view of the possibility of a non-conservative staff model in this regard, that the licensing boards currently in progress for all PWR plants should be duly informed.

Richard H. Vollmer, Assistant Director
for Site Analysis
Division of Site Safety and
Environmental Analysis

Reg Cen

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

3/13/78

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

NRC STAFF'S COMMENTS ON APPLICANT'S PROPOSED PARTIAL DECISION

The NRC Staff has examined Applicant's Proposed Partial Decision dated February 22, 1978 which proposes that the environmental phase of this proceeding be terminated. Termination of this phase of the proceeding in accordance with Applicant's proposal is acceptable to the Staff.

Respectfully submitted,

David A. Kubichek

David A. Kubichek
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 13th day of March, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

NOTICE OF APPEARANCE

Notice is hereby given that the undersigned attorney herewith enters an appearance in the captioned matter. In accordance with §2.713(a), 10 CFR Part 2, the following information is provided:

Name	- David A. Kubichek
Address	- U.S. Nuclear Regulatory Commission Washington, D.C. 20555
Telephone Number	- Area Code 301-492-7268
Admissions	- Supreme Court for the State of Nebraska U.S. District Court for the District of Nebraska
Name of Party	- NRC Staff U.S. Nuclear Regulatory Commission

Respectfully submitted,

David A. Kubichek

David A. Kubichek
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 13th day of March, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S COMMENTS ON APPLICANT'S PROPOSED PARTIAL DECISION" and "NOTICE OF APPEARANCE" of David A. Kubichek in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or air mail, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 13th day of March, 1978:

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

Dr. Richard F. Cole*
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

George F. Trowbridge, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N.W.
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Docketing and Service Section
Office of the Secretary
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Richard Jones, Esq.
Associate General Counsel
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336 Fayetteville Street
Raleigh, North Carolina 27602

Atomic Safety and Licensing
Board Panel*
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing
Appeal Board*
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

David A. Kubichek

David A. Kubichek
Counsel for NRC Staff

Reg Con

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

3/8/78

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

NOTICE OF WITHDRAWAL OF APPEARANCE

Notice is hereby given that effective March 10, 1978, I will withdraw my appearance in the above captioned proceeding. All mail and service lists should be amended to delete my name after that date.

Respectfully submitted,

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 8th day of March, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NOTICE OF WITHDRAWAL OF APPEARANCE" of Auburn L. Mitchell in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or air mail, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 10th day of March, 1978:

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

Dr. Richard F. Cole*
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Atomic Safety and Licensing
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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

February 22, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

APPLICANT'S PROPOSED PARTIAL DECISION

I. PRELIMINARY STATEMENT

1. This partial decision terminates the environmental phase of a consolidated hearing in two proceedings concerning Operating License No. DPR-23, issued to Carolina Power & Light Company ("Applicant"[1/]) on July 31, 1970, by the Atomic Energy Commission[2/] authorizing the operation of the H. B. Robinson Steam Electric Plant, Unit No. 2, at Applicant's site in Darlington County, South Carolina. The first proceeding involves the Commission's review and determination pursuant to NEPA as to whether the operating license should be continued, modified,

1/ The Company is, technically, the "licensee" in one proceeding and an "applicant" in the other. The term "Applicant," however, was commonly used at the hearing by all of the parties and will therefore be employed throughout the decision.

2/ The Energy Reorganization Act of 1974, 42 U.S.C. § 5801, *et seq.*, abolished the Atomic Energy Commission and transferred its licensing functions to the Nuclear Regulatory Commission. The term "Commission" is used in this decision to refer to both the AEC and the NRC.

terminated or appropriately conditioned to protect environmental values. The second involves Applicant's pending application to the Commission for an amendment to the operating license increasing the authorized power level of the Robinson plant from 2200 MWT to 2300 MWT.

2. As explained more fully below, we terminate the environmental phase of the consolidated hearing because the only intervenor requesting a hearing has withdrawn from the proceeding and because the Board is satisfied on the basis of evidence presented in the hearings held to date that no serious environmental problem exists which requires its further attention. We consider it appropriate, however, first to describe briefly the history of the proceeding and the evidence presented to the Board.

3. The Robinson facility is subject to the provisions of Section B of Appendix D to 10 C.F.R. Part 50, which sets forth procedures for the environmental review of production and utilization facilities for which construction permits or operating licenses were issued in the period January 1, 1970, to September 9, 1971.[3/] On July 6, 1973, the Commission issued "Notice of Opportunity for Hearing Pursuant to 10 CFR Part 50 Appendix D, Section B."[4/] Notice was given therein that the Commission was providing an opportunity for hearing with respect

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3/ Pursuant to 10 C.F.R. § 51.56, Appendix D to Part 50, rather than Part 51, remains applicable to these proceedings.

4/ 38 Fed. Reg. 19148 (July 18, 1973).

to whether, considering the matters covered by Appendix D to 10 C.F.R. Part 50, the existing full term operating license should be continued, modified, terminated or appropriately conditioned to protect environmental values.

4. On September 6, 1973, an Atomic Safety and Licensing Board designated to rule on petitions for leave to intervene issued a Memorandum and Order in which it granted the August 16, 1973, petition of John D. Whisenhunt ("Intervenor") of Florence, South Carolina. On September 28, 1973, that Board issued "Notice of Hearing Pursuant to 10 CFR Part 50, Appendix D, Section B," which gave notice that a hearing would be held and that this Atomic Safety and Licensing Board ("the Board") had been designated to conduct the hearing.5/

5. In a notice issued on November 13, 1973, the Board scheduled a prehearing conference to be held in Hartsville, South Carolina, on November 30, 1973. In a Prehearing Conference Order of January 2, 1974, the Board set forth the actions taken at the conference, which included the approval of stipulations by the parties concerning the scheduling of discovery and the commencement of the evidentiary hearing, the order of appearance of witnesses at the hearing, and the matters in controversy.

6. On April 24, 1974, the Commission issued "Notice of Proposed Issuance of Amendment of Facility License," which gave

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5/ 38 Fed. Reg. 27433 (October 3, 1973).

notice that the Commission was considering the issuance of an amendment to the license which would authorize an increase in maximum steady-state power levels from 2200 to 2300 MWT, in response to Carolina Power & Light Company's application of February 4, 1974.[6/] Notice was given therein that petitions for leave to intervene might be filed in accordance with the Rules of Practice. On May 24, 1974, Mr. Whisenhunt petitioned to intervene in the operating license amendment proceeding and his petition was granted in July 22, 1974. On the same day the Board issued "Notice of Hearing on Modification of Facility Operating License," which gave notice that a hearing would be held by the Board concerning the license amendment application.[7/]

7. On July 22, 1974, the Board referred to the Commission the question of consolidating, pursuant to 10 CFR § 2.716, the proceeding pursuant to Section B of Appendix D to 10 CFR Part 50, with the proceeding on the issuance of an amendment to the license. The Board noted that the two proceedings involved the same parties and the same matters in controversy. On September 9, 1974, the Commission ordered the subject proceedings consolidated for hearing and all other purposes. CLI-74-34, RAI-74-9, 373.

6/ 39 Fed. Reg. 15061 (April 30, 1974).

7/ 39 Fed. Reg. 27748 (July 31, 1974).

8. The matters put in controversy in the consolidated proceeding were the following contentions raised by Intervenor:

> "Periodically since the installation and operation of the nuclear plant, the waters of Lake Robinson have been heated to such an extent as to be unfit for use for recreational purposes. Fish and other wildlife have been in Petitioner's opinion damaged by the excessive heat generated by the nuclear plant.
>
> "Said plant is detrimental to the ecology of the waters of Black Creek which provides the main water supply of Lake Robinson, both those waters above as well as below the lake and the lake itself is kept at such a high degree of heat as to be unusable by human beings and harmful to all wildlife therein."

9. On November 4, 1971, Applicant submitted to the Commission, and subsequently amended on three occasions, an Environmental Report ("ER") on the H. B. Robinson Steam Electric Plant, Unit No. 2.[8/]

10. The Staff, after receipt and consideration of the comments submitted on the Draft Environmental Statement, prepared a Final Environmental Statement ("FES"),[9/] which includes a discussion of the comments received.

8/ Applicant's Exhibit No. 3.

9/ Staff's Exhibit No. 5.

II. THE 1975 HEARINGS

11. Pursuant to Notices issued by the Board on July 22, 1975,[10/] and on September 2, 1975,[11/] sessions of the evidentiary hearing were held in Hartsville, South Carolina, on August 12 through 15, and September 23 through 26, 1975. The Board invited the presentation of limited appearance statements pursuant to 10 C.F.R. § 2.715(a), but none were presented.[12/] The record of the hearing includes the testimony of witnesses for Applicant, the Staff, and Intervenor, the testimony of officials from the State of South Carolina and from Region IV of the U. S. Environmental Protection Agency called by the Board, and exhibits. The testimony includes responses by the Applicant and Staff to numerous questions posed by the Board in the course of the proceeding.

12. The 1975 hearings were primarily concerned with the environmental impacts on Lake Robinson associated with the Robinson plant's once-through cooling system. Lake Robinson is an impounded lake built by Applicant to supply cooling water to Robinson Unit No. 1 (a small coal-fired plant) as well as to Robinson Unit No. 2. Cooling water flows to the plants through an intake structure located near the dam of the lake and is

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10/ 40 Fed. Reg. 31671 (July 28, 1975).

11/ 40 Fed. Reg. 42248 (September 11, 1975).

12/ Tr. 70.

discharged through a discharge canal at the upper end of the lake. The principal environmental impacts which were of concern to the Board were the impacts of thermal discharges on aquatic life in the lake, entrainment and possible planktonic shifts resulting from heat death of organisms passing through the condenser, and the impact of thermal discharges on the recreational value of Lake Robinson.

13. The parties to the 1975 hearings presented extensive testimony on the circulating water system, the resulting temperature régime and effects on the aquatic and terrestrial ecosystem, Applicant's environmental monitoring program, and recreational use of the Lake Robinson impoundment. All of this testimony has been taken into account by the Board in deciding to terminate the environmental phase of the hearing. The Board was also informed at the hearing that Applicant had under way, but had not completed, a 316 demonstration program in support of its application to EPA for approval of Robinson's once-through cooling system. Following the close of the 1975 hearings, the Board concluded that there were several deficiencies in the record which made it impossible for the Board to judge whether the Robinson operating license should be continued, modified or terminated in order to protect environmental values and that the record should be reopened to correct the deficiencies. The Board so advised all parties by Memorandum and Order dated March 23, 1976. The specific deficiencies found by the Board are enumerated and discussed below in connection with the resumption of the evidentiary hearings in January, 1978.

14. Following the issuance of the Board's March 23, 1976, order, both the Applicant and the Staff proposed that supplementation of the hearing record be postponed until after the completion by Applicant of its 316 demonstration report to the EPA in support of its request for an NPDES permit authorizing continued use of Robinson's once-through cooling system and until after EPA's review and determination of the request. Applicant explained that the 316 report would cover extensive studies, which had not been completed at the time of the 1975 hearings and which would directly address the matters as to which the Board had found deficiencies in the record. Accordingly no further hearings were scheduled by the Board until after issuance of EPA's 316 determination late in 1977.

III. INTERVENOR'S WITHDRAWAL

15. On March 24, 1977, Mr. Whisenhunt advised the Board that he had disposed of the property which gave rise to his knowledge and interest in this matter, and on April 17, 1977, formally moved the Board for an order dismissing him as a party from the proceeding. The Board granted Mr. Whisenhunt's motion to withdraw by Memorandum and Order dated May 9, 1977.

16. Following Mr. Whisenhunt's withdrawal, both the Applicant and the Staff proposed that the Board continue to await the outcome of the EPA 316(a) proceeding before considering the appropriate disposition of this proceeding.

IV. THE EPA 316 FINDINGS AND DETERMINATION

17. On November 15, 1977, the Regional Administrator of EPA Region IV acted favorably on Applicant's 316 request, by issuing formal findings and a determination that the protection and propagation of a balanced, indigenous population of fish, shellfish, and other acquatic organisms in and on Lake Robinson will be assured by the continued operation of the H. B. Robinson Steam Plant in its present once-through mode and by reissuing an NPDES permit to Applicant authorizing such operation. Copies of the EPA findings and determination[13/] and of the reissued NPDES permit[14/] were furnished to the Board, along with copies of Applicant's 316 demonstration report and supplements thereto submitted by Applicant to EPA.[15/] Applicant also filed with the Board written responses to the deficiencies in the evidentiary record identified by the Board in its March 23, 1976, order.[16/] The Staff presented its responses at the January 9 hearing.[17/] These documents were all admitted into evidence at the January, 1978, hearing discussed below. The NPDES permit sets forth detailed thermal

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13/ Applicant's Exhibit 17.

14/ Applicant's Exhibit 16.

15/ Applicant's Exhibits 12-13.

16/ Applicant's Exhibit 19.

17/ Following Tr. 1915.

discharge limitations during various seasons of the year and expressly authorizes operation at 2300 MWT. The maximum daily discharge temperature permitted is 111.2°F. in June through September and a roving thirty day average limitation of 108.7°F. is also imposed for that period.

V. THE JANUARY, 1978, HEARING

18. By notice[18/] published in the Federal Register for December 28, 1977, the Board scheduled a resumption of the hearing on January 9, 1978, to receive in evidence the EPA and other materials supplied to the Board, to respond to Board questions with respect to these materials, and to consider a motion filed by Applicant on December 29, 1977, that the Board, after consideration of the materials to be placed in evidence at the January 9 hearing, terminate the hearings in this proceeding.

19. Both the Applicant and the Staff presented responses to seven numbered comments contained in the Board's order of March 23, 1976, describing the deficiencies which the Board had found in the 1975 evidentiary record. The Board's comments and the responses it received are briefly summarized below.

20. Comment 1. The Board was concerned that insufficient data had been provided to assess the impact of maximum thermal

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18/ 42 Fed. Reg. 64749

discharges predicted by the Applicant under worst case conditions (114°F.). The Board's concern has become largely academic by reason of the conditions of the NPDES permit which limit the summer maximum daily discharge temperature to 111.2°F. and the thirty-day summer average temperature to 108.7°F.19/

21. Comment 2. Neither the Applicant nor the Staff had evaluated the impact on aquatic life of the predicted maximum temperatures of the cooling water discharge by comparison with established temperature and tolerance limits which appear in the record of the 1975 hearings. Applicant's 316 report to EPA contained an extensive discussion of this subject. In addition the Applicant testified that caution must be used in evaluating the applicability of published tolerance limits to the location, type of study (laboratory vs. field) and acclimation history of the species involved. The Staff also testified that actual field observations provide a better means for assessing impacts than the literature values based on laboratory experiments carried out in other geographical locations. Applicant's 316 report supports the conclusion that from a fish population standpoint Lake Robinson stacks up well with other blackwater lakes in the area.

19/ References in paragraphs 21 through 26 are principally to the Applicant's and Staff's responses to the Board's March 23, 1976, comments. Applicant's responses are contained in Applicant's Exhibit 19 and the Staff responses follow Tr. 1915.

22. Comment 3. The Board found no data in the 1975 hearings on entrainment or on the consequences of probable planktonic shifts resulting from heat death of organisms passing through the condenser system. Applicant's 316 report on planktonic sampling demonstrates to the satisfaction of the Board that ichthyoplankton entrainment is low and that phytoplankton samples have not shown any significant shifts in species either in the lake as a whole or in samples taken from different locations in the lake.

23. Comment 4. The Board was concerned that spawning occurs in Lake Robinson during periods when lake temperatures significantly exceed the spawning temperatures listed in the "EPA Blue Book" for most fish. Both the Applicant and the Staff have responded that those temperatures are not applicable to conditions in Lake Robinson, where the upper impoundment and springs in the main reservoir can provide suitable thermal regime for spawning regardless of unfavorable temperatures in the main body of the reservoir. The field data collected by Applicant in the course of its 316 demonstration program shows that reproduction adequate for the maintenance of a balanced, indigenous aquatic population is occurring in Lake Robinson.

24. Comment 5. At the time of the 1975 hearing Applicant's studies of the terrestrial ecosystem had not progressed to the point when definitive conclusions could be reached as

to the effect of plant operation. These studies were completed in the 316 program and the operation of the plant appears not to have had any noticeable impact on the terrestrial ecosystem, except for some reduction in vegetation and suitable habitat for amphibians in the area of the discharge canal.

25. Comment 6. The Board felt that differences between the observed temperatures in the lake and those predicted by Applicant's model were sufficiently large to raise serious questions about the validity of the model. Applicant testified that its model predictions, which are only for the lake surface, were generally in good agreement with measured temperatures at the points of intake and discharge, although less so at the middle of the lake. In any event the Board agrees with the Staff observation that since actual temperature surveys on Lake Robinson have been performed, these rather than model predictions should be used as the basis for environmental assessments.

26. Comment 7. The Board observed that no lake isotherm temperature data were provided in the 1975 hearings for any discharge temperature in excess of 104° and that Applicant had failed to describe adequately the environmental conditions during either typical or worst case conditions.

As previously noted, the NPDES permit now establishes an upper limit of 111.2° F. on the maximum daily summer discharge temperature and a roving thirty day average limit of 108.7° F. These limits are based on maximum measured temperatures observed during the 316 program. We conclude, therefore, that the status of the fish and fisheries is not likely to change as a result of the thermal discharge if the conditions of the NPDES permit are observed. Further, EPA has concluded that with operation at 2300 MWT and thermal discharges as high as 111.2° F., a balanced, indigenous population of fish will exist in Lake Robinson. In a recent Seabrook decision, the Nuclear Regulatory Commission decided that in NRC licensing proceedings such EPA determinations may and should be relied upon. Public Service Company of New Hampshire, Et Al. (Seabrook Station, Units 1 and 2, CLI-78-___, 7 NRC ___ (Slip Op. at 33-40) (January 6, 1978)).

27. The Board's concerns expressed in its March 23, 1976, order have been satisfactorily resolved by the materials and evidence presented at the January 9, 1978, hearing. The Staff witnesses testified that the results of the 316 program had reinforced the conclusions contained in the Staff's Final Environmental Statement with respect to the impacts associated with the thermal discharges and we find no reason to disturb those conclusions.

VI. CONCLUSIONS

28. Under the Commission's regulations, a hearing is not required in a Section B, Appendix D environmental review or for an amendment unless requested by an interested person and then only as to contested issues. Licensing Boards are instructed by Section 2.760a of the Rules of Practice to consider issues not in controversy in proceedings for the issuance of operating licenses only under extraordinary circumstances where a serious safety, environmental or common defense and security matter exists. The Board concludes that this Commission guidance should be equally applicable to other operating license proceedings where hearings are held at the request of an interested person.

29. With the withdrawal of Mr. Whisenhunt, there are no longer any issues in controversy. Therefore, unless the Board has identified a serious environmental or safety matter, there are no issues to be decided by the Board and no occasion to continue the hearings in this proceeding. In the light of the Board's findings in Part V above and resolution of its earlier concerns, the Board concludes that there are no longer any serious environmental matters requiring the Board's further attention and that the environmental phase of the consolidated hearing should be terminated.

30. The Board's action in terminating the environmental phase of the hearing is consistent with the actions taken by other Boards in Appendix D proceedings where intervenors have

withdrawn from the proceeding. See, e.g., Baltimore Gas and Electric Company (Calvert Cliffs Nuclear Power Plant, Units 1 and 2), LBP-73-15, 6 AEC 375 (1973), Tennessee Valley Authority (Browns Ferry Nuclear Plant Units 1, 2 and 3) LBP-73-43, 6 AEC 1062 (1973), Metropolitan Edison Company (Three Mile Island Nuclear Station, Unit 1), (unpublished order), Docket 50-289 (November 16, 1973) (all section C proceedings).

31. The Board has reviewed the Staff Safety Evaluation Report covering Applicant's request for an increase in authorized power level. Based on this review, the Board has not identified any serious safety matter requiring the Board's further attention. However, at the January 9 hearing, the Staff informed the Board that it planned to update and supplement its safety evaluation in the light of regulatory developments in the two and a half years since the SER. The Board has concluded that it will await the Staff's supplement before passing final judgment on safety matters. If, on the basis of the Staff's supplement, the Board finds no serious safety matters requiring its attention, the Board will issue a final order terminating the entire hearing.

VII. ORDER

32. The Board hereby orders:

1. That the environmental phase of the hearing is hereby terminated.

2. That the Staff is directed, upon completion of a supplement updating its safety review of the application to increase the authorized power level of the Robinson plant, to furnish to the Board a copy of the supplement.

3. That the Board's decision on terminating the safety phase of the hearing will await receipt of the Staff supplement.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge

George F. Trowbridge

Dated: February 22, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicant's Proposed Partial Decision," dated February 22, 1978, were served upon the following persons by deposit in the United States mail, postage prepaid, this 22nd day of February, 1978.

John F. Wolf, Esquire, Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

Auburn L. Mitchell, Esquire (3)
Office of the Executive Legal Director
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docketing and Service Section (21)
Office of the Secretary
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

George F. Trowbridge
George F. Trowbridge

Dated: February 22, 1978

NRC FORM 195
(2-76)

U.S. NUCLEAR REGULATORY COMMISSION

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NRC FORM 195 (2-76)

January 6, 1978

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261,
50-261 (OL Modification)

Gentlemen:

Enclosed are the Staff's responses to Board's comments in its March 23, 1976 Order. Dr. Sharma, Dr. Marmer and Mr. Bajwa will be available for examination at the hearing January 9, 1978.

Sincerely,

Auburn L. Mitchell
Counsel for NRC Staff

Enclosure

cc: (w/enclosure)
George F. Trowbridge, Esq.
Docketing and Service Section
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 6, 1978

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. A. Dixon Callihan
Union Carbide Corporation
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Dr. Richard F. Cole
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U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261,
50-261 (OL Modification)

Gentlemen:

Enclosed are the Staff's responses to Board's comments in its March 23, 1976 Order. Dr. Sharma, Dr. Marmer and Mr. Bajwa will be available for examination at the hearing January 9, 1978.

Sincerely,

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

Enclosure

cc: (w/enclosure)
George F. Trowbridge, Esq.
Docketing and Service Section
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board

January 6, 1978

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
	)	
(H. B. Robinson, Unit No. 2)	)	

NRC STAFF'S RESPONSE TO ATOMIC SAFETY AND LICENSING BOARD'S COMMENTS IN ORDER OF MARCH 23, 1976

Comment 1:

Insufficient data are provided to assess the impact of thermal discharges which the Applicant predicts might be sustained. (Predicted is a maximum discharge temperature of 114°F for combined operation of Units 1 and 2). (Staff Exhibit 3, twelfth page; Tr. 235-237; Tr. 498) 1/

1/ Temperatures above 99°F were first mentioned in these proceedings during the evidentiary hearing when documentation of the Applicant's request to EPA for a 316(a) exemption was introduced. (Tr. 237) Applicant's Environmental Report contains no mention of temperatures of 100°F or above although there is reference on page ER 3.6-6 to "90°F or above" and ER Figure 3.6-2 shows a discharge surface temperature of 99°F. The highest discharge temperature appearing in the FES is 97°F at the exit of the discharge canal, Figure 3.12. The highest temperature in the text of the FES is 94°F (p. 3-15). In the FES Section 5.2, however, the following statement does appear: "During the summer, water temperatures may become high enough (over 90°F) to make swimming unpleasant in the region of the lake near the discharge."

Response:

The Board is correct that temperatures in excess of 100°F are not mentioned explicitly in the FES. However, in fact, the Staff's aquatic impact assessment was performed at a maximum discharge temperature of 111°F

at the outlet of the discharge canal. The Staff assumed an intake temperature of 90°F because of the State's 90°F limitation on discharge over the dam which is in close proximity to the intake. (FES, 5-2, 5-3; Dr. Marmer's testimony ff. Tr. 1459 at p. 3). The Staff further assumed a ΔT of 21°F across the condensers (FES, §3.4.1 at p. 3-7) which together with the intake temperature yields 111°F at the discharge canal. We believe the Staff's assessment at 111°F maximum discharge temperature at the canal is also valid for 114°F. However, this is now unimportant since the NPDES contains a 111°F limitation. The Applicant has collected additional ecological data on Lake Robinson after issuance of the FES. Generally, these data indicate that despite maximum discharge temperature of 111°F, Lake Robinson has sustained fauna and flora representative of blackwater lakes and impoundments of southeastern United States.

Comment 2:

Neither Applicant nor Staff evaluated the impact on aquatic life of the predicted maximum temperatures of the cooling water discharge by comparison with established temperature preferenda and tolerance limits which appear in the record (ER Tables 3.6-1 through 3.6-4; Tr. 1520-1527; Applicant's testimony ff. Tr. 494).

Response:

The Staff has discussed thermal preference and avoidance of fishes in FES for H. B. Robinson (FES, p. 5-21) in general terms. The Staff believes that an "area of avoidance", governed by plume behavior, will be established in the vicinity of the discharge. Fish will avoid the

area having the maximum discharge temperatures of 111°F since they react to temperatures which may be lethal. Undoubtedly, those which do not react to avoid the hottest portions of the plume would not survive. However, the values reported in literature on thermal preference and avoidance may not be directly applicable to field conditions in case of H. B. Robinson. These values are usually obtained in laboratory set-ups which do not represent actual field conditions. Also, variations in tolerance can be expected in the same species from different geographical locations. These values do, however, serve as general bench-marks for assessing impacts of thermal discharges. However, in case of H. B. Robinson, actual field observations provide better means for assessing impacts than the literature values based on laboratory experiments carried out in other geographical locations.

Comment 3:

No data were presented on entrainment or on the consequences of probable planktonic shifts resulting from heat death of organisms passing through the condenser system. (FES §5.5.2.2, Tr. 1094, 1095, 1411, 1412)

Response:

The Staff has discussed entrainment and its probable consequences in FES (p. 5-20). The Applicant has collected data on ichthyoplankton entrainment and has conducted sampling for phytoplankton in the vicinity

of intake and discharge (316 Demonstration pp. 4-34 through 4-36). The sampling results indicate that ichthyoplankton entrainment is generally low. The phytoplankton samples have not shown any significant shifts in species either in the lake as a whole or in samples taken from different locations in the lake.

Comment 4:

Applicant's witness indicated spawning in Lake Robinson occurs during March and April when water temperatures are in the range of 78°F to 82°F (Tr. 1117) whereas data in the record indicate spawning temperatures for most fish are in the range of 55-61°F. (Tr. 1526-1528)

Response:

Most of the spawning activity in the lake occurs from mid-April through mid-October. The results of the sampling program indicate that temperature range for spawning of most of the species (55-69°F) reported in literature is not applicable to conditions in Lake Robinson. Upper impoundment and springs in the main reservoir can provide suitable thermal regime for spawning regardless of unfavorable water temperatures in the main body of the reservoir.

Comment 5:

As of the time of the evidentiary hearing, Applicant's study of the terrestrial ecosystem had not progressed to a point where any definitive conclusions could be reached as to the effect of Unit 2 operation. (Tr. 1166)

Response:

The Applicant has completed studies on the terrestrial ecosystem in the vicinity of the H. B. Robinson Station. These studies included vegetation inhabiting the shoreline and the lake and amphibians, reptiles, birds, and mammals which utilize the aquatic ecosystem as cover, food, resting, and breeding areas. The Staff does not foresee any noticeable impacts on the terrestrial ecosystem due to operation of H. B. Robinson Station.

Comment 6:

The differences between the observed and predicted temperatures in the lake which were presented are sufficiently large to raise serious questions as to the validity of the Applicant's thermal model. (Applicant's testimony ff. Tr. 705-722, Applicant's Exhibit 6)

Response:

The prediction of the temperature distribution on a cooling lake is a difficult hydrothermal problem, and the state-of-the-art for such predictions is not well developed. However, it is Staff's opinion that calculations should only be used in cases where field data are not available. Since temperature surveys on Lake Robinson have been performed, Staff believes that these should be used as the basis for all environmental assessments.

Comment 7:

In addition, no preoperational monitoring of aquatic or terrestrial biota was carried out (FES §6.1.3). This places a further burden on the Applicant to provide additional operational data. No lake isotherm data were presented for any discharge temperature in excess of 104°F. 2/

2/ Applicant testified to a 21°F rise across the condenser (Tr. 501) which, with a discharge temperature of 114°F, establishes an intake water temperature of 93°F. This indicates that virtually the entire lake would be at temperatures between 93°F and 114°F.

The Board finds that the Applicant has failed to estimate or to describe adequately the environmental consequences of the operation of Robinson Unit No. 2 during what the Applicant himself describes as typical summer conditions.Also lacking is an adequate description or estimate of the lake conditions and resultant impact during what might be described as "worst case" conditions (i.e., the 7-day or 10-day annual "worst" or the 7-day or 10-day "worst" period that occurs, on the average, once every 10 years).

Response:

Recent data (316 Demonstration, p. 3-44) show the surface isotherms for August 18, 1975. In this case, the discharge temperature was 107°F. The vertical temperature profiles presented in the 316 study (p. 3-46) show that for a discharge temperature of 107°F, there is a considerable volume of underlying water at 85° to 90°F. If the discharge temperature is raised to 111°F for an extended period of time, as a worst case, the Staff believes that such a 85° to 90°F zone would diminish which could result in significant impacts on fish and fisheries of the Lake.

However, in the Staff's opinion, if the thermal regimes experienced by plant operation in the past as reflected in the NPDES permit (p. 2 of 19) are not violated to any significant degree, the status of fish and fisheries of the Lake is not likely to change as a result of the thermal discharge.

Dated at Bethesda, Maryland,
this 6th day of January, 1978.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
)
CAROLINA POWER AND LIGHT COMPANY) Docket No. 50-261
) 50-261 (OL Modification)
(H. B. Robinson, Unit No. 2))

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S RESPONSE TO ATOMIC SAFETY AND LICENSING BOARD'S COMMENTS IN ORDER OF MARCH 23, 1976" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or air mail, or, as indicated by an asterisk by deposit in the Nuclear Regulatory Commission internal mail system, this 6th day of January, 1978:

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

Dr. Richard F. Cole*
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

George F. Trowbridge, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N.W.
Washington, DC 20036

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

Richard Jones, Esq.
Associate General Counsel
Carolina Power and Light Company
336 Fayetteville Street
Raleigh, North Carolina 27602

Atomic Safety and Licensing
Board Panel*
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Atomic Safety and Licensing
Appeal Board*
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

December 29, 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE AYOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. ~~50-261~~
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

APPLICANT'S MOTION TO DISMISS HEARING

1. By order dated December 20, 1977, the Board has scheduled for January 9, 1978, a resumption of the hearing in the consolidated proceeding concerning Operating License No. DPR-23 issued to Carolina Power & Light Company (Applicant) on July 31, 1970, for the H. B. Robinson Plant, Unit No. 2. The ultimate issues involved in the consolidated proceeding are: (1) whether, pursuant to Section B of Appendix D to 10 C.F.R. Part 50, the license should be continued, modified, terminated or appropriately conditioned to protect environmental values; and (2) whether the license should be amended to authorize an increase in maximum steady-state power levels from 2200 to 2300 MWt.

2. At the January 9 hearing Applicant will place in evidence the H. B. Robinson NPDES permit reissued on November 15, 1977, and related documents transmitted to the Board on

December 5, 1977, and December 15, 1977, including Applicant's response to questions raised by the Board in its order of March 23, 1976. Applicant moves the Board, after receipt and consideration by the Board of the materials to be placed in evidence at the January 9 hearing, to close the record in the consolidated proceeding and to dismiss the hearing.

3. Applicant submits that dismissal of the hearing will be appropriate on two counts. First, no hearing is required either under Section B of Appendix D or upon Applicant's request for an operating license amendment unless such a hearing has been requested by an interested person.* The only such request in this consolidated proceeding was made by Mr. John Whisenhunt. Mr. Whisenhunt withdrew his request for intervention and hearing on April 17, 1977, and his withdrawal from the proceeding was approved by order of the Board dated May 9, 1977. Thus there are no longer any matters in controversy. Under Section 2.760a of the Commission's Rules of Practice there is

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*Under Section B of Appendix D, which applies to all reactor licenses issued in the period January 1, 1970, to September 9, 1971, environmental hearings were made mandatory for construction permits issued during that period. For operating licenses, however, hearings were required only if requested by the licensee or by an interested person. Similarly, no hearing is required on an application for an operating license amendment unless requested by an interested person. Section 189 of the Atomic Energy Act of 1954, as amended; Section 2.105 of the Commission's Rules of Practice.

no occasion for a decision by the Board on matters not put in controversy by the parties unless the Board finds that there are extraordinary circumstances involving a serious safety, environmental, or common defense and security matter. Applicant believes that the Board will find upon examination of the materials to be submitted at the January 9 hearing that no serious environmental problem exists with respect to the cooling water discharges from the Robinson plant.

4. Dismissal of the proceedings would also be consistent with the allocation of statutory responsibilities between NRC and EPA and with EPA's formal 316(a) determination. As explained by the Appeal Board in its Seabrook decisions,* EPA has the sole responsibility for establishing limitations on effluents from the H. B. Robinson cooling system and no limitations other than those prescribed by EPA may be imposed by the NRC. EPA has determined pursuant to Section 316(a) of the FWPCA that the H. B. Robinson once-through cooling system can continue to be used consistent with maintaining a balanced indigenous population of shellfish, fish and wildlife in Lake Robinson and has issued detailed findings in

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*Public Service Company of New Hampshire, et al. (Seabrook Station, Units 1 and 2) ALAB 366, 5 NRC 39, 48-52 (January 21, 1977), aff'd CLI-77-8, 5 NRC 503 (March 31, 1977).

support of its determination. The EPA determination should, we believe, be accorded by this Board the full weight to which it is entitled by virtue of EPA's statutory responsibilities.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

George F. Trowbridge

George F. Trowbridge

Dated: December 29, 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicant's Motion to Dismiss Hearing," dated December 29, 1977, were served upon the following persons by deposit in the United States mail, postage prepaid, this 29th day of December, 1977.

John F. Wolf, Esquire, Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

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

Auburn L. Mitchell, Esquire (3)
Office of the Executive Legal Director
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docketing and Service Section (21)
Office of the Secretary
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

George F. Trowbridge

George F. Trowbridge

Dated: December 29, 1977

12/21/77

December 21, 1977

Docket No. 50-261

Mr. Frank Peartree
U. S. Court of Claims
717 Madison Place, N. W.
Washington, D. C.

Dear Mr. Peartree:

The purpose of this letter is to request permission to use a courtroom in the Court of Claims.

In a telephone conversation with Mrs. Mullen yesterday, I was told that Courtroom No. 3 (Room 309) was available on January 9, 1978 for a prehearing conference before a three-member Atomic Safety and Licensing Board in the matter of Carolina Power & Light Company's H. B. Robinson nuclear facility. I have conveyed to Mr. John Wolf, chairman of the licensing board, the hours that the court of claims observed, i. e., 10:00 a.m. to 4:30 p.m.

Thank you for your consideration of our request. In my absence during the holidays, Mrs. Eugenia Pleasant is acting branch chief; her telephone number is 634-1437.

Again, thank you for your assistance.

Sincerely,

C. R. Stephens, Chief
Docketing and Service Branch
Office of the Secretary of the Commission

bcc: Mr. John Wolf
ELD
ASLBP
ASLAP
Mrs. Ingram
Mrs. Duncan
Rec. Fac. Br.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

12/20/77

In the Matter of CAROLINA POWER & LIGHT COMPANY (H. B. Robinson Unit No. 2)	Docket No. 50-261 Docket No. 50-261 (OL Modification)

NOTICE OF HEARING

Pursuant to a conference by telephone which was participated in by members of the Board and by counsel for the Licensee, notice is hereby given of a hearing in the above-indicated matter on January 9, 1978, beginning at 10:00 a.m. in the U.S. Court of Claims, Courtroom No. 3 (Room 309), 717 Madison Place, N.W., Washington, D.C.

IT IS SO ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING BOARD

By John F. Wolf
John F. Wolf, Chairman

Dated at Bethesda, Maryland,

this 20th day of December, 1977.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

12/20/77

OFFICE OF THE SECRETARY

REQUEST FOR REPORTING SERVICE
Work Order No. AF-383

Case: CAROLINA POWER & LIGHT COMPANY (Robinson)

Docket No.: 50-261

Address of: Prehearing Courtroom No. 3 (Room 309)
U. S. Court of Claims
717 Madison Place, N. W.
Washington, D. C.
(Contact: Mrs. Mary Jane Mullen, 633-7257)

Hearing

Duration: Prehearing One day Hearing

Date of: Prehearing 1-9-78 Hearing

Time of: Prehearing 10:00 a.m. Hearing

Service Required: Prehearing

Hearing Schedule D

Type of Hearing:

Board: Chairman John Wolf ; Members Callihan, Cole

Copies of the transcript may be sold.

Date of oral request: 12-20-77
Date of confirmation: 12-12-77

By:

C. R. Stephens
Docketing and Service Section

bcc: Mr. Wolf
ELD
ASLBP
ASLAP
Mrs. Ingram
Mrs. Duncan
Mrs. Hargett
Rec. Fac. Br.
Controller

SPECIAL INSTRUCTIONS:

December 19, 1977

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

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Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261 and 50-261
(OL Modification)

Robinson:

Attached for the Board's information is a letter from David D. Beals, Attorney, Legal Branch, Enforcement Division, Region IV, EPA, transmitting the Regional Administrator's Findings Under 33 U.S.C. 1326 (dated November 15, 1977) and an additional document entitled ROBINSON STEAM PLANT, Findings of Fact.

Sincerely,

Auburn L. Mitchell
Counsel for NRC Staff

Attachment: As Stated

cc: (w/attachment)
George F. Trowbridge, Esq.
Docketing and Service Section
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board

OFFICE➤	OELD				
SURNAME➤	ALMitchell/dkw EJReis				
DATE➤	12/ /77				

Carolina Power & Light Company

POST OFFICE BOX 1551

Raleigh, North Carolina 27602

LEGAL DEPARTMENT

December 15, 1977

RELATED CORRESPONDENCE

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In the Matter of:
CAROLINA POWER & LIGHT COMPANY
(H. B. Robinson, Unit No. 2)
Docket No. ~~50-261,~~ 50-261 (OL Modification)

Gentlemen:

By letter dated December 5, 1977, Carolina Power & Light Company transmitted copies of the H. B. Robinson NPDES permit as issued by EPA on November 15, 1977, incorporating EPA's favorable §316(a) determination. On December 8 we obtained the official EPA §316 Findings supporting the reissued NPDES permit and are enclosing a copy for your use. Also enclosed is a copy of an undated and unsigned EPA staff report entitled, "Robinson Steam Plant, Findings of Fact".

Very truly yours,

Richard E. Jones
Associate General Counsel

REJ/gmc
Enclosures

cc: Auburn L. Mitchell, Esq.
Office of the Executive Legal Director
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV

IN THE MATTER OF

CAROLINA POWER AND LIGHT
H. B. ROBINSON STEAM PLANT
HARTSVILLE, SOUTH CAROLINA

NPDES Permit No. SC0002925

Findings Under 33 U.S.C. 1326

Pursuant to Section 316 of the Federal Water Pollution Control Act, as amended, 1972, and 40 CFR Part 122, the Regional Administrator comes now and makes the following findings relative to the H. B. Robinson Steam Plant:

1. The H. B. Robinson Steam Plant consists of two steam electric generating units with a maximum daily gross generating capacity of 931 MW. The larger of the units, Unit #2, has a maximum daily gross plant electrical output of 739 MW, but it may be capable of "stretch level" output of 769 MW. Cooling water for the main condenser is withdrawn from Lake Robinson near the dam, is circulated through the main condensers for both units, enters the discharge canal, and is discharged to the lake approximately 4.2 miles north of the steam plant. For both units, operating at full load, average condenser discharge is 855 MGD (593,000 gallons per minute), average temperature rise across the condensers is 20.3°F. (11.3°C.), and the average heat rejection is 6.05×10^9 BTU/hr.

2. Lake Robinson was created by the impoundment of the waters of Black Creek, a water of the United States originating about 30 miles northwest of the Robinson site, through construction, in 1959, of a 50-foot-high earthen dam. The lake has a total drainage area of approximately 170 square miles and at normal pool elevation of 220 feet above mean sea level (MSL) the lake has a storage capacity of approximately 31,000 acre-feet and a surface area of about 2,250 acres. It has a maximum length of about 7½ miles at the highest water elevation of 222 feet MSL and a maximum depth of 40 feet at the dam. The projected minimum 20-year pool level of this lake is 218 feet MSL. Lake Robinson was impounded primarily to provide a heat dissipative mechanism for waste heat rejected from the generating units of the H. B. Robinson Steam Plant but has also been opened for recreational purposes.

3. During the period of the Carolina Power and Light 316(a) Demonstration, steam plant generation was about 70 percent of capacity. Lake

Robinson was at or above normal pool elevation throughout the study period. The maximum 30-day average cooling water temperature at the discharge canal weir was 108.7°F. (42.6°C.), observed August 10 to September 8, 1975; the maximum 24-hour average weir discharge temperature of 111.2°F. (44.0°C.) was also recorded in August during this period. At the Robinson dam spillway the maximum 24-hour average temperature of 91.6°F. (33.1°C.) was recorded in September 1975. Maximum heat rejection from the steam plant during the study period was 5.45×10^9 BTU/hr.

4. Black Creek and Lake Robinson are "black water" acquatic environments characterized by low pH (<7) and darkly stained or amber-colored waters derived from the leaching of organic material, usually in swamp drainage. This "black water" condition is common to many similar waters in the Piedmont region of North and South Carolina. Lake Robinson is classified as a mesotrophic lake and, as with many "black water" systems, has an expected and typically low to moderate level of primary production. Habitat variations do exist between the lower lake, which receives the heated water discharge, and the upper lake, located upstream of the SR-346 bridge. The upper lake has large quantities of acquatic vegetation and numerous floating and submerged logs which provide fish habitat. In contrast, the lower lake has large areas of sandy shoreline subject to turbulence associated with wave action, and has generally a less desirable fish habitat.

5. Forty-four taxa of phytoplankton were collected from Lake Robinson during the 316 Demonstration study and Chlorophyta (green algae) was the predominant group throughout the year. Phytoplankton production and standing crop in Lake Robinson is moderately low but comparable to other "black water" systems in North and South Carolina and within the expected production range for mesotrophic lakes. Although the overall production rate in the lake is maintained within the expected range, the primary production rate near the discharge area is reduced when the phytoplankton community is stressed by prolonged exposure to temperatures exceeding 89.6°F. (32.0°C.).

6. The Pageland wastewater treatment facility is the only known point source for nutrient inputs to Lake Robinson. Its contribution of

phosphorus amounts to 28% of the total phosphorus input to the lake. Remaining phosphorus inputs are via non-point sources. Phosphorus export rates of Lake Robinson tributaries were the lowest measured in South Carolina in a 1975 survey due to runoff from the nutrient-poor Carolina sandhills. This low phosphorus loading coupled with the fact that Black Creek, the major tributary to Lake Robinson, flows through a considerable amount of swampland and marshland where detrital material and sediment absorb nutrients and macrophytes utilize them for growth, indicates strongly that nutrients are unavailable for substantial phytoplankton production necessary for sustaining a high-grade fishery in Lake Robinson.

7. Seventy-eight taxa of acquatic vascular plants were found in permanently inundated areas or in intermittently flooded areas during the Lake Robinson 316 Demonstration study. The growth of acquatic vascular plants in the protected coves on the eastern shore opposite the discharge canal and in coves directly north of the canal is restricted by exposure to the thermal effluent, and further growth reduction may occur in the mid-lake area impacted by temperatures in excess of 95°F. (35°C.). However, the potential impacts on these limited areas are not of major significance when considering the entire lake and do not pose a threat to the fishery in Lake Robinson.

8. One hundred thirty-five taxa of benthic macroinvertebrates were collected in Lake Robinson and portions of Black Creek during the study period. Macrobenthos diversity in the lake is related to habitat; the highest diversities were found in the upper lake in 11 of the 12 months while the lowest diversities were observed in the lower lake. There was no clear-cut pattern for the location of minimum diversity. In four summer months macrobenthos diversity was lowest in the area of the discharge, being reduced to zero in September and October. However, in 5 of the 12 months, diversity was lowest near the dam.

9. Thirty-two species of fish were collected from Lake Robinson. The species composition found was typical of those found in piedmont or coastal plains waters and was slightly better than the composition and

diversity of other "black water" bodies in North and South Carolina. Lake Robinson has a more diverse fish species composition, a greater total fish biomass, and a generally better ratio of bluegill to largemouth bass (7:1) than most similar lakes in the Carolinas. Fish distribution throughout Lake Robinson changes seasonally due to the thermal discharge. Species diversity near the discharge area declines through the early summer reaching a minimum in July, then increases to levels comparable to early spring during the autumn. During the spring, summer, and autumn months, a considerable portion of the lake exceeds the recommended temperature for prolonged exposure of bluegill and for largemouth bass. During the warmer months, fish avoid these areas near the discharge and seek refuge in cooler parts of the lake. In the heated sections, there is a general decrease in fish taxa, number, and weight during these warmer months.

10. Most spawning activity occured from mid-April through mid-October but larval fish were collected during all months. Larval species distribution generally corresponds to the pattern seen in adult sampling and in July and August larval fish are reduced in the area of the discharge.

11. Growth rates in Lake Robinson for bluegill and warmouth are within the range of values reported for several other "black water" lakes. However, the growth of largemouth bass in all areas was slow relative to other similar lakes. The food consumed by largemouth bass, warmouth, and chain pickerel were typical of literature descriptions of the diets of these species. The food consumed by bluegill in the lower lake was essentially different from foods consumed in the upper lake. This difference in foods consumed is due to a greater predominance and diversity of benthic food items, the typical diet of bluegill, in the upper lake compared with the heated areas of the lower lake. While bluegill are able to change to different kinds of food, the discharge area must be considered a marginal habitat during the summer months.

12. Fish standing crop estimates ranged from 26.1 lbs/acre in the upper lake to 134.8 lbs/acre in the lower lake with an average weight of

72.8 lbs/acre for Lake Robinson as a whole. A creel survey conducted during the 316 Demonstration study revealed a success rate of 0.25 fish per angler hour. Of the total catch in this survey, centrachids, like largemouth bass and bluegill, accounted for 90%; 36% of which were largemouth bass.

13. From comments received at the public hearing in this matter, it is apparent that fishing in Lake Robinson has deteriorated since creation of the lake. This deterioration is not unexpected in impoundments or reservoirs unless there are some unusual nutrient inputs supporting a high-grade fishery. Lake Robinson has relatively low amounts of nutrients and is considered mesatrophic and thus not potentially capable of supporting a high grade fishery. Inundation of land areas in the creation of this lake provided a great initial surge of nutrients and thus stimulated the fishery in Lake Robinson in its early years. However, as these nutrients were dissipated over the years without a good replacement source, the fishery declined accordingly.

14. In particular, the decline of the crappie fishery in Lake Robinson appears to be related to factors other than the discharge from the H. B. Robinson Steam Plant. Studies in other lakes indicate that crappie live in waters receiving considerable thermal discharges and are able to sustain themselves through cyclical changes in the presence of such discharges. Studies have also shown that crowding and relief from crowding has as great an impact on crappie populations as spawning success and predation. These fish are, therefore, subject to wide fluctuations in abundance and growth rate and, based on the available literature, appear to run in cycles from crowded and small to few and large. The inability to establish a threadfin shad population in Lake Robinson, a common difficulty in "black water" lakes, appears to be another contributing factor in the decline in the crappie population. Crappie are not predominant in black water and have historically been thin and small in piedmont reservoirs until the reservoirs are successfully stocked with threadfin shad, an important food item for crappie.

15. Although some entrainment by the power plant occured, primarily of darter larvae, this predation has not effected the darter population since after four years of plant operation they are widely distributed and abundant.

16. In spite of what appears to be a high rate of impingement, 2,263 lbs of fish per year, primarily of small bluegill, the lake is sustaining good populations of fish, including bluegill, and does not appear to be adversely impacted by impingement.

The existence of the above-stated facts having been established to the satisfaction of the Regional Administrator, I therefore further find that the protection and propagation of a balanced, indigenous population of fish, shellfish, and other acquatic organisms in and on Lake Robinson will be assured by the continued operation of the H. B. Robinson Steam Plant in its present once-through mode as established in the record.

I further find that the location, design, construction, and capacity of the cooling water intake structures at the H. B. Robinson Steam Plant reflects the best technology available for minimizing adverse environmental impact.

Date NOV 15 1977

John A. Little, Deputy
JOHN C. WHITE
Regional Administrator

ROBINSON STEAM PLANT

Finding of Fact

The Carolina Power and Light Company H. B. Robinson Steam Plant is located in the western corner of Darlington County, South Carolina, 5 miles west-northwest of Hartsville (Figure 2.1, NRC, 1975) at the boundary of the Upper Coastal Plain and Lower Coastal Plain (Figure 2.6, NRC, 1975).

A 50-foot-high earthen dam was constructed at the Robinson site in 1959 impounding Black Creek which originates about 30 miles northwest of the Robinson site (page 2-11, NRC, 1975; page 5, CP&L Summary, 1976). Black Creek was impounded to provide a heat dissipative mechanism for waste heat rejected from the Robinson generating units (page 5, CP&L Summary, 1976). Total drainage area into Robinson Lake is approximately 170 square miles (Table 3.2.1, CP&L, 1976). At normal pool elevation of 220 feet above mean sea level (MSL) (Table 3.2.1, CP&L, 1976) the lake has a storage capacity of approximately 31,000 acre-feet and a surface area of approximately 2,250 acres (page 2-1, NRC, 1975; page 4, EPA, 1975a). It has a maximum length of about 7-1/2 miles at the highest water elevation of 222 feet MSL and a maximum depth of 40 feet at the dam (page 2-11, NRC, 1975).

Habitat variations exist between the upper lake, located upstream of SR-346 bridge, and the lower lake. The upper lake has large quantities of aquatic vegetation and numerous floating and submerged logs which provide fish habitat. In contrast, the lower lake, which receives discharge water, has large areas of sandy shoreline subject to turbulence

from wave action, and it has generally less desirable fish habitat (page 6, CP&L Summary, 1976).

Black Creek and Robinson Lake are "black-water" aquatic environments characterized by low pH's (<7) (Exhibit 2.4, page 121, CP&L, 1976) and darkly stained or amber-colored waters derived from the leaching of organic material usually in swamp drainage (page 5, CP&L Summary, 1976). Most "black-water" systems like Robinson have low to moderate primary production which places them in a relative classification scheme of oligotrophic or mesotrophic. Studies by the EPA National Eutrophication Survey indicate Robinson Lake is a mesotrophic lake (page 1, EPA, 1975a).

Of the 4,750 acres making up the plant site area, 2,250 acres are occupied by the lake, 1000 acres are devoted to utility property, 1300 acres to forestry and watershed management protection, and 200 acres are leased to a farm management program (page 2-4, NRC, 1975). Some of the CP&L property extending back from the shore of Lake Robinson to an elevation of 230 feet MSL is leased to private individuals from that level to the water's edge (about 220 feet MSL). There is very little, if any, development near the west shore of the lake, but along some portions of the east shore there are private homes and boating facilities (page 2-4, NRC, 1975).

Robinson Steam Plant, located on the west side of Robinson Lake, consists of two steam electric generating units* with a maximum daily

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*Unit 1 was issued an operating permit in January 1960 by the South Carolina State Board of Health (NRC, 1975).

Unit 2 was issued an operating license on July 31, 1970 by the AEC (NRC, 1975).

gross generation capacity of 931 MWe (Attachment C, Utley, 1976). Unit #2 has a maximum daily gross plant electrical output of 739 MWe, but it may be capable of a higher output designated the "stretch level", which is 769 MWe gross (page 3-1, NRC, 1975). Circulating water is withdrawn from Robinson Lake near the dam, passes through the main condensers for both units and returns via the discharge canal to the lake approximately 4.2 miles north of the steam plant (Figure 2.1.1, CP&L, 1976). Measured velocities within the intake range from 1.0 to 3.0 feet per second (page 2-2, CP&L, 1976). Average condenser discharge at full load is 855 MGD (593,600 gallons per minute) (Table 2.1.1, CP&L, 1976). For both units, at normal full load, average temperature rise across the condensers is 20.3°F (11.3°C) (Table 2.1.1, CP&L, 1976), and the average heat rejection is 6.05×10^9 BTU/hr. (Table 2.1.1, CP&L, 1976) at full load. The maximum heat rejection rate normally expected from the facility is 6.29×10^9 BTU/hr., but under excessive condenser fouling, reduced circulating pump flows, or under other adverse conditions, a short-term maximum heat rejection rate of 6.74×10^9 BTU/hr. could occur (Attachment F, CP&L, 1976).

During the demonstration period, steam plant generation was about 70 percent of stretch capacity (EPA calculations based on data provided in Table 2.1.2, CP&L, 1976). Maximum 30-day average (roving maximum average during 12-month period) cooling water temperature at the discharge canal weir was 108.7°F (42.6°C) from August 10 to September 8 (Utley, 1976; Hogarth, 1976) and the maximum 24-hour average weir discharge temperature was 111.2°F (44.0°C) in August, 1975 (Exhibit 2.1, page 103, CP&L, 1976). At the Robinson dam spillway the maximum 24-hour average temperature of 91.6°F (33.1°C) was recorded in September, 1975 (Exhibit 2.1, page 99, CP&L, 1976). The steam plant maximum heat rejection rate was 5.45×10^9 BTU/hr.

as a monthly average (calculations based on flow and temperature rises in CP&L demonstration, 1976). During the demonstration, Robinson Lake was above normal pool (220 feet MSL) (Attachment E, Utley, 1976). The projected minimum 20-year pool level is 218 feet MSL according to data provided by J. Sell (1977).

Since 1959, Robinson Steam Plant has had the potential to adversely impact some or all of the organisms in Black Creek and Robinson Lake. Recognizing this potential for adversely affecting aquatic communities, Carolina Power and Light initiated a program of study in 1972 to determine what effects Robinson Steam Station would have on freshwater communities in Robinson Lake and Black Creek.

Biologists of EPA's Region IV Ecology Branch have visited the Robinson site, worked with Carolina Power and Light biologists and examined the 316 demonstration material submitted by Carolina Power and Light. Although Robinson Steam Plant adversely impacts some areas of Robinson Lake, the organisms, especially fish, are diverse and plentiful.

The demonstration shows that:

- Chlorophyll concentration, primarily representative of phytoplankton standing crop, ranged from <1 to 34 μg/liter (Table 5.3.1, CP&L, 1976). Ninety-one percent of the values were less than 20 μg/liter, the suggested oligotrophic to mesotrophic status of the Model State Water Monitoring Program (EPA, 1975b). Most of the chlorophyll values greater than 20 μg/liter occurred in the autumn when phytoplankton blooms could be expected and when vascular plants begin dying.

- Robinson phytoplankton production as measured by chlorophyll concentration was comparable to average summer chlorophyll concentrations of "black-water" bodies in North Carolina (Table 5.3.2, CP&L, 1976).
- Robinson Lake annual average production rate of 385 mg C/M^2/day (Table 5.3.8, CP&L, 1976) is within the range for mesotrophic lakes (200-750 mg C/M^2/day) as suggested by EPA (1975b).
- Overall, phytoplankton production was moderately low, which is not unexpected in "black-water" bodies, but it was within production for other water bodies in the area (Tables 5.3.2 and 5.3.8, CP&L, 1976).
- Forty-four taxa of phytoplankton (Table 5.3.3, CP&L, 1976) were collected during the Lake Robinson 316 demonstration study.
- Chlorophyta (green algae) was the predominant group all year (Table 5.3.3, CP&L, 1976). Members of the Cyanophyta (blue-green algae) (Table 5.3.3, CP&L, 1976) were present in Robinson Lake, but they were not a predominant group. This is good, as blue-greens are commonly associated with nuisance algal blooms and are usually less desirable as a food source for zooplankton, icthyoplankton, and some herbivorous fishes.
- Seventy-eight taxa of aquatic vascular plants (Table 7.2.1, CP&L, 1976) occurring in permanently inundated areas or in intermittently flooded areas were found during the 316 demonstration study.

- When considering the entire lake, limited areas potentially impacting aquatic vascular plants adversely at temperatures $\geq 95^{\circ}F$ ($> 35^{\circ}C$) do not pose a threat to the Robinson fishery (pages 7-11 to 7-13, CP&L, 1976; Figures 7.3.1 and 7.3.2, CP&L, 1976; Figure 3.3.16, CP&L, 1976).
- One-hundred and thirty-five taxa of benthic macroinvertebrates were collected in Robinson Lake and Black Creek (Table 6.3.1).
- Macrobenthos diversity ($\bar{d}$) appeared to be related to habitat as highest diversities were found (11 out of the 12 months) at stations F and G in the upper lake. Minimum diversity was found in the lower lake, but there was not a clear-cut pattern because minimum diversity was found at transect A, near the dam, 5 out of 12 months and near the discharge area, transect E, 4 out of 12 months. However, lowest diversities (0.00-0.35) were at transect E in the summer (August-October) (Table 6.3.6, CP&L, 1976).
- Eighty macrobenthic taxa were found in Black Creek (Table 6.3.1). Station H, just downstream of the Robinson dam outfall, had the fewest number of taxa and relatively highest number of organisms. The web-spinning hydropsychids, comprising 67% of the organisms collected, predominated at this station (Table 6.3.7, CP&L, 1976). Spence and Hynes (1971) found high numbers of web-spinning trichopterans downstream

from an impoundment outfall and proposed that high organic and detrital matter coming out of the lake supported high numbers of hydropsychids.

- Thirty-two fish species (Table 4.2.1, CP&L, 1976) collected at Robinson were typical of those found in piedmont or coastal plain waters (Table 4.2.2, CP&L, 1976).
- The fish species composition was not unlike that of other similar "black-water" bodies in North and South Carolina (Table 4.2.2, CP&L, 1976).
- Fish standing crop estimates ranged from 26.1 lbs./acre in the upper lake to 124.8 lbs./acre in the lower lake with an average weight of 72.8 lbs./acre for the entire lake (Table 4.3.1, CP&L, 1976).
- Robinson Lake had a more diverse fish species composition, a greater total fish biomass except for Parr Pond, and a generally better ratio of bluegill (*Lepomis macrochirus*) to largemouth bass (*Micropterus salmoides*) (7:1) when compared to certain similar lakes in North and South Carolina (Table 4.3.2, CP&L, 1976).
- Where typical bluegill food was not abundant, as in the lower lake, bluegill changed to other kinds of food (page 4-52, CP&L, 1976).
- The food of largemouth bass, warmouth (*Lepomis gulosus*) and chain pickerel (*Esox niger*) were typical of literature

descriptions of these species diets (pages 4-20 to 4-23, CP&L, 1976).

- Bluegill growth in Robinson Lake is similar to other "black-water" lakes (Table 4.5.2, CP&L, 1976).
- Growth rate estimates for warmouth in Robinson Lake are within the range of values reported for several North Carolina black-water lakes (Table 4.5.5, CP&L, 1976).
- Most spawning activity occurred from mid-April through mid-October, although larval fish were collected during all months (Table 4.7.1, CP&L, 1976).
- Larval species distribution generally correspond to the pattern seen in adult fish sampling (Section 4.0, CP&L, 1976).
- A creel survey conducted during the 316 demonstration revealed that 11,081 anglers fished 26,993 hours (12 hrs./acre) and caught 6,667 fish for a success rate of 0.25 fish per angler hour (Section 4.10.3, CP&L, 1976; Attachment G, Utley, 1976).
    a. Centrarchids, like largemouth bass and bluegill, accounted for 90% of the total catch of which 36% were largemouth bass.
    b. Pickerel accounted for 8% of the total catch.
    c. Other fishes accounted for 2% of the total catch.
- Although some entrainment by the power plant occurred of primarily

darter larvae, this predation has not effected the darter population since after 4 years of plant operation they are widely distributed and abundant (Section 4.8, CP&L, 1976).

- In spite of what appears to be a high impingement rate (110,960 fish per year or 2,263 lbs. of fish per year) of primarily small bluegills (89-95%) (Section 4.9, CP&L, 1976), the lake appears to be sustaining good populations of fish including bluegills.
- Thirty-two fish taxa (Table 4.13.1) were collected from Black Creek downstream of Robinson Dam. These fish are typical of the piedmont and coastal plain regions and many are generally associated with black-water streams.

Although the above facts indicate that Robinson Lake is sustaining an acceptable fishery, we cannot ignore the following impacts to areas of Robinson Lake:

- Zooplankton were reduced considerably in the discharge area of the lower lake during August (Table 5.3.4, CP&L, 1976).
- At temperatures exceeding 89.6°F (32.0°C) for long periods of time, a stress upon the phytoplankton community was indicated by reduction of primary production rate near the discharge area (pages 5-16 to 5-18, CP&L, 1976).
- Areas in which the thermal effluent restricts aquatic vascular plant growth occur in the protected coves on the eastern shore opposite the discharge canal and in the coves

directly north of the canal; however, further vascular plant growth reduction may occur in the mid-lake area of Robinson from approximately transect CA to SR346 bridge if 95°F (35°C) is used as the temperature where detrimental temperature effects may become apparent (pages 7-11 to 7-13, CP&L, 1976; Figures 7.3.1 and 7.3.2, CP&L, 1976; Figure 3.3.16, CP&L, 1976).

- Macrobenthos diversity and abundance was reduced to zero around the discharge area in September and October (Table 6.3.6, CP&L, 1976).
- Macrobenthos abundance was lower near the discharge area (transect E) when compared to abundance at other stations in summer months (page 6-19 and Table 6.3.6, CP&L, 1976).
- Fish species diversity, based on electrofishing near the discharge area, exhibited a decline through the early summer reaching a minimum in July, then increased to levels comparable to early spring in the autumn (Figure 4.2.2, CP&L, 1976).
- Low seining catches and low fish diversity at rotenone cove E-1 indicates fish are avoiding the discharge area in the summer (Section 4.0, CP&L, 1976).
- Fish distribution throughout Robinson Lake changes seasonally because of the thermal discharge. In the heated sections of the lake there is a general decrease in fish taxa,

numbers, and weight during the warmer months (Section 4.0, CP&L, 1976).

- Stomach analyses show that foods of bluegills in the upper lake were essentially different from foods consumed in the lower lake. This difference in foods consumed is due to a greater predominance and diversity of benthic food items in the upper lake compared with the heated areas of the lake. In terms of available food supply, the discharge area must be considered a marginal habitat during the summer months (Section 4.4.3, CP&L, 1976).
- Growth of largemouth bass in all areas was slow relative to other similar lakes (Table 4.5.8, CP&L, 1976).
- Percids, like the darters, and other species of larvae were reduced near the discharge area during July and August (Table 4.7.1, CP&L, 1976).
- During the spring, summer, and autumn months a considerable portion of the lake exceeds the recommended temperature for prolonged exposure of bluegill (78.6°F or 25.9°C) and largemouth bass (86.9°F or 30.5°C) (WQC, 1972). This recommended temperature is based on the ultimate incipient lethal temperature and optimum temperature. It offers a practical method for obtaining allowable limits, while retaining as its scientific basis the requirements of preserving adequate rates of growth.

During and after the Robinson Steam Station Public Hearing in Hartsville, South Carolina on February 8, 1977, a number of issues were brought to EPA's attention by the Public. At this time these issues will be addressed.

They primarily were:

1. Why had fishing deteriorated?
2. Crappie fishing was "very good" some years ago, and now they weren't catching crappie.
3. Threadfin shad were stocked in Robinson, but they did not survive.
4. White bass x striped bass hybrids were stocked in Robinson and didn't survive.

Unfortunately, we do not have any information about the Robinson fishery and fishing success in the years immediately following impoundment. However, there is no reason to doubt the word of long-time residents and fishermen on the lake that fishing has deteriorated to some degree. This deterioration is not unexpected in impoundments or reservoirs unless there are some unusual nutrient inputs supporting a high grade fishery. Robinson has relatively low amounts of nutrients (CP&L, 1976) and is considered mesotrophic (EPA, 1975a; EPA, 1975b) and thus not potentially capable of supporting a high grade fishery similar to that found in some southeastern piedmont reservoirs.

According to Neel (1967), filling of reservoirs inundates topsoils and decaying organic matter from plant and animal resources. Subsequently, decaying organic matter and any fertilizers in the soil

release nutrients which attain significant concentrations and thus stimulate very great photosynthetic activity by the phytoplankton. This initial surge in production may last for a few to several years.

After the initial high period of production, most reservoirs suffer a decline that appears generally due to certain combinations of the following factors:

1. Decline in quantities of land-supplied organic debris.
2. Nutrients arising from decomposition on the bottom become unavailable through the agency of thermal stratification and formation of density layers. Once nutrients accumulate in deeper waters, they often leave the reservoir in withdrawals through penstocks and other tunnels and so rob the reservoir of life that would otherwise be produced during periods of complete circulation. Withdrawal of bottom waters thus routinely deprives a reservoir of decomposition products arising from allochthonous sources and its own autotropism. Hence with increasing age, reservoirs generally must depend more and more upon nutrients brought in by inflowing water; and their availability from this source may fluctuate with seasonal discharges or be prevented by stratification and other conditions, and the level of production inherent in river water may not be realized.

Drew and Tilton (1970) have noted this phenomenon of production surges and declines in Texas reservoirs. Game species invariably showed

exceptional growth in the first and second year of life of reservoirs. Fishing pressure and success were both high but about 3-4 years later it declined.

The Pageland wastewater treatment facility is the only known point source for nutrient inputs to Lake Robinson. Its contribution of phosphorus amounts to 28% of the total phosphorus input to the lake. Remaining phosphorus inputs to Robinson are via non-point sources (EPA, 1975a). EPA (1975a) found collectively that phosphorus export rates of Lake Robinson tributaries were the lowest measured in South Carolina during their survey. They attributed low export rates to runoff from the nutrient-poor Carolina sandhills. The low phosphorus loading is less than that proposed by Vollenweider and Dillon as an oligotrophic loading (EPA, 1975a). This low phosphorus loading coupled with the fact that Black Creek, the major tributary to Robinson Lake, flows through a considerable amount of swampland and marshland where detrital material and sediment adsorb nutrients and macrophytes utilize them for growth indicates strongly that nutrients are unavailable for substantial phytoplankton production necessary for sustaining a high-grade fishery in Robinson Lake.

The only available comparative fisheries data is that provided by H. J. Logan (1974) of the South Carolina Wildlife and Marine Resources Department. Information provided in his letter on fish population estimates for the year 1968-69, when Unit #2 was not in operation, indicates that 20 fish species were collected in 1968-69 compared to

32 fish species found in 1975. Bluegill and Golden shiner (Notemigonus crysoleucas) were numerically predominant in the 1968-69 study. South Carolina rotenoned 3.1 acres in Robinson and collected 144.1 lbs./acre which was 19.3 lbs./acre more than found during CP&L's demonstration study.

Regardless of whether fishing has declined in Robinson, it appears, based on the 316 demonstration, that for a "black water" fishery Robinson is as good or better than similar fisheries in the Carolinas.

Deterioration of crappie fishing to the point where fishermen are not catching them any more is a serious and valid concern since they are an indigenous species protected under Public Law 92-500. During the Public Hearing, blame for "demise" of the crappie fishery was attributed to the Robinson Steam Plant.

With the high water temperatures being emitted by the Robinson Steam Plant, it is, at first glance, easy to attribute a crappie fishing decline to heated water; however, there are other factors which need to be considered based on available crappie ecology and physiology information.

There are two cases where substantial amounts of heated water entering reservoirs supported a viable crappie fishery.

In the first case, McNeely and Pearson (1974), studying distribution and condition of fishes in a small (815 acres) reservoir (North Lake) in northeast Texas, found a viable crappie population. North Lake has a 700 MW, 3 unit, fossil fuel steam plant (constructed in 1957) on its

shores discharging 490 MGD at temperatures as high as 108°F (42.2°C). Maximum depth of the lake is 65.6 feet, average depth is 21.3 feet, and volume is 175,655 acre-feet. Reservoir water temperatures ranged from 84.6°F to 107.6°F (29.2°C to 42°C) from bottom to top respectively in the summer (July - September). They found, using gill nets and seining, white crappie *Pomoxis annularis* in the discharge area in the spring and summer and throughout the reservoir at other times of the year.

Bennett (1972) studied length-weight of black crappie (*Pomoxis nigromaculatus*) and bluegill in Par Pond, South Carolina. Par Pond is a 2800-acre reservoir providing cooling water for one nuclear reactor. Based on Figure 1 of Bennett's article, maximum temperatures of 111.2°F (44°C) were discharged in July, 1969 and temperatures ranged from approximately 68°F to 111.2°F (20°C to 44°C) in Par Pond during the summer (June thru September, 1969). Maximum discharge temperatures in the summer were 104°F (40°C) or greater; however, discharge temperatures ranged from about 75.2°F to 111.2°F (24°C to 44°C) in the summer. Coefficients of condition for adult black crappie from the heated station were significantly higher ($P \leq 0.05$) than those from the control station ($T=2.02$, 89 d.f.).

Both of the above studies indicated that crappie live in waters receiving considerable amounts of thermal heat and are able to sustain themselves through cyclic changes along with bass and bluegill.

An examination of information in Table 1 indicates that crappie should survive at Robinson temperatures and do as well if not better than bluegill at various stages of their life cycles.

TABLE 1

Thermal Tolerance Limits in °C (WQC, 1972; Hogenson, 1977)

	Adult Largemouth	Adult Bluegill	Juvenile White Crappie	Juvenile Black Crappie	Adult White Crappie	Adult Black Crappie
Upper limiting temperature for prolonged exposure °C	30.5	25.9	32.2	32.2		
Optimum temperature for growth °C	27.5	22		22-25	25	22-25
Ultimate upper incipient lethal temperature °C		33.8	33.0	33.0		32.5
Upper incipient lethal temperature °C	36.4			28.9		
Reproduction temperatures °C						
Spawning	16-27	19-32			14-23	14-20
Eggs	13-26	22-34			14-23	
Embryo 24-hr limit Beyond this limit mortality occurs.					23	20

TABLE 1 (Continued)

Definitions

1. Lethal thresholds or incipient lethal temperature (UILT)	=	Survival of 50% of a sample of individuals.
2. Ultimate incipient lethal temperature (UILT)	=	Represents the breaking point between the highest T° to which an animal can be acclimated and the lowest of the extreme T° that will kill the warm-acclimated organism. At T° above and below the UILT, survival depends not only on the T°, but also on duration of exposure, with mortality occurring more rapidly the farther the T° is from the threshold.
3. Upper limiting temperature for prolonged exposure	=	$\frac{\text{opt. } T^{o} + \text{UILT}}{3}$ The upper limiting T° for prolonged exposure is based on Optimum T° and UILT (Table III-12) (WQC, 1972). It offers a practical method for obtaining allowable limits, while retaining as its scientific basis the requirements of preserving adequate rates of growth.
4. Prolonged exposure	=	1 week or longer.

According to Bennett (1972) crappies, sunfishes, the white and yellow basses, and several kinds of bullheads live but a few years and are replaced. These fishes are subject to wide fluctuations in abundance and growth rates and should be cropped when they are available. In fact, Jester (1971) points out, that crowding and relief from crowding rather than spawning success or predation control populations of black and white crappie. Drew and Tilton (1970) reported that on Lake Belton, Texas, in spite of record catches of crappie during its early years, reproduction exceeded catch and the population became stunted, and this species was lost to the fishery.

Swingle and Swingle (1967) based on long-term studies at Lake Martin, Alabama found that crappies ran in approximately 5-year cycles from crowded and small to few and large.

Some people suggested at the Public Hearing that bluegill competed with crappie for food. It is possible, since these fishes diets are similar; however, crappie may prefer threadfin shad and do better when they are available. Green and Murphy (1974) examined stomachs of white crappie from Benbrook Lake in Texas. Threadfin shad were the predominant food consumed; insect larvae were the next most important food consumed. Mather (1972) in studies on Conowingo Reservoir, MD, examined 903 white adult crappie and found by volume zooplankton (Cyclops & Daphnia) and small fishes (sunfishes and Johnny darters) were predominant food items in most of the spring, summer and autumn months.

Beers and McCornell (1956) found food intake of black crappie was predominantly threadfin shad and chironomid larvae and pupae.

According to Davis (1977b) and Carnes (1977b) of the North Carolina Wildlife Resources Commission, crappie are not predominant in black-waters and fishing for crappie is not good. Crappie are always poor (thin and small) in piedmont city reservoirs (500-1000 acres) until they stock them with threadfin shad ; then crappie do quite well (Carnes, 1977b).

Although we cannot say exactly why crappie numbers declined, it appears that other extenuating circumstances besides thermal impacts contributed to the crappie decline. Crappie are still in Robinson as a few have been collected (Page 4-43, CP&L, 1976).

Although threadfin shad are not indigenous to Robinson, the Public did question why stocked threadfin shad did not survive in Robinson after stocking. The problem of stocked threadfin shad not surviving in black-water lakes is not uncommon in the Carolinas, especially in North Carolina. Discussions with North and South Carolina fisheries personnel revealed the following information. North Carolina tried to stock threadfin shad in four "black-water" lakes, Waccamaw, Catfish, Phelps, and Ledbetter, and they did not survive (Carnes, 1977a; Davis, 1977a). Both biologists believe the primary reason for non-survival was lack of food supply. Apparently, gizzard shad doesn't do well in "black-water" lakes either. Threadfin and gizzard shad do sustain themselves in "black-water" rivers where presumably there is more food. Golden shiners will survive in "black-water" lakes (Carnes, 1977a; Davis, 1977a), but they are considered a poor quality forage fish because they grow too fast.

Joe Logan (1977a & b) of the South Carolina Division of Game and Freshwater Fisheries said Robinson was the only "black-water" reservoir in South Carolina. They only have tried to stock threadfin in Lakes Robinson, Jocasse and Keowee. Threadfin survived in Keówee the first time stocked, but they didn't survive in Jocasse until the second stocking the following year. They were only stocked in Lake Robinson one year.

The fourth issue raised concerned the non-survival of the striped bass x white bass hybrid stocked in Robinson. J. Bayless (1977), of the Monks Corner fish hatchery where the hybrid is grown, said he didn't know of any other hybrid stockings in "black-waters" other than Robinson nor was he aware of any hybrid heat tolerance studies. He thought possibly the hybrid didn't do well in Robinson because of low production and poor forage stock. In the piedmont reservoirs like Clark Hill the hybrid is doing well, but Mr. Bayless noted that these reservoirs have good stocks of threadfin and gizzard shad in them. Mr. Carnes (1977b) said they put the hybrid in two lakes last year, and they appear to be doing well.

Mr. Jack L. Nettle's (1977) transmitted comments to Ms. Mona Ellison after the Public Hearing for consideration by EPA. Most of his comments have been addressed in other parts of this Finding of Fact; however, he did state that "We also observed beaver in and about the lake prior to the nuclear plant being put in operation and we have not seen signs of beaver for the last two or three years." The 316 Robinson demonstration

submittal contradicts this statement as it contains information on the presence of beaver. It would be expedient if CP&L biologists would show Mr. Nettles where beaver are located. Mr. Frey and Dr. Raschke, EPA biologists, did not observe beaver while they were on Lake Robinson in November of 1975, but they were not particularly looking for beaver at that time.

Another citizen and intervenor in this demonstration, Mr. Whisenhunt, submitted comments (Whisenhunt, 1977) after the Public Hearing to EPA for consideration. His concern for the loss of hybrid bass, threadfin shad and substantial reduction in crappie have been addressed elsewhere in this Finding of Fact Statement. Mr. Whisenhunt in his submittal was aware of Mr. Frey and Dr. Raschke's visit to Lake Robinson during the week of November 10, 1975, and asked on page 5 of his transmittal "... I would like to have known what he himself (Dr. Raschke) saw or found as opposed to what was furnished to him and accepted as correct." The Ecology Branch memo of January 28, 1976 from Raschke and Frey to Zeller concerning their trip report should answer Mr. Whisenhunt's question. Dr. Raschke and Mr. Frey took temperature readings and sampled benthos and fish with CP&L personnel. EPA temperatures were comparable to what CP&L recorded at thermal monitors as can be seen in the following table.

TABLE 2

Date	Station	Location	EPA Time	EPA °C	CP&L* Time	CP&L* °C
11/11/75	E	At discharge Canal mouth	1518	24.9	1500	24.4
11/11/75	–	West Tower near surface	1533	22.1	1500 1600	22.0 22.0
11/11/75	–	Dam Spillway	1540	22.0	1500 1600	21.4 21.4

*File Memorandum. Atkins Continuous Recorder Data. Data delivered by Mr. C. E. Coefield to Mr. Paul Frey and Dr. Ron Raschke on November 14, 1975.

After the EPA biologists completed their work on Friday the 14th, they were furnished with copies of field fish data recorded during the week of November 10 and returned to Athens.

After returning home, the data were examined and the findings were:

1. A greater variety and more biomass of fish were collected upstream of SR-346 bridge.
2. More numbers of small sunfish were taken near Robinson dam.
3. Young-of-the-year bass and other sunfish were collected.
4. List of taxa includes:

   Largemouth bass

   Bluegill

   Warmouth

Yellow bullhead

Chain pickerel

Golden shiner

Flat bullhead

Creek chubsucker

Lake chubsucker

Pirate perch

Dollar sunfish

Redfin pickerel

Bowfin

Sunfish sp.

Spotted sucker

In spite of high discharge temperatures and some adverse impacts, it is the Ecology Branch's opinion that, under conditions existing at the time of the 316 study, the demonstration presented information which leads us to conclude and agree with Carolina Power and Light that the Robinson Lake fishery is acceptable and similar to other "black-water" fisheries in North and South Carolina.

Allowing Carolina Power and Light to operate at relatively high discharge temperatures does not minimize our concerns about the Robinson fishery; therefore, we believe it would be advisable for the State of South Carolina and Carolina Power and Light to initiate thermal and biological monitoring and a fish management program in Robinson Lake.

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December 1, 1977

12/1/77

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In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261
50-261 (OL Modification)

Gentlemen:

Attached for your information is a copy of a November 9, 1977, letter from Robert W. Reid of the Staff to Carolina Power and Light Company requesting the Company to submit proposed Technical Specifications changes requiring the operability of separate batteries and chargers whenever the associated A.C. emmergency power supplies are required operable. Appropriate surveillance requirements also will be required.

Sincerely,

Auburn L. Mitchell
Counsel for NRC Staff

Enclosure
As Stated

cc w/encl: George F. Trowbridge, Esq.
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board
Docketing and Service Section

OFFICE ➤	OELD	OELD	OELD			
SURNAME ➤	Mitchell/dmr	Reis	Grossman			
DATE ➤		11-30	11\30			

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 9, 1977

Docket No.: 50-261

Carolina Power & Light Company
ATTN: Mr. J. A. Jones
Senior Vice President
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

RE: H. B. ROBINSON UNIT NO. 2

We have recently noted that in addition to the D.C. power supplies which provide an uninterruptable power source for instrumentation and control systems, additional dedicated separate batteries and chargers are utilized at your facility for initiating operation of onsite A.C. emergency power supplies (diesel generators, switchgear, etc.).

We have concluded that these additional batteries and chargers perform a safety function and have reviewed your Technical Specifications to determine the adequacy of the requirements provided to demonstrate and maintain the operability of these D.C. power supplies. Based upon this review, we have concluded that the Technical Specifications for your facility should be supplemented to require the operability of these batteries and chargers whenever the associated A.C. emergency power supplies are required operable. Surveillance requirements which demonstrate the operability of these batteries and chargers should also be added to your Technical Specifications. These Surveillance Requirements should be comparable to those currently included in your Technical Specifications and applicable to the other safety batteries and chargers.

We request that you submit within 60 days from receipt of this letter, an application for amendment to your license that will change your technical specifications to be in conformance with the above requirements.

In the event you should desire further discussion of this matter, please contact us.

Sincerely,

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

cc: See next page

cc: G. F. Trowbridge, Esquire
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N. W.
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Harisville, South Carolina 29550

November 15, 1977

NRC Central

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Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

In the Matter of
Carolina Power and Light Company
(H. B. Robinson, Unit No. 2)
Docket No. 50-261, 50-261 (OL Modification)

Gentlemen:

I enclose for the Board's information copies of the following material which has been placed in the Commission's Public Document Room:

1. Memorandum for: James R. Yore
   From: Walter H. Jordan
   Subject: Errors in 10 CFR §51.20, Table S-3 (September 21, 1977)

2. Memorandum for: Chairman Hendrie
   From: James R. Yore
   Subject: Communication from Dr. Walter H. Jordan concerning Table S-3, 10 CFR §51.20 (September 21, 1977)

3. Memorandum for: James R. Yore
   From: Chairman Hendrie
   Subject: Communication from Dr. Walter H. Jordan concerning Table S-3, 10 CFR §51.20 (October 5, 1977)

OFFICE➤						
SURNAME➤						
DATE➤						

4. Material Concerning The Interaction Between Control Systems and Protection Systems including:

   a. Letter to: Honorable Griffin Bell
      From: Robert D. Pollard
      (October 13, 1977)

   b. Attachments to Item 4(a)

   c. Letter to: Robert D. Pollard
      From: Stephen H. Hanauer
      (September 29, 1977)

   d. Letter to: Robert D. Pollard
      From: D. G. Eisenhut
      (September 29, 1977)

   e. Memorandum for: E. Case
      From: Stephen H. Hanauer
      (September 28, 1977)

   f. Memorandum for: S. H. Hanauer
      From: E. G. Case
      (September 23, 1977)
      Enclosure:
      Discussion Paper, Interaction Between Control Systems and Protection Systems

   g. Letter to: Stephen H. Hanauer
      From: Robert D. Pollard
      (September 16, 1977)

   h. Letter to: Darrell G. Eisenhut
      From: Robert D. Pollard
      (September 16, 1977)

   i. Note to: J. Guibert
      From: D. Eisenhut
      (August 24, 1977)

   j. Memorandum for: E. G. Case
      From: Stephen H. Hanauer
      (August 18, 1977)

Sincerely,

Auburn L. Mitchell
Counsel for NRC Staff

OFFICE ➤

SURNAME ➤ Enclosures: As Stated

DATE ➤ cc: See Page Three

cc w/encl: George F. Trowbridge, Esq.
Richard Jones, Esq.
Atomic Safety and Licensing Board Panel
Atomic Safety and Licensing Appeal Board
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DOCKETED USNRC APR 20 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

4/17/77

In the Matter of)
)
CAROLINA POWER & LIGHT COMPANY) Docket No. 50-261
) 50-261 (OL Modification)
(H. B. Robinson, Unit No. 2))

INTERVENOR'S RESPONSE TO APPLICANT'S MOTION
AND INTERVENOR'S REQUEST FOR A FORMAL ORDER OF WITHDRAWAL

Intervenor in what he deems to be the last communication to this Board apologizes for the manner of his last two communications, they being merely copies of letters sent to EPA and its equivalent State agency. As reference to the file will reflect, most of the pleadings and other matters filed were this individual's poor typing the result of night, early morning and weekend efforts. At times short cuts were taken and these were two examples.

Applicant has clearly set forth the position of Intervenor at this time, both in its Motion and by the copy of my letter of March 24th attached thereto.

Intervenor does hereby formally move for an Order of this Board dismissing him as a party to any further proceedings that may be held.

Whether appropriate or not, Intervenor hereby expresses to the Board, to those on the service list and through them to the agencies they represent his sincere appreciation for the many kindnesses shown.

Respectfully submitted,

John D. Whisenhunt, Intervenor

Florence, S. C.

April 17, 1977

CERTIFICATE OF SERVICE

I hereby certify that copies of "INTERVENOR'S RESPONSE TO APPLICANT'S MOTION AND INTERVENOR'S REQUEST FOR A FORMAL ORDER OF WITHDRAWAL" dated April 17, 1977, have been served on the following by deposit in the United States mail, first class postage prepaid this 18th day of April, 1977.

John F. Wolf, Esquire, Chairman
3409 Shepherd Street
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Union Carbide Corporation
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Auburn L. Mitcheal, Esquire
Office of the Executive Legal Director
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Florence, S. C.

April 18, 1977

John D. Whisenhunt

Reg Central

04/14/77

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

NRC STAFF SUPPORT OF APPLICANT'S MOTION FOR
THE ISSUANCE OF AN ORDER ACCEPTING WITHDRAWAL OF INTERVENTION

The NRC Staff (Staff) supports Applicant's Motion of April 1, 1977 requesting that the Board issue an order accepting the withdrawal of Mr. John D. Whisenhunt as a party to this consolidated proceeding. By letter to EPA, Region IV, March 24, 1977, Mr. Whisenhunt withdrew his request for an EPA adjudicatory hearing and also indicated that he no longer had any basis to continue in this proceeding. On April 12, 1977, Mr. Whisenhunt, in a telephone conversation with Staff counsel, reaffirmed his intent to withdraw from this proceeding as manifested by his March 24, 1977 letter to EPA (with copy to the Board) and as previously indicated in discussion with Staff counsel April 1, 1977. Therefore, the Staff supports Applicant's motion.

The Staff, like Applicant, is of the understanding that EPA expects to act soon on Applicant's §316(a) request.[1/] Once EPA has acted, it

[1/] The Staff received for comment a draft NPDES permit for the H. B. Robinson Steam Plant April 8, 1977

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will be appropriate to consider the proper disposition of this consolidated proceeding.

Respectfully submitted,

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 14th day of April, 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF SUPPORT OF APPLICANT'S MOTION FOR THE ISSUANCE OF AN ORDER ACCEPTING WITHDRAWAL OF INTERVENTION" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or air mail, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 14th day of April, 1977:

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Chevy Chase, Maryland 20015

Dr. A. Dixon Callihan
Union Carbide Corporation
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Dr. Richard F. Cole*
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Washington, D. C. 20555

Atomic Safety and Licensing
Board Panel*
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

April 1, 1977

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY	)	Docket No. 50-261
	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

APPLICANT'S MOTION FOR THE ISSUANCE OF AN ORDER ACCEPTING WITHDRAWAL OF INTERVENTION

Carolina Power & Light Company ("Applicant") hereby moves the Atomic Safety and Licensing Board ("the Board") to issue an order accepting the withdrawal of intervenor John D. Whisenhunt as a party to this consolidated proceeding.

In a letter of March 24, 1977, to Region IV of the U.S. Environmental Protection Agency ("EPA") and the South Carolina Department of Health and Environmental Control (attached hereto), Mr. Whisenhunt withdrew his request for an adjudicatory hearing on Applicant's request for an alternative thermal effluent limitation pursuant to Section 316(a) of the Federal Water Pollution Control Act Amendments of 1972 ("FWPCA")1/

1/ 33 U.S.C. §1326(a).

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and announced that he no longer had any basis for continuing as an intervenor or party before the Nuclear Regulatory Commission. The letter indicates that a copy of it was being sent to the Board.

Applicant therefore requests that the Board acknowledge Mr. Whisenhunt's submission by issuing an order which accepts his withdrawal as a party to this consolidated proceeding. Following the issuance of EPA's decision on Applicant's request under Section 316(a) of the FWPCA, which is expected to occur in the near future,[2/] Applicant will communicate to the Board its proposal for the appropriate disposition of the consolidated proceeding.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

By George F. Trowbridge
George F. Trowbridge
Counsel for Applicant

2/ EPA conducted a legislative (non-adjudicatory) hearing on the request on February 8, 1977.

BRIDGES AND WHISENHUNT

ATTORNEYS AND COUNSELLORS AT LAW

FLORENCE, SOUTH CAROLINA 29501

March 24, 1977

ATTN: MONA ELLISON
U. S. Environmental Protection Agency
Region IV, Water Enforcement Branch
1421 Peachtree Street, N. E.
Atlanta, Georgia

ATTN: CHARLES J[illegible]
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, South Carolina 29211

Re: Adjudicatory Hearing, NPDES Permit No. SC0002925
Carolina Power & Light Company - H. B. Robinson Steam Plant

Under date of February 14, 1977 and on page 6 of a 7 page letter, I requested and, if appropriate, demanded an adjudicatory hearing in connection with the 316 demonstration and the permit resulting therefrom. In 1974 when I first wrote to EPA relative to Lake Robinson, I recall that I had to state my interest in the matter and that I would be available and make any witnesses of mine available. That Petition was disposed of by an Order of Judge Yost. So that there can be no misunderstanding and before any response is made to my letter of February 14th, I withdraw any request for or any demand for any adjudicatory hearing. I withdraw any committment to appear, participate or contribute in any manner to any hearing that may be scheduled. Any witnesses that I have furnished in the past are, of course, free to do as they desire. I withdraw only myself as an intervenor or participant.

The writer has disposed of the property which gave rise to my knowledge and interest in the matter. It was clearly demonstrated at the meeting on February 8, 1977, in Hartsville, South Carolina, that my efforts were contrary to the general trend of the public who attended at my published invitations as many who came did not want to express an opinion, many who had indicated an intent to speak declined and a number who did speak felt that any possible bad effects were outweighed by the good. In the light of this, I accepted the invitation expressed that night to negotiate, did so and no longer have any basis for continuing as an intervenor or party before your organizations or before the Nuclear Regulatory Commission. A copy of my letter of the 14th of February to you went tothe members of the Board of that organization and therefore a copy of this letter is being sent to them.

Thank you for past considerations.

Yours very truly,

John D. Whisenhunt

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	)	50-261 (OL Modification)
(H. B. Robinson, Unit No. 2)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Applicant's Motion for the Issuance of an Order Accepting Withdrawal of Intervention" were served upon each of the persons listed on the attached Service List by deposit in the United States mail, postage prepaid, this 1st day of April, 1977.

SHAW, PITTMAN, POTTS & TROWBRIDGE

By George F. Trowbridge
George F. Trowbridge
Counsel for Applicant

Dated: April 1, 1977

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SERVICE LIST

John F. Wolf, Esquire
3409 Shepherd Street
Chevy Chase, Maryland 20015

Dr. Richard F. Cole
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

Auburn L. Mitchell, Esquire
Office of the Executive Legal Director
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

John D. Whisenhunt, Esquire
Bridges and Whisenhunt
P.O. Box 130
Florence, South Carolina 29501

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

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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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CAROLINA POWER AND LIGHT COMPANY	)	Docket No. 50-261
	)	
(H. B. Robinson, Unit No. 2)	)	

NOTICE OF APPEARANCE

Notice is hereby given that the undersigned attorney herewith enters an appearance in the captioned matter. In accordance with § 2.713(a), 10 CFR Part 2, the following information is provided:

Name	-	Auburn L. Mitchell
Address	-	Office of Executive Legal Director U.S. Nuclear Regulatory Commission Washington, D.C. 20555
Telephone Number	-	Area Code 301 - 492-7268
Admissions	-	Supreme Court of the State of Oklahoma District of Columbia
Name of Party	-	NRC Staff U.S. Nuclear Regulatory Commission Washington, D.C. 20555

Auburn L. Mitchell

Auburn L. Mitchell
Counsel for NRC Staff

Dated at Bethesda, Maryland
this 8th day of March, 1977.

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NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)
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CAROLINA POWER AND LIGHT COMPANY) Docket No. 50-261
)
(H. B. Robinson, Unit No. 2))

CERTIFICATE OF SERVICE

I hereby certify that copies of "NOTICE OF APPEARANCE", dated March 8, 1977, in the above-captioned matter, have been served on the following by deposit in the United States mail, first class or air mail, or, as indicated by an asterisk, through deposit in the Nuclear Regulatory Commission's internal mail system, this 8th day of March, 1977:

John F. Wolf, Esq., Chairman
3409 Shepherd Street
Chevy Chase, Maryland 20015

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

Dr. Richard F. Cole*
Atomic Safety and Licensing Board
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Hartsville Memorial Library
Home and Fifth Avenues
Hartsville, South Carolina 29550

George F. Trowbridge, Esq.
Shaw, Pittman, Potts & Trowbridge
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Washington, D. C. 20006

Docketing and Service Section
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Washington, D. C. 20555

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Atomic Safety and Licensing
Appeal Board*
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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Board Panel*
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