EXHIBIT D

A
N. A. Eisenberg

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 0 6 1978

MEMORANDUM TO: Files

FROM: Catherine R. Mattsen, FPSSB, ES, SD

THRU: Keith G. Steyer, Chief, FPSSB, ES, SD

SUBJECT: CHANGE IN POTENTIAL HAZARDS FROM RELEASE OF SPENT FUEL AFTER 5-YEAR DECAY

In considering the potential hazards of transporting spent fuel through urban environs as analyzed in SAND 77-1927, the question arose to the staff: To what extent would holding back spent fuel for five years before shipment reduce the potential hazards that could result from the release of the radioactive material by accident or through sabotage?

To answer this question I calculated the relative potential latent cancer fatalities for 120-day-old spent fuel versus 5-year-old spent fuel (SAND 77-1927 analyzed 150-day-old spent fuel). For the radionuclide inventory at 120 days and five years a recent (May 1978) run of these values, using the ORIGEN code, was obtained from O. W. Herman, ORNL (note attachment "A"). The maximum percent released for the various nuclides was assumed the same as in SAND 77-1927. These actually play a small part in calculating the relative hazards; since the nuclides that were the primary contributors to the dose were all solids, the same percent release (1%) was assumed for all of these. Rem-per-microcurie values came from SAND 77-1927, table 58; for a few nuclides which were not included in table 58, values were obtained from WASH-1400 and adjusted to reflect the difference between rem-per-microcurie-deposited in the pulmonary compartment and rem-per-curie inhaled. For the risk factors, i.e., latent cancer fatalities per million person-rem, I used those in WASH-1400 and repeated the calculation using those in SAND-77-1927. These two sets of risk factors varied in only two cases (for thyroid and for bone, Sandia used a varying risk factor), however the difference in the bone risk factor did affect the final answer.

As a result of these calculations I concluded that the potential hazard from release of 5-year-old spent fuel was one third to one half of the

567 195

POOR ORIGINAL

7907160301 C

potential hazard of 120-day-old spent fuel or that holding back 120-day-old spent fuel for an additional 4 2/3 years results in a decrease in potential hazard by a factor of 2 or 3 depending upon which risk factors are more accurate.

/s/

Catherine R. Mattsen
Fuel Process Systems Standards Br.
Division of Engineering Standards
Office of Standards Development

Attachments:
A. Ltr. dated 5/3/78 from O. Hermann (Union Carbide) to R. Stanford, SD
B. Methods Involved in Calculating Relative Potential Hazards from Release of Spent Fuel at 120 Days and at 5 Yrs.

Distribution: Central Files
SD Rdg/Alpha
FPSSB Rdg/Subj

bcc:
R. B. Minogue
R. G. Smith
G. A. Arlotto
R. M. Bernero
K. G. Steyer
R.E.L. Stanford
C. R. Mattsen
N. A. Eisenberg
D. R. Hopkins
A. N. Tse
D. O. Nellis
R. F. Barker
K. R. Goller
V. Hodge
C. Sawyer
W. Lahs
C. MacDonald
D. Nussbaumer

FPSSB Task No.: N/A

567 196

OFFICE	SD:FPSSB	SD:FPSSB				
SURNAME	CRMattsen:bh	KGSteyer				
DATE	12/5/78	12/1- /78				

EXHIBIT 5

Calculations for transshipment costs compared to on-site storage

October 11, 1978

Mr. J. J. Mackay
Design Engineering

Subject: Fuel Storage
Spent Fuel Transportation Costs
File GS 513.20

Dear Sir:

The attached information is supplied on the above subject as requested.

Please advise if I can provide other information.

Yours very truly,

D. F. Frech
Nuclear Engineer

DFF:mo

Attachment

CC W/Att: Mr. H. T. Snead
Mr. R. F. Wardell
Mr. R. G. Snipes
Mr. H. B. Tucker

POOR ORIGINAL

567 197

ESTIMATED SPENT FUEL TRANSPORTATION COSTS

October, 1978

Equipment and Services

Daily lease charges for cask, yoke, vehicle and special tools and equipment:

Truck	$ 520
Rail	3600

Freight

Truck: $1.85 per mile for loaded or empty cask.
Note: $455 for each fuel assembly shipped off-site could be added to this, based on $17.50 per hour standby charges.

Rail Cask:

See Mr. J. W. Long's attached October 9, 1978 letter. Although previous information assumed that mandatory special trains would be utilized in the loaded direction, realistic estimates should assume special train in both directions to meet schedule constraints.

Labor

The following estimates are based on $13/hr. including fringe benefits and overhead, ten assembly rail cask and experience and observations concerning spent fuel shipments.

Cask	Type of Transfer	Cask Turnaround, Hr.	Number Persons	Hours	$ Per Fuel Assembly
Truck	on-site	6	4	24	624
Truck	off-site	16	5	80	2080
Rail	on-site	20	5	100	260
Rail	off-site	36	6	216	562

567 198

[illegible]

RAIL TRANSPORTATION
(See switching note below)

BETWEEN / AND	CHEROKEE	MCGUIRE	PERKINS	OCONEE (RAILHEAD)
CATAWBA				
(1)	$ 5,865	$ 6,168	$ 9,048	$ 9,048
(2)	2,420	2,543	3,735	3,735
(3)	2,319	4,638	2,319	2,319
(4)	4,638	9,276	4,638	4,638
CHEROKEE				
(1)		6,576	9,048	8,280
(2)		2,723	3,735	3,420
(3)		4,638	2,698	2,319
(4)		9,276	5,396	4,638
MCGUIRE				
(1)			7,824	9,600
(2)			3,263	3,960
(3)			4,638	4,638
(4)			9,276	9,276
PERKINS				
(1)				11,472
(2)				4,748
(3)				4,427
(4)				8,854

(1) LOADED CASK - MINIMUM WEIGHT 240,000 lbs.

(2) EMPTY CASK - MINIMUM WEIGHT 225,000 lbs.

(3) SPECIAL TRAIN SERVICE - ONE WAY

(4) SPECIAL TRAIN SERVICE - ROUND TRIP

SWITCHING NOTE - CATAWBA, CHEROKEE AND PERKINS, SWITCHING CHARGE OF $274.00 PER CAR OR $556.92 IF SPECIAL TRAIN SERVICE PERFORMANCE IN ADDITION.

567 199

JWL
10/9/78

POOR ORIGINAL

Contention 5

~~Criticality and~~

~~Even before the problem~~

Nuclear Reactors ~~are~~ Plants have always ~~been~~ had spent fuel pools which were designed to accommodate provision for the temporary placement of the reactor full core complement of fuel assemblies. ~~It has only been since the~~

Unfortunately, the federal ban on reprocessing has ~~[illegible]~~ created the need to violate this accepted design standard at certain utility facilities. We fully understand that no NRC regulation ~~[illegible]~~ has been promulgated simply because the matter is ~~[illegible]~~ certainly a financial risk as opposed to a safety consideration. Moreover the cost of replacement power for ~~[illegible]~~ Oconee approximates $200,000 per day. The potential value then of a full core reserve for an Oconee spent fuel pool is then $35,400,000. whereas the costs of shipping 177 fuel assemblies off-site to McGuire approximates $344,000,

567 200

POOR ORIGINAL

23. Question

In accordance with Table 5.2-1 of the aforementioned submittal, the occupational exposure expected for the spent fuel pool modification is estimated to be 125.5 man-rem. Provide the data showing the derivation of this estimation. The data should include the expected dose rate to workers during each phase of the operation, the number of people involved and their occupancy times. Include the exposure that will be received from removal, decontamination and disposal of miscellaneous equipment presently stored in the pool.

Response

Since the original estimate of 125.5 man-rem for completion of the proposed modification was submitted, a subsequent estimate has been calculated using more reliable data and additional information which was unavailable previously. Also, information from the Ginna modification was reviewed and factored into the revised estimate where applicable. The total occupational exposure necessary to accomplish the pool modification is presently estimated to be approximately 76 man-rem. This estimate is broken down in the revised Table 5.2-1 as to work group, number of individuals involved, occupancy time, average dose rate, and job exposures. It should be noted that uncertainties exist as to the effectiveness of underwater vacuuming in reducing dose rates to divers, and as to radiation levels from removed rack sections.

567 201

TABLE 5.2-1 (revised)

OCONEE NUCLEAR STATION

SPENT FUEL POOL 1 & 2 MODIFICATION DOSE ESTIMATES

1. Removal, Decontamination, and Disposal of Miscellaneous Equipment Presently Stored in Pool:

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Avg. Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
Operations	2	70	10	0.7
Engineering	2	70	10	0.7
Total	4	140	-	1.4

2. Underwater Vacuuming:

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Avg. Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
Miscellaneous[1]	2	160	15	2.4
Operations	1	80	10	0.8
Health Physics	1	80	5	0.4
Total	4	320	-	3.6

3. Base Plate Survey:

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Avg. Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
Miscellaneous				
diver	1	30	100	3.0
diver supvr.	1	30	10	0.3
Engineering	5	20	10	0.2
Health Physics	1	30	10	0.3
Janitorial	2	10	10	0.1
Total	10	120	-	3.9

567 202

TABLE 5.2-1 (continued)

4. Rack Removal and Installation:

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Avg. Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
Miscellaneous				
divers(underwater)	5	300	100	30.0
divers(pool side)	5	300	5	1.5
diving supvr.	1	300	10	3.0
Operations				
bridge operators	2	1200	10	12.0
crane operators	2	800	5	4.0
Engineering	2	200	5	1.0
Health Physics	3	1200	10	12.0
Quality Assurance	1	20	10	0.2
Janitorial	2	200	5	1.0
Total	23	4520	-	64.7

5. Rack Disposal:

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Avg. Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
Miscellaneous[2]	2	18	100	1.8
Health Physics	2	14	5	0.1
Janitorial	2	14	5	0.1
Total	6	46	-	2.0

GRAND TOTALS

Work Group	No. of Individuals	Occupancy Time (Man-Hrs.)	Effective Dose Rate (mrem/hr)	Job Exposure (Man-Rem)
ALL	47	5146	15	75.6

[1]Vendor underwater vacuum operators

[2]Vendor power saw operator and assistant

567 203