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RESPONSE TO NRC REQUEST OF 08/09/78... FORWARDING ADDL INFO CONCERNING THE  
PROPOSED SHIPMENT OF FOUR FUEL ASSEMBLIES FROM THE CRYSTAL RIVER 3 REACTOR TO  
OCONEE NUC STATION.

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REGULATORY DOCUMENT COPY

DUKE POWER COMPANY

POWER BUILDING

422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.  
VICE PRESIDENT  
STEAM PRODUCTION

August 30, 1978

TELEPHONE: AREA 704  
373-4083

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Attention: Mr. Robert W. Reid, Chief  
Operating Reactor Branch #4

Reference: Oconee Nuclear Station  
Docket Numbers: 50-269, -270, -287

Dear Sir:

Please find attached responses to the requests for additional information concerning the proposed shipment of four fuel assemblies from the Crystal River 3 reactor to Oconee Nuclear Station, transmitted by your letter of August 9, 1978. As requested, 40 copies of our response have been provided.

Very truly yours,

*William O. Parker Jr.*  
William O. Parker, Jr. *by WAH*

KRW:scs  
Attachments (40)

782480098

*Acc  
5/40\**

DUKE POWER COMPANY

Response to Request for Additional Information  
Shipment of Spent Fuel from Crystal River 3  
to Oconee Nuclear Station

QUESTION 1

Discuss the occupational exposure for the movement of four spent fuel assemblies from Crystal River 3 to Oconee. Address the expected dose rates in the vicinity of the spent fuel pools at each plant, number of workers involved at each plant and occupancy times for each phase of the operation. Include moving the cask into the fuel building, placing the fuel in or removing it from the cask, and removing the cask from the building. Provide the resultant man-rem exposure.

RESPONSE

The following is a summary of Oconee experience involved in the preparation for transport of spent fuel. The results are conservative with respect to such operations at Crystal River since the spent fuel pool at Crystal River is relatively clean. Dose rates experienced at Crystal River are less than 1 mR/hr compared to 10 mR/hr levels currently experienced at the Oconee Unit 3 pool due to the recent refueling. Actual exposure at Oconee should also be significantly lower than those used here since the pool itself should be quite cleaner and therefore, expected dose levels will be much lower.

I. Crane moves cask from truck to platform and lid is removed.  
Lift adapters are attached.

a) dose rate in area ~ 10 mR/hr due to recent refueling  
(time ~ 1 hour)

$$(10 \text{ mR/hr}) \times (1 \text{ hr}) \times (3 \text{ men}) = \underline{0.030 \text{ man-rem}}$$

II. Crane moves cask into pool. Fuel assembly is loaded, from bridge, into cask. Crane then moves loaded cask back to platform and lift fittings are removed

a) dose rate for bridge operator ~ 20 mR/hr (time ~ 0.5 hr)  
~ 15 mR/hr (time ~ 0.5 hr)

b) dose rate for crane operator ~ 15 mR/hr (time ~ 0.5 hr)  
- while attaching lid ~ 100 mR/hr (time ~ 0.5 hr)

c) dose rate for person standing  
by ~ 15 mR/hr (time ~ 1.0 hr)

$$((20 \text{ mR/hr}) \times (0.5 \text{ hr}) \times (1)) + ((15 \text{ mR/hr}) \times (0.5 \text{ hr}) \times (1)) + ((15 \text{ mR/hr}) \times (0.5 \text{ hr}) \times (1)) + ((100 \text{ mR/hr}) \times (0.5 \text{ hr}) \times (1)) + ((15 \text{ mR/hr}) \times (1.0 \text{ hr}) \times (1)) = \underline{0.090 \text{ man-rem}}$$

III. Crane lifts cask while personnel spray down cask

a) dose rate in area ~ 10 mR/hr (time ~ 1 hr)

$$(10 \text{ mR/hr}) \times (1 \text{ hr}) \times (3 \text{ men}) = \underline{0.030 \text{ man-rem}}$$

IV. Cask moved to pool level and decontaminated

a) dose in area ~ 10 mR/hr (time ~ 12 hr)

$$(10 \text{ mR/hr}) \times (12 \text{ hr}) \times (3 \text{ men}) = \underline{0.360 \text{ man-rem}}$$

V. Swipes taken by HP to assure effectiveness of decontamination procedures.

a) dose in area ~ 10 mR/hr (time ~ 1 hr)

$$(10 \text{ mR/hr}) \times (1 \text{ hr}) \times (2 \text{ men}) = \underline{0.020 \text{ man-rem}}$$

VI. Cask placed on truck. No appreciable exposure involved.

VII. Cask prepared for shipment (attaching tie-down straps, etc.)

a) dose rate in area ~ 3mR/hr (time ~ 1 hr)

$$(3 \text{ mR/hr}) \times (1 \text{ hr}) \times (3 \text{ men}) = \underline{0.01 \text{ man-rem}}$$

$$\text{Total dose (I through VII)} = \underline{0.540 \text{ man-rem (per loading)}}$$

The total occupational dose at Oconee due to the four shipments should be no more than 2.2 man-rem. Thus the maximum dose at both plants should be considerably less than 5 man-rem.

## QUESTION 2

Provide the details for transporting the spent fuel from Crystal River 3 to Oconee (e.g., route, distance, mode of transportation, etc.). Provide the expected man-rem exposure to workers transporting the spent fuel and to the population on the route. Address the expected dose rates, number of people involved, and occupancy times.

## RESPONSE

### ROUTE

The transportation of the four assemblies will be performed by a common carrier. The actual rate taken by the trucks is determined by the carrier and the Department of Transportation through its regulations in this regard. The route taken by the four Duke assemblies transported to Crystal River is listed below and a similar route is anticipated for the shipments from Crystal River. The total distance, one way, is 476 miles and is expected to take approximately 13 hours to complete.

The route taken to Crystal River was:

- (1) Appropriate secondary highways to US-76/US-123;
- (2) US-76 to I-85 South;
- (3) I-85 to I-285 East (Atlanta bypass);
- (4) I-285 to I-75 South to North Central Florida;
- (5) Appropriate secondary roads to US-19 and Crystal River site.

### Radiological Effects

The radiological effects of the transport of spent fuel off-site is addressed in WASH-1238 "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants" (December 1972). The assumptions, calculations and results reported therein are considered to be applicable to the proposed shipments except where noted below.

### Drivers

The radiological effect on the drivers is small. The maximum exposure allowed in the cab is 2 mrem/hr. The route is expected to take 13 hours. Two drivers will occupy the cab for the duration. If a maximum time of 15 hours and the maximum dose rate is experienced to and from Oconee, the resultant exposure will be 0.480 man-rem. In WASH-1238 it was assumed that the actual exposure would be 10 mrem/driver/trip (20 hour trip). This corresponded to actual industry experience. This would be corrected to 6.5 mrem/driver/trip (13 hour trip) for these shipments. Thus the total expected dose would be approximately 0.05 man-rem.

General Public

The expected population dose to the public is divided into 2 categories; on-lookers and those encountered in route.

On-lookers

The assumptions in WASH-1238 are that no more than 10 individuals/trip will approach the transport vehicle during periods when the truck is stopped for eating, or otherwise, and that each would receive a maximum dose of 1.3 mrem (3 minutes at 3 feet). Thus by reducing the annual value given in WASH-1238 by a factor of 15 (4/60) an estimate of the number of and dose to on-lookers can be made.

Population In-route

The assumptions in WASH-1238 are in need of two corrections to be used for this situation. The report assumes a constant population density of 330 persons/square mile and a route length of 1000 miles (20 hrs.). The actual route to be used is less than 500 miles long and should take no more than 15 hours. Also, the report is dealing with annual shipments and therefore assumes 60 such shipments. This operation will only require four shipments. Additional conservatisms remain to assure adequate margin between expected and actual doses. The annual doses reported in WASH-1238 are therefore reduced by  $(4/60) \times (15/20) = 0.05$ . The number of persons exposed can only be reduced by 50% since the number is a linear function of route distance.

EXPECTED DOSE AND NUMBER OF INDIVIDUALS AFFECTED

	<u>WASH - 1238</u>	<u>CRYSTAL RIVER TO OCONEE</u>
On-lookers		
Number	600	40
Dose	0.8 man-rem	0.052 man-rem
Encountered In-route		
Number	300,000	150,000
Dose	1 man-rem	0.05 man-rem

Total expected dose to general public is approximately 0.1 man-rem

QUESTION 3

Provide the burnup and age of the four spent fuel assemblies to be shipped from Crystal River 3 to Oconee.

RESPONSE

In Florida Power Company's amendment request transmitted by a June 28, 1978 letter from W. P. Stewart to Director, ONRR, the following information was provided on the subject fuel:

<u>B&amp;W Identification Number</u>	<u>Initial Enrichment W/O U-235</u>	<u>Burnup MWD/MTU</u>	<u>Type</u>	<u>Original Fuel Density Theoretical</u>
3A-48	1.93	8580	Mark B-3	92.5
3A-10	1.93	8580	Mark B-3	92.5
3A-06	1.93	8580	Mark B-3	92.5
3A-37	1.93	8580	Mark B-3	92.5

The Crystal River 3 Unit was shutdown on March 3, 1978. The fuel will have decayed approximately 250 days before the proposed transportation will begin.