PDR 50-186

UNIVERSITY OF MISSOURI

Research Reactor Facility

Research Park
Columbia, Missouri 65201
Telephone (314) 882-4211

July 12, 1979

Director
Office of Nuclear Material
Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Enclosed is our request for route approval between Columbia, Missouri and Savannah River Plant, South Carolina. This request concerns our fourth spent fuel shipment this year which is planned after the 16 July deadline for implementation of NUREG-0561. An expeditious response would be appreciated so that our target date of 30 July can be met.

If any questions arise, please call Dave McGinty, Reactor Physicist, at 314-882-4011.

Sincerely,

Don M. Alger

Don Alger
Associate Director

DA:vs

Enclosure

FEE EXEMPT

655 110

SHIPMENTS OF IRRADIATED REACTOR FUELS

UNIVERSITY OF MISSOURI RESEARCH REACTOR

Table of Contents

E. Food and Fuel Stop Locations

F. Safe Havens for:

-- Temporary refuge.

-- Emergency assistance.

G. Trip Log

-- Names of carriers, drivers and escorts.

-- Dates and times of departure and arrival (planned and actual).

-- Dates, times and locations of stops and layovers.

-- Identification of designated central location.

-- Dates, times and locations of status calls to designated location.

-- Deviations from planned route.

-- Other abnormal occurrences with regard to routes, equipment, vehicles, personnel, weather, traffic or threats.

A. CARGO DESCRIPTION

SHIPPING DATA

A. Cargo Description - continued

Gross weight of shipment

1. Cask weight empty	23,310	lbs.
2. Shipping base	6,000	lbs.
3. Fuel load	113 + 390 (basket)	lbs.
4. Coolant	136	lbs.
5. Parts, boxes and yokes	N/A	lbs.
Gross weight	29,949	lbs.

655 114

Ship. Date _____

III. Information on Solid Preirradiated Nuclear Fuels Shipped

Element Serial Number	Design & Type	U_{235} gms	U_{238} gms	U_{235} + U_{238} gms	Total Wt. of Element
775F55	MURR Plate	773.943	56.583	830.526	6295 ± 10
775F62	MURR Plate	773.948	56.437	830.526	6295 ± 10
775F66	MURR Plate	774.390	56.680	831.070	6295 ± 10
775F75	MURR Plate	775.060	56.940	832.000	6295 ± 10
775F76	MURR Plate	775.220	56.950	832.170	6295 ± 10
775F78	MURR Plate	775.420	56.970	832.390	6295 ± 10
775F95	MURR Plate	775.410	56.620	832.390	6295 ± 10
775F97	MURR Plate	774.980	56.620	831.600	6295 ± 10
Total No. Elements 8					
TOTALS		6,198.371	453.8	6,652.672	50,360

Entered by David M. McGinty Checked by J C McFarlane

of MURR

Date 9 July 1979

655 115

UNIVERSITY OF MISSOURI RESEARCH REACTOR

III. Information on Solid Irradiated Nuclear Fuels Shipped

Element Serial Number	Np_{237} gms	U_{235} gms	U_{238} gms	Pu* gms	U_{236}+ U_{235}+ U_{238} gms	U^{236} gms
775F55	5.42	588.862	56.583	0	674.823	29.378
775F62	5.42	589.660	56.437	0	675.349	29.252
775F66	5.42	589.535	56.680	0	675.557	29.342
775F75	5.42	590.596	56.940	0	676.816	29.280
775F76	5.42	590.756	56.950	0	676.986	29.280
775F78	5.42	596.525	56.970	0	681.891	28.396
775F95	5.42	588.250	56.620	0	674.580	29.710
775F97	5.42	587.30	56.620	0	673.720	29.800

Total No.
Elements 8

TOTALS	43.36	4,721.484	453.8	0	5,409.722	234.438

*ORIGN code output indicates less than 0.2 grams per element total plutonium (ORNL-4628).

Entered by David M. McGinty

Checked by [signature]

of MURR

Date 29 June 1979

655 116

Ship. Date _____

UNIVERSITY OF MISSOURI RESEARCH REACTOR

III. Information on Solid Irradiated Nuclear Fuels Shipped

ement Serial Number	Date of Initial Irradiation	Date of Final Irradiation	Irradiation Period* (days)	Cooling Period to Shipping Date/4July77 (days)***	Burn-up (MW-days)	Decay Heat Load** (watts)	Activity (curies)
775F55	19 May 75	19 Dec 77	120	573 (570)	146.890	45.4	1.17×10^4
775F62	13 Oct 75	19 Dec 77	120	573 (570)	146.260	45.4	1.17×10^4
775F66	9 Aug 76	23 Jan 78	120	538 (510)	146.710	52.8	1.34×10^4
775F75	27 Feb 77	6 Feb 78	120	524 (510)	146.400	52.8	1.34×10^4
775F76	27 Feb 77	6 Feb 78	120	524 (510)	146.400	52.8	1.34×10^4
775F78	17 Dec 76	13 Feb 78	120	517 (510)	141.980	52.8	1.34×10^4
775F95	10 Jan 78	12 Feb 79	120	153 (150)	148.540	301.2	7.30×10^4
775F97	21 Mar 78	12 Feb 79	120	153 (150)	148.950	301.2	7.30×10^4

tal No.
ements 8

TOTALS					1,172.13	904.4	2.23×10^5

*MURR fuel elements rotate in and out of core. They are not irradiated to total burnup in a continuous run.

**Heat load and activity calculated based on operating history using the ORIGN code, ORNL-4628.

***Numbers in parentheses are de tim used in determining ORIGN output dat

Estimated total activity, (curies of β & γ) 2.23×10^5

Estimated total decay heat load, (Btu/hr.) 3,086.7 BTU/hr

Entered by David M. McGinty

Checked by J C Nuttall
of MURR

Date 29 June 1979

Form NRC-618
(12-73)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE

For Radioactive Materials Packages

1.(a) Certificate Number	1.(b) Revision No.	1.(c) Package Identification No.	1.(d) Pages No.	1.(e) Total No. Pages
5942	2	USA/5942/B( )F	1	4

2. PREAMBLE

2.(a) This certificate is issued to satisfy Sections 173.393a, 173.394, 173.395, and 173.396 of the Department of Transportation Hazardous Materials Regulations (49 CFR 170-189 and 14 CFR 103) and Sections 146-19-10a and 146-19-100 of the Department of Transportation Dangerous Cargoes Regulations (46 CFR 146-149), as amended.

2.(b) The packaging and contents described in item 5 below, meets the safety standards set forth in Subpart C of Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

2.(c) This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application—

3.(a) Prepared by (*Name and address*):

General Electric Comapny
P.O. Box 460
Pleasanton, CA 94566

3.(b) Title and identification of report or application:

General Electric Application dated December 23, 1968, as supplemented.

3.(c) Docket No. 71-5942

4. CONDITIONS

This certificate is conditional upon the fulfilling of the requirements of Subpart D of 10 CFR 71, as applicable, and the conditions specified in item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Fissile Class, Other Conditions, and References:

(a) Packaging

(1) Model No.: GE-700

(2) Description

A steel encased lead shielded shipping cask enclosed by a double-walled protective jacket of the same shape with a rectangular base-plate. The cask is a double-walled steel circular cylinder, 37-inch-diameter by 65-inch high with a central cavity 15-inch-diameter by 51-inch high. Approximately 10.25 inches of lead surround the central cavity. The cask is equipped with a cavity drain line and lifting device. Closure is accomplished by a gasketed and bolted steel lead filled plug. The maximum weight of the packaging is 23,000 pounds.

The cask may be modified with a 14-inch high cavity extension. The modified cask is 79 inches high and weighs 28,000 pounds.

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5. (a) Packaging (Continued)

(3) Drawings

The packaging is constructed in accordance with the following General Electric Company Drawings Nos.:

237E325, Rev. 2
106D4150, Rev. 0
106D4331, Rev. 0
195F127, Rev. 0
289E646, Rev. 1
289E647, Rev. 1
289E642, Rev. 2

(b) Contents

(1) Type and form of material

Byproduct, source, and special nuclear material contained in solid or metal oxide form.

(2) Maximum quantity of material per package

(i) 740 gm U-235, provided that the maximum U-235 enrichment does not exceed 6 weight percent; or

(ii) 1,200 gm U-235, provided that the fuel material is in the form of MTR-type fuel elements with a minimum active fuel length of 23 inches; or

(iii) 220 gm fissile material; or

(iv) 1,650 gm U-235, provided that the maximum U-235 enrichment does not exceed 3.5 weight percent and the fuel material is in the form of 88 rods loaded with 0.376-inch diameter pellets with a minimum active fuel length of 37 inches; or

(v) those values presented in Figure 1, UO_2 Weight Limits for Model 700 Shipping Container, of GE application dated February 25, 1970, applicable to fuel material in the form of rods with a minimum pellet diameter of 0.40-in , or

(vi) 5,100 gm U-235, provided the fuel is in the form of ETR-type fuel elements (GETR Fuel) with each element containing no more than 510 gm U-235 and inserted in the spaced stainless steel fuel shipping basket described in GE application dated February 25, 1970 and GE Drawing No. 106D4150, Rev. 0.

5. (b) Contents (Continued)

(2) Maximum quantity of material per package (Continued)

(vii) 6,200 gm U-235, provided the fuel is in the form of MURR TRTR type elements containing not more than 775 gm U-235 per element; loaded and spaced in the stainless steel fuel shipping basket as described in MURR Drawing No. 1228, Sheets 1 thru 5, Revision 0. Fuel elements shall have at least 150 days cooling time since last reactor operation.

(3) Maximum quantity of radioactive decay heat per package

(i) 6,500 watts for dry shipments, or

(ii) 1,500 watts for wet shipments, provided that the cavity shall contain at least a 1,000 cu in air void (at standard temperature and pressure) at the time of delivery to a carrier for transport.

(c) Fissile Class III

Maximum number of packages per shipment 2

6. The material specified in Paragraph 5.(b)(1) shall be clad, encpasulated, or contained in a metal encasement of such material and construction as to withstand the combined effects of internal heat load and the 1475° fire with the closure pretested for leak tightness or in accordnace with the statements and representations contained in GE application dated February 4, 1969. Shoring may be provided to minimize movement of contents during transport.

7. The applicant shall confirm annually that the pressure relief valve is operable at 100 psig.

8. When needed, sufficient antifreeze in the cask shall be used to prevent damage of any component of the package due to freezing.

9. The total radioactivity in the coolant shall not exceed the limits specified in 10 CFR §71.36(a)(2).

10. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12(b).

11. Expiration date: April 30, 1980.

REFERENCES

General Electric application dated December 23, 1968.

Supplements dated: February 4, 8, and 27, 1969; February 25, 1970; and April 4 and June 7, 1972.

Additional References Required for the Contents Limited In Item 5.(b)(2)(vii).

University of Missouri application dated January 10, 1979.

Supplement dated: May 22, 1979.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Branch
Division of Fuel Cycle and
Material Safety

Date: JUN 12 1979

B. ANTICIPATED SCHEDULE

C. ROUTE

SHIPPING DATA

B. Anticipated Schedule

1. Date of leaving reactor site — 30 July 79

2. Date of arriving at reprocessing site or other. — 1 August 79

C. ROUTE

PROPOSED:			Approx. Miles
From Columbia,	MISSOURI	I-70	125
	MISSOURI	I-55	5
	ILLINOIS	I-64	75
	ILLINOIS	I-57	45
	ILLINOIS	I-24	50
	KENTUCKY	I-24	18
	KENTUCKY	US-62	2
	KENTUCKY	US-68	50
	KENTUCKY	I-24	20
	TENNESSEE	US-41 Alternate	20
	TENNESSEE	I-24	180
	GEORGIA	I-75	115
	GEORGIA	I-285	41
	GEORGIA	I-20	132
	SOUTH CAROLINA	US-25	12
To Savannah River Plant	SOUTH CAROLINA	US-278	15
		TOTAL	875

continued on page 2 of Shipping Data

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C) Route - continued

PROPOSED ALTERNATE:

			Approx. Miles
From Columbia,	MISSOURI	I-70 - MO-47	60
	MISSOURI	MO-47 - MO-100	20
	MISSOURI	MO-100- I-44	13
	MISSOURI	I-44 - MO-141	13
	MISSOURI	MO-141- I-55	8
	MISSOURI	I-55 - MO-72 - ILL-146	100
	ILLINOIS	ILL-146- ILL-3	4
	ILLINOIS	ILL-3 - US-60/62	30
	KENTUCKY	US-60 - I-24	43
	KENTUCKY	I-24 - Western Ky Pkwy	36
	KENTUCKY	W.Ky Pkwy - Green River Pkwy -I-65	58
	KENTUCKY	I-65 - Cumberland Pkwy	26
	KENTUCKY	Cumberland P. - I-75	139
	KENTUCKY	I-75 - US-25E	12
	TENNESSEE	US-25E- I-81	110
	TENNESSEE	I-81 - I-40	10
	NORTH CAROLINA	I-40 - I-26	60
	NORTH CAROLINA	I-26 - SC-72 - US-25	25
To Savannah River Plant	SOUTH CAROLINA	US-25 - BYPASS 25 - US-278	140
		Total	907

Entered by _____ Checked by _____

Of _____

Date _____

655 124

INFORMATION FOR SECTIONS D, E, AND F WILL BE PROVIDED BY THE NRC STAFF ACCORDING TO NUREG 0561.

G. TRIP LOG

ROUTE LOG

Origin ______________________ Destination* ______________________

Time and date leaving ______________________ Time and date arriving ______________________

*No unauthorized stops en route will be made including off-site truck terminal lay-over at end of haul.

TIME	MILEAGE Estimated	MILEAGE Actual	ROUTE	STATE	CASK CONDITION NOTES
					655 127

Specific Precautions:

1. Do not park adjacent to another truck carrying radioactive materials.

2. Do not park nearer than 50 yards to gasoline, petroleum products, explosives or chemical trucks.

3. Do not park at filling stations any longer than necessary to fill tanks and while there, always have at least one driver in the cab.

4. Do not park at regular commercial truck depots.

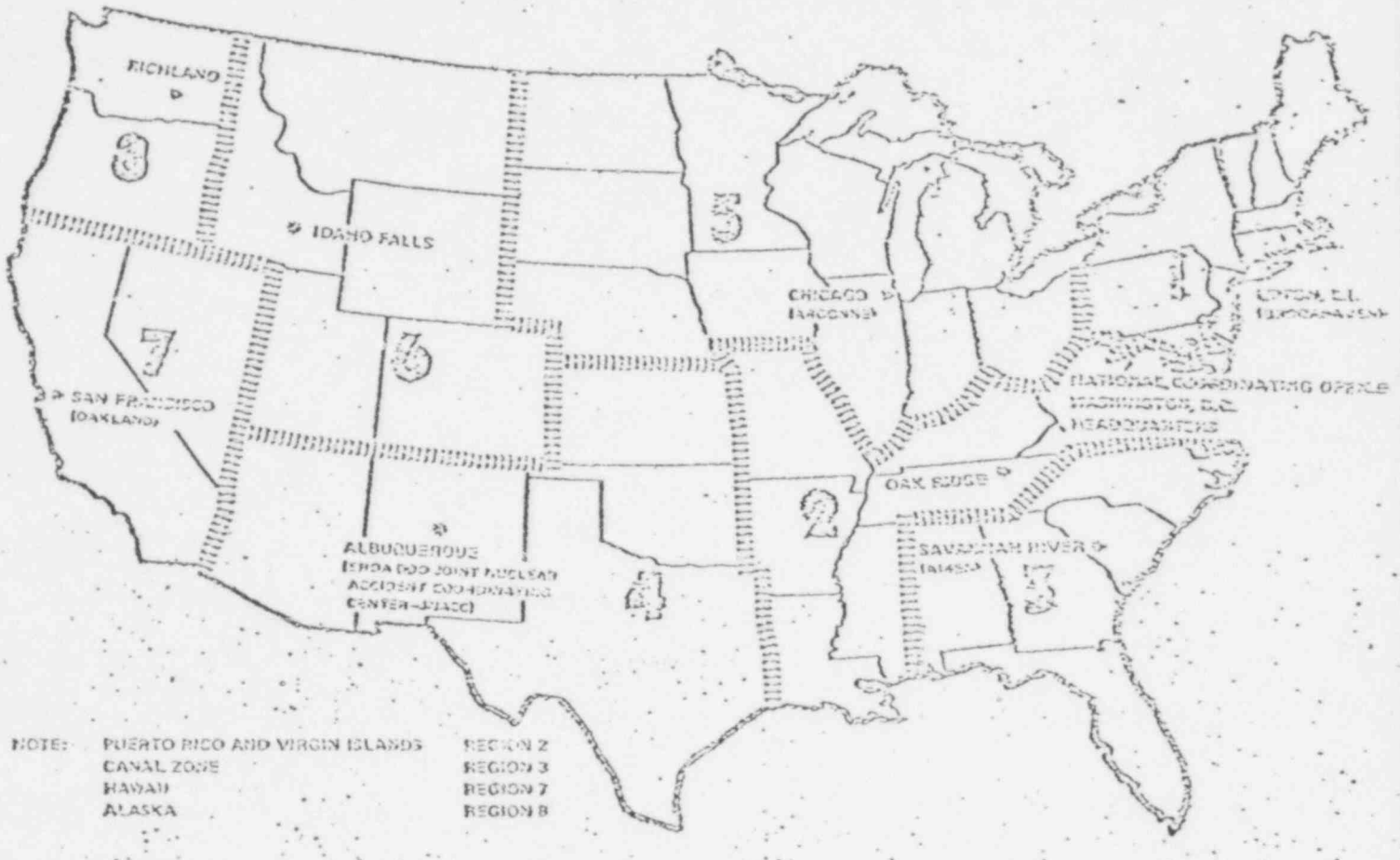
Reviewed by _____ Checked by _____

Of _____
(Carrier)

Date _____

655 123

ERDA Radiological Assistance Regions & Coordinating Offices



NOTE: PUERTO RICO AND VIRGIN ISLANDS — REGION 2
CANAL ZONE — REGION 3
HAWAII — REGION 7
ALASKA — REGION 8

REGION	OFFICE	
1	Brookhaven	516 345-2200
2	Oak Ridge	615 483-8611 Ext. 3-4510
3	Savannah River	803 824-6331 Ext. 3333
4	Albuquerque	505 264-4667
5	Chicago	312 739-7711 Ext. 2111 Duty hours Ext. 4451 Off hours
6	Idaho	208 526-0111 Ext. 1515
7	San Francisco	415 273-4237
8	Richland	509 942-7381

Shipping Instructions to Carriers

A. Notification of Departure Time

At the time of departure, advise the University of Missouri Research Reactor Facility, Columbia, Missouri, 65211, of the time of departure and any anticipated modification in the scheduled transit by phone (314-882-4011).

B. Notification in the event of delay or required change in route.

The time scheduled for this shipment from departure to arrival is _____ hours. When it is apparent that delays for any reason will increase this time by four (4) hours or more, advise the University of Missouri Research Reactor Facility, Columbia, Missouri, 65211, by phone (314-882-4011) of the new estimated time of arrival and the cause of delay. Any change in route must be cleared with the University of Missouri Research Reactor Facility before making them.

C. Inspection by authorized officials en route.

This shipment is proceeding under the full compliance of all known regulations and with the authorization of all cognizant authorities. At each port of entry, this Record and Report Form and the Bill of Lading should be presented for the inspection of the responsible authorities and they are to be permitted access to the truck and its load for their inspection purposes. Under no conditions should anyone except the consignee be permitted to release tie-down cables, open parts boxes, or break seals without having written authorization from the University of Missouri Research Reactor Facility.

D. Notification in the event of emergency involving the load.

In the event of emergency that involved the shipment, notify:

1. Local fire and police departments.

2. The University of Missouri Research Reactor Facility.
   (day) area code 314-882-4011
   (night) area code 314-882-4013

3. US ERDA designated regional office (see attachment).

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E. Measures to be taken in case of fire or accident.

1. There is no explosion hazard from the shipment.

2. There is reasonable time (probably as much as one (1) hour) to take action to avoid any radiological hazard in the event of fire.

3. Keep sightseers back from the shipment - 50 yards.

4. Treat as petroleum fire - use foam type blanketing agent or CO_2 extinguishers for small fires. Avoid direct water streams that might tend to spread any solid radioactivity.

5. Use gamma radiation survey meters while approaching - not to exceed 10 mr/hr. (These meters are to be acceptable to the University of Missouri Research Reactor Facility and calibrated before each trip.)

F. Route Log.

The carrier agrees to stop at a safe stopping place (at least 100 yards away from any building) every 50 miles to check tire conditions and other mechanical conditions of the truck and to log time and place and results of this inspection.

Additionally, approximately every 4 hours the carrier is to inspect the general condition of the shipment and the tie-downs and to monitor for radiation with a survey meter. (Should snow or ice or other material be present and possibly impairing the cooling efficiency, it should be removed.) The maximum readings permitted are:

1. At surface of cask - 200 mr/hr

2. At 6 ft. from surface - 10 mr/hr

3. In drivers' compartment - 2 mr/hr

These readings obtained are to be logged, and the conditions of tie-downs and other data logged. Copy of the log is to be sent on arrival by Air Mail to the University of Missouri Research Reactor Facility, Columbia, Missouri 65211.

Should survey meter readings be above those shown, notify the University of Missouri Research Reactor Facility (See D.2 above).

G. Stops en route.

Under no conditions is the truck with this shipment to be left unattended. Every reasonable precaution has been taken to assure the safety of shipment and tie-down system. However, special operation attention is needed to avoid contingent accident by avoiding accident possibilities.