NUREG-0383
Volume 2
Revision 24

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

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NUREG-0383
Volume 2
Revision 24

Directory of Certificates of Compliance for Radioactive Materials Packages

Certificates of Compliance

Manuscript Completed: February 2003
Date Published: March 2003

Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ABSTRACT

The purpose of this directory is to make available a convenient source of information on packaging approved by the U.S. Nuclear Regulatory Commission. To assist in identifying packaging, an index by Model Number and corresponding Certificate of Compliance Number is included at the front of Volumes 1 and 2. An alphabetical listing by user name is included in the back of Volume 3 of approved Quality Assurance programs. The reports include a listing of all users of each package design and approved Quality Assurance programs prior to the publication date of the directory as of December 31, 2002.

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12/31/2002

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NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
0361	7	USA/0361/B(U)F-85	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Nuclear Regulatory Commission
Washington, DC 20555

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

NUREG-0361; Safety Analysis Report for the Plutonium Air Transportable Package Model No. PAT-1, as supplemented.

c. DOCKET NUMBER 71-0361

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: PAT-1

(2) Description

A stainless steel containment vessel (designated TB-1) surrounded by a stainless steel and redwood overpack (designated AQ-1). The contents are sealed within a stainless steel product can (designated PC-1) inside the containment vessel.

The AQ-1 overpack is a right circular cylinder, approximately 42-1/2 inches long by 24-1/2 inches outside diameter. The walls of the overpack consist of approximately 8 inches of grain oriented redwood encased within double stainless steel drums. The ends of the drums are doubly closed. A copper heat conducting element and an aluminum load distributer are encased within the redwood.

The TB-1 containment vessel is approximately 8-1/2 inches outside length by 6-3/4 inches outside diameter. The minimum wall thickness of the vessel is approximately 1/2 inch. The interior cavity of the vessel is a right circular cylinder, 4-1/4 inches diameter, with hemispherical ends. The vessel is closed by 12, 1/2-inch diameter bolts and doubly sealed with a copper gasket and knife edges and an elastomer O-ring.

5. (a) Packaging (continued)

(2) Description (continued)

The weight of the package is approximately 500 pounds. The weight of the TB-1 containment vessel, when loaded with 4.4 pounds of contents is approximately 41.7 pounds.

(3) Drawings and Specifications

The Model No. PAT-1 packaging is fabricated in accordance with the drawings and specifications in Section 9.0 of the Safety Analysis Report, NUREG-0361 as supplemented by Issue B of Drawing Nos. 1004, 1009, 1013, 1016, 1017, 1018, 1019, 1020 and 1022.

(b) Contents

(1) Type and form of material

Plutonium oxide and its daughter products, in any solid form. The plutonium oxide may be mixed with uranium oxide and its daughter products, in any solid form.

(2) Maximum quantity of material per package and additional permissible contents

(i) Maximum 2.0 kg total radioactive material, plus: maximum 16 grams of water and 10 grams of polyethylene or polyvinylchloride bagging material. The maximum decay heat load of the contents may not exceed 25 watts.

(ii) Maximum 200 grams total radioactive material, plus: maximum one gram of water, maximum 200 grams of metal canning material (in addition to the PC-1 product can, Drawing No. 1024), maximum 64 grams of aluminum foil or honeycomb (in addition to the top spacer, Drawing No. 1015), maximum 175 grams of glass and maximum 35 grams polyethylene or polyvinylchloride bagging material. The maximum decay heat load of the contents may not exceed 25 watts.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The PC-1 product can (Drawing No. 1024) and the top spacer (Drawing No. 1015) need not be used when the contents include 20 curies or less of plutonium.

7. Prior to first use, each packaging shall meet the acceptance tests and standards specified in Subsection 8.1 and Section 9.0 of the Safety Analysis Report.

8. Prior to each shipment, the package shall meet the tests and criteria specified in Subsection 8.2 of the Safety Analysis Report.

9. The package shall be prepared for shipment and operated in accordance with the procedures specified in Section 7.0 of the Safety Analysis Report.

10. The systems and components of each packaging shall meet the periodic tests and criteria specified in Subsection 8.3 of the Safety Analysis Report.

11. Repair and maintenance of the packaging shall be in accordance with Sections 8.0 and 9.0 of the Safety Analysis Report.

12. The packaging shall be designed, procured, fabricated, accepted, operated, maintained, and repaired in accordance with a quality assurance plan approved by the Nuclear Regulatory Commission for this purpose.

13. Through special arrangement with the carrier, the shipper shall ensure observance of the following operational controls for each shipment of plutonium by air:

    (a) The package(s) must be stowed aboard aircraft on the main deck in the aft-most location that is possible for cargo of its size and weight. No other type cargo may be stowed aft of the package(s).

    (b) The package(s) must be securely cradled and tied-down to the main deck of the aircraft. The tie-down system must be capable of providing package restraint against the following inertia forces acting separately relative to the deck of the aircraft: Upward, 2g; Forward, 9g; Sideward, 1.5g; Downward, 4.5g.

    (c) Cargo which bears one of the following hazardous material labels may not be transported aboard an aircraft carrying a package(s):

Explosive A	Non-Flammable Gas
Explosive B	Flammable Liquid
Explosive C	Flammable Solid
Spontaneously Combustible	Flammable Gas
Dangerous When Wet	Oxidizer
Organic Peroxide	Corrosive

    This restriction does not apply to hazardous material cargo labeled solely as:

Radioactive I	Poison
Radioactive II	Poison Gas
Radioactive III	Irritant
Magnetized Materials	Etiologic Agent

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

15. The package authorized by this certificate is hereby approved for transportation of plutonium by air.

16. Expiration date: September 30, 2003.

REFERENCES

Safety Analysis Report for the Plutonium Air Transportable Package Model Number PAT-1, NUREG-0361, June 1978.

Sandia Laboratories application dated February 20, 1980.
Supplements dated: July 27, 1990 and July 20, 1993.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: Sept. 15, 1998

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of the Air Force
Air Force Technical Application Center/CC
1030 S. HWY A1A
Patrick AFB, FL 32925-3002

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Teledyne Energy Systems applications dated April 26, 1985 and August 19, 1986, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: Sentinel-25A, LCG-25A; Sentinel-25B, LCG-25B
Sentinel-25C, LCG-25C; Sentinel-25C3, -25D, -25E, -25F

(2) Description

The packages are thermoelectric generators. The major components include the main housing, tungsten shield, housing flange, and electrical connectors. The approximate dimensions and weights for the various Model Nos. are as follows:

Model No.	Dimensions (inches)	Weight (lbs.)
Sentinel-25A, LCG-25A	25 OD x 25	3000
Sentinel-25B, LCG-25B	25 OD x 25	3300
Sentinel-25C, LCG-25C	24 OD x 32	2000
Sentinel-25C3	24 OD x 32	1300
Sentinel-25D	25 OD x 27	3300
Sentinel-25E	25 OD x 34	4200
Sentinel-25F	25 OD x 32	1400

5. (a) Packaging (continued)

(3) Drawings

The packagings are constructed in accordance with the following Drawing Nos.:

Model No.	Drawing Nos.
All Models	Isotopes, Inc. Drawing Nos.: 001-20000, Rev. E 001-20001, Rev. F 001-20002, Rev. F 001-20003, Sht. 1, Rev. B 001-80003
Sentinel-25A, LCG-25A	Martin Company Drawing Nos.: N0013100, Rev. A N0013108, Rev. D 001-40000, Rev. A Isotopes, Inc. Drawing Nos.: 001-10000, Rev. B 001-70024, Rev. C 001-70025, Sht. 1, Rev. D 001-70033, Shts. 1 & 2, Rev. A 001-70036 001-80005
Sentinel-25B, LCG-25B	Martin Company Drawing Nos.: N0013200, Rev. C 001-40012 Isotopes, Inc. Drawing Nos.: 001-70024, Rev. C 001-70025, Sht. 1, Rev. D 001-70033, Shts. 1 & 2, Rev. A 001-70036 001-80005
Sentinel-25C, LCG-25C	Martin Company Drawing Nos.: 001-40004, Rev. A 001-70010 001-70012, Rev. B 001-80004 Isotopes, Inc. Drawing Nos.: 001C10000, Sht. 1 Rev. D, & Sht. 3 001-70009, Rev. D

Model No. (continued)	Drawing Nos. (continued)
Sentinel-25C3	Isotopes, Inc. Drawing Nos.: 001C10000 Shts. 1 & 2, Rev. D 001-70009, Rev. D 001-70057, Rev. D 001-70060, Rev. C 001-40019, Rev. B
Sentinel-25D	Martin Company Drawing No. 001-80004 Isotopes, Inc. Drawing Nos.: 001D10000 Shts. 1 & 2, Rev. C 001-70036 001-70033 Shts. 1 & 2, Rev. A 001-70025 Sht. 1, Rev. D 001-70024, Rev. C 001-40015, Rev. C 001-40006, Rev. B
Sentinel-25E	Isotopes, Inc. Drawing Nos.: 001E10000, Shts. 1 & 2, Rev. E, & Sht. 3 001-70039, Rev. C 001-70025, Sht. 1, Rev. D & Sht. 2 001-70024, Rev. C 001-40017, Shts. 1 & 2, Rev. D 001-40006, Rev. B
Sentinel-25F	Isotopes, Inc. Drawing Nos.: 001F10000, Shts. 1 & 2, Rev. H* 001-70070, Rev. C 001-70060, Rev. C 001-70009, Rev. D 001-40025, Rev. A *As modified by Figure 1 of the April 26, 1985, application.

(b) Contents

(1) Type and form of material

(i) Strontium 90 titanate doubly encapsulated in a Hastelloy or Uniloy fuel capsule which meet the requirements of special form radioactive material; or

(ii) Model No. Sentinel-25F may have, strontium fluoride doubly encapsulated in Hastelloy or Uniloy fuel capsule, with a Hastelloy C-276 liner which meets the requirements of special form radioactive material.

(2) The maximum quantity of material per package

125,000 curies

6. A barrier (permitting the free circulation of air) must be provided with sufficient separation distance to ensure that the requirement of 10 CFR 71.43 (g) will be met.

7. Eye-bolts shall be removed or covered during transportation to prevent their use as tie-down devices of packages.

8. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be operated, prepared for shipment and maintained in accordance with the following Operating Procedures and Maintenance Programs:

Model No.	Operating Procedures	Maintenance Program
Sentinel-25A, LCG-25A	Appendix E of TES-3206, as revised	Appendix F of TES-3206, as revised
Sentinel-25B, LCG-25B	Appendix E of TES-3209, as revised	Appendix F of TES-3209, as revised
Sentinel-25C, LCG-25C	Appendix E of TES-3210, as revised	Appendix F of TES-3210, as revised
Sentinel-25C3	Appendix E of TES-3211, as revised	Appendix F of TES-3211, as revised
Sentinel-25D	Appendix E of TES-3212, as revised	Appendix F of TES-3212, as revised
Sentinel-25E	Appendix E of TES-3213, as revised	Appendix F of TES-3213, as revised
Sentinel-25F	Chapter VIII of TES-3202, as revised	Chapter IX of TES-3202, as revised

9. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR 71.12.

10. Expiration date: January 31, 2007

REFERENCES

Teledyne Energy Systems applications dated April 26, 1985; and August 19, 1986.

Teledyne supplements dated: November 3, 1986; September 17 and December 2, 1991.

Department of the Air Force supplement dated: November 12, 1993; December 11, 1996; January 15, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

e: January 29, 2002

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
4986	38	USA/4986/AF	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Global Nuclear Fuel - Americas, L.L.C.
P.O. Box 780
Wilmington, NC 28402

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application dated September 10, 1997, as supplemented.

c. DOCKET NUMBER 71-4986

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: RA-3

(2) Description

A fuel assembly and fuel rod shipping container. Packagings are right rectangular boxes consisting of an outer container of wooden construction and a metal inner container separated by cushioning material.

The metal inner container is approximately 11 inches by 18 inches by 178 inches long and is positioned within a wooden outer container approximately 30 inches by 30 inches by 207 inches long. Cushioning is provided between the inner and outer containers by phenolic impregnated honeycomb and ethafoam. Closure is accomplished by bolts. A pressure relief (breather) valve is provided on the inner container, and is set for 0.5 psi differential. The total weight of the packaging and contents is 2,800 pounds.

(3) Drawings

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

769E229, Revision 9
769E231, Revision 8

(4) Product Container

The fuel rod product container is constructed in accordance with General Electric Company Drawing No.:

0028B98, Revision 0

5.(b) Contents

(1) Type and form of material

(i) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of either 60 or 62 rods in an 8 x 8 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.0 percent by weight, and the maximum average enrichment is 5.0 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-H, of the supplements dated June 27 and November 1, 1995.

(ii) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of 74 full and partial length rods in a 9 x 9 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.0 percent by weight, and the maximum average enrichment is 4.6 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-I, of the supplements dated June 27 and November 1, 1995.

(iii) Unirradiated UO_2 fuel assemblies. Each fuel assembly is made up of 92 full and partial length rods in a 10 x 10 square array with maximum fuel cross-sectional area of 25 square inches and a maximum fuel length of 150 inches. The maximum U-235 enrichment is 5.5 percent by weight, and the maximum average enrichment is 5.0 percent by weight. The maximum pellet diameter, minimum clad thickness, water rod specifications, and poison rod specifications are in accordance with Section 6.1, Appendix 8-J, of the supplements dated June 27 and November 1, 1995.

(iv) Unirradiated UO_2 fuel rods, which are contained within the product container specified in 5(a)(4). The maximum U-235 enrichment is 5.0 by weight. The fuel rods are clad with zircaloy, incaloy, inconel, or stainless steel. The minimum pellet diameter is 0.340 inch, and the maximum pellet diameter is 0.515 inch.

(v) Unirradiated UO_2 fuel rods, which may be loose or may be strapped together. The maximum U-235 enrichment is 5.0 by weight. The fuel rods are clad with zircaloy, incaloy, inconel, or stainless steel. The minimum pellet diameter is 0.340 inch, and the maximum pellet diameter is 0.515 inch.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii):

Two (2) fuel assemblies. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(ii) For the contents described in 5(b)(1)(iv):

Two (2) fuel bundles. A fuel bundle is defined as any number of fuel rods contained within the product container specified in 5(a)(4).

(iii) For the contents described in 5(b)(1)(v):

Two (2) fuel bundles. A fuel bundle is defined as a maximum of 14 fuel rods positioned within one side (channel) of the inner container.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For the contents described in 5(b)(1)(i), 5(b)(1)(ii) and 5(b)(1)(iii), and limited in 5(b)(2)(i):	0.4
For the contents described in 5(b)(1)(iv), and limited in 5(b)(2)(ii):	6.3
For the contents described in 5(b)(1)(v), and limited in 5(b)(2)(iii):	2.9

6. Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene sheath which may not extend beyond the ends of the fuel assembly. The ends of the sheath may not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

7. Polyethylene holders with a maximum effective thickness of 0.151 inches (0.3835 cm) may be placed surrounding the fuel assembly up to a maximum of 0.13 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. The effective holder thickness is the linear average of the maximum and minimum thickness.

8. Polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.10 grams H_2O hydrogen equivalent per cubic centimeter averaged over the assembly. The shipping shims may be used with or without the polyethylene holders.

9. For shipment of fuel rods described in 5(b)(1)(iv) and 5(b)(1)(v), each fuel rod may be contained within a polyethylene sheath with a maximum thickness of 0.01 inch. Dunnage is permitted within the product container, and within the inner container, provided that the dunnage does not have a hydrogen density greater than that of water.

10. Maximum average enrichment means the highest enrichment averaged over any axial zone of the assembly.

11. In addition to the requirements of Subpart G of 10 CFR Part 71, each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 6 of the application, and the package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 6 of the application.

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

13. Expiration date: March 31, 2003.

REFERENCES

General Electric Company application dated September 10, 1997.

Supplements dated: November 20, 1997; June 5 and 25, July 1 and 21, and August 14, 1998; and October 14, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 10, 2000

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Nuclear Fuel Services, Inc.
P.O. Box 337, MS 123
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Fuel Services, Inc., application dated January 20, 2000, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: NFS Uranyl Nitrate Tank Trailer

(2) Description

A stainless steel bulk liquid cargo tank, which is permanently mounted to a semitrailer, designed for the transport of fissile uranyl nitrate solutions. The tank is cylindrical with torispherical heads. It is approximately 437 inches in length and 50-1/2 inches in diameter, with a shell and head wall thickness of 3/16 inch. The tank is covered with about 4 inches of fiberglass insulation with an outer jacket of 22-gage or 14-gage stainless steel. The nominal tank capacity is 3700 gallons with a design ullage of 3 percent. The tank is equipped with access ports on top of the tank .

(3) Drawings

The tank trailer is constructed in accordance with the following drawings:

Independent Metal Products Drawing No. UNF 2232, Sheet 1 of 3, Rev. A; and Sheet 3 of 3, Rev. A; and Nuclear Fuel Services, Inc., Drawing No. 000-M0337-D, Rev. -.

5. (b) Contents

(1) Type and form of material

Uranyl nitrate in dilute acid solution. The solution must meet the following limits:

Maximum uranium enrichment	5 weight percent U-235 (0.05 grams U-235/gram U)
Uranium concentration	70 - 350 grams U/liter solution
Maximum U-235 concentration	5 gram U-235/liter solution
Maximum solution freezing point	0°C (32°F)
Maximum solution density	13 pounds/gallon
Free HNO_3 concentration	0.1 M - 0.8 M

The uranium may be prepared from either non-recycled or recycled uranium. The uranium must meet the following limits:

Constituent	Maximum concentration
Tc-99 concentration	5 micrograms Tc-99/gram U
U-232 concentration	0.002 microgram U-232/gram U
U-234 concentration	2,000 micrograms U-234/gram U
U-236 concentration	25,000 micrograms U-236/gram U
Alpha activity (Np and Pu)	40 bequerel/gram U
Gamma activity (fission products)	440,000 MeV-bequerel/kilogram U

(2) Maximum quantity of material per package

Not more than 3,589 gallons and not more than 45,600 pounds net weight of uranyl nitrate acid solution. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 100

6. The solution must be at a temperature of 68°F or above at the time of packaging.

7. Transport of the package may only be initiated if the minimum predicted temperature along the transport route for the anticipated transport period is greater than 32°F. In the event freezing weather is encountered, the carrier must comply with the administrative procedures and controls as specified in Section 3.2.2 of the application.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) Each package must be maintained in accordance with Chapter 8 of the application.

   (b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application.

   (c) Each package shall comply with U.S. Department of Transportation requirements for the use, qualification, and maintenance of specification MC 311 cargo tanks, including the provisions of Subpart E of 49 CFR Part 180.

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

10. Expiration date: May 31, 2007.

REFERENCES

Nuclear Fuel Services, Inc., application dated January 20, 2000.

Supplements dated: October 13 and November 21, 2000; and October 19 and December 13, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L Miller for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 11, 2002

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5086	11	USA/5086/B(U)F	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505-0785

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Babcock and Wilcox Company application dated November 29, 1993.

c. DOCKET NUMBER 71-5086

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: UNC-2600

(2) Description

The inner container is an 11-gauge steel box with inside dimensions of 2-5/8" high x 7" wide x 96" long. The inner container is supported in a 22-1/2" ID by 102-1/2" long, 14-gauge steel drum by an insertable cage formed by nine 21-1/2" diameter by 3/8" thick steel plates, spaced approximately 12" apart, with a channel formed through the center of the plates by angle irons. The outer container closure is made with a 14-gauge drum lid with 12-gauge bolt locking ring with drop forged lugs, one of which is threaded, having a 5/8" diameter bolt.

(3) Drawing

The packaging is constructed in accordance with Thomas Gutman Consultant Drawing No. B-2600-2, Sheets 1 through 6, Rev. 3.

(b) Contents

(1) Type and form of material

Unirradiated, uranium-zirconium, Naval fuel elements. The uranium may be enriched to any degree in the U-235 isotope.

(2) Maximum quantity of material per package

Up to 8.9 kilograms of U-235 per package. The ratio of the weight of U-235 to the weight of U-235 plus zirconium shall not exceed 0.074. The net weight of the contents shall not exceed 265 pounds.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 1.4

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with Chapter 7 of the application.

(b) The package must be acceptance tested and maintained in accordance with Chapter 8 of the application.

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

8. Expiration date: January 31, 2004.

REFERENCES

Babcock and Wilcox application dated November 29, 1993.

Supplements Dated: September 19, 1994; January 5, 1995; and December 21, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: January 29, 1999

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5149	10	USA/5149/B( )F	1	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock & Wilcox Company application dated September 20, 1979, as supplemented.

c. DOCKET NUMBER 71-5149

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

(1) Model No.: 814A

(2) Description

Steel container as described in Babcock & Wilcox Company's application dated September 20, 1979.

(b) Contents

(1) Type and form of material

Unirradiated fuel cluster

(2) Maximum quantity of material per package

One fuel cluster containing U-235 with inserted poison fixture as specified in Babcock & Wilcox Company's application dated September 20, 1979.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 25.0

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

7. Use of packaging fabricated after August 31, 1986, is not authorized.

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8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in the application supplement dated May 18, 1990.

   (b) The package shall be maintained in accordance with the Maintenance Program in the application supplement dated May 18, 1990.

9. Expiration date: June 30, 2005.

REFERENCE

Babcock & Wilcox application dated September 20, 1979.

Babcock & Wilcox supplements dated: May 18, 1990, and April 27, 1995.

BWX Technologies Inc., supplement dated: June 1, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 28, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5580	8	71-5580	USA/5580/B( )F	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20858

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for S5W Power Unit shipping container dated August 9, 1968, as amended.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No: S5W Power Unit

(2) Description

The S5W Power Unit shipping container (PUSC) is a container and support assembly designed to ship and store new naval reactor power units. The PUSC is comprised essentially of three major assemblies: (1) the outer frame, (2) the inner frame, and (3) the shipping container. During shipment, the shipping container is bolted to the inner frame in a horizontal position. Two trunnions welded to the middle section of the shipping container support the lower end of the container and also provide the means whereby the container can be rotated from the horizontal (shipping) attitude to the vertical (loading-unloading) attitude in the inner frame. The inner frame and shipping container are supported by the outer frame and pedestal through 80 elastic shock mounts, each of which is secured to both the inner frame and outer frame.

Approximate dimensions of the three major assemblies of the PUSC are: shipping container: 95 inches diameter by 234 inches; Inner Frame: 109 inches width by 52 inches height by 269 inches length; Outer Frame: 121 inches width by 56 inches height by 236 inches length. Maximum weight of the loaded PUSC is approximately 127,900 lbs.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 936F963, Rev. 3 and 936F964, Rev. 2.

5.(b) Contents

(1) Type and form of material

Unirradiated fuel in the form of S3G Core 3 power units with control rods installed and secured in place by holddown mechanisms.

(2) Maximum quantity of material per package

One fuel assembly.

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Expiration date: December 31, 2007

REFERENCE

Safety Analysis Report for S5W Power Unit Shipping Container, WAPD-OP(R)SA-820 dated August 9, 1968; Addendum to WAPD-OP(R)SA-820 dated September 28, 1987.

Naval Reactors Supplements dated: March 2, 1992 (G#92-03388) and June 11, 1997 (G#97-03513); and Naval Reactors letter (G#02-0820) dated June 13, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date July 29, 2002

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5607	11	USA/5607/B( )F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

T-2 Shipping Package, Safety Analysis Report, Draft: April 1980, as supplemented.

c. DOCKET NUMBER 71-5607

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: T-2

(2) Description

Packaging for irradiated reactor fuel and components consisting of a lead encased in steel cask, removable containment vessel insert and shipping case.

The cask is a double-walled steel circular cylinder with thickened shielding in the center portion. The central cavity is 6.065 inches in diameter by 100 inches long. The lead shielding is 8.0 inches thick along a 45-inch center section reduced to 4.2 inches at each 36-inch end section. The containment vessel is positioned within the cask. Cask closure is accomplished by a gasketed and bolted steel plug. The cask is enclosed in the shipping case which is 36 inches in diameter by 133 inches long welded to a 4-foot by 6-foot steel pallet. The maximum weight of the packaging is 18,400 pounds.

(3) Drawings

(i) The shipping case is constructed in accordance with DuPont Drawing Nos.: W716539, Rev. 0; 180191, Rev. 1; 180192, Rev. 0; 180193, Rev. 1; 180194, Rev. 0; 180197, Rev. 0; W716538, Rev. 0; 180195, Rev. 0; 180196, Rev. 0; and 180089, Rev. 0.

(ii) The cask is constructed in accordance with General Electric Drawing Nos.: 919D755, Rev. 0; 135C5202, Rev.0; 153F966, Rev. 0; and 106D3721, Rev. 0; or it is constructed in accordance with DuPont Drawing Nos.: W239534, Rev. 2*; 147214, Rev. 15; 147215, Rev. 2*; and 147216, Rev. 1.

* As provided in the April 12, 1983, supplement

5.(a) (3) Drawings (Continued)

(iii) The ANL insert is constructed in accordance with Argonne National Laboratory Drawing Nos.: W0147-0227-DD, Rev 7; W0147-0228-DD, Rev. 6; W0147-0229-DC, Rev. 6; W0147-0231-DD, Rev. 3; W0147-0234-DC, Rev. 4; and W0147-0312-DE, Rev. 2.

(b) Contents

(1) Type and form of material

(i) Irradiated clad fuel in the form of solid metal, oxides, nitrides, and carbides of uranium, plutonium, or mixed uranium-plutonium contained within the ANL insert. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 150 days.

(ii) Irradiated clad fuel pins of uranium dioxide enriched to up to 3.0 w/o in U-235 contained within the ANL insert. Average exposure of fuel not to exceed 18 megawatt days per kilogram. The clad fuel may contain small quantities of Na or NaK. The minimum cooling time must be no less than 90 days.

(iii) Irradiated reactor components held within the container shown in Drawing No. W0147-0234-DC, Rev. 4.

(2) Maximum quantity of material per package.

Internal decay heat not to exceed 208 watts, and:

(i) For the material described in 5(b)(1)(i), fissile material not to exceed 1.71 kg.

(ii) For the material described in 5(b)(l)(ii), fissile material (U-235) not to exceed 300 grams.

(c) Transport Index for Criticality Control

For the contents described in 5(b)(l)(i) and 5(b)(l)(ii), and limited in 5(b)(2)(i) and 5(b)(2)(ii):

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The contents must be shipped dry. When loaded underwater, the package must be dried using Consumer Power Company's procedure, "T-2 Cask Liner Assembly Drying Procedure," Proc. No. EE&T-C12, Rev. 1, 11/12/81.

7. The ANL Insert must be leak tested prior to first use and annually thereafter in accordance with the procedures specified in Argonne National Laboratories Document No. W0195-0054-ES-00.

8. Prior to each shipment, the package must be leak tested in accordance with procedures specified in Appendix A to HFEF/N OMM 6202, Rev. 2, March 17, 1981.

9. In addition to the requirements of Subpart G of 10 CFR Part 71 and the other conditions of this certificate:

   (a) The package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application, as supplemented; and

   (b) The package must be maintained in accordance with the Maintenance Program of Chapter 8 of the application, as supplemented.

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

11. Expiration date: May 31, 2003.

REFERENCES

DuPont Safety Analysis Report, Draft April 1980.

Department of Energy supplements dated: February 11, April 8 and 20, 1982; April 12, 1983; February 26, 1992; February 3, 1993; and April 22 and June 4, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: July 24, 1998

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5740	6	71-5740	USA/5740/B( )	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, D.C. 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for Packaging (SARP) of the Oak Ridge National Laboratory TRU Californium Shipping Container, August 7, 1981, Rev. of Report No. ORNL-5409/R1 as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: ORNL TRU Californium Shipping Container

(2) Description

A 304L stainless steel encased concrete shipping cask. The outer shell consists of two, 1/2-inch thick, 66-inch diameter hemispherical heads joined by a 6-inch cylindrical section. The cylindrical cavity has a 1-inch thick stainless steel wall and is 3 inches in diameter x 6 inches long. Shielding consists of 30 inches of Blackburn Limonite concrete having a density of approximately 175 lb/ft3. Upper and lower level ball valves located at the end of concrete filled plugs define, isolate, and seal the cavity. Both of these plugs have O-ring seals, are bolted in place and are protected with a gasketed cover plate. Fusible plugs are located in the cover plates and the shell.

The top ball valve and plug may be replaced by other plugs for multiple source shipments. Sources are contained in special form inner containers.

The cask is mounted onto a 1-inch thick steel base plate by eight steel 2-1/2 inch NPS Schedule 40 pipe struts. The cask is transported on a special trailer. The package gross weight is 23,500 pounds.

5. (a)(3) Drawing

The package and special trailer are constructed in accordance with Oak Ridge National Laboratory (ORNL) Drawing Nos.:
M-11230-EN-001-D Rev. 4
M-11230-EN-002-D Rev. 0
M-11230-EN-003-D Rev. 0
M-11230-EN-004-D Rev. 2
M-11230-EN-005-D Rev. 0
M-11230-EN-006-D Rev. 0
M-11230-EN-007-D Rev. 0
M-11230-EN-008-D Rev. 1
M-11230-EN-012-E Rev. 4
M-11230-EN-014-E Rev. 3
M-11230-EN-017-D Rev. 3
M-11230-EN-018-E Rev. 0
(Appendix A, August 7, 1981 revision of ORNL-5409/R1, as supplemented.)

(2) Contents

(1) Type and form of material

The contents consist of isotopes of Americium (Am), Curium (Cm), Berkelium (Bk), Californium (Cf), Einsteinium (Es), and Fermium (Fm) as a solid (metal, oxide, oxysulfate, or dry salt), contained in capsule(s) that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

For the contents described in 5(b)(1):

Three (3) grams and the maximum internal heat not to exceed 5 watts.

6. The contents described in 5(b)(1) must be shipped in a seal welded special form inner container as described in section 5.2.1 of the application.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(1) Each packaging must be maintained in accordance with the supplement dated May 10, 1991; and

(ii) The package must be prepared for shipment and operated in accordance with the supplement dated May 10, 1991.

8. A minimum of two lifting ribs shall be used to lift the package.

9. The package authorized by this certificate is hereby approved for use under general license provisions of 10 CFR 71.12.

10. Expiration date: July 31, 2006.

REFERENCES

Safety Analysis Report for Packaging (SARP) of the Oak Ridge National Laboratory TRU Californium Shipping Container, August 7, 1981, revision of Report No. ORNL-5409/R1.

Supplements dated: April 4, 1986; March 26, April 23, and May 10, 1991; June 4, 1992; May 13, 1996; and May 24, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: August 8, 2001

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5757	7	USA/5757/B( )F	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for S5W
Refueling Source shipping container
dated February 14, 1968, as supplemented

c. DOCKET NUMBER 71-5757

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: S5W Refueling Source

(2) Description

The S5W Refueling Source shipping container consists of two structures, one nested within the other, having an overall envelope of 5 feet, 5 inches diameter by 9 feet, 5-5/8 inches length. The outer structure, the shipping container, is a ring of polyethylene 11-1/2 inches thick with an OD of 5 feet 4 inches and length of approximately 5 feet 2 inches. The polyethylene is canned in a ½-inch thick carbon steel shell. The inner structure, the replacement and installation container, fits into the cavity of the outer structure. This assembly consists of a 6-1/2 inch OD, 79-5/8 inches long stainless central tube, which is plugged at both ends by machined stainless steel forging. Three cavities are machined in the bottom end plug to contain the neutron source assemblies. A jacket of lead, 6 inches thick, encircles the central tube and this innermost layer of shielding to attenuate the gamma radiation. A wall of polyethylene, 8-1/2 inches thick, surrounds the lead shield and is canned with a ½-inch thick carbon steel plate. Gross weight is approximately 19,000 pounds.

(3) Drawings

The packaging is constructed in accordance with Westinghouse Electric Corporation Drawing Nos. 905D318, Rev. C; 905D315, Rev. F; and 905D285, Rev. A.

5.(b) Contents

(1) Type and form of material

(i) Radium-Beryllium special form radioactive material neutron source. These sources may be either new or irradiated and have surface contamination as a result of previous use.

(ii) Plutonium 238-Beryllium special form radioactive material neutron source. These sources may be either new or irradiated and have surface contamination as a result of previous use.

(2) Maximum quantity of material per package

(i) One, two, or three neutron sources as described in 5(b)(1)(I) and limited to a total content of not more than 940 curies, with radium limited to not more than 2.5 curies (gms) and total emission rate of 3.8×10^7 n/sec. These sources are limited to a combined surface contamination of not more than an A_2 quantity of radioactive material.

(ii) One, two, or three neutron sources as described in 5(b)(1)(ii) and limited to a total content of not more than 925 curies and total emission rate of 1.48×10^9 n/sec. These sources are limited to a combined surface contamination of not more than an A_2 quantity of radioactive material.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 11.2

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

10. Expiration date: March 31, 2003.

REFERENCES

Safety Analysis Report for S5W Refueling Source Shipping Container, WAPD-OP(R)S-2473 dated February 14, 1968.

Supplements: Bettis Atomic Power Laboratory letter WAPD-OP(R)C-474 dated December 22, 1975. Naval Reactors letter G#92-03738, dated October 15, 1992; and G#C97-03621 dated October 17, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 31 MAR 98

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Advanced Medical Systems Inc.
121 North Eagle Street
Geneva, OH 44041

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Advanced Medical Systems, Inc. application dated June 21, 2002

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model Nos.: 181375 and 181361

(2) Description

Overpacks that provide impact and thermal protection for teletherapy head assemblies or source exchange assemblies. The cubical overpacks covered with 16 gauge steel panels. Reinforcing steel straps and angles are welded together and spaced to limit the openings between them to less than 6 inches. Skid runners are provided to facilitate fork lift usage. Dimensions of the Model No. 181375 are 43.5"L x 39.75"W x 41"H with a maximum gross weight of 3,750 pounds. Dimensions of the Model No. 181361 are 39"L x 34.25"W x 44.5"H with a maximum gross weight of 4,000 pounds.

(3) Drawing

(i) The Model No. 181375 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos.: E590G; D16423A; D16423B; D16424D; D16479; D16568; C16580E; B46411; A46686A; E63790F; D181368G; D181369E (2 pages); D181375N; D184705; D184713; D200016G; D200043; D200073F; D200074C; D200075C; D200079C; C200742-1 THRU 5; B200743-1,5; and B200745-1 THRU 4.

(ii) The Model No. 181361 packaging is constructed in accordance with Advanced Medical Systems, Inc. Drawing Nos.: D-T60-478-B; C50104-B; D55100-A; C55103-B; C55105-B; D13706A-D (2 pages); D-181356-F; D-181357-F; D-181361-E, B181390-B; and D-200017-A.

5. (b) Contents

(1) Type and form of material

(I) Cobalt 60 sealed sources that meet the requirements of special form radioactive material; or

(ii) Cesium 137 in the form of cesium chloride encapsulated in sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

(I) 13,680 curies of cobalt 60 with a radioactive decay heat load not to exceed 200 watts; or

(ii) 2,200 curies of cesium 137 with a radioactive decay heat load not to exceed 17 watts.

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The packages must be operated and prepared for shipment in accordance with the Operating Procedures of Chapter 7 of the application.

(b) Each packaging must meet the Acceptance Tests and Maintenance program of Chapter 8 of the application.

7. Use of packaging fabricated after August 31, 1986, is not authorized.

8. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.

9. Expiration date: August 31, 2007.

REFERENCES

Advanced Medical Systems, Inc. application dated June 21, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Materials Safety
and Safeguards

Date: August 15, 2002

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, D.C. 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

U.S. Department of Energy
application dated May 30, 1991,
as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: Inner HFIR Unirradiated Fuel Element Shipping Container, and Outer HFIR Unirradiated Fuel Element Shipping Container

(2) Description

Packaging for unirradiated fissile radioactive material as fuel elements for the High Flux Isotope Reactor (HFIR). The containers are right circular cylinders with an 11-gauge carbon steel shell. The lid is attached to the container with sixteen 3/8-16x1-inch steel bolts. The steel shell is filled with stacked fir plywood rings. The plywood rings form a central cavity which is lined with 1-inch thick polyethylene foam.

The packaging for the inner HFIR fuel element has overall dimension of 25 inches OD bye 45 inches high, a 10-7/8-inch diameter by 30-1/4-inch deep cavity, and a 660 pound gross weight.

The packaging for the outer HFIR fuel element has overall dimensions of 31.5 inches OD x 45.75 inches high, a 17-3/8-inch diameter by 31-1/8-inch deep cavity, and a 1,050 pound gross weight.

(3) Drawings

(i) The packaging for the inner HFIR fuel is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-20978-EL-003E, Rev. E, and M-20978-EL-008E, Rev. C

5. (a) (3) Drawings (continued)

(ii) The packaging for the outer HFIR fuel is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-20978-EL-002E, Rev. D, and M-20978-EL-008E, Rev. C

(b) Contents

(1) Type and form of material

Uranium as U_3O_8-Al cermet, enriched up to 95% in the U-235 isotope, and clad in aluminum, 10-mils thick, and:

(i) For the packaging described in 5(a)(3)(i), the contents are described in ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3," and in the following Oak Ridge National Laboratory Drawing Nos.: E-42118, Rev. Q; E-42112, Rev. H; D-42113, Rev. G; E-42114, Rev. H; and E-42117, Rev. H.

(ii) For the packaging described in 5(a)(3)(ii) the contents are described in ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3," and in the following Oak Ridge National Laboratory Drawing Nos.: E-42126, Rev. M; E-42120, Rev. H; D-42121, Rev. H; D-42122, Rev H; and E-42125, Rev. J.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i) not more than 2.63 kg of U-235.

(ii) For the contents described in 5(b)(1)(ii) not more than 6.88 kg of U-235.

(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The lid lifting attachments must be blocked as shown on Martin Marietta Energy Systems, Inc., Drawing No. M-20978-EL-009E, Rev. 2, to prevent inadvertent use of the attachments during transport.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) Each package shall be maintained in accordance with the Maintenance Program in Chapter 8 of the application;

   (b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application; and

   (c) The fuel element shall meet the fabrication inspection requirements of ORNL/TM-9220, "Specifications for High Flux Isotope Reactor Fuel Elements HFIR-FE-3."

8. Use of packaging fabricated after December 31, 1976, is not authorized.

9. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.12.

10. Expiration date: September 30, 2007.

REFERENCES

U.S. Department of Energy Application dated May 30, 1991.

Supplements dated: February 26, 1992; April 2, 1993; and September 23, 1996; September 2, 1998; February 24, 2000; and February 4, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: ~~September 20,~~ 2002

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5805	20	71-5805	USA/5805/B( )	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Duratek
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Chem-Nuclear Systems, Inc., application dated February 25, 1994.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: CNS 3-55

(2) Description

The package is a steel-encased, lead-shielded cask with crushable impact limiters. The basic cask is a steel cylinder 133-3/4 inches long by 50-1/2 inches in diameter with maximum cavity dimensions of 36 inches in diameter by 116 inches long reduced to 111 inches by the shield ring attached to the lid cover. Shielding is provided by 6 inches of chemical lead in the sides and closure base plate and 5-1/4 inches in the closed end.

The outside steel encasement is made up of two, ½-inch plates on the sides and three plates totaling 2-5/8 inches on the end. The containment vessel is a 1/4-inch thick cylinder with a ½-inch end plate. The shells are welded together with the lead shielding poured to fill the annular and end spaces.

The removable, flanged and recessed base plate weldment consists of 3/8-inch and 1-1/4-inch outside plates and a 5/8-inch inside plate. The space between the plates is lead-filled.

The base plate is secured to the cask body by means of twelve, 1-1/2-inch high strength bolts and nuts and sealed with two silicone O-rings.

The cavity is penetrated by a vent line at the closed end and a drain line through the base plate. The vent line is sealed by a gasketed and shielded plug. The drain line is sealed with a 25 psig relief valve.

5.(a)(2) Description (continued)

Cask appendages include two, 8-inch lifting trunnions and two, 4-inch removable tilting trunnions on the cask side.

Removable impact limiters are provided at the cask ends and at the two, 8-inch trunnions. The former consist of a series of 6-inch diameter closed end tubes. Each impact limiter has tubes approximately 6 inches long around the end periphery. The closure end impact limiter has 12 tubes, six about 6 inches long and six about 2 inches long, around the sides. The closed end impact limiter has six tubes about 6-inches long around the sides. A gusseted tube acts as the trunnion impact limiter.

The cask is secured horizontally to a skid which is mounted to the transport vehicle for shipment. An optional sunshade is provided.

The gross weight of the package, excluding the skid and sunshade is approximately 70,000 pounds. The skid weighs about 4,200 pounds.

(3) Drawings

The packaging is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing Nos.: MOD 100, Rev. 13; C-111-D-0001, Rev. 0; and C-111-E-0002, Rev. 2; and ATCOR Drawing Nos.: MOD 189-1, Rev. K; MOD 140, Rev. C; MOD 124, Rev. 5; 0999-D-07, Rev. 8; and 0999-C-08, Rev. 8. An optional sunshade is constructed in accordance with Chem-Nuclear Systems, Inc. Drawing No. C-110-D-5001, Rev. 1.

(b) Contents

(1) Type and form of material

Depleted Antimony-Beryllium (Sb-Be) neutron sources and irradiated metal components packaged in secondary containers.

(2) Maximum quantity of material per package

Package internal decay heat load not to exceed 250 watts. The source strength of depleted neutron sources not to exceed 2.3 curies of Antimony-124.

6. (a) Both the inner cask cavity and the secondary container must be free of water when the package is delivered to a carrier for transport.

(b) Except for close fitting items, shoring must be placed between contents, secondary container and cask cavity to minimize secondary impacts due to accident sequence.

(c) The maximum gross weight of the contents, secondary container and shoring is limited to 9,220 pounds.

7. Prior to each shipment, the silicone O-ring seals (base plate and vent plug) must be inspected, the seals must be replaced with new seals if inspection shows any defects or every six (6) months, whichever occurs first.

8. Prior to delivery of the package to a carrier for transport, the package containment cavity shall be leak tested. The sensitivity of the test shall be at least 1×10^{-1} atm-cm^3/sec (STP). In addition, the packaging containment cavity shall be leak tested at least once every twelve (12) months. The sensitivity of the test shall be at least 1×10^{-3} atm-cm^3/sec (STP).

9. The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application.

10. Each packaging must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12. Fabrication of additional packagings after December 31, 1983 is not authorized.

12. Expiration date: March 31, 2002.

REFERENCES

Chem-Nuclear Systems, Inc. application dated February 25, 1994.

Supplements dated: February 16, 1999, December 5, 2000, January 23, February 2, March 2, 2001, and April 23, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 12, 2001

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5830	8	USA/5830/B( )	1	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Minnesota Mining and Manufacturing Co.
Application dated June 28, 1968, as supplemented

c. DOCKET NUMBER 71-5830

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

(1) Model No.: SNAP-21

(2) Description

A thermoelectric generator 16 inches in diameter by 39 inches long packaged in a right circular metal protective enclosure 52 inches in diameter by 68 inches long. Main components of the generator consist of an outer Beryllcoy 165 housing; neutron, gamma, and X-ray shielding; thermal insulation; thermoelectric modules and the heat source. Total weight of the package is 1,900 pounds.

(3) Drawings

The SNAP-21 is constructed in accordance with Minnesota Mining and Manufacturing Company Drawing No. B-SK-[illegible]-4014 and Drawings included in 3M Report No. MMM-3691-33.

(b) Contents

(1) Type and form of material

Strontium 90 titanate pellets doubly encapsulated by a thin inner liner and a 0.2-inch thick Hastelloy C primary containment capsule which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package 33,000 curies.

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. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment, operated and maintained in accordance with Minnesota Mining and Manufacturing Company Report No. MMM 3691-42, "SNAP-21 Program, Phase II, Deep Sea Radioisotope-Fueled Thermoelectric Generator Power Supply System, Shipping and Handling Manual."

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

8. Expiration date: November 30, 2005

REFERENCE

Minnesota Mining and Manufacturing Company application dated June 28, 1968. Department of Navy supplements dated June 8 and October 10, 1990, and September 20, 1995, April 16, 1998, and April 27, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 28, 2000

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5862	8	71-5862	USA/5862/B( )	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of the Air Force
HQ ATAC/SEG
1030 S. Highway A1A
Patrick AFB, FL 32925-3002

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Teledyne Energy Systems application dated June 26, 1985, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: Sentinel 100F

(2) Description

The package, a thermoelectric generator, is 45.5 inches in height with a base diameter of 24.5 inches (excluding mounting pads), and weighs approximately 2,600 pounds. The components include a Tungsten biological shield (10.705" X 13.837" OD) which is within the aluminum (6061) outer protective housing. Four 6061-T6 mounting pads at the base of the aluminum housing provide the shipping pallet attachment points.

(3) Drawings

The packaging is constructed in accordance with the following Isotopes, Inc. Drawing Nos.:

010F10000	Sheets 1-3 (Rev. C), Generator Assembly Sentinel 100F
010-20000	Sheets 1-2 (Rev. B), Fuel Capsule Assembly
010-70003	(Rev. A) Shield Body
010-70004	Shield Plug
001-90064	Sheets 1-2 (Rev. A), Shipping Crate Sentinel RTG
001-90039	Sheets 1-2 (Rev. J), Sheet 3 (Rev. H), and Sheet 4, Pallet Assembly

5. (b) Contents

(1) Type and form of material

Strontium-90 titanate doubly encapsulated in a stainless steel liner and Hastelloy or Uniloy HC capsule which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

370,000 curies.

6. Fabrication of additional packagings is not authorized.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in the supplement dated August 30, 1985.

(b) The package must be maintained in accordance with the Maintenance Program in the supplement dated August 30, 1985.

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

9. Expiration date: September 30, 2005.

REFERENC--

Teledyne Energy Systems application dated June 26, 195..

Teledyne supplements dated: August 30, 1985; and July 26, 1990.

Department of the Air Force supplements dated: November 12, 1993; August 15, 1995; and August 25, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: October 6, 2000

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5926	17	USA/5926/B( )F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

General Electric Company
P.O. Box 460, Vallecitos Road
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated November 19, 1987, as supplemented.

c. DOCKET NUMBER 71-5926

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: GE-100

(2) Description

A steel encased lead shielded shipping cask. The cask is double-walled steel circular cylinder, 20-1/4-inch diameter by 26-7/8 inch high with a central cavity approximately 7-5/8-inch diameter by 10 inches high. Approximately 5-7/8 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. For additional shielding lead, tungsten or uranium liners may be inserted in the cask cavity. The maximum weight of the packaging is 4,800 pounds.

(3) Drawings

The packaging is constructed in accordance with General Electric Company Drawing Nos. 129D4727, Rev. 5; 129D4729, Rev. 5; 129D4730, Rev. 4; and 129D4731, Rev. 1.

5. (b) Contents

(1) Type and form of material

(i) Byproduct and irradiated special nuclear material in the form of fuel rods, or plates, fuel assemblies, or meeting the requirements of special form radioactive material; or

(ii) Solid nonfissile irradiated metal hardware and reactor control rods (blades).

(2) Maximum quantity of material per package

Radioactive decay heat not to exceed 400 watts and 500 grams U-235 equivalent mass fissile material. (U-235 equivalent mass equals U-235 mass plus 1.66 times U-233 mass plus 1.66 times Pu mass).

Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy or reactor elements,

(c) Transport Index for Criticality Control

For the contents described in 5.(b)(1)(i):

Minimum transport index to be shown on label for nuclear criticality control: 5.6

6. Shoring shall be provided to minimize movement of contents during accident conditions of transport.

7. At the time of delivery of the loaded package to a carrier for transport, the package contents shall be dry and the fissile material unmoderated (H to X atomic ratio less than 2).

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be maintained in accordance with the maintenance procedures submitted with GE application dated January 18, 1993.

(b) The package must be prepared for shipment and operated in accordance with the operating procedures submitted with GE application dated January 18, 1993.

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

10. Expiration date: May 31, 2003.

REFERENCES

General Electric Company application dated January 18, 1993.

Supplements dated: March 3, 1993 and November 19, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 15, 1998

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

General Electric Company
P.O. Box 460, Vallecitos Road
Pleasanton, CA 94566

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Electric Company application
dated November 19, 1992, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 1500

(2) Description

A steel encased lead shielded shipping cask. The cask is double-walled steel circular cylinder, approximately 30 1/4-inch diameter by 48 1/2 inches high with a central cavity approximately 7-inch diameter by 25 inches high. The diameter is reduced from 30 1/4 inches to 17 1/2 inches by cone construction at the top 7 inches of the cask. Approximately 11 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. A protective jacket consisting of an upright circular cylinder with open bottom and a protruding box section diametrically across the top and vertically down the sides attaches to a square pallet. Dimensions of the protective jacket are approximately 60 7/8 inches high by 50 inches wide across the box section. The outer cylindrical diameter is 36 1/2 inches and the pallet is 59 1/2 inches square. The maximum weight of the packaging is approximately 15,500 pounds.

(3) Drawings

(i) The packaging is constructed in accordance with General Electric Company Drawing Nos. 129D4748, Rev. 7; 129D4749, Rev. 5; and 129D4750, Rev. 9.

(ii) An optional canister insert is constructed in accordance with the following Chem-Nuclear Systems, Incorporated Drawing Nos.:

C-110-D-48019-001, Rev. D; and C-110-A-48019-002, Rev. C.

5.(b) Contents

(1) Type and form of material

(i) Byproduct material and special nuclear material meeting the requirements of special form radioactive material and antimony pins encased in stainless steel, or

(ii) Byproduct material as $^{90}SrF_2$ or $^{137}CsCl$ capsules meeting Condition No. 6, below, or

(iii) Solid nonfissile irradiated metal hardware and reactor control rods (blades), or

(iv) Stainless steel encapsulated solid metal Co-60 sources, or

(v) Byproduct material as $^{137}CsCl$ capsules meeting Condition No. 7, below.

(2) Maximum quantity of material per package

Not to exceed a decay heat generation of 3,120 watts and

(i) Item 5(b)(1)(i) above:

500 grams U-235 equivalent mass. (U-235 equivalent mass equals U-235 mass plus 1.66 times Pu mass). Plutonium in excess of 20 curies per package must be in the form of metal, metal alloy or reactor fuel elements.

(ii) Item 5(b)(1)(ii) above:

458,000 curies.

(iii) Item 5(b)(1)(iv) above:

200,000 curies.

(iv) Item 5(b)(1)(v) above:

157,000 curies.

(c) Maximum Transport Index for Criticality Control

For contents described in 5(b)(1)(i)
and limited in 5(b)(2)(i):

Minimum transport index to be shown on
label for nuclear criticality control: 5.7

6. For the contents described in 5(b)(1)(ii): The $^{90}SrF_2$ capsules must be in accordance with Vitro Drawing Nos. H-2-66759, Rev. 0; and H-2-66758, Rev. O. The $^{137}CsCl$ capsules must be in accordance with Vitro Drawing Nos. H-2-66760, Rev. 0; and H-2-66761, Rev. 0. After fabrication, the $^{90}SrF_2$ and $^{137}CsCl$ capsules must be leak tested using a method having sufficient sensitivity to detect a leak rate of 10^{-8} atm cc/sec. Any capsule with a detectable leak may not be delivered to a carrier for transport.

7. For the contents described in 5(b)(1)(v): The $^{137}CsCl$ capsules must be contained in the canister insert described in item 5(a)(3)(ii), above. The $^{137}CsCl$ capsules must be constructed and tested in accordance with Section 1.2.3 of the Chem-Nuclear Systems, Incorporated supplement dated March 1, 1993. The canister insert must be operated, tested, and maintained in accordance with Chapters 7 and 8 of the Chem-Nuclear Systems, Incorporated supplement dated March 1, 1993. The shipment period must be completed within 30 days following the placement of the canister lid on the canister insert.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) Except for packaging Serial Number 1506, the package must be prepared for shipment, operated, and maintained in accordance with the "Shipping Package Assembly/Disassembly" sections of the application, as supplemented.

   (b) The silicone rubber lid gaskets must be replaced within the 12-month period preceding each shipment. Prior to each shipment the silicone rubber lid gaskets must be inspected. The silicone rubber gaskets must be replaced if inspection shows any defects. Cavity drain line must be sealed with appropriate sealant applied to threads of pipe plug.

   (c) Packaging Serial Number 1506 must be prepared for shipment, operated, and maintained in accordance with Neutron Products, Inc., supplement dated October 10, 2002.

   (d) Packaging Serial Number 1506 must be bubble tested within the 12-month period preceding each shipment, and after each third use. The bubble test must be performed in accordance with Neutron Products, Inc., supplement dated October 10, 2002.

9. Except for packaging Serial Number 1506, the package may only be dry loaded and unloaded; loading or unloading under water is not authorized.

10. The package authorized by this certificate is hereby approved for use under the general license provision of 10 CFR 71.12.

11. Expiration date: October 31, 2003.

REFERENCES

General Electric Company application dated November 19, 1992.

General Electric Company supplements dated December 12, 1997, August 13, 1998, and August 27 and September 27, 2001.

Chem-Nuclear Systems, Inc., supplement dated March 1, 1993.

Neutron Products, Inc., supplements dated February 1 and October 10, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

John D. Monninger, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 13, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5957	27	71-5957	USA/5957/B( )F	1	OF	8

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, D.C. 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Department of Energy application dated April 18, 1995, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: BMI-1

(2) Description

A steel-encased lead shielded shipping cask. The basic cask body is a cylinder 33.37 inches in diameter by 73.37 inches high formed by two concentric stainless steel shells whose annular region is filled with lead. The outer ½-inch thick shell has a 0.12-inch thick plate spot welded to it, providing a 0.06-inch thick air gap insulator. The inner shell is 15.5 inches inside diameter by 54 inches inside length. The cask lid is a stainless steel weldment having 7.75 inches of lead shielding. The cask lid is secured to the cask by twelve steel studs which are welded to the cask body. The cask is provided with a drain line with needle valve and plug, pressure gauge, and a pressure relief valve. The total cask weight, including maximum contents of 1,800 lbs, is 23,660 lbs.

(3) Drawings

The cask is constructed in accordance with the following Battelle Memorial Institute (BMI) Drawing Nos.: 43-6704-0001, Rev. B; and 41-4409-0003, Rev. B.

5. (a) Packaging (continued)

(4) Product Containers

The various authorized product containers are constructed in accordance with the following Drawing Nos.:

(i) Inner can assembly as shown in BMI Drawing No. 00-000-421, Rev. C.

(ii) Basket Assembly as shown in BMI Drawing Nos. BCL-000-500, Rev. A; BCL-000-501, Rev. A; and 0048, Rev. A.

(iii) Fermi Fuel Element copper casting assembly as shown in BMI Drawing No. K5928-5 0049D, Rev. to May 12, 1966.

(iv) Basket Assembly as shown in BMI Drawing No. 1020, Rev. B (or with alternate spacer shown in CI Drawing No. 334D2193) or GA Drawing No. 9590001, Rev. A. Failed fuel assemblies must be seal welded in aluminum or stainless steel tubes with wall and end cap thicknesses of at least 0.015 inch.

(v) Basket Assembly defined by BMI Drawing No. BCL-000-500, Rev. A, as modified by BMI Drawing Nos. 00-000-236, Rev. C, and BCL-000-502, Rev. B.

(vi) Basket Assembly and storage can defined by BMI Drawing No. 00-000-391, Rev. C, and Atomic International Drawing No. AIHL, S8DR 0019-01, Rev. A, respectively.

(vii) Inner can assembly as shown in Union Carbide Corporation Drawing No. 101501, Rev. A.

(viii) Basket Assembly as shown in University of Missouri Research Reactor (MURR) Drawing No. 2234, Sheets 1 through 5, Revision 0.

(ix) HFBR assembly basket and spacer plate as shown in Brookhaven National Laboratory Drawing Nos.: BNL 93-001, Sheets 1, 2, and 3, Rev. 2, and BNL 93-002, Sheet 1, Rev. 2.

(x) Basket assembly as shown in General Electric Company Drawing No. 183C8253, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Intact irradiated MTR- or BRR-type fuel assemblies containing not more than 200 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

5. (b) Contents (Continued)

1. Type and form of material (Continued)

(ii) Intact irradiated Enrico Fermi Core. A fuel assembly containing not more than 4.77 kgs U-235 prior to irradiation. Uranium may be enriched to 25.6 w/o in the U-235 isotope.

(iii) Greater than Type A quantity of radioactive material which may include uranium enriched in the U-235 isotope, U-233, plutonium, as metal, oxides, or compounds which are thermally stable up to 600°F. Plutonium in excess of twenty (20) curies per package must be in the form of metal, metal alloy, or reactor elements.

(iv) Greater than Type A quantity of byproduct material meeting the requirements of special form radioactive material.

(v) Greater than Type A quantity of byproduct material in normal form as metal, oxides, or compounds which are thermally stable up to 600°F.

(vi) Irradiated Triga Type fuel assemblies described in Section 6.6 of the application (pp. 6-23 through 6-27).

(vii) Irradiated S8DR fuel elements 0.56-inch OD by 18.7 inches long by 0.010-inch wall thickness of Hastelloy-N. The fuel material is UZrH fully enriched in U-235.

(viii) Intact irradiated CP-5 fuel assemblies containing not more than 176 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93 w/o in the U-235 isotope. Active fuel length shall be 28.5 inches.

(ix) Solid nonfissile irradiated hardware which may contain encapsulated fission monitors.

(x) Irradiated uranium oxide waste enriched in the U-235 isotope up to a nominal 93 w/o which is thermally stable up to 800°F.

(xi) Irradiated uranium enriched in the U-235 isotope meeting the requirements of special form radioactive material.

(xii) Intact irradiated MURR fuel assemblies containing not more than 775 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be 24 inches.

5. (b) Contents (Continued)

(1) Type and form of material (Continued)

(xiii) Intact irradiated MITR-II fuel assemblies containing not more than a nominal 510 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 24 inches.

(xiv) Intact irradiated High Flux Beam Reactor (HFBR) fuel assemblies containing not more than a nominal 351 grams of U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum of 93.5 w/o in the U-235 isotope. Active fuel length shall be nominal 24 inches.

(xv) Intact irradiated MTR-type fuel assemblies containing not more than 240 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

(xvi) Irradiated MTR-type fuel sections containing not more than 176 grams U-235 per fuel section prior to irradiation. Uranium may be enriched to a maximum 93.5 w/o in the U-235 isotope. Active fuel length per fuel section shall be approximately 11 inches. The fuel assembly shall be sectioned only in the non-fuel bearing regions of the assembly.

(xvii) Intact irradiated MTR-type fuel assemblies containing not more than 282.7 grams U-235 per assembly prior to irradiation. Uranium may be enriched to a maximum 20 w/o in the U-235 isotope. Active fuel length shall be approximately 25 inches.

(2) Maximum quantity of material per package

The minimum cooling time of each fuel assembly and rod is 90 days, maximum decay heat generation per package not to exceed 1.5 kW, and the external dose rate not to exceed 10 mrem/hr 3 feet from the external surface of the cask and:

(i) For the contents described in 5(b)(1)(i):

Twenty-four (24) fuel assemblies as contained in product containers specified in 5(a)(4)(ii) or 12 fuel assemblies as contained in product containers specified in 5(a)(4)(v).

(ii) For the contents described in 5(b)(1)(ii):

One (1) fuel assembly as contained in product container specified in 5(a)(4)(iii).

5. (b) Contents (Continued)

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

(iii) For the contents described in 5(b)(1)(iii):

480 grams U-233 or 480 grams Pu-239 or 800 grams U-235 as contained in product container specified in 5(a)(4)(i).

(iv) For the contents described in 5(b)(1)(iv):

Gamma sources securely confined in the cask cavity to preclude secondary impacts during accident conditions of transport. Thermal heat generation rate is limited to 200 watts.

(v) For the contents described in 5(b)(1)(v):

Contained in product containers specified in 5(a)(4)(i) and limited to 200 thermal watts.

(vi) For the contents described in 5(b)(1)(vi):

Thirty-eight (38) fuel assemblies as contained in product containers specified in 5(a)(4)(iv). Fuel assemblies with an initial enrichment (U-235 in U) of greater than 70 w/o U-235 are limited to 19 assemblies per product container. Shipments of less than 19 assemblies with a U-235 enrichment greater than 70 w/o may be combined with assemblies of 70 w/o U-235 or less provided: $x/38 + y/19 \leq 1$; x = no. assy's $\leq$ 70 w/o U-235, y = no. assy's > 70 w/o U-235.

(vii) For the contents described in 5(b)(1)(vii):

Twenty-four (24) fuel elements per can and six sealed cans per basket as described in 5(a)(4)(vi). Each of the six cans may contain up to 818 g U-235 and 158 g hydrogen. The cask is limited to 4.908 kg U-235.

(viii) For the contents described in 5(b)(1)(viii):

Twelve (12) fuel assemblies.

(ix) For the contents described in 5(b)(1)(ix):

Thermal heat generation rate is limited to 200 watts.

(x) For the contents described in 5(b)(1)(x):

Twenty-four (24) containers each limited to 352 grams U-235 as contained in product containers specified in 5(a)(4)(vii). The decay heat per container is limited to 20 watts. The containers must be leak tested in accordance with Union Carbide Corporation letter dated November 17, 1980.

5. (b) Contents (Continued)

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

(xi) For the contents described in 5(b)(1)(xi):

Twenty-four (24) capsules each limited to 100 grams U-235.

(xii) For the contents described in 5(b)(1)(xii):

Eight (8) fuel assemblies as contained in the product container specified in 5(a)(4)(viii). The maximum burnup is 150 MWD/Assembly and the minimum cooling time of each fuel assembly is 150 days. The maximum radiation source term is 400,000 curies.

(xiii) For the contents described in 5(b)(1)(xiii):

Eight (8) fuel assemblies, contained in the product container specified in 5(a)(4)(viii). The maximum decay heat per package is 200 watts.

(xiv) For the contents described in 5(b)(1)(xiv):

Twenty (20) fuel assemblies contained in two baskets separated by a spacer plate as specified in 5(a)(4)(ix). Each shipment must contain twenty fuel assemblies. The maximum burnup is approximately 130 MWD/assembly, and the minimum cooling time is 470 days.

(xv) For the contents described in 5(b)(1)(xv):

Twelve (12) fuel assemblies contained in product container specified in 5(a)(4)(v).

(xvi) For the contents described in 5(b)(1)(xvi):

Forty (40) fuel sections contained in the product container specified in 5(a)(4)(x). When a shipment contains less than the maximum number of fuel sections (40), empty fuel section basket spaces must be provided with an aluminum or steel spacer in the form of an open-ended pipe with a minimum outer diameter of 2.5 inches and a minimum wall thickness of 0.125 inches. The spacer must be of sufficient length to replace the absent fuel sections.

(xvii) For the contents described in 5(b)(1)(xvii):

Eight (8) fuel assemblies contained in the peripheral locations of the basket specified in 5(a)(4)(v). The maximum burnup is 14%, the maximum decay heat is 15 watts per fuel assembly, and the minimum cool time is 120 days. Four aluminum inserts, as shown in Lockheed Martin Drawing No. 507584, Rev. 1, must be positioned in each of the four center basket locations.

5. (c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1) For the contents described in 5(b)(1)(iii) and 5(b)(1)(xv), and limited in 5(b)(2)(iii) and 5(b)(2)(xv): 0.4

(2) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xvi), and 5(b)(1)(xvii), and limited in 5(b)(2)(i), 5(b)(2)(ii), 5(b)(2)(vi), 5(b)(2)(vii), 5(b)(2)(viii), 5(b)(2)(x), 5(b)(2)(xi), 5(b)(2)(xii), 5(b)(2)(xiii), 5(b)(2)(xiv), 5(b)(2)(xvi), and 5(b)(2)(xvii): 100

6. For Item 5(b)(1)(iii), mixtures of fissile material are authorized, provided the following equation is satisfied:

$$\frac{X}{480} + \frac{Y}{480} + \frac{Z}{800} \leq 1, \text{ where}$$

X = Grams U-233 to be shipped
Y = Grams Pu-239 to be shipped
Z = Grams U-235 to be shipped

7. Except for the contents described in 5(b)(1)(ii), 5(b)(1)(iv) and 5(b)(1)(xii); and limited in 5(b)(2)(ii), 5(b)(2)(iv) and 5(b)(2)(xii), the cask must be shipped dry.

8. If the cask contents of 5(b)(1)(ii), 5(b)(1)(iv) or 5(b)(1)(xii) are shipped wet, the licensee must confirm that the pressure relief valve is operable (set pressure - 75 psig). When needed, sufficient antifreeze in the cask must be used to prevent damage of any component of the package by freezing.

9. Loading and unloading operations of the contents described in 5(b)(1)(iii) and limited in 5(b)(2)(iii) must preclude contact of water with the contents.

10. When the contents of 5(b)(1)(vi) are loaded wet, the optional 0.5-inch diameter drain hole must be present in the primary basket lower plate to assure proper draining of the basket.

11. The presence and effectiveness of the Boral poison plate in the Basket Assemblies as shown in BMI Drawing Nos. BCL-000-500, Rev, A; 0048, Rev. A; and 00-000-236, Rev. C, must be verified by neutron measurements prior to first use and records maintained of such verification. Verification of the presence of the Boral must be made in each subsequent use.

12. Contents 5(b)(1)(i) and 5(b)(1)(x) may be mixed provided the sum of the product containers and fuel assemblies does not exceed 24.

13. Axial movement of fuel assemblies must be limited so that the active fuel region will remain correctly positioned with respect to the poisoned section of the basket. Removable spacers may be used in each section of the basket to limit axial movement of the assemblies.

14. Contents must be securely confined in the cask cavity to minimize movement.

15. Prior to each use, adequacy of containment vessel must be demonstrated by performance of the leak test described in Section 7.1.1.1 of the application.

16. Gaskets and seals (cask and fuel canister) must be replaced at least every 12 months or earlier if visible degradation occurs.

17. For contents described in 5(b)(1)(iii) and limited in 5(b)(2)(iii), the mass of fissile material contained in reactor fuel must be based on the mass prior to irradiation.

18. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application. Additionally, for the contents described in 5(b)(1)(xvii), the package must be prepared for shipment in accordance with the procedures specified in the supplement dated January 29, 1999.

    (b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

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

20. Expiration date: March 31, 2008.

REFERENCES

Department of Energy application dated: April 18, 1995

Department of Energy supplements dated: November 20, 1995, September 4, 1998, January 29 and April 20, 1999, and December 13, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: February 9, 2001

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
5979	10	USA/5979/B( )	1	2

PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Alpha-Omega Services, Inc.
9156 Rose Street
Bellflower, CA 90706

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Alpha-Omega Services, Inc. application dated June 1980, as supplemented.

c. DOCKET NUMBER 71-5979

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

(1) Model No.: 5979

(2) Description

A shipping container for teletherapy cobalt sources. Configuration of the outer container is box-like measuring approximately 38" x 50" x 40". The box is lined with 4.5" of plywood with a 0.125" outer steel shell welded to an exterior angle framework. Transverse strips across the bottom facilitate use of a fork-lift and lifting lugs are provided at the four top corners. The inner shield vessel is essentially a 24" diameter, lead-filled, barrel-shaped configuration. Three different cylindrical plug inserts and bolted end caps provide flexibility to accommodate several sizes and shapes of sources. Gross weight is approximately 5,000 lbs.

(3) Drawings

The packaging is constructed in accordance with Alpha-Omega Services, Inc. Drawing Nos.: 0090, Rev. 0; 0091, Rev. 0; 0092, Rev. 1; and 0093, Rev. 0.

(b) Contents

(1) Type and form of material

Cobalt 60 or cesium 137 as sealed sources which meet the requirements of special form radioactive material.

PRINTED ON RECYCLED PAPER

5.(b) Contents (continued)

(2) Maximum quantity of material per package

13,000 curies Co-60 or 3,000 curies Cs-137, with decay heat load not to exceed 200 watts.

6. Lifting eyes shall be covered or blocked to prevent use as tie-down attachments.

7. The shield vessel closures shall be equipped with gaskets.

8. Bolts used to secure the shield vessel closure caps shall be secured against loosening by vibration during transport.

9. In addition to the requirements of Subpart G of 10 CFR Part 71:

a) Each package must meet the Maintenance Inspection Program of the supplement dated August 20, 1990; and

b) The package must be prepared for shipment in accordance with the Operating Procedures of the supplement dated August 20, 1990.

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

11. Expiration date: September 30, 2005.

REFERENCES

Alpha-Omega Services, Inc. application dated June 1980.

Supplement dated: April 12, 1983, May 22 and August 20, 1990, and January 30, November 16, 1995, and July 5, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 08/23/00

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
5984	7	71-5984	USA/5984/B( )	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

J. L. Shepherd and Associates
1010 Arroyo Avenue
San Fernando, CA 91340-8095

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

J. L. Shepherd and Associates applications dated September 12, 1974; and April 26, 2001, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 5984

(2) Description

A protective overpack which provides impact resistance, and thermal resistance for its contents which are contained within a single snug-fitting shielded inner container. The overpack consists of a vented-steel jacketed, laminated plywood outer container. Dimensions of the overpack are approximately 28" in diameter by 43" high and the plywood thickness is approximately 4" on the sides and 6" on the top and bottom. The total weight including weight of the contents is approximately 1,780 pounds.

(3) Drawings

The overpack is constructed in accordance with J. L. Shepherd and Associates Drawing Nos. A-0068-2C-1 dated March 8, 1969; and A-0068-2C dated April 26, 1995.

The inner shielded containers are constructed in accordance with J. L. Shepherd and Associates Drawing Nos. A-0068-1B, Rev. 2, or A-0068-1B-B, dated April 26, 1995, or A-0068-1B-A, dated April 26, 1995 . The special form source capsule is constructed in accordance with J. L. Shepherd and Associates Drawing No. A-0068-10 dated January 30, 1969.

(b) Contents

(1) Type and form of material

Cesium 137 as cesium chloride sources doubly encapsulated in stainless steel tubes which meet the requirements of special form radioactive material.

5 (b) Contents continued

(2) Maximum quantity of material per package

12,000 curies.

6. Use of packaging fabricated after August 31, 1986, is not authorized.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

a. The package shall be prepared for shipment and operated in accordance with "Inspection Operation, Handling and Maintenance Procedures" in the J. L. Shepherd and Associates submittal dated May 1, 1995.

b. The package must meet the "Acceptance Tests" and "Checkout and Maintenance Procedures" in the J. L. Shepherd and Associates submittal dated February 20, 1990.

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

Expiration date: August 31, 2007.

REFERENCES

J. L. Shepherd and Associates' applications dated September 12, 1974; and April 26, 2001.

Supplements dated: January 20, 1975; February 20, 1990; February 6, and May 1, 1995;April 11, 1996; and June 8, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: August 12, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6003	20	71-6003	USA/6003/B( )F	1	OF	6

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for M-130 shipping container dated December 30, 1968, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

a) Packaging

(1) Model No.: M-130

(2) Description

The Model No. M-130 shipping container is an upright cylinder 84 inches in diameter by 158 inches overall height. The container walls consist of a finned 1-inch thick outer shell fabricated from either carbon steel, carbon steel with stainless steel clad, or solid stainless steel, 10 inches of lead shielding, and a 1-inch thick inner pressure vessel fabricated from carbon steel clad with stainless steel. The top of the container is covered with a shielded closure head which is bolted to the container and seals the pressure vessel. An access opening with a bolted shield plug is provided in the closure head for loading and unloading spent fuel.

The pressure vessel has an inside diameter of 55 inches. The central region contains a secondary heat exchanger (not used during shipment) surrounded by 1/2-inch thick carbon steel backup cylinder 29 inches in diameter. The annulus which remains between the backup cylinder and the pressure vessel provides a space 13-inches wide and 130-inches high for spent fuel. The spent fuel is contained in the annulus by module holders designed for the particular core to be shipped.

The container has external penetrations to the pressure vessel for steam and water relief lines and a fill and drain line (which are capped during shipment) and a pressure sensing line which remains open to a pressure gage during shipment. The container also has penetrations which do not open to the pressure vessel for secondary heat exchanger lines (which are capped during shipment) and a temperature sensing line.

The container is supported on its transport vehicle by an "A" frame structure. Gross weight of the loaded container without its support structure is approximately 228,000 pounds.

5. (a) Packaging (continued)

(3) Drawings

The packaging is constructed in accordance with General Electric Drawing Nos. 247E209, Sheet 1, Rev. R; Sheet 2, Rev. K; Sheet 3, Rev. T; Sheet 4, Rev. U; Sheet 5 of 5, Rev. F, and 247E228, Rev. F.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies, activated corrosion products and structural parts containing up to 40 gallons of residual contaminated water. The fuel assemblies and structural parts are of the following types:

(i) Deleted.

(ii) Deleted.

(iii) Deleted.

(iv) D1G fuel modules of core types 1 or 2.

(v) D1G removable fuel assemblies of core types 1 or 2.

(vi) Deleted.

(vii) Deleted.

(viii) S3G-3/3A fuel module with or without control rods. The core age must be at least 4000 logging-corrected full-power hours.

(ix) Deleted.

(x) S3G-3/3A irradiated thermocouples and thermocouple cases.

(xi) S8G full size fuel cell with or without control rod.

(xii) S8G partial size fuel cell with or without control rod.

(xiii) Deleted.

(xiv) Deleted.

(xv) D2W fuel cells with control rods.

(xvi) NR-1 fuel modules with or without control rods.

5. (b) Contents (continued)

(xvii) Deleted.

(xviii) A1W-3 recoverable irradiated fuel modules. Fuel modules that use control rod shall have control rods inserted.

5.(b)(2) Maximum quantity of material per package.

(i) Deleted.

(ii) Deleted.

(iii) 6 fuel assemblies as described in 5(b)(1)(iv) and 4 fuel assemblies as described in 5(b)(1)(v).

(iv) Deleted.

(v) 10 fuel assemblies as described in 5(b)(1)(viii).

(vi) 9 fuel assemblies as described in 5(b)(1)(viii).

(vii) 9 fuel assemblies as described in 5(b)(1)(viii) and 1 structure as described in 5(b)(1)(x).

(viii) 4 fuel cells as described in 5(b)(1)(xi) or 2 fuel cells as described in 5(b)(1)(xi) and 2 fuel cells as described in 5(b)(1)(xii).

(ix) Deleted.

(x) Deleted.

(xi) 4 fuel cells as described in 5(b)(1)(xv) plus 2 corner fuel cells or 1 RFA fuel cell.

(xii) 4 fuel modules as described in 5(b)(1)(xvi).

(xiii) Deleted.

(xiv) For contents described in 5(b)(1)(xviii), 6 fuel modules or 8 fuel modules, as described in supplement dated March 30, 1992.

(3) Shipments shall be further limited by thermal requirements as follows:

(i) Shipment of contents specified in 5(b)(1)(iv) and 5(b)(1)(v) and limited in 5(b)(2)(iii) shall be made no earlier than 75 days after shutdown and shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.

(ii) Deleted.

5. (b) Contents (continued)

(iii) Shipment of contents specified in 5(b)(1)(viii), and 5(b)(1)(x) and limited in 5(b)(2)(v), 5(b)(2)(vi), and 5(b)(2)(vii) shall be made at a time after shutdown, as determined from Bettis Atomic Power Laboratory report WAPD-OP(PP)S-4401 dated June 29, 1979, and shall have a decay heat load not to exceed 28,620 Btu/hr for the shipboard core and 30,000 Btu/hr for the prototype core.

(iv) Deleted.

(v) Shipment of contents specified in 5(b)(1)(xi) or 5(b)(1)(xii), as limited by 5(b)(2)(vii), shall have a fully loaded container heat load not to exceed 15,400 Btu/hr per shipment.

(vi) Deleted.

(vii) Deleted.

(viii) Shipment of contents specified in 5(b)(1)(xv) and limited in 5(b)(2)(xi) shall have a heat load not to exceed 19,100 Btu/hr and shall be made no earlier than 420 days after shutdown.

(ix) Shipment of contents specified in 5(b)(1)(xvi) and limited in 5(b)(2)(xii) shall have a heat load not to exceed 6,000 Btu/hr and shall be made no earlier than 50 days after shutdown.

(x) Deleted.

(xi) Shipment of contents specified in 5(b)(1)(xviii) and limited in 5(b)(2)(xiv) shall have a heat load not to exceed 43,800 BTU/hr and shall be made no earlier than 400 days or 175 days for A1W-3E and A1W-3J fuel, after shutdown.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

Except for the contents described in 5(b)(1)(iv) (Core 2), 5(b)(1)(v) (Core 2) and 5(b)(1)(viii) and limited in 5(b)(2)(iii) and 5(b)(2)(v)	100
For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(v)	25
For the contents described in 5(b)(1)(iv) (Core 2) and 5(b)(1)(v) (Core 2) and limited in 5(b)(2)(iii)	0

6. Deleted.

7. For shipments involving the contents specified in 5(b)(1)(viii) or 5(b)(1)(x), the thermocouples and thermocouple cases if included or the vacant module holder shall be located in the mid-position of either cage and module holder assembly.

8. Shipments shall be made in the dry condition, except for residual water as limited in 5(b)(1).

9. Container number three (M-130-3) has been modified by adding two 4-inch thick by 8-inch wide steel plates welded between fins 25 and 50 and between fins 110 and 135 at approximately 14.75 inches from the bottom of the container. The cooling fins in this localized area are removed to permit attachment of the plate directly to the outer shell of the container.

10. Container number four (M-130-4) has been modified by adding a 2-inch thick by 4-inch wide steel plate welded between fins 32 and 49 at approximately 18.4 inches from the bottom of the container. The cooling fins in this localized area are removed to permit attachment of the plate directly to the outer shell of the container.

11. Containers M-130-3, M-130-4, M-130-6, and M-130-7 may be used for the contents specified in 5(b)(1)(viii) and 5(b)(1)(x) only. Containers M-130-10 and M-130-15 may be used for the contents specified in 5(b)(1)(viii), 5(b)(1)(x), and 5(b)(1)(xviii) only.

12. Container M-130-11 may be used for the contents specified in 5(b)(1)(xvi) only.

13. Deleted.

14. Expiration date: September 30, 2007.

REFERENCES

Safety analysis report for M-130 shipping container, MAO-E8-703 dated December 30, 1968.

Supplements: Naval Reactors (NR) letters A#2256 dated February 24, and G#1931 dated March 3, 1969; General Electric Company (GE) letter ONP-74520-526 dated April 3, 1972; NR letter G#3207 dated April 27, 1972; GE letter ONP-74520-528 dated April 28, 1972; NR letter G#3250 dated June 6, 1972; GE letters ONP-74570-635 dated October 25, ONP-74570-654 dated December 4, and ONP-14570-666 dated December 12, 1972; ONP-74570-682 dated January 12, ONP-74570-698 dated January 31, ONP-74570-687 dated February 6, ONP-74390-65 dated March 26, and DLGN-85570-854 dated September 24, 1973; and DLGN-85570-901 dated January 10, 1974; NR letter G#4061 dated January 29, 1974; GE letters DLGN-85570-924 dated February 15, DLGN-85570-923 dated March 6, and DLGN-85570-969 dated May 24, 1974; NR letter G#4991 dated November 25, 1975; GE letters ONP-74340-JTT-73 dated December 17, 1975; CGN-85570-1145 dated September 9, CGN-85570-1146 dated September 10, and CGN-85570-1148 dated September 14, 1976; Bettis Atomic Power Laboratory letters WAPD-R(K)-1378 dated August 30, 1976, and WAPD-OP(PP)S-4401 dated June 29, 1979; NR letters G#6197 dated July 13, 1979, G#7022 dated July 14, WAPD-LP-(CES)SE-170 dated July 1981; and WAPD-LD-(CES)SE-181 dated September 1981; WAPD-LP(CES)SE-96 dated February 1982, G#7136 dated March 17, 1982; G#7160 dated May 18, 1982; G#7582 dated September 7, 1983; G#C87-5692 dated September 2, and G#C87-5689 dated September 23, 1987; G#C87-8008 dated January 19, G#C88-5931 dated May 12, and G#C88-5961 dated July 25, 1988; G#C89-2825 dated March 29, and G#C89-2863 dated August 11, 1989;

REFERENCES (continued)

G#C92-03392 dated March 30, and G#92-03729 dated October 20, 1992; G#C93-10935 dated October 8, 1993; G#96-03344 dated March 6, and G#96-03610 dated December 9, 1996; G#97-03543 dated July 10, G#C97-03685 dated December 19, 1997; and G#02-0754 dated April 16, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 26, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6058	14	71-6058	USA/6058/B( )F	1	OF	4

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Cintichem, Inc., application dated March 31, 1985, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: B-3

(2) Description

The packaging consists of a lead shielded steel weldment in the shape of a right hollow cylinder with a bottom and a recessed, plug type gasketed and bolted lid. The packaging provides a minimum of 6 inches of lead shielding. Packaging features include lifting and tie-down devices and a drain to the central cavity. The maximum weight of the loaded packaging is 30,000 pounds.

The outer shell is of a laminated steel construction and is 41 inches in diameter and 57 inches high. The two laminates are of plate material 1/2-inch and 1/4-inch in thickness. The inner shell is of 1/2-inch thick steel plate. The internal cavity dimensions are 26-1/2 inches in diameter and 43-1/4 inches high. The lid is of the same construction as the sides and bottom and is secured to the body of the packaging by twelve, 1-1/4-inch diameter by 2-inch long high strength bolts and sealed with a silicone O-ring.

(3) Drawing

The packaging is as described and constructed in accordance with Cintichem, Inc. Drawing No. 330E2053E, Revision E.

(b) Contents

(1) Type and form of material

(i) Byproduct and uranium enriched in the U-235 isotope, U-233 or plutonium as solids, non-powder, and dry, which will not decompose at temperatures up to 525°F and packaged within DOT Specification 17H steel drums.

(ii) Byproduct and uranium enriched in the U-235 isotope, U-233 or plutonium which meets the requirements of special form radioactive material.

(iii) Byproduct material and uranium enriched in the U-235 isotope, U-233, or plutonium as solids, non-powder, and dry which will not decompose at temperatures up to 525°F, packaged within a nominal 1/2-inch thick (24-inch OD) polyethylene High Integrity Container (HIC). Liquids must be solidified in Chemtree Iron Oxide mix in a steel container. Small items, including glassware, must be placed in 1-gal steel containers and compressed (as required).

(2) Maximum quantity of material per package

For the contents described in 5(b)(1)(i) and 5(b)(1)(ii):

Not to exceed 400 watts thermal decay.

For the contents described in 5(b)(1)(iii):

The HIC must be limited to 200 A_2 quantities of solidified liquid radioactive material and not more that 50 A_2 quantities of other radioactive materials. The maximum thermal decay heat load must not exceed 15 watts.

For the fissile contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii) not to exceed the following:

Fissile Material	Maximum per Package (grams)
U-235	350
U-233	200
Plutonium*	200

or, pro-rated mixtures such that the sum of the ratios of the quantity of each fissile material to its maximum per packaging does not exceed unity.

*Plutonium in excess of 20 curies per package must be in the form of reactor fuel, fuel elements, metal, or metal alloy.

5. (c) Transport Index for Criticality Control

For contents containing special nuclear material:

Minimum transport index to be shown
on label for nuclear criticality control: 10.0

6. For gamma-emitting special form materials, at least 5 inches of additional lead shielding may be added as required as a lining on all sides within the internal cavity.

7. The total weight of the contents including additional lead shielding as may be required shall not exceed 9,000 pounds.

8. Prior to each shipment, the lid O-ring shall be inspected. The O-ring shall be replaced with a new O-ring if inspection shows any defects or every twelve (12) months, whichever occurs first.

9. Prior to the shipment of contents described in 5.(b)(1)(*i*), the package must be leak tested as specified in Section I of the application.

10. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) Each package shall be maintained in accordance with Section I of the application, as supplemented; and

    (b) Each package shall be operated and prepared for shipment in accordance with Section I of the application, as supplemented.

11. Fabrication of additional packagings is not authorized.

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

13. Expiration date: December 31, 2005.

REFERENCES

Cintichem, Inc. application dated March 31, 1985.

Supplements dated: August 30 and October 31, 1985, and October 2 and November 27, 1990.

Department of Energy supplements dated July 15 and December 21, 1992, November 20, 1995, and September 29, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 20, 2000

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering, Inc. application dated July 9, 1996, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model Nos.: 927A1 and 927C1

(2) Description

A steel fuel bundle shipping container consisting of a strongback and fuel bundle clamping assembly, shock mounted to a steel outer container. The fuel bundles are separated by 3/16" thick, high carbon steel segmented separator blocks permanently attached to the strongback. The segmented separator blocks are 6" x 8" and are installed (welded) in segments to form a continuous block for the entire active length of the fuel assembly. The Model No. 927A1 package is approximately 43" in diameter by 189" long with an approximate gross weight of 6,700 lbs. The Model No. 927C1 package is approximately 43" in diameter by 216" long with an approximate gross weight of 7,300 lbs.

(3) Drawings

The Model Nos. 927A1 and 927C1 containers are constructed in accordance with Combustion Engineering, Inc. Drawing No. L-6078-01, Sheets 1 through 4, Rev. 5.

(b) Contents

(1) Type and form of material

(i) Model No. 927A1: unirradiated fuel bundles consisting of 0.38" diameter uranium dioxide fuel pellets clad in 0.028" thick zircaloy tubes in a 14 x 14 square array with a 0.58" pitch. Each fuel bundle consists of a maximum of 176 fuel rods with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 19.6 kg U-235.

5.(b) (1) Contents (Continued)

(ii) Model No. 927A1: unirradiated fuel bundles consisting of 0.381" diameter uranium dioxide fuel pellets clad in 0.026" thick zircaloy tubes in a 14 x 14 square array with a 0.58" pitch. Each fuel bundle consists of a maximum of 176 fuel rods with a maximum 4.76 w/o enrichment in the U-235 isotope, and contains not more than 19.6 kg U-235.

(iii) Model No. 927A1: unirradiated fuel bundles consisting of 0.33" diameter uranium dioxide fuel pellets clad in 0.025" thick zircaloy tubes in a 16 x 16 square array with a 0.506" pitch. Each fuel bundle consists of a maximum of 236 fuel rods with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 20.76 kg U-235.

(iv) Model No. 927A1: unirradiated fuel bundles consisting of 0.31" diameter uranium dioxide fuel pellets clad in 0.024" thick zircaloy tubes in a 16 x 16 square array with a 0.472" pitch. Each fuel bundle consists of a maximum of 231 fuel rods with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 11.68 kg U-235.

(v) Model No. 927C1: unirradiated fuel bundles consisting of 0.33" diameter uranium dioxide pellets clad in 0.025" thick zircaloy tubes in a 16 x 16 square array with a 0.506" pitch. Each fuel bundle consists of a maximum of 236 fuel rods with a maximum 5.0 w/o enrichment in the U-235 isotope, and contains not more than 22.77 kg U-235.

(vi) Model No. 927C1: unirradiated fuel bundles consisting of 0.324" diameter uranium dioxide fuel pellets clad in 0.0235" thick zircaloy tubes in a 17 x 17 square array with a 0.501" pitch. Each fuel bundle consists of 264 fuel rods with a maximum 3.6 w/o enrichment in the U-235 isotope, and contains not more than 16.43 kg U-235.

(2) Maximum quantity of material per package

Model No. 927A1: Two fuel bundles weighing not more than 1400 lbs. each.

Model No. 927C1: Two fuel bundles weighing not more than 1506 lbs. each.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 15.7

6. Each fuel assembly shall be unsheathed or shall be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath shall not be folded or taped in any manner that would prevent flow of liquids into or out of the sheathed fuel assembly.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented.

   (b) The packaging must be maintained in accordance with the Maintenance Program of Chapter 8 of the application, as supplemented.

8. Fabrication of additional packagings is not authorized.

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

10. Expiration date: October 31, 2005.

REFERENCES

Combustion Engineering, Inc. application dated July 9, 1996.

Supplements dated May 7, June 2, June 5, June 19, July 31 and August 14, 1998.

ABB Combustion Engineering Nuclear Power, Inc. supplement dated June 10, 1999.

ABB C-E Nuclear Power, Inc. supplements dated: March 28, and April 4 and 12, 2000.

CE Nuclear Power, LLC supplements dated: September 7 and 14, 2000.

Westinghouse Electric Company LLC supplement dated: September 18, 2000 and September 19, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 24, 2001

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Framatome ANP, Inc.
P.O. Box 11646
Lynchburg, VA 24506-1646

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

B&W Fuel Company application
dated April 23, 1990, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: Model B

(2) Description

A fuel assembly shipping container consisting of a steel strongback clamping assembly, shock mounted to a steel outer container. Two, 3/16-inch thick, 8-5/8-inch high and full length stainless steel plates containing 1.5% minimum boron are positioned between adjacent fuel assemblies. The outer container is approximately 40 inches in diameter by 200 inches long. Gross weight of the loaded container not to exceed 7,600 pounds.

(3) Drawings

The container is constructed in accordance with Framatome Cogema Fuels Drawing Nos. 1273422, Rev. 0; 1273423, Rev. 0; 1273424, Rev. 0; 1273425, Rev. 0; 1273426, Rev. 0; and 1273427, Rev. 0.

(b) Contents

(1) Type and form of material

Unirradiated, sintered UO_2 pellets in fuel rods. The maximum inner diameter and the minimum outer diameter of the fuel rod cladding, guide tubes and instrument tubes are in accordance with Table 3 of B&W Fuel Company supplement dated October 27, 1995; and the minimum guide tube outer diameter and minimum wall thickness are in accordance with Framatome Cogema Fuels supplement dated February 7, 1996. The locations of the guide tubes and instrument tubes are in accordance with Figures 2 through 5 of B&W Fuel Company supplement dated October 27, 1995. The rods are assembled into fuel assemblies. The fuel assemblies may contain inserted control rod assemblies.

5. (b)(1) Contents (continued)

Fuel assemblies as described above have the following specifications:

Assembly Type	15x15	15x15	15x15	17x17	17x17	15x15
No. fuel rods	208	208	208	264	264	204
No. non-fuel tubes	17	17	17	25	25	21
Fuel rod pitch, in.	0.568	0.568	0.568	0.496	0.502	0.563
Maximum fuel pellet OD, in.	0.3707	0.3742	0.3622	0.3232	0.3252	0.3671
Tube material	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4	Zr-4
Maximum active fuel length, in.	144	144	144	145.825	144	144
Maximum enrichment w/o U-235	5.05	5.05	4.98	5.05	5.05	5.05
Maximum U-235 Loading (kg)	25.1978	25.6758	23.7220	24.3108	24.6126	24.2355

(2) Maximum quantity of material per package

Two fuel assemblies. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 6.3

6. Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath must not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

7. There must be a bow clamp to restrain each spacer grid and end fitting. The ratio of assembly weight to the number of clamp bows must not exceed 168 pounds per clamp.

8. The weight of the contents (fuel assemblies, control rods, spacers, etc.) must not exceed 3,360 pounds.

9. Fabrication of additional packagings is not authorized.

10. In addition to the requirements of Subpart G of 10 CFR Part 71, the package shall be operated and maintained in accordance with Section 7.0 of the application, as supplemented.

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

12. Expiration date: September 30, 2005.

REFERENCES

B&W Fuel Company application dated April 23, 1990.

Supplements dated: July 23, 1990; May 4, August 18, August 25, and October 14, 1992; September 24, 1993; and April 8, May 2, and November 23, 1994; February 26, March 17, April 7, July 31, October 27, and December 1, 1995.

Framatome Cogema Fuels supplements dated February 7, 1996; January 20, March 19 and 26, and April 17, 1998; and August 29, September 8, and November 13, 2000; and February 9, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: February 14, 2001

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6280	7	USA/6280/B( )	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

J. L. Shepherd and Associates
1010 Arroyo Avenue
San Fernando, CA 91340

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

J. L. Shepherd and Associates application dated September 5, 1979, as supplemented.

c. DOCKET NUMBER 71-6280

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: A-0109 Irradiator in A-0117 Overpack

(2) Description

The packaging consists of an inner, lead-filled, steel weldment (Model A-0109 irradiator) enclosed within an outer protective enclosure (Model A-0117 overpack). The irradiator is a right cylinder, 31 inches diameter by 36 inches high, with a bolted top plug closure. The overpack is a double-walled steel cylinder enclosing a shock absorbing and thermal insulation core of glue-bonded layers of balsa wood (11 lbs/cu ft. density, 12 inches thick on the sides). The irradiator is held in place at each end. The void between the irradiator and inside wall of the overpack is filled with hardwood spacers. The overpack cover is secured by 30, 5/8-inch diameter bolts. The dimensions of the package are 50.5 inches diameter by 73 inches long. The weight of the shielded irradiator is 7,000 lbs and the weight of the overpack is 3,400 lbs, totaling 10,400 lbs.

(3) Drawings

The overpack and irradiator are constructed in accordance with J. L. Shepherd and Associates Drawing Nos.: A-0109-A1, dated June 6, 1969; A-0109-10, dated February 3, 1970; A-0109-20, dated February 5, 1970; A-0117-B, change D (not dated); A-0117-C, dated April 2, 1970; and A-0117-C1, dated April 2, 1970.

5. (b) Contents

(1) Type and form of material

Cobalt-60 as metal, doubly encapsulated and heliarc welded in stainless steel. The source(s) is in an annular configuration approximately 6 inches in diameter by 6 inches long. The source(s) must meet the requirements for special form radioactive material.

(2) Maximum quantity of material per package

30,000 curies

6. The overpack must be modified by the addition of not less than 14-1/4-inch diameter vent holes in the outer shell (two each in the top cap and cap side, two in the bottom, and in two side tiers of 4 holes each, at 90° separation, with each tier located about one foot from each end). The holes must be sealed to prevent the inleakage of water but not so as to affect their capability of venting in the event of fires.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be maintained in accordance with the Maintenance Program described in the J. L. Shepherd and Associates submittal dated February 2, 1990.

(b) The package must be prepared for shipment and operated in accordance with the Operating Procedures described in the J. L. Shepherd and Associates submittal dated February 2, 1990.

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

9. Expiration date: February 28, 2005.

REFERENCES

J. L. Shepherd and Associates' application dated September 5, 1979.

Supplements dated: November 29 and December 31, 1984, January 16, 1985, November 22, 1989, February 2, 1990, December 6, 1994, and December 29, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date March 2, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6294	26	71-6294	USA/6294/AF	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Combustion Engineering, Inc. application dated July 27, 1990, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: UNC-2901

(2) Description

A maximum 10.80-inch square by 30-inch long inner container constructed of minimum 14-gauge steel, with bolted and gasketed top flange closure and sealed welded bottom sheet. Inner container is centered and supported in a 22.5-inch ID by 34-inch high 18-gauge steel drum with 16-gauge head and DOT Specification 17H closure by asbestos or ceramic sheet, plywood, hardboard, and insulating material. Gross weight of the package is 660 pounds.

(3) Drawings

The packaging is constructed in accordance with Combustion Engineering, Inc., Drawing Nos. D-5007-8086, Rev. 6, and B-5007-8112, Rev. 1.

(b) Contents

(1) Type and form of material

(i) Sintered uranium oxide pellets and rejected pellets enriched to a maximum 5.0 w/o in the U-235 isotope.

(ii) Uranium oxide as powder enriched to a maximum 5.0 w/o in the U-235 isotope.

(iii) U_3O_8 powder, placed in polyethylene bags then pressed and compacted into blocks, with a maximum enrichment of 4.5 w/o in the U-235 isotope. Water may be injected into the blocks.

5. (b) Contents (cont'd.)

(2) Maximum quantity of material per package

Maximum weight of contents within the inner container is 427 pounds, including radioactive material, secondary containers, and other packaging material.

(i) For the contents described in 5(b)(1)(i):

320 pounds of pellets, with the U-235 content not to exceed 6.4 kg. Pellets must be packaged in trays in accordance with Combustion Engineering, Inc. Drawing Nos. D-5018-2001, Rev. 1, and NFM-D-4263, Rev. 2, or NFM-E-4661, Rev. 2 and NFM-D-4721, Rev. 1. Trays containing pellets must contain a maximum of 9.07 kg and a minimum of 6.7 kg of pellets with a maximum pellet diameter of 0.4 inch.

(ii) For the contents described in 5(b)(1)(ii):

220 pounds of powder, with the U-235 content not to exceed 1.5 kg. Powder must be packaged in secondary containers in accordance with Combustion Engineering, Inc. Drawing Nos. NPM-C-3389, Rev. 0 or Rev. 3, and NFM-D-4750, Rev. 1.

(iii) For the contents described in 5(b)(1)(iii):

30.4 kg of U_3O_8, with the U-235 content not to exceed 1.15 kg per package. The U_3O_8 blocks shall be placed in perforated aluminum cans, which shall then be packaged in secondary containers in accordance with Combustion Engineering, Inc. Drawing Nos. NPM-C-3389, Rev. 0 or Rev. 3, and NFM-D-4750, Rev. 1.

(c) Transport Index for Criticality Control

(1) For the material described in Items 5(b)(1)(i) and 5(b)(1)(ii):

Minimum transport index to be shown on label for nuclear criticality control: 0.5

(2) For the material described in Item 5(b)(1)(iii):

Minimum transport index to be shown on label for nuclear criticality control 1.3

6. Prior to each shipment the insert (containment vessel) gasket shall be inspected. This gasket shall be replaced if inspection shows any defects.

7. For the contents specified in 5(b)(1)(i), the pellet trays and wood spacers must provide a snug axial and cross sectional fit in the inner container. For packages with fewer than 16 loaded pellet trays, wood spacers or pellet trays with wood spacers inside must be substituted for pellet trays.

8. For the contents specified in 5(b)(1)(ii), powder cans and wood spacers must provide a snug axial and cross sectional fit in the inner container. For packages with fewer than two loaded powder cans, a wood spacer or a powder can with a wood spacer must be substituted for the powder can.

9. For the contents specified in 5(b)(1)(iii), the packaging may be constructed in accordance with Combustion Engineering, Inc., Drawing Nos. D-5018-8454, Rev. 1 and D-5007-8112, Rev. 1.

10. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (i) Each packaging must meet the acceptance tests and be maintained in accordance with Chapter 8 of the application; and

    (ii) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application, as supplemented.

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

12. Expiration date: March 31, 2006.

REFERENCES

Combustion Engineering, Inc. application dated July 27, 1990.

Supplements dated: October 19, 1990; January 27, and July 28, 1994; August 17, 1995; and July 14, 1998.

ABB Combustion Engineering Nuclear Power, Inc., supplement dated June 10, 1999.

ABB C-E Nuclear Power, Inc. supplements dated: March 28, and April 4 and 12, 2000.

CE Nuclear Power, LLC supplement dated: September 14, 2000.

Westinghouse Electric Company LLC supplements dated: September 18, 2000, and February 16, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: March 1, 2001

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6346	28	71-6346	USA/6346/B( )F	1	OF	5

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Duratek
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Public Service Company of Colorado
Application dated March 28, 1996, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: FSV-1

(2) Description

The FSV-1 is a stainless steel-encased, depleted uranium-shielded cask. The cask body is a cylinder 208-inches long and 28-inches in diameter, except for the top flange area, which is 31-inches in diameter. The cavity is approximately 17.7-inches in diameter and 187.6-inches long.

The cask may be used in one of seven configurations (A through G) depending on contents. Configurations A, B, C, and D are used to ship solid, non-fissile irradiated hardware. These configurations use an outer lid consisting of a 3.75-inch thick stainless steel plate and a 2.25-inch thick depleted uranium shield. The lid is bolted to the cask body by 24 1.25-inch diameter fasteners. The primary seal is a silicone elastomeric seal ring between the outer lid and cask body. Configuration B does not require an inner container. Configuration C uses a supplemental stainless steel shield ring and cover plate. Configuration D uses a supplemental carbon steel shield ring and cover plate.

Configuration E is used to ship Fort St. Vrain (FSV) high temperature gas reactor (HTGR) fuel elements. This configuration uses the stainless steel inner container (as shown in General Atomic Drawing Nos. GADR 55-2-1, Rev. C, and GADR 55-2-2, Rev. A) as the containment vessel. The inner container lid is a stainless steel shell containing depleted uranium 4.15-inches thick. The inner lid is secured to the inner container body by 12 0.5-inch diameter fasteners. The primary seal is a silicone elastomeric seal ring between the inner lid and inner container body. Configuration E is equipped with an impact limiter on the upper end.

5.(a)(2) Description (continued)

Configurations F and G are used to ship solid non-fissile irradiated and contaminated hardware from the FSV HGTR. These configurations use a 4.75-inch thick steel outer lid. The lid is secured to the cask body by 24 1.25-inch diameter fasteners. The primary seal is a molded silicone elastomeric seal ring between the outer lid and cask body. Configurations F and G both use an impact limiter on the upper end. Configurations F and G also use a burial canister with a 12-inch thick carbon steel plug. The shielded spacer in the burial canister is used only in Configuration G.

The overall weight for the FSV-1 package is 46,025 pounds for Configurations A, B, C, and D and 47,600 pounds for Configurations E, F, and G.

(3) Drawings

The FSV-1 package is constructed in accordance with the following drawings:

Configuration A

National Lead Company Drawing Nos.: 70086F, Rev. 7; 70296F, Rev. 2; and General Atomics Drawing No. 1501-003, Rev. C.

Configuration B

Same as for Configuration A except that an inner container is not required.

Configurations C and D

In addition to the drawings for Configuration A, General Atomics Drawing Nos. GADR 55-2-10, Issue D, and GADR 55-2-14, Issue N/C (optional). Configuration C uses a supplemental stainless steel shield ring and cover plate constructed in accordance with Drawing No. GADR 55-2-11, Issue B. Configuration D uses a supplemental carbon steel shield ring and

5. (b) Contents

(1) Type and form of material

(i) Irradiated fuel elements consisting of graphite body, hexagonal in horizontal cross section, approximately 31.2-inches high and 14.2-inches across the flats. Prior to irradiation, each fuel element contains thorium and uranium enriched to a maximum of 93.5 w/o in the U-235 isotope, or

(ii) Solid, irradiated, and contaminated hardware, which may include fissile material, provided the quantity of fissile material does not exceed a Type A quantity and does not exceed the mass limits of 10 CFR §71.53 and neutron source components, or

(iii) Solid, non-fissile, irradiated and contaminated hardware which has been removed from the Fort St. Vrain High Temperature Gas Cooled Reactor and the surface contamination does not exceed 51 millicuries per package.

(2) Maximum quantity of material per package

Decay heat not to exceed 4.1 kw and:

(i) Item 5(b)(1)(i) above:

Six fuel elements each containing a maximum of 1.4 kg of enriched uranium, having a thorium/uranium ratio greater than 9.1:1 and weighing approximately 300 pounds. The gross weight of the cask cavity contents, including the component spacers, inner container, and irradiated fuel elements shall not exceed 4,430 pounds. Contents must be shipped in Configuration E.

(ii) Item 5(b)(1)(ii) above:

The gross weight of the cask cavity contents, including appropriate component spacers, liners, inner containers, shield rings and solid, nonfissile, irradiated and contaminated hardware shall not exceed 3,720 pounds. Contents must be shipped in Configurations A, B, C, or D.

(iii) Item 5(b)(1)(iii) above:

The gross weight of all of the cask cavity contents, including burial canister and spacers, with or without supplemental shielding shall not exceed 4,430 pounds. Contents must be shipped in Configurations F or G.

5. (c) Transport Index for Criticality Control

   Minimum transport index to be shown on label for nuclear criticality control: 100

6. As needed, appropriate component spacers must be used in the cask cavity when shipping the contents described in paragraph 5(b) to limit movement of contents during shipment.

7. For transport of the contents of Item 5(b)(1)(ii) in Configuration D, the dose rate measured on the surface of the package must not exceed 200 mr/hr. For the purpose of this requirement, the surface of any personnel barrier may not be considered the surface of the package.

8. The Model No. FSV-1 cask may be wrapped with reinforced plastic when shipping the contents described in Item 5(b)(1)(ii) or (iii) provided the heat generation rate does not exceed 500 watts. The applicable requirements of 10 CFR §71.87 must be satisfied prior to wrapping the cask.

9. Use of packaging fabricated after August 31, 1986, is not authorized.

10. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) Configurations A, B, C, and D of the Model FSV-1 shipping cask shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0, Volume I, of the application, as supplemented. The package shall be maintained in accordance with the Maintenance Program in Section 8.0, Volume I, of the application, as supplemented.

    (b) Configurations E, F, and G of the Model FSV-1 shipping cask shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0, Volume II, of the application, as supplemented. The package shall be maintained in accordance with the Maintenance Program in Section 8.0, Volume II, of the application, as supplemented.

    (c) The main flange seals must be replaced within twelve (12) months prior to any use of the packaging and must be replaced if inspection shows any defect.

    (d) The silicone O-ring on the inner container primary plug in Configuration E must be replaced within the twelve (12) months prior to any use of the packaging and must be replaced if inspection shows any defect.

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

12. Expiration date: May 31, 2006.

REFERENCES

Public Service Company of Colorado application dated March 28, 1996.
Chem-Nuclear Systems, L.L.C. supplement dated May 19, 1997 and
Duratek, supplements dated April 23 and April 30, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 11, 2001

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6347	10	71-6347	USA/6347/AF	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
3550 General Atomics Court
San Diego, CA 92186

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Atomics Company Application dated February 19, 1982, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: FSV-3

(2) Description

Inner container is a 18.5" ID x 34" high, 18-gage steel drum. Inner container is centered and supported in a 22.5" ID x 38.25" high, 16-gage steel drum. Void spaces between the inner and outer container and within the inner container are filled with vermiculite. Total weight, including contents, is 500 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomics Company Drawing No. FFE-613, Issue D.

(b) Contents

(1) Type and form of material

Unirradiated fuel element consisting of a graphite body, hexagonal in transverse cross-section, approximately 14.2" across the flats and 31.2" high. Dispersed in columns within the fuel element body there is a maximum 1.41 kg U-235 plus U-238 and Th-232. The U-235: U-238: Th-232 atomic ratio is about 1:0.07:8.3. The atomic ratio of carbon to the U-235 is in the range of 1800 to 1.

5.(b) (2) Maximum quantity of material per package

One fuel element containing not more than 1.41 kg U-235 and weighing not more than 320 pounds. Total quantity of radioactive material within a package may not exceed a Type A quantity.

(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 1.3

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(i) The package must be operated and prepared for shipment in accordance with the operating procedures of Chapter 6 of the application.

(ii) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 7 of the application.

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

8. Expiration date: September 30, 2007.

REFERENCE

General Atomics Company application dated February 19, 1982.

Supplements dated: March 9, 1982; February 24, 1992; February 28, 1997; and April 30, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 20, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6357	8	71-6357	USA/6357/AF	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

BWX Technologies, Inc.
P.O. Box 785
Lynchburg, VA 24505

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Babcock & Wilcox Company application dated March 29, 2001.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

a) Packaging

(1) Model No.: NNFD-10

(2) Description

The packaging consists of a containment vessel, 5-9/16 inches OD by 22-3/8 inches high, constructed from a 5-inch scheduled 40 steel pipe with a screw-type cap and a welded bottom plate. The containment vessel is centered and supported in a 55-gallon DOT secification 17C or 6C steel drum by industrial cane fiberboard.

The nominal gross weight of the packaging and contents is 350 pounds.

(3) Drawing

The packaging is constructed in accordance with Babcock and Wilcox Fuel Company Drawing No. 1198767E.

(b) Contents

(1) Type and form of material

Uranium metal, alloys or compounds. Uranium may be enriched to any degree in the U-235 isotope.

(2) Maximum quantity of material per package

Contents shall not exceed 100 pounds, and the U-235 content shall not exceed 350 grams. Maximum quantity of radioactive material within the package may not exceed a Type A quantity.

5. (c) Transport Index for Criticality Control

Minimum Transport index to be shown on label for nuclear criticality control: 2.1

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) Each package must meet the Acceptance Tests and Maintenance Program in Chapter 8 of the application.

(b) Each package shall be operated and prepared for shipment in accordance with the Operating Procedures in Chapter 7 of the application.

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

8. Expiration date: April 30, 2006.

REFERENCES

Babcock & Wilcox application dated March 29, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 11, 2001

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6386	15	USA/6386/B(U)F	1	3

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Safety Analysis Report for 235R001 Shipping Container dated August 11, 1970, as supplemented.

c. DOCKET NUMBER 71-6386

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 235R001

(2) Description

The 235R001 shipping container structure is horizontal, having an oblong cross section and is fabricated from 0.104-inch thick carbon sheet steel. The container is 313 inches long and has a maximum weight of 4,640 pounds, empty. The oblong cross section dimensions are approximately 35.5 inches high by 33.0 inches wide. The container was originally designed to ship unirradiated fuel modules of the AIG/A4W type. Subsequently, the container has been adapted to ship standard size or partial S8G fuel modules by use of a special frame assembly and cradle clamps, S3G-3 refueling modules using cell support assemblies, rodded or unrodded DIG fuel modules, and rodded or unrodded D2W fuel cells. The loaded container maximum weight is 12,200 pounds.

(3) Drawings

The packaging is constructed in accordance with Container Research Corporation Drawing Nos. 235R001, Rev. C, 235R004, Rev. C, and 235R005, Rev. 0, and Westinghouse Electric Corporation Drawing Nos. 973D425, Rev. 1, 903E693, Rev. 3, Sheet 1, 2 and 3 of 3, and 947J076, Rev. 0.

5.(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following types:

(i) A1G reactor cell without upper mechanism and with control rod, leadscrew and shipping fixture installed on rodded type modules.

5.(b)(1) continued

(ii) Standard size S8G reactor cluster with regular or substitute support adapters and regular control rods. If only one cell is shipped per container, a dummy load shall be installed for balance.

(iii) Partial size S8G reactor cluster with regular or substitute support adapters and regular control rods. If only one cell is shipped per container, a dummy load shall be installed for balance.

(iv) S3G-3 refueling cells, with a maximum of one 0-1 reactor cell assembly per container.

(v) D1G fuel module, rodded.

(vi) D1G removable fuel assembly (RFA), unrodded.

(vii) A1G fuel cluster, fueled end only of full A1G reactor cell, rodded. This fuel assembly type is not authorized for transport.

(viii) D2W side or central fuel cells with control rod and control rod holddown device.

(ix) D2W corner fuel cells, without shear blocks, unrodded.

(x) D2W side or central fuel cell and shear block with control rod inserted in rodded fuel cell.

(xi) D2W corner fuel cell, with shear block, unrodded.

(2) Maximum quantity of material per package

(i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(x), or 5(b)(1)(xi).

(ii) Two fuel assemblies as described in 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix).

(iii) Four fuel assemblies as described in 5(b)(1)(vi).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1) For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(ii): Not authorized for transport.

5.(c) continued

(2) For the contents described in 5(b)(1)(viii), 5(b)(1)(ix), and limited in 5(b)(2)(ii).: 50.0

(3) For contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(x), and 5(b)(1)(xi) and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii): 25.0

6. Expiration date: April 30, 2005.

REFERENCES

Safety Analysis Report for 235R001 Shipping Container, WAPD-OP(R)RD-357 dated August 11, 1970.

Supplements: Knolls Atomic Power Laboratory letter A1G 25-159, dated October 2, 1970. Bettis Atomic Power Laboratory letters WAPD-0P(R)RD-444, dated October 9, 1970; WAPD-OP(R)RD-476, dated October 26, 1970; and WAPD-OP(R)RD-488, dated October 30, 1970. Knolls Atomic Power Laboratory letters AIG 25-181, dated April 9, 1971; and A1G 25-191, dated May 11, 1971. Bettis Atomic Power Laboratory letters WAPD-OP(R)C-94, dated May 16, 1972; WAPD-OP(R)C-199, dated December 13, 1972; and WAPD-OP(R)C-229, dated March 6, 1973. Naval Reactors letters G#5078, dated January 26, 1976; G#5776, dated September 8, 1977; G#5905, dated January 23, 1978; G#5923, dated February 22, 1978; G#6095, dated August 17, 1978; G#6208, dated March 8, 1979; G#6373, dated September 4, 1979; G#6813, dated October 17, 1980; G#C85-0467, dated July 17, 1985; G#C88-8112, dated October 18, 1988; G#90-03655, dated August 10, 1990; G#92-03560, dated June 15, 1992; G#96-03371, dated March 15, 1996, G#C97-03444 dated April 8, 1997, G#C99-03514, dated June 1, 1999, and G#C99-03688, dated December 30, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Dated: 31 March, 2000

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Westinghouse Electric Company, LLC
(WELCO)
P.O. Box 355
Pittsburgh, PA 15230-0355

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Westinghouse Electric Corporation application dated August 7, 1981, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 6400

(2) Description

A protective overpack which provides impact and thermal protection for its contents. The inner shell (cavity) is approximately 76" x 76" x 172" constructed of 3/16" thick and 10-gauge mild steel. Closure of the cavity is by a 1/4" thick aluminum plate with silicone rubber gasket which is bolted to the main inner shell. The cavity is centered and supported in an outer 3/16" thick steel jacket by approximately 32" of polyurethane foam insulation at the end and 10" on the sides. A removable section or cap consisting of approximately 34" of polyurethane foam insulation encased in steel with a silicone rubber gasket is bolted to the main outer steel jacket. The overall dimensions of the package are approximately 8' x 8' x 20'. Vent holes are provided on the sides and ends of the container. Set into each corner of the outer container are standard I.S.O. steel castings. The total weight including weight of the contents is 45,000 pounds.

(3) Drawings

Packaging is constructed in accordance with one of the following sets of drawings: (1) Protective Packaging, Inc, Drawing Nos. 32106, Sheet 1, Rev. F and 32106, Sheet 2, Rev. 0; or (2) Westinghouse Electric Corporation Drawing No. 2020D08, Sheet 1 and 2, Rev. 0; or (3) Babcock and Wilcox Company Drawing No. 11-D-2130, Rev. 0; or (4) Protective Packaging, Inc., Drawing Nos. 32106-1, Sheet 1, Rev. F and 32106, Sheet 2, Rev. 0, as modified by Nuclear Packaging Inc. Drawing No. E.G.-60-01D, Sheets 1 and 2, Rev. 0; or (5) Protective Packaging, Inc. Drawing No. 32395, Sheets 1 through 9, Rev. B, as modified by Sandia Laboratories letter dated May 8, 1980; or (6) Lawrence Livermore National Laboratory Drawing Nos. AAA81-108683-00, Rev. 0 and AAA81-110194-00, Rev. 0.

5.(b) Contents

(1) Large, decontaminated equipment waste of such size as not to fit into a 55-gallon drum (with legs or other readily removable appendages removed). Not to exceed 200 grams plutonium within the package.

Equipment waste surfaces containing more than 0.5 Ci must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm^2 prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than ten percent. After fixation, equipment waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm^2. Outer surfaces must have a smearable level of contamination of no greater than 20 dpm/100 cm^2. Prior to fixing of contamination, large equipment waste must be inspected to insure that: (a) all sharp or protruding objects have been removed, blunted or protected with packaging material, and (b) pipe caps, gasketed blind flanges, covers, etc., have been installed wherever possible. Following such inspection, the inner surfaces containing more than 0.5 Ci must be fixed with "strip" or "clear" coating. The inner surface(s) may alternatively be fixed with a polyurethane foam.

The large equipment waste must be enclosed in a tight-fitting, 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); or enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1, and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the equipment and the box must be filled with foam (1" minimum foam thickness) and between equipment (1/2" minimum foam thickness). Alternatively, gloveboxes contaminated and fixed as described above may be broken down as follows:

Glovebox windows are removed and separately packaged in 12-mil thick PVC bags and sealed. The inner bag is tape sealed and the outer bag is heat sealed.

Glovebox panels are cut to dimensions to fit inside the 3/16" thick corrugated steel burial crates constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). All sharp or protruding objects are removed, blunted, or protected with packaging material. The glovebox panels are bundled such that internal box surfaces are facing inward. Cut glovebox panels from not more than one glovebox are banded with metal strap banding such that two metal strap bands in each direction are placed around the length and width of the glovebox sections. The glovebox window and cut panel packages are enclosed and foamed in place within the box.

Blocking or dunnage is placed within the box to ensure a one inch foam barrier on the sides and bottom of the box. Likewise, dunnage is provided between the banded glovebox sections to maintain a 1/2" thick foam barrier between banded packages.

5.(b) Contents (continued)

(2) Decontaminated hard waste items, such as equipment, metal cans, tools, etc., must be double bagged within 12-mil thick PVC with each bag heat sealed. The total fissile quantity of all the sealed packages in one container must not exceed 200 grams.

Hard waste surfaces must be decontaminated to a smearable level of no more than 150,000 dpm/100 cm^2 prior to fixation or until successive decontamination cleaning operations do not reduce the smearable contamination levels by more than 10 percent. After fixation, hard waste surfaces must have a smearable level of contamination of no greater than 10,000 dpm/100 cm^2. Prior to fixing of contamination, hard waste must be inspected to insure that sharp or protruding objects have been removed, blunted, or protected with packaging material. Following such inspection, the outer surfaces must be fixed with "strip" or "clear" coating. Hard waste items such as furnace shells, muffles, or other items with large cavities not accessible for decontamination must be filled with foam within the cavities. Surfaces that are not easily accessible, e.g., interiors of small diameter tubing and piping which were in contact with process materials, must have been swabbed or immersed in cleaning solution to insure removal of residual material. Open ends of the tubing and piping must be sealed using mechanical fittings.

Alternately, large heavy walled process glassware must be painted inside and outside to fix contamination and double bagged in 12-mil thick PVC with each bag heat sealed. The glassware must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-4, Rev. 0. The box must be filled with foam and total activity limited to less than two (2) Ci in a box.

Alternately, stainless steel transfer tubes and HEPA filters must be double bagged in 12-mil thick PVC with each bag heat sealed. The tubes/filters must be secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-28, Rev. 0. The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

Alternately, round steel ducting must be capped and secured in a box constructed in accordance with General Electric Company Drawing No. 272E81-29, Rev. 0; 272E81-30, Rev. 0; or 272E81-31, Rev. 0. Outer surfaces ducting will have a smearable level of contamination no greater than 20 d/m/100 cm^2. The box must be filled with foam and total activity limited to less than 0.5 Ci in a box.

5.(b) Contents (continued)

Sealed packages and boxes of hard waste must be enclosed in a tight-fitting, 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the packages and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between the sealed packages must be filled with foam (1/2" minimum foam thickness).

(3) Glove box absolute (HEPA) filters must be double bagged within 12-mil thick PVC, with each bag heat sealed and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams. Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2, or 908E648, Rev. 0, or 908E649, Rev 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

(4) Soft waste items such as sheeting, gloves, paper, prefilter media, polyethylene bottles, shoe covers, etc., must be double bagged in 12-mil thick PVC, with each bag heat sealed (bag size must not exceed 22" x 16" x 10") and packaged within DOT Specification 17H or 17C steel drums (maximum size of 55 gallons). Each drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams. Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

5.(b) Contents (continued)

(5) Liquid waste (decontamination solutions only) must be solidified in concrete in a 30-gallon drum which must be sealed in a plastic bag and centered and supported in a DOT Specification 17H or 17C 55-gallon steel drum by absorbent material. The 55-gallon drum must be lined with a sealed plastic liner and equipped with a standard drum closure. Each drum must not exceed a fissile quantity of 60 grams.

Alternatively, liquid waste is solidified in concrete in maximum size one (1) gallon packages which are double bagged and heat sealed in 12-mil thick PVC and placed with a DOT Specification 17H or 17C steel drum (maximum size of 55 gallons). The drum is lined with a sealed plastic liner and equipped with a standard drum closure. Each 55-gallon drum must not exceed a fissile quantity of 60 grams. For drums smaller than 55 gallons, the total fissile quantity of all the sealed packages (drums) in one container must not exceed 200 grams. Sealed drums must be enclosed in a tight-fitting 1-inch thick plywood box constructed in accordance with Westinghouse Electric Corporation's Drawing No. 1620E43, Sheets 1, 2, 3, and 4, Rev. 3; or a tight-fitting 3/16" thick corrugated steel box constructed in accordance with Rockwell Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified); enclosed in a tight-fitting box constructed in accordance with General Electric Company Drawing Nos. 908E614, Rev. 1 and 908E619, Rev. 2 or 908E648, Rev. 0 or 908E649, Rev. 0; or enclosed in a tight fitting box constructed in accordance with Babcock and Wilcox Company Drawing No. LRC-70019 H, Rev. 2. The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be filled with foam (1/2" minimum foam thickness).

(6) Uranium 233 oxide and thorium oxide in the form of intact LWBR-type fuel rods with the following limitations:

(i) Rods must be packaged within the Model No. 6400 packaging as described in Section 1 of WAPD-LP(FE)-220, Rev. 3 (February 1983);

(ii) The fuel content must not exceed 50 kg U-233 per shipment;

(iii) All rod storage containers must be filled to capacity (at least 70% of cross-sectional area) with rods or aluminum shim stock;

(iv) Each rod storage container must contain not more than one sub-container of 5/9 or 12 w/o BMU seed rods;

(v) Each rod storage container must weigh not more than 2,000 pounds;

(vi) The fuel rod heat generation must not exceed 30 watts; and

(vii) Operating Procedures and Acceptance Tests and Maintenance Program must be modified to meet the requirement of Item 11 of this approval.

5.(b) Contents (continued)

(7) Liquid analytical residues from the dissolution of spent reactor fuel rods, solidified in cement (see table, p. 3 of application*). The cement is contained in 1.5-gal steel can closed with a slip cover lid. The two primary cans are packed in a secondary steel can sealed with a press fit lid (see Figure 2 of application*). The secondary containment package contents are placed within a radiation shield (lid secured with six (6), 1/2"-13UNC bolts with welds in accordance with application*) centered in a DOT Specification 17-C 55-gal steel drum (see Figure 1 of application*). The drums are sealed with styrene-butadiene rubber gasket contained with a standard drum closer. Total weight of the drum will be less than 1,450 lb, and each drum will not exceed a fissile quantity of 12 g and 435 Ci of fission products.

Six (6), 55-gal sealed drum assemblies will be enclosed in a tight-fitting 3/16-in thick corrugated steel box constructed in accordance with Rockwell-Hanford Operations' Drawing No. H-2-91888, Sheet 1, Rev. 0 (modified or unmodified). The space between the drums and the box must be filled with foam to a minimum thickness of 1 inch. Void spaces between drums must be fitted with foam to a minimum thickness of 1/2 inch. Two (2) corrugated steel box assemblies may be transported in the packaging.

* U.S. Department of Energy letter dated April 15, 1983.

(8) Uranium 233 oxide and thorium oxide in the form of intact LWBR-type fuel rods with the following limitations:

(i) Rods must be packaged as shown in Figure 4, Application dated July 8, 1983, and contained within the Model No. NNFD-SA-2 packaging (Certificate of Compliance No. 5910);

(ii) The fuel content must not exceed 2.0 kg U-233 per shipment;

(iii) Each loaded LWBR Rod Transport Box must weigh not more than 99 pounds;

(iv) The fuel rod heat generation rate must not exceed 2 watts; and

(v) Operating Procedures and Acceptance Tests and Maintenance Program must be modified to meet the requirement of Item 11 of this approval.

5.(b) Contents (continued)

(9) Maximum of four (4) Cf-252 sources with the following limitations:

(i) Each source must be doubly encapsulated with the inner capsule meeting the requirements for special form radioactive material;

(ii) The total Cf-252 content must not exceed 6.1 mg;

(iii) The sources must be packaged in a shielded container as described in Chapter 1 of WAPD-LP(CE)POB-591 (January 1984); and

(iv) The decay heat generation from the source material must not exceed one watt.

(10) Compressed krypton-85 gas in mixture with other non-radioactive gases that are chemically compatible with the 3AA2015 cylinder. No fissile material (Requirement of 5.(c) does not apply). Shipment of krypton-85 gas is subject to the following limitations:

(i) Radioactivity not to exceed 2,700 curies. Maximum internal decay heat not to exceed 15 watts. Maximum volume of krypton-85 and other non-radioactive gases shall not exceed 1480 liters at STP (1 atm, 25°C);

(ii) The maximum initial fill pressure shall not exceed 500 psig at 25°C;

(iii) The DOT Specification 3AA2015 gas cylinder shall be certified for an operating load of 2,015 psig, at least once every 5 years by testing to 3,360 psig;

(iv) A minimum of 24 hours after loading with krypton-85 gas the krypton packaging primary containment shall have a leak rate of less than 0.0014 microcuries per second. The leak test shall be performed with the containment vessel within the lead shield container prior to placement within its thermal overpack;

(v) Content of the package shall be verified by mass spec analysis;

(vi) Acceptance, maintenance and use of the krypton package shall be in accordance with the procedures and requirements of Chapter 7 and 8 of Westinghouse Idaho Nuclear Company, Inc. Report No. WIN-236, Revision 1, March 1988. The retaining ring shall be tightened around the gas cylinder to a 40 to 50 inch-pound torque;

(vii) The position and securement of the krypton package within the Model No. 6400 is as specified in Westinghouse Idaho Nuclear Company, Inc. Drawing No. 059888;

(viii) Krypton package must be enclosed within a tight fitting plywood box constructed in accordance with Westinghouse Idaho Nuclear Company, Inc. Drawing No. 059886.

5.(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 100

6. The polyurethane foam must be Instapak 200, or equivalent.

7. The maximum weight of the contents including secondary packaging, dunnage, shoring and bracing must not exceed 30,000 pounds.

8. Sufficient dunnage, shoring and/or bracing must be utilized to minimize secondary impact of the secondary packaging within the cavity under accident conditions.

9. Protrusions from secondary packaging such as lifting eyes, etc., must be positioned such that they will not contact the cavity walls, or shoring must be provided to prevent puncture of the cavity walls by the protrusions under the accident conditions.

10. Contents must be positioned in the cavity such that the center of gravity of the loaded package is substantially the same as the center of gravity of an empty package.

11. The cavity of the overpack must be vented through an absolute filter to equalize pressure between the outside and inside of the overpack.

12. Contents packaged under the conditions of this certificate of compliance are exempt from the requirements of 10 CFR §71.63. Condition 5(c) of this certificate of compliance is not applicable where the fissile material is excluded as provided by 10 CFR §71.53.

13. In addition to the requirements of Subpart G of 10 CFR Part 71, the package must be prepared for shipment, operated, and maintained in accordance with "Operating Inspection and Maintenance Procedure No. CSK-003, Rev. 0," included in the Westinghouse Electric Corporation supplement dated April 14, 1992.

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

15. Expiration date: November 30, 2007.

REFERENCES

Westinghouse Electric Corporation application dated August 7, 1981.

General Electric Company supplement dated: October 1, 1981.

Babcock and Wilcox Company supplements dated: March 8, 1982; and January 10, 1985.

Department of Energy, Division of Naval Reactors, supplements dated: April 22, and July 8, 1983; and March 5, 1984.

Department of Energy, Chicago Operations Office, supplement dated: April 15, 1983.

Department of Energy, Washington, DC, supplement dated: June 6, 1988.

Westinghouse Electric Corporation supplements dated: April 14, 1992; and April 14, 1997.

Westinghouse Electric Company, Division of CBS Corporation supplements dated: December 22, 1997; September 28, 1998; and February 22, 1999.

Westinghouse Electric Company, LLC supplement dated: June 14, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

John D. Monninger, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 7, 2002

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6406	11	USA/6406/AF	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

U.S. Energy Research and Development Administration application dated July 19, 1977, as supplemented.

c. DOCKET NUMBER 71-6406

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: None specified

(2) Description

Specific packaging is not required. Safety is independent of packaging.

(b) Contents

(1) Type and form of material

Unirradiated fuel assemblies of the following types:

(i) S5G Fuel Experiment Assembly (FEA) in the Model No. FEA shipping container.

(ii) S5G Double Fuel Experiment Assembly (DFEA) in the Model No. DFEA shipping container.

(iii) A1W-3 Removable Uninstrumented Subassembly (RUS) in the Model No. 25.0 shipping container.

(iv) A1W-3 Prototype "A" Module or A1W-3 Shipboard "A" Module in the Model No. 2.7/3.6 shipping container.

(v) Rodded instrumented S1C fuel module in the Model No. 7481E12 shipping container.

(vi) S1C fuel module or S1C peripheral assembly in the Model No. S1C bird cage shipping container.

(vii) S1W-3 Removable Subassembly (RSA) in the Model No. S1W RSA/Metal Box.

(viii) S5W-2 Removable Subassembly (RSA) in the Model No. S5W RSA/Bird Cage.

5.(b) Contents (Continued)

(1) Type and form of material (Continued)

(ix) S5W-R2/R3 or S5W-2 module in the Model No. S5W New Module container.

(x) A1W-2/R2 cluster or half cluster in the Model No. 658C shipping container.

(xi) S3G-2A/2B fuel module in the Model No. 7481E12 or Model No. 9SK218 shipping container.

(xii) D2W rodded fuel cell or unrodded corner type D2W fuel module in a Model No. 658H1AB shipping and storage container. Rodded type fuel module shall have a control rod and control rod holddown device installed.

(xiii) S7G unit cell or reactor cell assembly in a Model No. 658E1AB shipping and storage container, with shipping clamp installed.

(xiv) Advanced Test Core (ATC) welded fuel cluster or ATC cage assembly fuel cluster in a Model No. 660B1/660C1 container.

(xv) D1G fuel module in a model 572A1 or 572B1 shipping container and D1G Removable Fuel Assembly (RFA) in a Model No. 573A1 or 573B1 shipping container. A control rod and control rod holddown device need not be installed in the D1G fuel module.

(xvi) D1G Removable Fuel Assembly (RFA) in a Model No. 573A1 or 573B1 shipping container.

(xvii) PWR Core 1 (Seed 2, 3 or 4) unrodded seed fuel assembly or PWR Core 2 (Seed 1 or 2) unrodded seed fuel assembly, in unspecified shipping containers.

(xviii) PWR Core 1 (Seed 2, 3 or 4) unrodded seed fuel subassembly or PWR Core 2 (Seed 1 or 2) unrodded seed fuel subassembly, in unspecified shipping containers.

(xix) S8G rodded fuel cell in unspecified shipping container with control rod holddown device installed.

(xx) S5G type unit cell in a Model No. 658E1AB shipping container.

(xxi) A1W-3 Prototype Peripheral Subassembly or A1W-3 Prototype Center Subassembly in the Model No. 2.7/3.6 shipping container.

(xxii) S7G Partial Fuel Cell Subassembly in a DOT specification (Type 20 WC-3) container.

5.(b) Contents (Continued)

(1) Type and form of material (Continued)

(xxiii) S5G Central Subassembly

(xxiv) S3G-3 Removable Noninstrumented Fuel Assembly (RNFA) in a Model No. 95K-218 shipping container.

(2) Maximum quantity of material per package

(i) One fuel assembly as described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(iv), 5(b)(1)(v), 5(b)(1)(vi), 5(b)(1)(vii), 5(b)(1)(viii), 5(b)(1)(ix), 5(b)(1)(x), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xvi), 5(b)(1)(xvii), 5(b)(1)(xviii), 5(b)(1)(xix), 5(b)(1)(xx), 5(b)(1)(xxii), 5(b)(1)(xxiii), and 5(b)(1)(xxiv).

(ii) Two fuel assemblies as described in 5(b)(1)(xv).

(iii) Three fuel assemblies as described in 5(b)(1)(xxi).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

(1)	For the contents described in 5(b)(1)(iv), 5(b)(1)(vi), 5(b)(1)(xi), 5(b)(1)(xii), 5(b)(1)(xiii), 5(b)(1)(xiv), 5(b)(1)(xv), 5(b)(1)(xvii), 5(b)(1)(xix), 5(b)(1)(xx), 5(b)(1)(xxi), 5(b)(1)(xxii), 5(b)(1)(xxiii), and 5(b)(1)(xxiv), and limited in 5(b)(2)(i), 5(b)(2)(ii), and 5(b)(2)(iii):	100
(2)	For the contents described in 5(b)(1)(iii), 5(b)(1)(v), 5(b)(1)(ix), 5(b)(1)(x), and 5(b)(1)(xviii), and limited in 5(b)(2)(i):	62.5
(3)	For the contents described in 5(b)(1)(viii) and limited in 5(b)(2)(i):	41.7
(4)	For the contents described in 5(b)(1)(vii) and limited in 5(b)(2)(i):	31.3
(5)	For the contents described in 5(b)(1)(xvi) and limited in 5(b)(2)(i):	12.5
(6)	For the contents described in 5(b)(1)(i) and limited in 5(b)(2)(i):	41.7
(7)	For the contents described in 5(b)(1)(ii) and limited in 5(b)(2)(i):	100

6. Expiration date: July 31, 2002.

REFERENCES

U.S. Energy Research and Development Administration application dated July 19, 1977.

Supplements: Department of Energy letters G#5868 dated January 4, 1978, with enclosures; #6291 dated July 13, 1979; G#7609 dated September 30, 1983; G#C85-0435 dated April 19, 1985; G#C87-8027 dated December 23, 1987; G#92-03690 dated September 11, 1992; and G#97-03513 dated June 11, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 07/23/97

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6441	8	71-6441	USA/6441/B( )F	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Division of Naval Reactors
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report for D2G Power Unit Shipping Container dated August 4, 1969, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: D2G Power Unit

(2) Description

The D2G Power Unit shipping container assembly consists of five main assemblies; (1) the barrel assembly, (2) the upper cover, (3) the lower cover, (4) the main shipping skid, and (5) the barrel trunnion supports. To prepare the power unit shipping container for shipment of a power unit, the container barrel is rotated to the vertical position, the upper cover is removed and the power unit is loaded into the barrel and secured in the container with eight (8) shipping studs. The upper cover is then installed and the container is rotated to the horizontal position for shipment. The container assembly is 31 feet long and 8-1/2 feet wide and it is attached to a government owned permanently assigned depressed center railroad car; the maximum height above the rails is 13 feet, 10 inches in the shipping configuration. The power unit is shipped complete with design control rods and mechanisms installed.

The Type D or E power unit are retained in the container by means of eight shipping bolts. A special shipping ring is used to clamp the closure head and core cartridge assembly to the barrel upper flange of the shipping container. The control rods are restrained in the unit by means of rebound and outmotion latches located in the latching portion of the control rod drive mechanisms. The container assembly weighs about 100,000 pounds empty and about 270,000 pounds loaded.

(3) Drawings

The packaging is constructed in accordance with Baldwin-Lima-Hamilton Corporation Drawing Nos. R-126361, Rev. E, and R-126347, Rev. K, and Westinghouse Electric Corporation Drawing Nos. 955F632, Rev. 5, and 972D940, Rev. 5.

5. (b) Contents

(1) Type and form of material

Unirradiated enriched uranium as contained in Naval Reactors Type D or E power units consisting of core barrel, unirradiated fuel assemblies, closure head, mechanisms and associated hardware, with all design control rods and mechanisms installed.

(2) Maximum quantity of material per package

One power unit as described in 5(b)(1).

(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Expiration date: August 31, 2007.

REFERENCES

Safety Analysis Report for D2G Power Unit Shipping Container, ONP-74252-13, dated August 4, 1969.

Supplements: Bettis Atomic Power Laboratory letters WAPD-DP(CH)-1252, dated November 30, 1973; WAPD-DP(CH)-1466, dated October 18, 1974; Knolls Atomic Power Laboratory letter CGN 85542-250, dated February 5, 1981; Naval Reactors letter NR:RR:ESSNIDER G#92-03731, dated October 7, 1992; Naval Reactors letter NR:RR:SLDUNN G#97-03543, dated July 10, 1997; and Naval Reactors letter NR:RR:MSHonea G#02-0735, dated March 13, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 05, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6553	18	71-6553	USA/6553/AF	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

United States Enrichment Corp.
6903 Rockledge Drive
Bethesda, MD 20817

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Report No KY-665, Revision 1, dated October 28, 1998, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: Paducah Tiger

(2) Description

A protective overpack which provides impact and thermal resistance for the Model No. 48X 10-ton cylinder. The cylinder is welded steel, and is 48 inches in diameter, 121 inches long, and has a 5/8-inch thick wall. The cylinder has a 108.9 ft3 volume, and is rated at 200 psig service pressure. The protective overpack has overall dimensions of approximately 153 inches x 76 inches x 72 inches. The overpack consists of two parts, a body and a lid, which are clamped and secured by four, 1-3/8-inch ratchet type binders, and eight, 1-3/4-inch guide pins, fitted with 3/4-inch high strength latch pins. The closed, assembled overpack consists of an outer 1/8-inch steel shell backed on both long sides, top and bottom by two, 10-gauge stainless steel breakaway plates. The valve end is protected by a 3/8-inch stainless steel breakaway plate and a 2-inch thick aluminum stiffening plate. A centrally located 3/16-inch steel shell, 60 inches in diameter x 128 inches long is separated from the outer shell by fire retardant polyurethane foam. The cylinder is held in the overpack by rubber shock isolators. Four mild steel brackets are provided on the body for lifting. Four, 2-inch bolts are used in conjunction with the ISO corner fittings for tie-down. The maximum gross weight of the package is 40,000 pounds.

(3) Drawings

The Paducah Tiger overpack is constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-1209-NRC-1, Rev. 0, M-1209-NRC-2, Rev. 0, M-1209-NRC-3, Rev. A, M-1209-NRC-4, Rev. 1, and M-1209-NRC-5, Rev. 0.

5.(b) Contents

(1) Type and form of material

Solid uranium hexafluoride (UF6) at not more than 4.5 w/o U-235 isotope enrichment, and an H/U ratio of no more than 0.088.

(2) Maximum quantity of material per package.

The maximum weight of UF6 not to exceed 21,030 pounds (9,540 kg). The maximum U-235 content not to exceed 640 pounds (290 kg).

(3) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control: 0.0

6. Each Model No. 48X cylinder must be inspected, tested, maintained, assembled, and used in accordance with American National Standards Institute (ANSI) N14.1-1990. The cylinders must be designed and fabricated in accordance with ANSI N14.1-1990 or an earlier version of ANSI N14.1 in effect at the time of fabrication. The cylinders must be fabricated in accordance with Section VIII, Division I, of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code and must be ASME Code stamped. Except that the 48X cylinders manufactured by W.H. Stewart Company in accordance with ANSI N14.1-1971 after ANSI N14.1-1982 was approved may be used for shipment in the Paducah Tiger package provided that they are inspected, tested and re-certified in accordance with ANSI N14.1-1990.

7. In addition to the requirements of Subpart G of 10 CFR Part 71, each package shall be maintained, repaired, operated and prepared for shipment in accordance with Operating Instructions and Acceptance Tests and Maintenance Program in the application dated October 28, 1998, as supplemented December 21, 1998, June 7, 1999, and February 29, 2000.

8. Use of Model No. 48A cylinders is not authorized.

9. Use of Model No. 48X cylinders made of A-285 steel is not authorized.

10. The Model 48X cylinder valve stem and plug may be tinned with ASTM B32, alloy 50A or Sn50 solder material, or a mixture of alloy 50A or Sn50 with alloy 40A or Sn40A material, provided the mixture has a minimum tin content of 45 percent.

11. Paducah Tiger overpacks previously constructed in accordance with Martin Marietta Energy Systems, Inc., Drawing Nos. M-1209-NRC-1, Rev. C; M-1209-NRC-2, Rev. A, M-1209-NRC-3, Rev. A; and M-1209-NRC-4, Rev. A, may be used until September 10, 1999. For the overpacks authorized by this condition, the clearance distance between the end of the cylinder valve and the plane of the end of the cylinder skirt must be measured prior to each shipment. The clearance distance must be at least 3/8 inch.

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

13. Expiration date: July 31, 2004.

REFERENCES

Safety Analysis Report on the "Paducah Tiger" Protective Overpack for 10-Ton Cylinders of Uranium Hexafluoride, Union Carbide Corporation Report No. KY-665, Revision 1, Dated October 28, 1998.

Supplements dated: December 21, 1998; January 12 and June 7, 1999; February 29, 2000; June 12, 2000; and November 1, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 20, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6574	27	71-6574	USA/6574/B( )	1	OF	4

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Allied Technology Group, Inc.
669 Emory Valley Road
Oak Ridge, TN 37830

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Scientific Ecology Group, Inc., application dated December 27, 1990, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 3-82B

(2) Description

The packaging consists of a steel-lead-steel annulus cask fabricated in the form of a right circular cylinder and three different types of inner containers. The shielded cask, closed at one end and a lid closure at the other, is 66.25-inches in diameter by 74.5-inches in height. The cask wall consists of a 3/8-inch inner steel shell, 3-3/4-inches of lead shielding, one-inch outer steel shell, and a steel flange connecting the two shells. The cask outer shell is surrounded by a one-inch layer of insulating material and canned in 11-gauge steel.

The lid, sealed by a silicone flat gasket, is bolted to the cask body. A cylindrical shield plug is located in the center of the cask lid and is sealed by a silicone flat gasket. Lifting and tie-down devices are attached to the cask body. Impact skirts, consisting of removable rings of shock absorbing foam, are attached to the ends of the cask.

(3) Drawings

The package is fabricated in accordance with the following Scientific Ecology Group, Inc. Drawing No.: STD-02-076, Sheets 1 through 3, Revision 7.

5. (b) Contents

(1) Type and form of material

Byproduct material consisting of dewatered, solid radioactive waste, including spent ion exchange resins, filter sludges, solidified evaporator concentrates, spent filter cartridges, and contaminated or irradiated solid materials.

(2) Maximum quantity of material per package

Greater than Type A quantity of byproduct material, which may contain not more than a Type A quantity of fissile material, provided the fissile material does not exceed the limits specified in 10 CFR 71.53. The cask contents must be contained within one of the following inner containers and limited as follows:

(a) Single disposable cylindrical containers constructed of metal or high integrity plastic with tightly fitted covers. A maximum decay heat load of 205 Btu/hr.

(b) Two pallets with four, 30-gallon drum size containers per pallet. Drums to be constructed of metal or high integrity plastic with a tightly fitted cover. A maximum decay heat load of 84 Btu/hr.

(c) One pallet with three, 55-gallon drum size containers. Drums to be constructed of metal or high integrity plastic with tightly fitted covers. A maximum decay heat load of 116 Btu/hr.

6. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis of a representative package such that the following criteria are met over a period of time that is twice the expected shipment time:

(i) The hydrogen generated must be limited to a molar quantity that would be no more than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void if present at STP (i.e., no more than 0.063 g-moles/ft^3 at 14.7 psia and 70°F); or

(ii) The secondary container and cask cavity must be inerted with a diluent to assure that oxygen must be limited to 5% by volume in those portions of the package which could have a hydrogen concentration greater than 5%.

For any package delivered to a carrier for transport, the secondary container must be prepared for shipment in the same manner in which determination for gas generation is made. Shipment period begins when the package is prepared (sealed) and must be completed within twice the expected shipment time.

6. (b) For any package containing materials with radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of preparation, or within 10 days after venting of drums or other secondary containers, the determination in (a) above need not be made, and the time restriction in (a) above does not apply.

7. The total weight of the package must not exceed 50,000 pounds and the weight of the contents (including dunnage, etc.) must not exceed 8,195 pounds.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with Operating Procedure STD-P-02-024, Rev. 5, dated May 10, 2001.

   (b) The package shall be maintained in accordance with the maintenance program in the supplement dated March 13, 1991.

9. Except for close fitting contents, sufficient dunnage, shoring, and/or bracing must be utilized to minimize secondary impact of the contents within the cavity under accident conditions of transport.

10. Prior to each shipment, the seal on the main cover and the seal on the shield plug cover, if opened, or if the security seal is broken, must be inspected. The seals must be replaced if the inspection shows any visible defects or every 12 months, whichever occurs first.

11. The packaging must be leak tested in accordance with Section 8.2.2 of the application. For contents that meet the definition of low specific activity material or surface contaminated objects in 10 CFR 71.4, and also meet the exemption standard for low specific activity material and surface contaminated objects in 10 CFR 71.10(b)(2), the pre-shipment leak test is not required.

12. The package authorized by this certificate is hereby approved for use under the general provisions of 10 CFR 71.12.

13. Expiration date: May 31, 2006.

REFERENCES

Scientific Ecology Group Incorporated application dated December 27, 1990.

Supplements dated: March 13, 1991; March 7, 1996; and October 10, 1997.

ATG Nuclear Services, LLC, supplements dated: December 1, 1998; August 9 and 11, 1999.

ATG, Inc. supplements dated March 29, 2001; and May 10, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Mele
for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 18, 2001

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6581	31	71-6581	USA/6581/AF	1	OF	4

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Framatome ANP Richland, Inc.
2101 Horn Rapids Road
Richland, WA 99352-0130

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Advanced Nuclear Fuels Corporation application dated October 15, 1990, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 51032-1

(2) Description

A steel shipping container for fuel bundles, consisting of a strongback and fuel bundle clamping assembly, shock mounted to a steel outer container. Steel separator blocks are bolted between fuel assemblies. The separator blocks are a minimum 6 inches wide by approximately 8 inches high and 9 inches long, with a minimum nominal 3/8-inch thick wall. The outer container is approximately 43 inches in diameter by 216 inches long. The maximum weight of the package, including contents, is 7,400 pounds.

(3) Drawings

The packaging is constructed and assembled in accordance with the following Siemens Power Corporation Drawing Nos.:

EMF-309,813, Rev. 2, Sheets 1 and 2
EMF-303,359, Rev. 7
EMF-303,360, Rev. 6
EMF-303,898, Rev. 5
EMF-300,607, Rev. 3
EMF-309,582, Rev. 0

5.(b) Contents

(1) Type and Form of material

Unirradiated fuel rods consisting of uranium dioxide fuel pellets clad in zircaloy or stainless steel tubes. Uranium is enriched to a maximum of 5.0 wt% in the U-235 isotope except for the T15X15 cruciform assemblies, which have a maximum enrichment of 2.8 wt% in the U-235 isotope. The sum of the cladding wall thickness and the pellet-clad radial gap must not be less than 0.023 inch, except for the T15X15 square array fuel assemblies. For the T15X15 square array fuel assemblies the sum of these two parameters must not be less than 0.016 inch. The maximum length of the active fuel region is 196 inches, except for the T15X15 cruciform assemblies, whose maximum active fuel region is 116 inches. Fuel rods must be in one of the following configurations:

(i) Fuel assemblies consisting of a maximum of 204 fuel rods in a 15 x 15 square array with a maximum nominal fuel rod pitch of 0.563 inch and a maximum assembly cross section of 8.445 inches square. The fuel rod cladding must have an OD not less than 0.410 inch and not greater than 0.430 inch. The fuel rod arrangement is as shown in Figure 11.1 of the application.

(ii) Fuel assemblies consisting of a maximum of 264 fuel rods in a 17 x 17 square array (with any number of edge rods missing) with a maximum nominal fuel rod pitch of 0.496 inch and a maximum assembly cross section of 8.432 inches square. The fuel rod cladding must have an OD not less than 0.355 inch and not greater than 0.380 inch. The fuel rod arrangement is as shown in Figure 11.2 of the application.

(iii) Fuel assemblies consisting of any number of fuel rods in a square array with maximum assembly cross section of 8.25 inches square. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch.

(iv) Any number of fuel rods positioned in a rod container. The rod container consists of a schedule 40 steel pipe with a maximum nominal diameter of 5 inches. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch.

(v) Fuel assemblies consisting of a maximum of 208 fuel rods in a 15 x 15 square array (with any number of edge rods missing) with a maximum nominal fuel rod pitch of 0.527 inch and a maximum assembly cross section of 7.91 inches square. The fuel rod cladding must have an OD not less than 0.364 inch and not greater than 0.400 inch. The fuel rod arrangement is as shown in Figure VII-1 of the application.

(vi) Fuel assemblies consisting of a maximum of 28 fuel rods in a cruciform array with a maximum nominal fuel rod pitch of 0.556 inch and a maximum assembly cross section of 8.25 inches square. The fuel rod cladding must have an OD not less than 0.260 inch and not greater than 0.500 inch. The fuel rod arrangement is as shown in Figure VII-3 of the application.

5.(b) Contents (Continued)

(2) Maximum quantity of material per package

Total weight of fuel assemblies, or fuel rods and rod containers, not to exceed 3400 pounds, and

(i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), 5(b)(1)(v) and 5(b)(1)(vi):

Two full length fuel assemblies. Two short fuel assemblies may be substituted for each full length fuel assembly provided the two short assemblies are shipped end-to-end and the total fuel length does not exceed the maximum fuel length for a full length assembly.

(ii) For the contents described in 5(b)(1)(iv):

Two rod containers.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. Each fuel assembly must be unsheathed or must be enclosed in an unsealed polyethylene sheath which will not extend beyond the ends of the fuel assemblies. The ends of the sheaths must not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assemblies.

7. Hydrogenous shims are not permitted within the fuel assemblies.

8. Separator blocks, shock mounts, and fuel element clamp assemblies must be in accordance with Tables 2.2, 2.3, 2.4, 2.5, and VII-3 of the application.

9. Each separator block must be attached to the strongback by one of the following methods, as shown in Drawing No. EMF-309,813, Rev. 2, Sheet 2:

(a) Two, 5/8-11 UNC Grade 5 steel cap screws and nuts. A 5/8-11 UNC Grade 2 (or better) steel stud may be substituted for one of the cap screws.

(b) Two, 1-8 UNC Grade 8 steel cap screws and nuts. A 1-8 UNC Grade 8 steel stud may be substituted for one of the cap screws.

10. The fuel assembly cross section is defined as the rod pitch times the number of rods on the edge of the assembly.

11. Rods containing gadolinia or other neutron poison are authorized but not required.

12. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) The package shall be prepared for shipment and operated in accordance with the procedures in Chapter 3.0 of the application, and supplemental operating procedures dated July 1, 1997.

    (b) Each packaging shall be maintained in accordance with the procedures in Section 3.4 of the application.

    (c) Each packaging shall meet the acceptance tests in Chapter 4.0 of the application.

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

14. Expiration date: May 31, 2004.

REFERENCES

Advanced Nuclear Fuels Corporation application dated October 15, 1990.

Siemens Nuclear Power Corporation supplements dated September 18, 1991; April 22, 1992; January 25, 1994; July 1, 1997; March 16, 18, 21, and 24, 1998; April 28, May 6, August 31 and October 6 and 12,1999; July 7 and September 29, 2000; and February 6, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges for

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: 30 March, 2001

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

AEA Technology, QSA Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

AEA Technology QSA Inc application dated July 19, 2001, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

a) Packaging

(1) Model No.: 702

(2) Description

The cask system overall dimensions are 19" x 21" x 20". The cask is a stainless steel weldment containing depleted uranium shielding. The cask has a central cavity which is 2.26 inches in diameter by 3.25 inches long. Closure is accomplished by a neoprene gasket, six, 3/8-inch bolts and a stainless steel stepped plug containing depleted uranium shielding. The closure is equipped with an eye bolt and two drain and vent plugs. The cask is mounted on a 19" x 21" rectangular steel skid with four, 1/2-inch bolts and a tie-down system consisting of four, 1/2-inch diameter threaded rods which connect a clamp ring at the top of the cask to channel brackets welded to the skid. A protective cage constructed of 1-1/4-inch square steel tubing and perforated 18 gauge steel sheets tack welded to the tubular frame surrounds the cask and is bolted to the skid by four, 1/2-inch bolts. Maximum gross weight of the packaging is 410 pounds.

(3) Drawings

The cask and other system components are constructed in accordance with AEA Technology, QSA, Inc., Drawing Nos.: 70290, Sheets 1 to 10, Rev. M.

5. (b) Contents

(1) Type and form of material

Sources which meet the requirements of special form radioactive material. Authorized isotopes include Cs-137, Ir-192, Se-75, and Yb-169.

(2) Maximum quantity of material per package:

Isotope	Output Curies
Cs-137	500
Ir-192	15,000
Se-75	10,000
Yb-169	10,000

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

(3) Maximum decay heat per package:

129 watts.

6. The name plate must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) Each package shall be operated and prepared for shipment in accordance with Section 7.0 of the application, as supplemented.

(b) The package must meet the Acceptance Tests and Maintenance Program, Section 8.0 of the application, as supplemented.

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

9. Packages may be marked with Package Identification Number USA/6613/B(U) until June 30, 2003.

9. Expiration date: June 30, 2003.

REFERENCES

AEA Technology, QSA Inc., application dated July 19, 2001.

Supplements dated: March 12 and July 19, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: August 20, 2002

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
6642	7	71-6642	USA/6642/B( )	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Safety Analysis Report - Packages SRL 4.5 Ton Californium Shipping Cask, DPSPU 74-124-6, December 1974, Rev. 1, March 1976, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 4.5-Ton Cf

(2) Description

A shielded packaging for special form materials. The outer container is a 3/4-inch thick, 61-1/2-inch OD spherical steel shell filled with borated water extended polyester (WEP) shielding. Outer shell is fitted with nine (9) fusible plugs and a vent valve for relief of gases generated in the WEP material. The cylindrical containment cavity approximately 4-inch diameter by 6-3/8 inches high is centrally located in the sphere and surrounded by lead of 2 inches, 1.9 inches and 1.75 inches thickness on the bottom, sides and top, respectively. The containment vessel is an integral part of the outer container, and is held by a 31-1/2-inch long 4-1/2-inch OD tube welded to a 3/4-inch thick 22-1/2-inch diameter top plate mounted to the outer container closure assembly. Closure of the containment vessel is accomplished by a flange plate and sleeve insert assembly. The sleeve is a 27-inch long, 4-inch OD tube filled with lead and water extended polyester and is gasketed and bolted to the top closure assembly of the container. A 22-1/2-inch diameter protective cover bolts to the closure assembly sleeve. A hexagonal shaped assembly, approximately 5 feet across the flats mounts, to the spherical shell as a base. Four equally spaced lifting lugs are provided around the upper hemisphere. The cask gross weight is approximately 9,500 pounds.

(3) Drawings

The SRL 4.5-Ton Californium shipping cask is as described, and is constructed in accordance with E.I. duPont de Nemours Company Drawing Nos.: ST5-15813, Rev. 33; ST5-15814, Rev. 29; ST5-15815, Rev. 0; ST5-15816, Rev. 0; ST5-15817, Rev. 0; and ST5-15818, Rev. 5.

5.(b) Contents

(1) Type and form material.

Californium 252, as sealed source which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package.

46 curies (85 mg).

6. Prior to each shipment, the WEP shielding space shall be vented, using the1/4-inch angle valve which is then closed.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with the Operating Procedure described in the application, as supplemented dated September 18, 1991.

(b) The package must be maintained in accordance with the Maintenance Program described in the application, as supplemented dated September 18, 1991.

8. Use of packaging fabricated after August 31, 1986, is not authorized.

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

10. Expiration date: February 28, 2007.

REFERENCES

Safety Analysis Report - Packages SRL 4.5-Ton Californium Shipping Cask, DPSPU 74-124-6, December 1974, Revision 1, March 1976.

Supplements dated: September 18, 1991; July 17, 1996; and January 25, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material
Safety and Safeguards

Date: 5/14/02

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6717	10	USA\6717\B(U)	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Amersham Corporation application dated October 10, 1990, as supplemented.

c. DOCKET NUMBER 71-6717

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 6717-B

(2) Description

Radiographic device within a protective overpack. The overpack consists of an outer container which is a 10-gallon open head steel drum (approximately 14 inches in diameter and 17 inches in height) having a minimum 20-gauge body and cover, welded seams and a clamp-ring type head closure. The void space between the inner and outer container is filled with 1-1/2" thick molded asbestos free liner on sides, and 1 inch on the top and bottom, plus molded polyurethane filler to position and secure the radiographic device within the drum. Maximum gross weight of the package not to exceed 100 pounds.

The maximum gross weight of the secondary packaging (device and molded polyurethane filler) not to exceed:

i) 65 pounds for the Model Nos.: Century, Century S, Century SA, Century S Universal, Century SA Universal, C-10, 35, 35S and 35SA;

ii) 60 pounds for the Model Nos.: 20V, 40V, 20VS, 40VS and U-110;

iii) 45 pounds for the Model Nos. Pipeliner Model 1, Pipeliner Model 201 and Mariner; and

iv 54.5 pounds for the Model No. MX-IC-100.

(3) Drawings

The overpack must be constructed in accordance with Amersham Corp. Drawing Nos. 93590, Rev. C; 93690, Rev. C; 93790, Rev. D; 93890, Rev. B; and 93990, Rev. C.

(a) Packaging (continued)

(3) Drawings (continued)

The radiographic devices, as secondary packaging, authorized for use in the overpack are constructed in accordance with the following Drawing Nos.:

For the Model No. Century: Gamma Industries Drawing Nos. 821-1001-101, Rev.- dated 7/2/76; and 821-1001-005, Rev. 4;

For the Model Nos. Century S and Century SA: Gamma Industries Drawing Nos. 821-1001-439A, Rev. A; 821-1001-101, Rev. - dated 7/2/76; and 821-1001-005, Rev. 4;

For the Model Nos. Century S Universal and Century SA Universal: Gamma Industries Drawing No. 821-1001-441A, Rev. - dated 2/15/82; and 821-1001-101 Rev. - dated 7/2/76;

For the Model No. C-10: Gamma Industries Drawing Nos. 821-1005-018 Rev.- dated 9/27/93; and 821-1001-101, Rev. - dated 7/2/76;

For the Model Nos. 35 and 35S: Gamma Industries Drawing Nos. 821-1001-105, Rev.- dated 9/15/70; and 821-1001-002, Rev. 2C;

For the Model No. 35SA: Gamma Industries Drawing Nos. 821-1001-105, Rev. - dated 9/15/70; and 821-1001-003, Rev. 2C;

For the Model Nos. 20V and 40V: Gulf Nuclear, Inc., Drawing Nos. 1000-51-03, Rev. - dated 12/14/83; A-31, Sheets 3 & 4, Rev. 1; A-31-21 Sheets 1, 2 and 3, Rev. 1; and A-31-34 Sheet 1 and 2 of 4, Rev. 1.

For the Model Nos. 20VS and 40VS: Gulf Nuclear, Inc. Drawing Nos. A-31 Sheets 3 and 4, Rev. 1; A-31-1 Sheet 1, Rev. 1 and Sheet 2, Rev. - dated 1/15/83; A-31-12, Rev. - dated 1/4/84; A-31-16, Rev. 2; A-31-18, Rev. 1; A-31-20, Rev. 1; A-31-21 Sheets 1, 2, and 3, Rev. 1; A-31-31 Sheets 1,2 and 3, Rev 2; A-31-32, Rev.2; A-31-34 Sheet 1, Rev. 1 and Sheet 2, Rev. - dated 1/11/84; 1000-50-14, Rev. -; and 1000-50-13, Rev. 2;

For the Model No. U-110: Amersham Corp. Drawing No. 93691, Rev. - dated 10/9/90; 93692, Rev. A; and Gulf Nuclear, Inc., Drawing No. A-31-21 Sheets 1, 2 and 3, Rev. 1,

For the Model No. Pipeliner Model 1: Amersham Corp. Drawing No. 93591, Rev. A; SK 2473, Rev. - dated 4/1/88; and SK 2473-1, Rev. - dated 1/21/88; and Gamma Industries Drawing No. 811-1001-287, Rev. 1;

For the Model No. Pipeliner Model 201: Gamma Industries Drawing Nos. 821-1001-019B, Rev. 5; and Drawing No. 821-1001-235, Rev. 5;

For the Model No. Mariner: Gamma Industries Drawing Nos. 821-1001-024, Rev. 1; and 821-1001-351, Rev. 1; and

For the Model No. Magnaflux Model MX-IC-100: Magnaflux Corp. Drawing No. C-211626, Rev. - dated 2/9/78.

(b) Contents

(1) Type and form of material

Iridium-192 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package.

(i) 35 Curies contained in the Model Nos. 35, 35S or 35SA.

(ii) 100 Curies contained in the Model No. MX-IC-100.

(iii) 120 Curies contained in the Model Nos. Century, Century S, Century SA, Century S Universal, Century SA Universal, Pipeliner Model 1, 20V, 20VS or U-110.

(iv) 220 Curies contained in the Model Nos. 40V or 40VS.

(v) 240 Curies contained in the Model Nos. C-10, Pipeliner Model 201 or Mariner.

6. The source shall be secured in the shielded position of the radiographic device by the shipping plug, source assembly, and locking device. The shipping plug and source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The ball stop of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with the operating procedures in Chapter 7 of the application, as supplemented.

(b) The drum should be assembled without a gasket and with the clamping ring tightened until the maximum gap between the lug nuts is 3/16-inch.

(c) The package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application.

8. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

9. Expiration date: November 30, 2003.

REFERENCES

Amersham Corporation application dated October 10, 1990.

Amersham Corporation supplements dated: December 3, 1990; March 12, April 1, July 18, October 25, and December 20, 1991; May 14, July 2, and September 21 and 27, 1993; and May 20, 1994.

AEA Technology/QSA Inc. supplement dated September 1, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 5, 1998

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
6786	6	USA/6786/B( )F	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:
Aerojet Application dated February 18, 1971, as supplemented.

c. DOCKET NUMBER 71-6786

4. CONDITIONS
This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model Nos.: URIPS-8A and URIPS-8B

(2) Description

The packages, thermoelectric generators, are 28.5 inches in overall height, with an outer diameter of 19.14 inches, and total weight of approx. 1,600 pounds. The components include a depleted uranium shield (470 lbs.), a steel housing, cover bolts (recessed and caulked over), an electrical adaptor, cooling fin system, and cylindrical fin guard, stiffened by eight ribs on the inside surface. The housings are equipped with lifting and tie down devices. The Model No. URIPS-8B differs from Model No. URIPS-8A in the electric converter system. The thermoelectric generator may be secured in a shipping frame identified in Drawing No. 1138459, Rev. A.

(3) Drawings

The package is constructed in accordance with the following Aerojet Company Drawing Nos.:

1138441	8-Watt URIPS-8A Assembly
1138442, Rev. C	Generator Housing
1138457	Cooling Fins
1139240, Rev. A	Fin Guard
1139245, Rev. A	Shipping Package URIPS-8
1139246	8-Watt URIPS Assembly
1138459, Rev. A	Shipping Frame-URIPS-8
1138443, Rev. B	Top Cover
1138444	Bottom Cover
1138436	Fuel Capsule
1138437, Rev. B	Shield Uranium
1138435	Fuel Liner
1138440, Rev. A	W-2 Shield Plug
1138453	Insulation
1138455, Rev. B	Copper Plug

(b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

56,850 ci.

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must be prepared for shipment and operated in accordance with the operating procedures specified in the supplements dated April 16 and August 6, 1998.

(b) The package must be maintained in accordance with the maintenance procedures specified in the supplements dated April 16 and August 6, 1998.

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

8. Expiration date: September 30, 2003.

REFERENCES

Aerojet Nuclear Systems Company application dated February 18, 1971.

Supplemented by Naval Nuclear Power Unit letter dated: December 10, 1971, and Oak Ridge National Laboratory dated: December 28, 1972; and February 27 and March 27, 1973.

Department of the Navy application dated: June 8, 1990.

Supplements: Department of the Navy letter 5104 Ser 455/1U599998 dated June 18, 1991; Department of the Navy letter 5104 Ser N455C/8U595525 dated April 16, 1998; and Department of the Navy letter 5104 Ser N455C/8U595912 dated August 6, 1998.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: _____

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9001	36	71-9001	USA/9001/B( )F	1	OF	9

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Duratek
140 Stoneridge Drive
Columbia, SC 29210

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
VECTRA Technologies, Inc., application dated March 30, 1995, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: IF-300

(2) Description

A stainless steel encased, depleted uranium shielded cask. The cask is cylindrical in shape, 64 inches in diameter, and a maximum of 210-inches long with maximum cavity dimensions of 37-1/2 inches in diameter by 180-1/4-inches long. Shielding is provided by 4 inches of depleted uranium, 2-1/8 inches of stainless steel, and a minimum of 4-1/2 inches (550 gallons) of a water ethylene glycol mixture.

Two closure heads are provided for the shipment of BWR and PWR fuel assemblies. The heads are 304 stainless steel forgings and end plates which encase the 3-inch thick depleted uranium shielding. Either closure head may be used for packaging solid irradiated hardware.

The closure heads are secured to the cask body by means of 32, 1-3/4 inch studs and nuts. The cask is sealed with a metallic ring gasket.

The cavity is penetrated by a vent line at the top and a drain line at the bottom. These lines are sealed by bellows stainless steel globe valves and valved quick-disconnect couplings. Stainless steel pipe caps or pipe plugs may be used in lieu of the quick-disconnect couplings. The vent line is also equipped with a 350-400 psig rated rupture disk. All valves are housed in protected boxes on the cask exterior.

5.(a) Packaging (continued)

(2) Description (continued)

Neutron shielding is provided by a liquid-filled, thin-walled, corrugated containment on the cask exterior. This cylindrical structure is separated into two longitudinal compartments, each equipped with two expansion tanks, fill and relief valves. The fill line from each compartment is terminated by a stainless steel globe valve in a protected box (separate from cavity boxes) on the cask exterior. The stainless steel globe valves may be replaced by stainless steel blind flanges. The vent line from each compartment goes to an expansion tank which is provided with a pressure relief valve set at 200 psig.

The cask has three types of fuel baskets which can be interchanged to accommodate various fuels. The PWR basket holds seven assemblies (except for Group III PWR contents, where six assemblies are authorized and the center cell does not contain a fuel assembly), the unchanneled BWR basket holds eighteen assemblies, and the channeled BWR basket holds seventeen assemblies. The channeled and unchanneled BWR fuel baskets may be provided with supplementary shielding (depleted uranium) near the cask closure.

The cask is shipped horizontally with the bottom supported in a tipping cradle between two pedestals and the upper end resting in a semi-circular saddle; the upper end is pinned to the saddle. The cask supports are welded to the framing of a 37-1/2-foot long by 8-foot wide structural steel skid. The skid may also have installed on it an auxiliary cooling system, consisting of two diesel engines driving two blowers which discharge cooling air to the corrugated surface of the cask via common ducting. Neither installation nor operation of all or part of this auxiliary cooling system is a requirement of this package approval.

The entire cask and cooling system is covered by a retractable aluminum enclosure. Access to the enclosure is via locked panels in the side and a locked door in one end. Although the Model No. IF-300 cask can be transported for short distances on the highway, its principal mode of transportation is by railroad.

The gross weight of the cask is approximately 140,000 pounds. The skid and other external components weigh approximately 45,000 pounds.

(3) Drawings

The Model No. IF-300 shipping cask is described by the following General Electric Company Drawing Nos.: 159C5238 - Sheet 1, Rev. 9; Sheet 2, Rev. 3; Sheet 4, Rev. 8; Sheet 5, Rev. 5; Sheet 6, Rev. 8; Sheet 7, Rev. 4; Sheet 8, Rev. 5; Sheet 9, Rev. 8; Sheet 10, Rev. 5; and Sheet 11, Rev. 2, GTS Duratek Drawing No.: C-110-B-57915-001, Rev. 1, Duratek Drawing No. C-002-044125-001, Rev. 0, and Pacific Nuclear Systems, Inc. Drawing Nos.: 420-11-3000, Sheets 1 through 9, Rev. 1; 420-11-3001, Sheet 1, Rev. 1; 420-11-3002, Sheets 1 and 2, Rev. 1; 420-11-3003, Sheets 1 and 2, Rev. 1; 420-11-3004, Sheets 1 and 2, Rev. 1; 420-11-3005, Sheets 1 and 2, Rev. 1; and 420-11-3006, Sheet 1, Rev 1.

5.(a)(4) Basic Components

The basic components of the Model No. IF-300 shipping cask that are important to nuclear safety are listed in Section IX, Table IX-1.

(b) Contents

(1) Type and form of material

(i) Irradiated PWR and BWR uranium oxide fuel assemblies. PWR assemblies may be shipped with or without control rods. Partial fuel assemblies, that is, assemblies from which fuel pins are missing, must not be shipped unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins. The specific power of each fuel assembly must not exceed 40 kW/kgU. The BWR and PWR fuel assemblies must have the following dimensions and specifications:

Group Ia fuel assemblies

	PWR	BWR
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	465	198
Maximum initial U-235 enrichment, weight percent	4.0	4.0
Maximum assembly average burnup, MWd/MTU	35,000	35,000
Minimum cooling time, days	120	120
Maximum initial bundle cross section, in	8.75	5.75
Fuel pin array	14x14/15x15	7x7
Initial fuel diameter, in	0.380-0.460	0.500-0.600
Initial fuel pin pitch range, in	0.502-0.582	0.647-0.809
Maximum initial active fuel length, in	145	146

5.(b)(1)(i) Contents - Type and form of material (continued)

Group Ib fuel assemblies

	PWR
Fuel form	Clad UO_2 pellets
Cladding material	Zr or SS
Maximum initial U content/assembly, kg	439
Maximum initial U-235 enrichment, weight percent	4.0
Maximum assembly average burnup, MWd/MTU	45,000
Minimum cooling time, years	5
Maximum initial bundle cross section, in	8.75
Fuel pin array	15x15
Initial fuel diameter, in	0.380-0.460
Initial fuel pin pitch range, in	0.502-0.582
Maximum initial active fuel length, in	144

5.(b)(1)(i) Contents - Type and form of material (continued)

Group II fuel assemblies

	PWR	BWR
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	475	198
Maximum initial U-235 enrichment, weight percent	4.0	4.0
Maximum assembly average burnup, MWd/MTU	35,000	35,000
Minimum cooling time, days	120	120
Maximum initial bundle cross section, in	8.75	5.75
Fuel pin array	16x16/17x17	8x8
Initial fuel diameter, in	0.376-0.400	0.475-0.505
Initial fuel pin pitch range, in	0.496-0.507	0.630-0.645
Maximum initial active fuel length, in	150	150

5.(b)(1)(i) Contents - Type and form of material (continued)

Group III fuel assemblies

	PWR[a]	BWR[b]
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr	Zr
Maximum initial U content/assembly, kg	442	187
Maximum initial U-235 enrichment, weight percent	4.25	4.25
Maximum assembly average burnup, MWd/MTU	45,000	45,000
Minimum cooling time, years	5	4
Maximum initial bundle cross section, in	8.75	5.75 (8x8) 5.75 (9x9)
Fuel pin array	15x15	8x8/9x9
Initial fuel diameter, in	0.424	0.483 (8x8) 0.440 (9x9)
Initial fuel pin pitch, in	0.563	0.640 (8x8) 0.566 (9x9)
Maximum initial active fuel length, in	144	150 (8x8) 146 (9x9)
Minimum initial top/bottom blanket length, in[c]	6	6 (8x8) 6 (9x9)

Notes:

[a] The center fuel assembly location in the PWR basket must not contain a fuel assembly, with the six PWR assemblies being placed in the six peripheral basket positions.

[b] This fuel is only authorized for shipment in Cask Serial Nos. IF-303 and IF-304.

[c] Length of natural UO_2 fuel above and below the enriched portion of the active fuel.

5.(b)(1) Contents - Type and form of material (continued)

(ii) Solid irradiated hardware, which may include fissile material, provided the quantity of fissile material does not exceed a Type A quantity and does not exceed the mass limits of 10 CFR §71.53. As needed, appropriate component spacers must be used when loading irradiated hardware into the cask cavity to limit movement of the contents during accident conditions of transport. Use of a steel liner is authorized provided: (1) its outside dimensions are approximately those of the cask cavity inside dimensions, (2) constructed of single thickness of steel plate with full penetration welds, (3) thickness of steel plate does not exceed one inch, and (4) the liner is provided with a drain and vent to insure water removal.

(2) Maximum quantity of material per package

Maximum decay heat per package not to exceed 40,000 Btu/hr. Maximum 5,725 Btu/hr/PWR assembly. Maximum 2,225 Btu/hr/BWR assembly.

(i) Seven PWR fuel assemblies for Groups Ia, Ib and II as described in 5.(b)(1)(i).

(ii) Six PWR fuel assemblies for Group III as described in 5.(b)(1)(i). The center fuel assembly location in the PWR basket for Group III PWR contents must not contain a fuel assembly, with the six PWR assemblies being placed in the six peripheral basket positions.

(iii) Seventeen channeled BWR assemblies (for Groups Ia, II and III), or eighteen unchanneled BWR fuel assemblies (for Groups Ia and II), as described in 5.(b)(1)(i).

(iv) Above fuel assemblies to be contained in their respective fuel baskets as shown in GE Drawing No. 159C5238 - Sheet 6, Rev. 8 and GTS Duratek Drawing No. C-110-B-57915-001, Rev. 1, or PNSI Drawing No. 420-11-3000, Sheets 1 through 9, Rev. 1.

5. (c) Unloaded package - contents and maximum quantity of material

Greater than a Type A quantity of residual radioactive material consisting of mixed-fission and activation products adhering to interior cavity and fuel basket surfaces.

(d) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control:

For Groups Ia, Ib and II PWR and BWR fuel assemblies as described in 5.(b)(1)(i)	0.4
For Group III PWR and BWR fuel assemblies as described in 5.(b)(1)(i)	0.0

6. The end of life total calculated residual gas that could become available from the fuel pins must not exceed 0.50 lb moles for content 5.(b).

7. The maximum gross weight of the cavity contents must not exceed 21,000 pounds.

8. For the shipment of irradiated fuel assemblies, the cask cavity (containment vessel) must be promptly inerted following removal of the water from the cavity. The cask cavity must be purged at least three times with argon, nitrogen, or helium. Each purge volume must be equivalent to or greater than the cask cavity volume. After the final purge, the cavity must be promptly filled with argon, nitrogen, or helium at 1.0 atm pressure.

9. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.

10. Prior to loading Group III PWR contents, a plug must be inserted into the center assembly location of the PWR basket and there must not be a Group III PWR assembly in the center basket location at any time.

11. Prior to each shipment, the licensee must confirm that the cask contains no more than 1 cubic foot of water in the cavity and the licensee must prepare the cask for shipment, in accordance with Subsection 10.1 of the application.

12. The cask contents shall be so limited that under normal conditions prior to transport, 62 times the neutron dose rate plus 6.3 times the gamma dose rate will not exceed 560 mrem/hr at a distance of six feet from the side of the cask (ten feet from the cask center-line).

13. The neutron shielding tanks must be filled with approximately a 50/50 volume percent mixture of ethylene glycol and water during the months of October through May.

14. Replacement globe valves other than the valve specified on Drawing No. 159C5238-Sheet 4, Rev. 8, must be tested as stated in Subsection 6.6.3.2 of the application.

15. The packaging must be maintained in accordance with the requirements of Subsection 10.2 of the application. During inactive periods, the maintenance and testing frequency may be disregarded provided that the package is brought into full compliance with these requirements prior to the next use of the package.

16. The cask cavity must be equipped with a rupture disk device with a burst pressure within the range of 350-400 psig (443°F) including all tolerances.

17. The uranium shielding material must be separated from all steel surfaces with a minimum copper thickness of 4-mils, except that the stud bolts attaching the shield assemblies to top of the unchanneled BWR basket must be coated with a minimum of ½-mil of copper.

18. A shutoff valve must not be installed between each neutron shield tank and its respective thermal expansion tank.

19. The cask may be wrapped with reinforced plastic during shipment, provided that the decay heat of the contents does not exceed 1.5 KW. The reinforced plastic used to wrap the cask must not be greater than 0.015 inches thick or have a thermal conductivity less than 0.0242 Btu/hr-ft-°F. The reinforced plastic wrapping cannot be used as the cask surface for purposes of complying with 10 CFR 71.87.

20. The package authorized by the certificate is hereby approved for use under the general license provisions of 10 CFR 71.12.

21. Expiration date: September 30, 2005.

REFERENCES

VECTRA Technologies, Inc., application dated March 30, 1995.

VECTRA Technologies, Inc., supplements dated: April 27, and August 18, 1995; November 25, 1997;

Chem-Nuclear Systems supplements dated January 9, 1998; June 8 and June 21, 1999; January 14, February 17, March 16, June 16, July 14, October 11, October 20, and November 9, 2000; and April 23, 2001.

Duratek supplements dated February 4, September 9, and October 21, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

John D. Monninger, Chief
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date December 2, 2002

NRC FORM 618
(3-96)
10 CFR 71

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

U.S. NUCLEAR REGULATORY COMMISSION

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9009	18	USA/9009/B( )F	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Nuclear Fuel Services
P.O. Box 337, MS 123
Erwin, TN 37650

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

General Electric Company application
dated January 27, 1984, as supplemented.

c. DOCKET NUMBER 71-9009

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: FL 10-1

(2) Description

Two, 16-gauge 55-gallon drums welded end to end, approximately 68 inches long and 22-1/2 inches in diameter. The outer drum closure shall be accomplished by at least a 12-gauge bolt-locking ring with drop-forged lugs, one of which is threaded to receive at least a 5/8-inch diameter bolt and lock nut. The pressure vessel support mechanism consists of wood supports, steel inner sleeve and nut ring to receive the containment vessel, and fire resistant phenolic foam, formed in place to an average finished density of at least 8 pounds per cubic foot for the main body and 10 pounds per cubic foot for the cap. Gas relief holes shall be provided in the outer steel drum.

The containment vessel is a 304L stainless steel 5-inch Schedule 40 pipe, approximately 53-1/2 inches long, with a 304L stainless steel ½-inch thick welded bottom plate and a 304L stainless steel 300 pound slip-on flange and blind flange which is fastened by eight, 3/4-inch steel bolts. The flange closure is gasketed by two fluoroelastomer O-rings with a pressure tap between the two O-ring grooves. During shipment, the O-ring groove pressure tap is sealed with a pipe plug with threads wrapped in teflon tape. A 1/4-inch stainless steel valve is screwed into the blind flange of the containment vessel. The valve is sealed by a pipe cap (threads wrapped with Teflon tape) and is protected by a 2-1/2 inch high section 5-inch Schedule 40 pipe welded to the top of the flange. The packaging has a maximum gross weight of 515 lbs.

(3) Drawings

The Model No. FL 10-1 package is constructed in accordance with General Electric Company Drawing No. 112D3018, Rev. 2.

(b) Contents

(1) Type and form of material

(i) Uranyl nitrate solutions enriched in the U-235 isotope, provided the U-233 content is not more than 1% of the U-235 content; or

(ii) Uranyl nitrate solutions having a combined concentration of uranium-233 and uranium-235 not exceeding 250 grams per liter and an H to fissile material atomic ratio not less than 80 provided the U-233 content is not greater than 20% of the combined U-233 and U-235 content; or

(iii) Uranyl sulfate solution (UO_2SO_4) containing uranium-235; or

(iv) Dry compounds and mixtures of uranium-235; or

(v) Uranium oxide interspersed with graphite or silicon carbide plus plastic packing material; or

(vi) Uranyl nitrate solutions enriched in the U-235 isotope having a U-235 concentration not to exceed 350 grams per liter.

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(l)(i) and 5(b)(1)(ii):

Not to exceed 3.675 kilograms fissile material, 21 watts decay heat, and 10.5 liters of solution.

(ii) For the contents described in 5(b)(1)(iii):

Not to exceed 950 grams fissile material and 18 watts decay heat.

(iii) For the contents described in 5(b)(1)(iv):

Not to exceed 4.5 kilograms fissile material and 30 watts decay heat.

(iv) For the contents described in 5(b)(1)(v):

Not to exceed 300 grams fissile material and 10 watts decay heat.

(v) For the contents described in 5(b)(1)(vi):

Not to exceed 10.0 liters of solution.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. The solution contents of the package shall be contained within a bottle having one of the following specifications:

   (a) For contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii):

      (i) Slit-vent polyethylene bottle per Drawing No. CAPE-1170-37,

      (ii) Duo-vent polyethylene bottle per General Electric Company Drawing No. 112D3013, Rev. 0, or

      (iii) Stainless steel bottle as shown on General Electric Company Drawing Nos. FRO-140 and FRO-140A.

   (b) For contents described in 5(b)(1)(vi):

      Slit-vent or duo-vent polyethylene bottle per Nuclear Fuel Services, Inc., Specification U-1, Rev. 2, and Drawing No. 5B-U-740, Rev. 2.

7. For shipment of solutions, the shipment must be completed no later than 365 days after the stainless steel or polyethylene bottle is closed. After filling with solution, the minimum remaining free volume within the stainless steel or polyethylene bottle must be at least 0.44 liters.

8. The polyethylene bottles may be packaged within the metal inner container described by Chester-Jensen Company, Inc., Drawing Nos. 1092M-1, 1093M-1, 1095M-1 and 1096M-1, Issue 1, dated April 26, 1971.

9. The packaging for the polyethylene bottles shall include a flexible restraining device (such as recommended in ARH-1819 "Vibration Testing of L-3 and L-10 Shipping Containers") placed between the cap assembly of the polyethylene bottle and the closure flange of the pressure vessel to assure that the polyethylene bottle will vibrate at the same frequency as the pressure vessel during transport.

10. Dry compounds and mixtures which shall be packaged within sealed metal cans or DOT Specification 2R containers and placed within an inner container constructed and leak tested as specified on General Electric Illustration AFL 1105. Following the gas leak testing specified on the Illustration, all inner container welds shall be tested using a liquid penetrant method in accordance with Article 6, Section V, ASME Code. Alternatively, the inner container shown in the Illustration may be constructed of 300 series stainless steel pipe with an outside diameter of 4.500 ± 0.031 inches with a wall thickness ranging between 0.095 and 0.140 inch.

11. Appropriate steps shall be taken to assure that from the time of sealing to the time of delivery to the consignee, the pressure in the containment vessel will not exceed 40 psig.

12. Prior to each shipment of more than a Type A quantity of radioactive material, the space between the double O-ring shall be tested at 100 psig and leak detection performed by a method capable of detecting a leak greater than 10^{-3} atm cc/sec at standard temperature and pressure. No package with a detectable leak shall be delivered to a carrier for transport.

13. In addition to the requirements of Subpart G of 10 CFR 71, a test shall be performed on each containment vessel and associated 1/4-inch stainless steel valve (without its associated pipe cap) initially and once each year at 300 psig and the leak detection performed by a method capable of detecting a leak greater than 10^{-6} atm cc/sec at standard temperature and pressure. Any chamber that fails to pass the test shall be withdrawn from service and repaired to meet the test. For shipment of contents of not more than a Type A quantity of radioactive material, this test shall not be required.

14. The fire resistant phenolic foam shall be in accordance with AEC Materials and Equipment Specification SP-9 or as modified by ORGDP Reports K/TL-729 and K/P-6567S.

15. Prior to release of the package for shipment, a radiation survey should be performed, including a determination of surface contamination, to assure compliance with 10 CFR §§71.47 and 71.87.

16. In addition to the conditions in this certificate, each packaging must meet the Acceptance Test Section 8.0 of the current Safety Analysis Report of January 27, 1984, as revised April 26 and May 16, 1984.

17. In addition to the conditions in this certificate, the packaging shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the current Safety Analysis Report of January 27, 1984, as revised April 26 and May 16, 1984.

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

19. Expiration date: September 30, 2004.

REFERENCES

General Electric Company application dated January 27, 1984.

Supplements dated: April 26 and May 16, 1984; and February 8 and June 7, 1994.

Westinghouse Electric Corporation supplement dated: May 15, 1984.

Nuclear Fuel Services, Inc. supplements dated: July 3 and October 23, 1996, November 6, 1997, and May 28, 1999.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

M. Wayne Hodges
for

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 20, 1999

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive, Suite 200
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Assurance Corporation application, dated February 27, 1996.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: NLI-1/2

(2) Description

A depleted uranium, water, and lead shielded shipping cask, encased in stainless steel, and equipped with balsa impact limiters. The cylindrical cask body is 195-1/4 inches long by 47-1/8 inches OD. The principal shielding consists of 2-3/4 inches of depleted uranium, 2-1/8 inches of lead, and 5 inches of (borated) water-ethylene glycol mixture.

A 7/8-inch thick stainless steel outer shell is welded to a solid stainless steel forging at each end of the cask. The outer shell of the cask is surrounded by a 1/4-inch thick steel water jacket that is also attached to the end forgings. A water expansion tank is welded to the water jacket shell. The inner cask cavity is formed by a 1/2-inch thick, stainless steel cylindrical shell; welded at its top end to the upper cask forging and its bottom end to a circular plate.

There are four separate configurations of the cask.

Configuration (A): The containment vessel is a right circular stainless steel shell, 12-5/8 inches ID by 178 inches inside length by 1/4-inch thick, located within the inner cask cavity. The containment vessel is closed and sealed by a 5-inch thick, composite steel and uranium closure head, twelve, 1-inch diameter bolts, and silver plated, metallic O-ring. Eight of the twelve closure bolts are used to secure the containment vessel to the upper cask forging. Closure of the cask cavity is by a 1-1/2-inch thick steel closure head, eight, 1-inch diameter bolts, and elastomer O-ring. The radioactive contents are positioned and supported within the containment vessel (inner container) by an aluminum basket and internal support structure.

5.(a) Packaging (continued)

(2) Description (continued)

Configuration (B): The containment vessel is the 1/2-inch thick inner cavity shell. The 1/4-inch thick inner container is not used. The cask cavity is closed by two closure heads. The inner head is a 6-inch thick, composite steel and uranium plate secured to the upper cask forging by twelve, 1-inch diameter bolts and sealed with a silver plated, metallic O-ring. The outer head is 1-1/2-inch thick steel plate secured to the top of the upper cask forging by eight, 1-inch diameter bolts and sealed with an elastomer O-ring. The radioactive contents are positioned and supported within the containment vessel (inner cask cavity) by a modified aluminum basket and internal support structure.

Configuration (C): Same as Configuration (B), above, except the radioactive contents are positioned and supported within the containment vessel (inner cask cavity) in a stainless steel structure containing Boral sheets positioned so as to provide necessary neutron absorption.

Configuration (D): Same as Configuration (B) above, except that the radioactive contents are positioned and supported within the containment vessel (inner cask cavity) in a 3-element stainless steel structure as shown in NAC Drawing No. 347-291-F12, sheet 1, Rev. 2, and the cask must be enclosed in a closed shipping container.

The package, including impact limiters, has an overall length of 237 inches and an outside diameter of 75 inches. The maximum weight of the contents is 3,000 pounds. The weight of the package is approximately 49,250 pounds.

(3) Drawings

The Model No. NLI-1/2 shipping cask is constructed in accordance with the following National Lead Company Drawing Nos.:

General

70514F, Sheet 1, Rev. 8, Cask and Trailer General Arrangement
70514F, Sheet 2, Rev. 8, Cask and Trailer General Arrangement
70885F, Sheet 1, Rev. 3, Spent Fuel Cask Details
70885F, Sheet 2, Rev. 2, Spent Fuel Cask Details
70885F, Sheet 3, Rev. 2, Spent Fuel Cask Details
70885F, Sheet 4, Rev. 1, Spent Fuel Cask Details
70887F, Sheet 1, Rev. 1, Outer Closure Head
70888F, Sheet 1, Rev. 3, Spent Fuel Cask General Assembly

Configuration (A)

70516F, Sheet 1, Rev. 8, Spent Fuel Cask General Assembly
70562F, Sheet 1, Rev. 11, Inner Container
70562F, Sheet 2, Rev. 7, Inner Container
70562F, Sheet 3, Rev. 0, Inner Container*
70562F, Sheet 4, Rev. 0, Inner Container*

5.(a) Packaging (continued)

(3) Drawings (continued)

Configuration (B)

70886F, Sheet 1, Rev. 2, Basket Concept
70884F, Sheet 1, Rev. 2, Inner Closure Head

Configuration (C)

460-052-F8, Sheet 1, Rev. 4, Rockwell Fuel Basket-NLI-1/2 Cask*
460-052-F9, Sheet 1, Rev. 3, Container - Fermi Fuel, Rockwell Basket, NLI-1/2 Cask, Assembly of*

Configuration (D)

347-291-F12, sheet 1, Rev. 2, Liner - 3 Element, NLI-1/2 Cask, Fuel Movement Project*

*Nuclear Assurance Corporation drawings.

(b) Contents

(1) Type and form of material

(i) Irradiated PWR or BWR uranium oxide fuel assemblies of the following specifications:

	PWR	BWR	Consolidated Fuel Rods
Fuel form	Clad UO_2 pellet	Clad UO_2 pellet	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS	Zr or SS
Maximum initial fuel pin pressure at 100°F, psig	550	200	550
Maximum initial U content/assembly, kg	475	197	950
Maximum average initial U-235 enrichment, w/o	3.70	2.65	3.70
Maximum bundle cross section, inches	8.75	5.75	8.75
Fuel pin array size	14x14/15x15 16x16/17x17	7x7 8x8	Pins from 7x7, 8x8, 14x14, 15x15, 16x16, 17x17 in triangular pitch

5.(b)(1)(i) (continued)

	PWR	BWR	Consolidated Fuel Rods
Maximum active fuel length, inches	144	145.25	144
Maximum specific power, kW/kgU	40	27	40
Maximum average burnup, MWD/MTU	40,000**	34,000	40,000
Maximum decay heat, kW	10.6	10.6	0.6
Minimum cooling time, days	150*	120	4,380

The PWR type assembly may be shipped either with or without burnable poison rods or control rods.

*Four (4) fuel rods may have a minimum cooling time of 120 days.

**PWR fuel assembly may have a maximum average burnup of 56,000 MWD/MTU provided the minimum cooling time prior to shipment is 450 days and the neutron shield fluid contains 1.0 weight percent boron. (The borated fluid may be left in the shielding tanks during the shipment of other contents.)

(ii) Irradiated metallic fuels of the following specifications:

	Fermi-1	EBR-II Blanket
Fuel form	Uranium-molybdenum alloy pins	Uranium metal cylindrical slugs
Cladding material	Zr	Aluminum containers
Max. initial U content/assembly, kg	18.7/assy. 300/16 assy. cask load	292/container
Max. avg. initial U-235 enrichment, w/o	26.0	0.21 (3.88 kg Pu/canister)
Max. bundle cross section, inches	2.93 sq	4.875 dia
Fuel rods per canister	140	41
Max. active fuel length, inches	30.5/assy 122/cask	157
Max. average burnup, MWD/MTU	2,840	2,400
Max. decay heat, watts	20	300
Min. cooling time, days	5,000	365

5.(b)(1)(continued)

(iii)

	Research Reactor
Fuel form	Uranium metal rods
Cladding material	Aluminum
Maximum initial U content/assembly-kg	54.5
Maximum average initial U-235 enrichment	Natural
Maximum bundle cross-section, inches	1.36
Intact fuel rods per canister, maximum	7
Canisters per cask	3 intact fuel
Max. active fuel length, inches	120.5
Maximum average burnup MWD/MTU	1,600
Maximum decay heat, watts	750
Minimum cooling time, days	365

(iv) Irradiated PWR* or BWR uranium oxide fuel rods of the following specifications:

	PWR Rods	BWR Rods
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial fuel pin pressure at 100°F, psig	550	200
Maximum initial U content, kg	58.2	75
Maximum average initial U-235 enrichment, w/o	4.9	5.0
Maximum bundle cross section, inches	8.75	5.75
Maximum active fuel length, inches	150	150
Maximum specific power, kW/kgU	44	60
Maximum average burnup, MWD/MTU	60,000	75,000

5.(b)(1)(iv) (continued)

	PWR Rods	BWR Rods
Maximum decay heat, kW	1.65	4.0
Minimum cooling time, days	150	150

* For the shipments of irradiated PWR fuel rods, the neutron shield fluid must contain 1.0 weight percent boron (the borated fluid may be left in the shielding tanks during the shipment of other contents).

(v) Solid, non-fissile, irradiated hardware and neutron source components.

(vi) Byproduct and special nuclear material in the form of irradiated uranium and plutonium oxide fuel rods. Prior to irradiation, the maximum average enrichment in U-235 plus plutonium not to exceed 3.70 w/o and the maximum enrichment not to exceed 4.0 w/o.

(vii) Irradiated PWR uranium oxide fuel assemblies including additional irradiated fuel rods inserted and secured in the guide thimbles. The fuel assemblies must conform to the maximum active dimensions as described in Item 5(b)(i) except that maximum initial U content must be 495 kg and the maximum average initial U-235 enrichment shall be 3.35 w/o.

(viii) Irradiated Connecticut Yankee fuel assembly with a maximum average initial U-235 enrichment of 4.0 w/o and each of the 15 x 15 fuel rods clad by stainless steel. 204 rods/assembly; active length of 121.4 inches.

(ix) Irradiated MARK 42 fuel assemblies consisting of three concentric fuel tubes with PuO_2-Al powder metallurgy cores clad with type 6063 aluminum, containing a total of 3.35 kg of plutonium. The plutonium was initially enriched to contain 78.28 w/o Pu-239, 2.27 w/o Pu-241 and 0.15 w/o Pu-238.

(x) Irradiated MARK 22 fuel assemblies consisting of two concentric fuel tubes with uranium-aluminum cores clad with type 8001 aluminum, containing a total of 3.2 kg of uranium-235. The uranium was initially enriched to contain 66 w/o to 80 w/o uranium-235. The irradiated MARK 22 fuel assembly has an active length of 150 inches, a maximum burn-up of 1226 MWD and a minimum cooling time of 150 days.

(2) Maximum quantity of material per package

(i) Items 5(b)(1)(i) or 5(b)(1)(vii) above: one PWR fuel assembly; two BWR fuel assemblies; or one consolidated fuel canister. Fuel assemblies to be contained in their respective fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11, or 70886F, Sheet 1, Rev. 2. The consolidated fuel canister to be contained in Configuration (A) fuel basket as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11.

(ii) Item 5(b)(1)(ii) above: four canisters per cask. The fuel canisters and fuel basket must be in accordance with Configuration (C) above.

5.(b)(2)(continued)

(iii) Item 5(b)(1)(iii) above:

(a) three canisters of unfailed fuel containing up to seven fuel rods per canister. The fuel canisters and fuel basket must be in accordance with Configuration (D) above; or

(b) up to six canisters containing one defective fuel rod per canister. The canisters are 2.75-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D2, Rev. 10, and are placed in the six-rod capacity liner as shown on Nuclear Assurance Corporation Drawing No. 347-029-20, Rev. 1. The maximum decay heat load for a defective fuel rod is limited to 5 watts; or

(c) up to three canisters containing either one defective fuel rod per canister or up to 10 failed fuel filters per canister. The canisters are 4.00-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D1, Rev. 10. The fuel basket is in accordance with Configuration (D) above. The weight of the filters is limited to 125 pounds per canister. The maximum decay heat load for the defective fuel rods and the failed fuel filters is limited to 5 watts per canister. Plutonium content of the filters not to exceed 20 curies plutonium per package.

(iv) Item 5(b)(1)(iv) above, the fuel rods will be shipped in Configuration (A) or (B). PWR fuel rods with burnup in excess of 45,000 MWD/MTU and BWR fuel rods with burnup in excess of 50,000 MWD/MTU will be shipped in Configuration (A) only. The maximum initial uranium content is limited to 58.2 kg per package for PWR rods and 75 kg per package for BWR rods; and

(a) up to 25 PWR fuel rods or up to 25 BWR fuel rods per cask. Up to 2 of the 25 PWR rods may have a maximum burnup of 65,000 MWD/MTU; or

(b) up to 18 PWR fuel rods, with a maximum specific power of 60 kW/kgU and a minimum cooling time of 300 days, per cask.

(v) Item 5(b)(1)(v) above, weight not to exceed 1,600 pounds.

(vi) Item 5(b)(1)(vi) above, the maximum mass of U-235 plus plutonium must not exceed 4.0 kg. Fuel rods must be contained in fuel baskets as shown on National Lead Company Drawing No. 70562F, Sheet 1, Rev. 11, or 70886F, Sheet 1, Rev. 2.

(vii) Item 5(b)(1)(viii) above: One Connecticut Yankee intact irradiated fuel assembly.

(viii) Item 5(b)(1)(ix) above: One irradiated MARK 42 fuel assembly in either intact or sectioned form, using Configuration (C) above. If sectioned, each section must be seal welded in a shipping can as shown on Martin Marietta Energy Systems Drawing Nos. M-12821-CP-105E, Rev. 0, and M-12821-CP-106E, Rev. 1. Four shipping cans will be loaded into a MARK 42 Segment Dry Shipping Canister as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-102, Rev. 1, along with a shipping canister spacer, as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-103, Rev. 1. The shipping canister will be loaded on top of a carrier spacer as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-112, Rev. 0. A maximum of 2 shipping canisters may be loaded into a cask.

5.(b)(2)(viii)(continued)

Intact fuel assemblies will be shipped in a MARK 42 Element Wet Shipping Canister as shown on Martin Marietta Energy Systems Drawing No. M-12821-CP-114, Rev. 0. A maximum of one intact assembly may be loaded into a cask.

(ix) Item 5(b)(1)(x) above: Two MARK 22 fuel assemblies or one MARK 22 fuel assembly with the two cores separated, using Configuration (C) above. Each assembly or core will be shipped in a shipping canister as shown on Sandia National Laboratory Drawing No. R21563, Sheet 1, Iss. B.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Irradiated fuels described in items 5(b)(1)(i), 5(b)(1)(ii), 5(b)(1)(iii), and 5(b)(1)(iv) above may not have a maximum burnup which exceeds 1.25 times the specified maximum average burnup.

7. The cask cavity and containment vessel (inner container) must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity and containment vessel by the methods described in Section XV of the application. Removal of the residual moisture from cask cavity when package is used in Configurations (B), (C), or (D) is not required providing the decay heat load does not exceed 2.0 kW.

8. For the shipment of irradiated fuel assemblies or a canister of consolidated irradiated fuel, the cask cavity canister of consolidated irradiated fuel (if present), and containment vessel must be promptly inerted following removal of the water from the cavity. For contents not vacuum dried, the cask cavity and containment vessel must be purged at least three times with argon, nitrogen, or helium. Each purge volume must be equivalent to or greater than the cask cavity and containment vessel volume. After the final purge, or following vacuum drying, the cavity and containment vessel must be promptly filled with argon, nitrogen, or helium at 1.0 atm pressure.

9. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks must be shipped in Configuration (A).

10. The consolidated fuel canister must be provided with vent and drain lines (openings) to permit free draining of the canister. No valves can be installed on the vent and drain lines.

11. The cask may be shipped in a closed shipping container (Configuration D) provided that the closed shipping container and the transport vehicle (trailer) meet the applicable requirements of the Department of Transportation. Tie-down devices which are a structural part of the cask and the cask support structures must comply with 10 CFR 71.45.

12. When the cask is shipped in a closed shipping container the center of gravity of the combined cask, closed shipping container and trailer must not exceed 75.0 inches.

13. When the cask is shipped in a closed shipping container, the internal heat load must not exceed 750 watts.

14. The neutron shielding tank must be filled with a mixture of water and ethylene glycol (52% by volume). This mixture must not freeze or precipitate in a temperature range from -40°F to 330°F. The neutron shield tank may be empty when the cask is in Configuration D.

15. The structures used to support the package on the transport vehicle must be as described in the application.

16. Any system used for cooling down the package must be provided with a pressure relief device set so that during the cool-down process, the maximum pressure in the containment vessel cannot exceed 310 psig when the package is used in Configuration (A) or 365 psig when the package is used in Configuration (B).

17. As needed, appropriate component spacers must be used in the cask cavity to limit movement of contents during shipment.

18. Shipping cans used for sectioned MARK 42 irradiated fuel assemblies must be seal welded and must be leak tested to 1×10^{-7} std cm^3/sec.

19. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) The package shall be prepared for shipment and operated in accordance with the operating procedures in Section XV of the application, as supplemented.

    (b) The package shall be maintained and tested in accordance with the maintenance program in Section XVI of the application, as supplemented.

    (c) When the package is to be used for the transport of authorized contents having a decay heat load of greater than 4.0 kW, a 220 psig hydrostatic test of the containment cavity, and a 405 psig hydrostatic test of the water jacket and expansion tank shall be performed as part of the maintenance program as specified in Section XVI of the application.

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

21. Expiration date: April 30, 2006.

REFERENCES

Nuclear Assurance Corporation application dated February 27, 1996, as supplemented March 26, 1996; June 9, 1998; March 29, May 20 and August 13, 1999; and February 15, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date March 29, 2001

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9015	20	71-9015	USA/9015/B ( )F	1	OF	5

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Transnuclear, Inc.
Four Skyline Drive
Hawthorne, NY 10532-2120

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Transnuclear, Inc., application dated March 25, 1991, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: TN-8 AND TN-8L

(2) Description

The TN-8 and TN-8L are lead, steel and resin-shielded irradiated fuel shipping casks. The cask approximates a right circular cylinder 1,718 mm in diameter and 5,516 mm long. The cavity consists of three stainless steel square pressure vessels welded to an end plate and a circular stepped top flange, separated by a T-shaped copper plate and surrounded with B4C + Cu plates. Each cavity is 230 x 230 mm and 4,280 mm long. The main shielding consists of 135 mm of lead, 26 mm of steel, and 150 mm of resin. A wet cement layer is located between the lead and the outer shell. Radial copper fins are welded to the outer shell and cover the surface of the cask between each end drum. The Model No. TN-8 has 150 rows of fins and the Model No. TN-8L has 104 rows of fins.

The lid is a welded stainless steel shell containing lead and resin shields. The pressure vessel is closed and sealed by sixteen, 1-1/4-inch diameter bolts and two silicone rubber or Viton O-rings located within recessed grooves on the top flange. Each extremity of the cask is surrounded by circular stainless steel drums reinforced by radial gusset plates and filled with balsa wood. A disk shaped impact limiter, constructed of carbon steel and balsa wood, is fastened to each drum with four, 1-1/4-inch bolts. The vent and drain lines which penetrate the inner cavity are equipped with positive closures. In addition, all access ports are protected by the impact limiters.

The lid of the cask may be replaced with a modified lid which increases the cavity length to 4,362 mm or to 4,394 mm with the lid plate removed. This arrangement is referred to as "Configuration X."

5.(a)(2) (Continued)
Trunnions are used for lifting and tie-down of the package. The package weighs approximately 36,000 kg.

(3) Drawings

The Model No. TN-8 packaging is constructed in accordance with Transnuclear Drawing No. 9317.01, Rev. J. The Model No. TN-8L is constructed in accordance with Transnuclear Drawing No. 9317.138, Rev. A. The materials of construction and welds shall be in accordance with Annexes A, B, and C to Chapter II of the application.

The lid for Configuration X is constructed in accordance with Transnuclear Drawing Nos. 9040-500-1, Rev. 1, 9040-500-2, Rev. 1 and 9040-500-3, Rev. 0.

(b) Contents

(1) Type and form of material

(i) Irradiated PWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO2 Pellets
Cladding material	Zr or SS
Maximum initial U content/assembly, kg	469
Maximum average initial U-235 enrichment with Zr cladding, w/o	3.2
Maximum average initial U-235 enrichment with SS cladding, w/o	4.0
Maximum bundle cross section, in	8.5
Maximum active fuel length, in	146
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	733; and

Group I fuel assemblies

Initial fuel pin pressure at 100°F, psig	250
Maximum average burnup, MWD/MTU	38,500; or

Group II fuel assemblies

Maximum average burnup, MWD/MTU	36,000

For the casks in Configuration X, the minimum cooling time of the fuel assemblies shall be 1,460 days with the lid plate installed and 2,190 days with the lid plate removed.

(ii) Solid non-fissile irradiated hardware. As needed, appropriate component spacers must be used when loading irradiated hardware into the cask cavity to limit movement of the contents during accident conditions of transport.

(iii) Intact BWR and PWR fuel rods. The rods shall be constrained by a basket or grid structure; initial U-235 content shall be less than 15.0 kg per rod bundle; cross sectional area of the rods, tubes, and full length structural material shall not be less than 29.6 square inches; and the bundle cross section shall not be greater than 8.5 inches. Maximum weight per bundle shall not exceed 733 kg. The Group I and Group II burnup limits of paragraph 5.(b)(1)(i) apply.

(2) Maximum quantity of material per package

(i) For the contents described in Item 5.(b)(1)(i), Group I fuel assemblies:

Three PWR assemblies. The maximum decay heat load is not to exceed 35.5 kilowatts per package and 12 kilowatts per assembly for the Model No. TN-8 packaging and 23.7 kilowatts per package and 7.9 kilowatts per assembly for the Model No. TN-8L packaging.

(ii) For the contents described in Item 5.(b)(1)(i), Group II fuel assemblies:

Three PWR assemblies. The maximum decay heat load and the maximum free gas volume are not to exceed the limits listed in the table below:

Decay Heat per Shipment, kw(a)	Maximum Free Gas for 3 Assemblies m^3 (NTP)(b)	Configuration X Maximum Free Gas for 3 Assemblies m^3 (NTP)(b)
1.5	0.558	0.601
3.0	0.543	0.585
9.0	0.483	0.520
15.0	0.441	0.475
21.0	0.408	0.439
27.0	0.384	0.413

Notes:

(a) Decay heat load per assembly must not exceed 7.9 kilowatts for Model No. TN-8L packaging.

(b) NTP conditions are 25°C and one (1) bar.

5.(b)(2) (Continued)

(iii) For the contents described in Item 5.(b)(1)(iii):

Three rod bundles. The maximum decay heat load and maximum free gas volume are not to exceed the limits listed in Paragraph 5.(b)(2)(ii).

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. Group I and Group II fuel assemblies, either Zr or SS clad, and bundles of PWR and/or BWR fuel rods that individually meet all the appropriate specifications of 5.(b)(1)(i), 5.(b)(2)(i), 5.(b)(1)(iii), and 5.(b)(2)(iii) above may be packaged in any combination.

7. PWR assemblies may be shipped either with or without burnable poison rod, thimble plug, or control rod assemblies.

8. As needed, appropriate component spacers may be used in the cask cavity to properly position the fuel assemblies.

9. The maximum weight of the contents (fuel assemblies, component spacers, inserts, irradiated hardware, etc.) must not exceed 2,200 kg.

10. The cask cavity must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity by the methods described in Annex I to Chapter VIII of the application. For contents 5.(b)(1)(i) and 5.(b)(1)(iii), the cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.

11. Known or suspected failed fuel assemblies (rods) and fuel cladding defects greater than pin holes and hairline cracks are not authorized.

12. For contents 5.(b)(1)(ii), the dryness verification test is required but leakage tests for containment assembly verification are not required.

13. The package contents must be so limited that under normal conditions of transport, the total dose rates must not exceed 17 mrem/hr at one meter from the surface of the package.

14. Any system used for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 7 atmospheres during the cool-down process.

15. The systems and components of each packaging must meet the periodic tests and criteria specified in Chapter VIII of the application. The Keff verification and shielding efficiency verification tests in Chapter VIII of the application must be performed on each packaging within the two year period preceding any shipment of contents listed in 5.(b)(1)(i) and 5.(b)(1)(iii). The Keff verification and shielding efficiency verification tests need not be performed on packaging during periods (which may exceed two years) when only irradiated hardware as specified in 5.(b)(1)(ii) is shipped.

16. In addition to the requirements of 10 CFR Part 71:

    (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in the application dated March 25, 1991.

    (b) Each package must be tested, repaired, and maintained in accordance with the Acceptance Tests and Maintenance Procedures in the application dated March 25, 1991.

17. All valves, fittings, seals, and relief devices must be of the type, size, model and manufacture as indicated on the design drawings. The resin material must be of the specifications stated in Annex A to Chapter II of the application.

18. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two years, the thermal performance of the cask must be analyzed to verify that the cask operation has not degraded below that which is licensed*. Following the initial acceptance tests, the heat source may be that provided by the decay heat from the loading of the package, provided that the heat source is equal to at least 25% of the design heat load for the package. Each cask that fails to meet the thermal acceptance criteria given in Annex L of the application must be withdrawn from service until corrective action can be completed or the license amended to limit the package to a lower heat load.

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*The thermal performance test is not required at periodic intervals when the maximum decay heat load per package does not exceed 25% of the design heat load.

19. The Configuration X lid shall be operated and maintained in accordance with Annex N to Chapter VIII, in the application dated March 25, 1991.

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

21. Expiration date: May 31, 2006.

REFERENCES

Transnuclear, Inc., application dated March 25, 1991, and supplements dated April 22, 1991; April 22, 1996; and March 22, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

ate: May 16, 2001

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
Transnuclear, Inc.
Four Skyline Drive
Hawthorne, NY 10532

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Transnuclear, Inc., application dated March 25, 1991, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: TN-9

(2) Description

The TN-9 is a lead, steel and resin shielded irradiated fuel shipping cask. The cask approximates a right circular cylinder 1,718 mm in diameter and 5,756 mm long. The cavity consists of three rectangular, stainless steel pressure vessels welded to end plates and a circular stepped top flange, separated by thin copper plates. The bays are divided into a total of seven square compartments, 150 x 150 mm and 4,520 mm long. The main shielding consists of 128 mm of lead, 26 mm of steel, and 150 mm of resin. A wet cement layer is located between the lead and the outer shell. Radial copper fins are welded to the outer shell and cover the surface of the cask between each end drum.

The lid is a welded stainless steel shell containing lead and resin shields. The pressure vessel are closed and sealed by sixteen, 1-1/4-inch diameter bolts and two silicone rubber or Viton O-rings located within recessed grooves on the top flange. Each extremity of the cask is surrounded by circular stainless steel drums reinforced by radial gusset plates and filled with balsa wood. A disk shaped impact limiter, constructed of carbon steel and balsa wood, is fastened to each drum with four, 1-1/4-inch bolts. The vent and drain lines which penetrate the inner cavity are equipped with positive closures. In addition, all access ports are protected by the impact limiters. Trunnions are used for lifting and tie-down of the package. The weight of the package is approximately 36,000 kg.

(3) Drawings

The package is constructed in accordance with Transnuclear Drawing No. 9317.03, Rev. J. The materials of construction and welds must be in accordance with Annex A, B, and C to Chapter II of the application.

5.(b) Contents

(1) Type and form of material

(i) Irradiated BWR uranium oxide fuel assemblies of the following specifications:

Fuel form	Clad UO2 Pellets
Cladding material	Zr or SS
Initial fuel pin pressure at 100°F, psig	200
Maximum initial U content/ assembly, kg	201
Maximum average initial U-235 enrichment, w/o	2.65
Maximum bundle cross section, in	5.52
Maximum active fuel length, in	144
Average burnup, MWD/MTU	36,500
Minimum cooling time, day	150
Maximum weight/fuel assembly, kg	300

(ii) Solid non-fissile irradiated hardware. As needed, appropriate component spacers must be used when loading irradiated hardware into the cask cavity to limit movement of the contents during accident conditions of transport.

(2) Maximum quantity of material per package

(i) Seven BWR assemblies. The maximum decay heat load per package is not to exceed 24.4 kilowatts and 3.5 kilowatts per assembly. As needed, appropriate component spacers may be used in the cask cavity to properly position the fuel assemblies.

(ii) The maximum weight of the contents (fuel assemblies, component spacers, inserts, irradiated hardware, etc.) must not exceed 2,110 kg.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. The cask cavity must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the cask cavity by the methods described in Annex I to Chapter VIII of the application. For contents 5.(b)(1)(i), the cavity must be promptly backfilled with 1.0 atm of helium, nitrogen, or argon gas.

7. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter VIII of the application.

   (b) Each package must be tested and maintained in accordance with the Acceptance Test and Maintenance Procedures in Chapter VIII of the application.

8. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.

9. For contents 5.(b)(1)(ii), the dryness verification test is required but leakage tests for assembly verification are not required.

10. The package contents must be so limited that under normal conditions of transport, the total dose rates must not exceed 14 mrem/hr at one meter from the surface of the package.

11. Any system used for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 7 atmospheres during the cool-down process.

12. The systems and components of each packaging must meet the periodic tests and criteria specified in Chapter VIII of the application. Each packaging that fails to meet these criteria must be withdrawn from service until corrective action has been completed.

13. All valves, fittings, seals, and relief devices must be of the type, size, model, and manufacture as indicated on the design drawings. The resin material must be of the specifications stated in Annex A to Chapter II of the application.

14. In accordance with Annex L to Chapter VIII, at periodic intervals not to exceed two years, the thermal performance of the cask must be analyzed to verify that the cask operation has not degraded below that which is licensed*. Following the initial acceptance tests, the heat source may be that provided by the decay heat from the loading of the package, provided that the heat source is equal to at least 25% of the design heat load for the package. Each cask that fails to meet the thermal acceptance criteria given in Annex L of the application must be withdrawn from service until corrective action can be completed or the license amended to limit the package to lower heat load.

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* The thermal performance test is not required at periodic intervals when the maximum decay heat load per package does not exceed 25% of the design heat load.

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

16. Expiration date: May 31, 2006.

REFERENCES

Transnuclear, Inc., application dated March 25, 1991, and supplements dated April 22, 1991; April 22, 1996; and March 22, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: May 16, 2001

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9023	8	USA/9023/B( )F	1	4

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

NAC International, Inc.
655 Engineering Drive
Norcross, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Nuclear Assurance Corporation, application dated November 18, 1991, as supplemented.

c. DOCKET NUMBER 71-9023

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: NLI-10/24

(2) Description

A lead, water, depleted uranium and high temperature polymer shielded shipping cask, encased in stainless steel, equipped with balsa impact limiters, and mounted to a railcar which is considered to be an integral part of the packaging for normal conditions of transport. The cask body is 204.5 inches long by 96 inches in OD. The principal shielding consists of 6 inches of lead and 9 inches of water. Depleted uranium plates are encased in the bottom end forging and cask inner closure head. High temperature polymer sheet is encased in the bottom end and positioned between the inner and outer closure heads at the top end.

The lead shield is bonded between 0.75-inch stainless steel inner shell and a 2-inch stainless steel outer shell. The outer shell is surrounded by a 0.75-inch stainless steel water jacket shell. The three shells are welded to stainless steel forgings at both ends. Four water expansion tanks are mounted to the railcar and are connected to the water jacket by a flexible metal hose.

The primary containment vessel is comprised of the 0.75-inch inner shell and the inner closure head. It is 179.5 inches long and has a 45-inch inside diameter. The inner closure head is held in place by sixteen bolts and is sealed with a metallic O-ring. Secondary containment is provided by the outer closure head which is bolted and has a Viton or silicone O-ring seal. There is no direct penetration between the containment cavity and the ambient. The two penetrations into the containment cavity are from the space between the inner and outer closure heads, which has a single penetration through the cask body connecting it with the ambient. The two lid penetrations are sealed with 1.5-inch quick-disconnect valves and metal O-ring seals each in a valve box arrangement.

The radioactive contents are positioned within the containment cavity using neutron poisoned aluminum baskets and internal support structures. The PWR and BWR fuel basket cavities are lined with neutron absorber sleeves composed of a silver-indium-cadmium (80-15-5 w/o) alloy.

5.(a) (2) Description (continued)

An auxiliary cooling system, mounted to the railcar, is used to maintain the cask and fuel temperatures so as to facilitate handling and cooldown.

The fully loaded cask, excluding the railcar, is approximately 194,000 pounds, which includes a maximum gross weight of the cavity contents of 34,100 pounds (fuel, spacers, fuel basket, etc.).

(3) Drawings

The Model No. NLI-10/24 shipping cask is constructed in accordance with the NL Industries, Inc., and National Lead Company Drawing Nos. as specified on page XVIII-1, Rev. 9, and page XVIII-2, Rev. 8, in Section XVIII of the application.

5.(b) Contents

(1) Type and form of material

Irradiated PWR and BWR uranium oxide fuel assemblies of the following specifications:

	PWR	BWR
Fuel form	Clad UO_2 pellets	Clad UO_2 pellets
Cladding material	Zr or SS	Zr or SS
Maximum initial U content/assembly, kg	475	200
Maximum average initial U-235 enrichment, w/o	3.5	2.8
Maximum initial U-235 content/assembly, kg	16.6	5.6
Maximum bundle cross section, inches	9.00	5.75
Fuel pin array size, number of pins	14x14/15x15 16x16/17x17	7x7/8x8
Maximum active fuel length, inches	144	144
Maximum specific power, kw/kgU	40	27
Maximum average burnup, MWD/MTU	35,500	29,700
Minimum cooling time, days	150	150

The PWR type assemblies may be shipped either with or without control rods.

5.(b)(2) Maximum quantity of material per package

The maximum decay heat load per package not to exceed 70 kilowatts, and:

Ten PWR fuel assemblies or twenty-four BWR fuel assemblies.

Above assemblies must be contained in their respective fuel baskets as shown on NL Industries, Inc., and National Lead Company Drawing Nos.:

70652F, Sheet 1, Rev. 7 PWR Fuel Basket,
Sheet 2, Rev. 5 10/24 Rail Cask
70653F, Sheet 1, Rev. 7 BWR Fuel Basket,
Sheet 2, Rev. 5 10/24 Rail Cask

5.(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 100

6. The maximum gross weight of the cavity contents must not exceed 34,100 pounds (fuel, spacers, basket, etc.).

7. The containment vessel must be dry (no free water) when delivered to a carrier for transport. Residual moisture must be promptly removed from the containment vessel by the methods described in Section XVI of the application. The containment vessel must be promptly filled with helium to 1.0 atm pressure.

8. Known or suspected failed fuel assemblies (rods) and fuel with cladding defects greater than pin holes and hairline cracks are not authorized.

9. The cask contents must be so limited under normal conditions of transport that the following measured dose rates be satisfied:

   a) at one meter from the external radial midplane surface of the package: 625 times the neutron dose rate plus 2.5 times the gamma dose rate will not exceed 1,000 millirems per hour; and

   b) at one meter from the external surface of the bottom of the package: 115 times the neutron dose rate plus 2.0 times the gamma dose rate will not exceed 1,000 millirems per hour.

10. The neutron shielding system and auxiliary cooling system must be filled with a mixture of water and ethylene glycol (53% to 58% by weight ethylene glycol).

11. The neutron shielding system must be equipped with two pressure relief valves (one on the cask and one on an expansion tank) set at 220 psig.

12. Any system used for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the containment vessel cannot exceed 233 psig during the cooldown process.

13. The systems and components of each packaging must meet the criteria for the periodic tests specified in Section XVII of the application.

14. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (i) Each packaging must meet the acceptance tests and be maintained in accordance with Section XVII of the application, and

    (ii) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Section XVI of the application.

15. Prior to first use, each packaging shall meet the criteria for the acceptance tests specified in Sections XIV and XV of the application, except that the prototype railcar test, meeting the stated design criteria, need be performed only once.

16. Packaging is authorized for rail mode of transport only.

17. Expiration date: July 31, 2003.

REFERENCES

Nuclear Assurance Corporation application dated November 18, 1991.

Supplements dated: February 7, 1992; and February 28 and November 25, 1997.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Cass R. Chappell

Cass R. Chappell, Chief
Package Certification Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date July 9, 1998

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

AEA Technology/QSA, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

AEA Technology/QSA Inc. application dated February 23, 1999, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 741-OP

(2) Description

The Model No. 741-OP consists of gamma ray projector within a protective carbon steel container. The protective container is of welded steel construction and is approximately 32 inches long, 19 inches wide, and 18.5 inches high. Polyurethane foam and wood inserts locate the Model No. 741 series projectors in the center of the container and provide impact protection.

The 741 series projectors include the Model Nos. 741, 741E, 741A, 741AE, 741B and 741BE. The primary components of the projector consist of an outer steel shell, internal bracing, polyurethane foam, depleted uranium shield, and an "S" tube. The radioactive contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. A 1/4-thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. Tamper-proof seals are provided on the outer steel container. The dimensions of the projector are approximately 19 1/8 inches long, 13 7/8 inches wide, and 11 3/8 inches in height. The maximum weight of the package is 515 pounds, and the maximum weight of the projector is 360 pounds.

(3) Drawings

The package is constructed in accordance with AEA Technology/QSA, Inc. Drawing Nos. R74190, Rev. E, Sheets 1-5; R741NP, Rev. B; R85790, Rev. A, Sheets 1-2; R85791, Rev. A, Sheets 1-2; R67691, Rev. A; R67692, Rev. A; R97010, Rev. E, Sheets 1-3; R97011, Rev. C; and R97012, Rev. D, Sheets 1-2.

5. (b) Contents
   (1) Type and form of material

   Cobalt-60 or iridium-192 as sealed sources which meet the requirements of special form radioactive material.

   (2) Maximum quantity of material per package.

   33 curies of cobalt-60; or
   240 curies of iridium-192 (output).

   Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap and safety plug assembly. The source assembly lock, lock cap and safety plug assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one half hour and maintaining their positioning function. The locking ball of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures in Section 7 of the application; and

   (b) The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the application.

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

10. Expiration date: February 28, 2006.

REFERENCES

AEA Technology/QSA, Inc. application dated February 23, 1999.

Supplements dated: April 20, June 7, and September 16 and 21, 1999; June 9, 2000; January 15 and July 18, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for
E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 13, 2001

NRC FORM 618
(6-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9030	9	USA/9030/B( )	1	2

PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Department of the Navy
Naval Sea Systems Command
Detachment
Radiological Affairs Support Office
PO Drawer 0260
NWS Yorktown, VA 23691-0260

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Teledyne Energy Systems application dated November 12, 1990, as supplemented

c. DOCKET NUMBER 71-9030

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

(1) Model Nos.: MW-3000 and Sentinel-8

(2) Description

The packages are thermoelectric generators. The major components include: the main housing, tungsten shield, housing flange, and electrical connectors. The approximate dimensions and weights for the Model Nos. are as follows:

Model No.	Dimension (inch)	Weight (lb)
MW-3000	24 OD x 23	2,700
Sentinel-8	24 OD x 25	3,200

(3) Drawings

The packagings are constructed in accordance with the following Drawing Nos.:

Model No.	Drawing Nos.
MW-3000	Martin Co. Drawing No. 471A1000000
Sentinel-8	Isotopes, Inc. Drawing No. J-30856-003-10000

(b) Contents

(1) Type and form of material

Strontium 90 titanate doubly encapsulated in Hastelloy fuel capsule which meet the requirements of special form radioactive material.

PRINTED ON RECYCLED PAPER

(2) The maximum quantity of material per package

Model No.	Quantity
MW-3000	25,000 Curies
Sentinel-8	40,000 Curies

6. Eye-bolts shall be removed or covered during transportation to prevent their use as tie-down devices of packages.

7. The MW-3000 and Sentinel-8 shall have their top steel cover plate bolted to the outer wrought steel shield at all times except when maintenance operations are being performed on the generator which require removal of the top steel cover plate.

8. Fabrication of additional units is not authorized.

9. In addition to the requirements of Subpart G of 10 CFR Part 71:

   (a) The package shall be prepared for shipment and operated in accordance with the operating procedures in the supplement dated February 1, 1991.

   (b) The package shall be maintained in accordance with the maintenance program in the supplement dated February 1, 1991.

10. The packages authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR §71.12.

11. Expiration date: October 31, 2005.

REFERENCES

Teledyne Energy Systems application dated November 12, 1990.

Teledyne supplement dated: February 1, 1991.

Department of the Navy supplement dated: February 7, 1994, and September 20, 1995, April 16, 1998, and April 27, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: July 28, 2000

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9034	12	71-9034	USA/9034/AF	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
San Diego, CA 92186-9784

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Atomics application dated October 4, 1995, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: TRIGA-I

(2) Description

TRIGA fuel element shipping container. The outer packaging is a steel drum, approximately 22.5 inches in diameter by 39-1/4 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 31 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/ft^3. Maximum gross weight including contents is approximately 235 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomic Company Drawing No. TOS396C160, Rev. G.

5. (b) Contents

(1) Type and form of material

TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconium-hydride with nominal fuel composition (excluding erbium content) as described in Table A.1-1 of the October 4, 1995 application, and clad with stainless steel, aluminum or incoloy. Uranium enriched to a maximum 93.5 w/o in the U-235 isotope. The H to Zr atomic ratio within the fuel meat must not exceed 1.65.

(2) Maximum quantity of material per package

U-235 content not to exceed 1.39 kg, contained in a maximum of 7 1.5-inch diameter fuel elements, or a maximum of 25 0.5-inch diameter fuel elements, with nominal fuel composition (excluding erbium content) as described in Table A.1-2 (Rev. 1) of the October 4, 1995, application. For enrichments greater than 5 weight percent U-235, uranium content not to exceed an A_2 quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 8 of the application.

(b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 9 of the application.

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

8. Expiration date: December 31, 2005.

REFERENCES

General Atomic Company application dated October 4, 1995.

Supplements dated: December 5, 1995, and October 16, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 3, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9035	18	71-9035	USA/9035/B(U)-85	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*
AEA Technology/QSA, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
AEA Technology/QSA, Inc. application dated February 15, 1999, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 680-OP

(2) Description

The Model No. 680-OP consists of a gamma ray projector within a protective carbon steel container. The protective container is of welded steel construction and is approximately 32 inches long, 19 inches wide, and 18 1/2 inches high. Polyurethane foam and wood inserts locate the Model 680 series projectors in the center of the container and provide impact protection.

The 680 series projectors include the Model Nos. 680, 680E, 680A, 680AE, 680B and 680BE. The primary components of the projector consist of an outer steel shell, internal bracing, polyurethane foam, depleted uranium shield, and an "S" tube. The radioactive contents are securely positioned in the "S" tube by a source cable locking device and shipping plug. A 1/4-inch thick steel shipping plate is bolted over the source locking mechanism for additional protection during transport. Tamper-proof seals are provided on the outer steel container. The dimensions of the projector are approximately 21 inches long, 14 5/8 inches wide, and 11 13/16 inches high. The maximum weight of the package is 615 pounds and the maximum weight of the projector is 465 pounds.

(3) Drawings

The package is constructed in accordance with AEA Technology/QSA, Inc. Drawing Nos. R68090, Rev. E, Sheets 1-5, R680NP, Rev. B, R85791 Rev. A, Sheets 1-2, R67691, Rev. A, R67692, Rev. A, R97011, Rev. C, R97010, Rev. E, Sheets 1-3, and R97013, Rev. F, Sheets 1-2.

(b) Contents

(1) Type and form of material:

Cobalt 60 as sealed sources which meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package:

110 curies (output)

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. The source shall be secured in the shielded position of the packaging by the source assembly lock, lock cap and safety plug assembly. The source assembly lock, lock cap and safety plug assembly must be fabricated of materials capable of resisting a 1475°F fire environment for one half hour and maintaining their positioning function. The locking ball of the source assembly must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

7. The nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package must meet the Acceptance Tests and Maintenance Program of Section 8 of the application; and

(b) Each package shall be operated and prepared for shipment in accordance with Section 7 of the application.

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

10. Expiration date: May 31, 2005.

REFERENCES

AEA Technology QSA, Inc. application dated February 15, 1999.

Supplements dated: April 20, June 7, and September 16 and 21, 1999; January 18 and June 9, 2000; and July 18, 2001.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: September 13, 2001

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9036	10	71-9036	USA/9036/B(U)-85	1	OF	2

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Source Production & Equipment Co.
113 Teal Street
St. Rose, LA 70087-9691

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Source Production & Equipment Company application dated February 28, 2001

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: C-1

(2) Description

The packaging consists of an outer overpack and a depleted uranium shielded radiographic source changer. The source changer configuration is that of a rectangular box approximately 9" high x 7.5" wide x 7.5" deep. All fittings and source locking components are protected and enclosed with a 1/8" carbon steel outer shell. The inner receptacle consists of a uranium shield equipped with two closed bottom Zircalloy or titanium "J" tubes, each of which may house one "pigtail type" special form source. The overpack is a 12-gallon, 20- or 22-gage steel drum partially filled with foam. The weight of the source changer is 51 to 70 lbs. The weight of the overpack is 19 to 22 lbs. Up to 8 lbs. of ancillary equipment may be included within the overpack. The maximum gross weight of the package is 100 lbs.

(3) Drawings

The package is constructed in accordance with Source Production & Equipment Company Inc. Drawing Nos. B322000, Rev. (1); B311000, Rev, (2); B311001, Rev (1); and B311002, Rev. (0).

(b) Contents

(1) Type and form of material

Iridium-192 as sealed sources that meet the requirements of special form radioactive material.

(b) Contents cont'd

(2) Maximum quantity of material per package

Two sealed sources with a combined activity not to exceed 240 curies.

6. Tungsten shield pads, with dimensions up to approximately 2-inches diameter and 1/2-inch thick, may be welded to the inside surface of the source changer housing.

7. The nameplate shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining its legibility.

8. In addition to the requirements of Subpart G of 10 CFR Part 71:

   a. The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the consolidated application dated February 28, 2001.

   b. The package must meet the Acceptance Tests and Maintenance Program of Section 8.0 of the consolidated application dated Februrary 28, 2001.

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

10. Expiration date: October 31, 2006.

REFERENCES

Source Production & Equipment Company applications dated September 27, 2000, and February 28, 2001.

Supplements dated: April 11 and May 11, 2001

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles L. Miller for
E. William Brach Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: June 20, 2001

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9037	12	71-9037	USA/9037/AF	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

General Atomics
P.O. Box 85608
San Diego, CA 92186-9784

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

General Atomics application dated October 4, 1995, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: TRIGA-II

(2) Description

TRIGA fuel element shipping container. The outer packaging is a steel drum, approximately 22.5 inches in diameter by 57.5 inches high. The inner vessel is a 5-inch Schedule 40 carbon steel pipe. Dimensions of the inner vessel are approximately 50 inches in height with a 1/4-inch thick wall and a 5-inch inside diameter. The top of the inner vessel is a threaded pipe cap and the bottom is a welded 1/4-inch thick flat disc. The inner vessel is centered and supported within the outer packaging by eight, 3/8-inch diameter braced, support spacer rods. The void between the inner vessel and the outer packaging is filled with vermiculite tamped to a minimum density of 4.5 lbs/ft^3. Maximum gross weight including contents is approximately 330 pounds.

(3) Drawing

The packaging is constructed in accordance with General Atomic Company Drawing No. TOS396C161, Rev. F.

5. (b) Contents

(1) Type and form of material

Special function TRIGA fuel elements containing uranium-zirconium-hydride or erbium-uranium-zirconium-hydride whose fuel portion has nominal compositions (except erbium content) as described in Table A.1-1 of the October 4, 1995, application, and clad with stainless steel, aluminum or incoloy. Uranium enriched to a maximum 93.5 w/o in the U-235 isotope. The H to Zr atomic ratio within the fuel meat must not exceed 1.65.

(2) Maximum quantity of material per package

U-235 content not to exceed 1.39 kg, contained in a maximum of 7 1.5-inch diameter fuel elements, or a maximum of 25 0.5-inch diameter fuel elements, whose fuel portion has nominal compositions (except erbium content) as described in Table A.1-2 (Rev. 1) of the October 4, 1995, application. For enrichments greater than 5 weight percent U-235, uranium content not to exceed an A_2 quantity.

(c) Transport Index for Criticality Control

Minimum transport index to be shown on label for nuclear criticality control: 0.4

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 8 of the application.

(b) The packaging must meet the Acceptance Tests and Maintenance Program of Chapter 9 of the application.

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

8. Expiration date: December 31, 2005.

REFERENCES

General Atomic Company application dated October 4, 1995.

Supplements dated: December 5, 1995, and October 16, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: November 3, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9039	10	71-9039	USA/9039/B(U)	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

AEA Technology QSA, Inc.
40 North Avenue
Burlington, MA 01803

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Amersham Corporation application dated May 11, 1995, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: 715

(2) Description

A protective overpack for radiographic devices. The overpack consists of an MS-27683-2, 18-gauge steel drum; 14-gauge clamp closure ring fastened by a bolt; 1.5 inches of Mil-I-2781 or Mil-2819 high temperature insulation; and a molded rubberized hair filler material. Overall dimensions of the overpack are approximately 15.5-inch diameter by 24-inch high. Maximum weight including contents is 105 pounds.

(3) Drawings

The radiographic devices, as secondary packaging authorized for use in the overpack are constructed in accordance with the following Sentinel, Amersham Corporation Drawing Nos.:

Model No.	Drawing Nos.
Overpack	R715, Rev. B
533	R53390, Rev. A
616	R61690, Rev. A
644	R64490, Rev. A
713	R71390, Rev. A

5. (b) Contents

(1) Type and form of material

Iridium 192 as sealed sources that meet the requirements of special form radioactive material.

(2) Maximum quantity of material per package

(i) 120 curies (output) contained in the Model No. 533, Model No. 644 or Model No. 713 radiographic device.

(ii) 240 (output) curies contained in the Model No. 616 radiographic device.

Output curies are determined in accordance with American National Standard N432-1980, "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography."

6. Source assemblies for use in this packaging are limited to those assemblies as identified in Technical Operations, Inc. Drawing No. C42400, Rev. F, Sheet 2, and Sheet 3 of 3, and Drawing Nos. 42401, Rev. 0, 42409, Rev. B.

7. Separate molded fillers shall be used for each model type radiographic device to ensure a snug fit within the overpack.

8. Nameplates shall be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

9. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with Section 7 of the application, as supplemented.

(b) Each package must be tested and maintained in accordance with the acceptance tests and maintenance program in section 8 of the application, as supplemented.

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

11. Expiration date: February 28, 2003. This certificate will not be renewed.

REFERENCES

Amersham Corporation application dated May 11, 1995.

Supplements dated: November 29, 1995; and November 28, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: February 23, 2001

NRC FORM 618
(3-96)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIALS PACKAGES

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. PACKAGE IDENTIFICATION NUMBER	d. PAGE NUMBER	e. TOTAL NUMBER PAGES
9056	11	USA/9056/B(U)	1	2

2. PREAMBLE

a. This certificate is issued to certify that the packaging and contents described in Item 5 below, meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

Source Production and
Equipment Company, Inc.
113 Teal Street
St. Rose, LA 70087

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION:

Source Production and Equipment Company Inc., application dated March 24, 2000, as supplemented.

c. DOCKET NUMBER 71-9056

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5. (a) Packaging

(1) Model No.: SPEC 2-T

(2) Description

A steel encased, uranium shielded Gamma Ray Projector. Primary components consist of an outer steel shell, internal bracing, depleted uranium shield, and a Zircalloy "S" tube. The contents are securely positioned in the Zircalloy "S" tube by a source cable locking device and shipping plug. The unit resembles a rectangular box approximately 13-3/8" long by 4-11/16" high by 4-3/8" wide with a maximum gross weight of 56 pounds.

(3) Drawings

The packaging is constructed in accordance with Source Production and Equipment Company, Inc. Drawing Nos. 12688-1, Rev. (2); 788-1, Rev. (4); and 788-2, Rev. (0).

The packaging may also be as shown in Source Production and Equipment Company Drawing No. 1000, Rev. (0), provided fabrication was completed prior to June 8, 1989.

The overpack is a 12 gallon open head 20 or 22 gauge National Motor Freight Classification 100-H, or succeeding issues, Item 260 steel drum constructed in accordance with Source Production and Equipment Company, Inc. Drawing No. 53189-2, Rev. (2).

(b) Contents

(1) Type and form of material

Iridium 192 as sealed sources which meet the requirements of special form radioactive material..

(2) Maximum quantity of material per package

225 curies

6. The source must be secured in the shielded position of the packaging by the shipping plug, source assembly, and locking device. The shipping plug and source assembly used must be fabricated of materials capable of resisting a 1475°F fire environment for one-half hour and maintaining their positioning function. The source assembly ball stop must engage the locking device. The flexible cable of the source assembly and shipping plug must be of sufficient length and diameter to provide positive positioning of the source in the shielded position.

. The nameplates must be fabricated of materials capable of resisting the fire test of 10 CFR Part 71 and maintaining their legibility.

8. For transportation of more than 45 curies per package in private carriage the shipment must be in accordance with 49 CFR 173.441(b).

9. For transportation of more than 45 curies per package by a common carrier, the package must be within a protective overpack as described and constructed in accordance with 5(a)(3).

10. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) The package shall be prepared for shipment and operated in accordance with the Operating Procedures of Section 7.0 of the application, as supplemented; and

    (b) The package must meet the Acceptance Test and Maintenance Program of Section 8.0 of the application, as supplemented.

11. The packaging authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR §71.12.

12. Expiration date: April 30, 2005.

REFERENCES

Source Production and Equipment Company, Inc. application dated March 24, 2000.

Supplement dated: March 30, 2000.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach, Director
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Date: April 10, 2000

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9067	7	71-9067	USA/9067/B( )F	1	OF	3

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. 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

a. ISSUED TO *(Name and Address)*

U.S. Department of Energy
Washington, DC 20585

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

U.S. Department of Energy application dated November 7, 1991, as supplemented

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: BCL-3

(2) Description

Steel encased, lead shielded shipping package. The packaging is provided with a recessed, plug-type lid and a gasketed, bolted closure; lifting and tie-down devices; and a drain line penetration. Containment for the contents is provided by an inner can assembly or by material in special form. The packaging dimensions, weight, and shielding are as follows:

Exterior height, in.	26.4
Exterior diameter, in.	19.0
Cavity height, in.	10.5
Cavity diameter, in.	4.5
Lead shielding, in.	6.0
Loaded weight, lb.	2,800 (Incl 110-1b. skid)

(3) Drawings

The packaging is constructed in accordance with Battelle Memorial Institute Drawing No. BCL3-01, Sheets 1 & 2, Rev. C.

The inner can assembly is constructed in accordance with Battelle Memorial Institute Drawing No. BCL3-38, Rev. B.

5. (b) Contents

(1) Type and form of material.

Byproduct material, source material, and special nuclear material in solid metal or oxide form, which is packaged within the inner can assembly specified in Item 5(a)(3), or which meets the requirements of special form radioactive material.

(2) Maximum quantity of material per package

Not to exceed 300 watts decay heat, and

(i) Fissile material not to exceed 100 grams U-235 equivalent mass.

(ii) Fissile material not to exceed 2,000 grams U-235 equivalent mass.

(c) Transport Index for Criticality Control (Criticality Safety Index)

Minimum transport index to be shown on label for nuclear criticality control:

For contents described in 5(b)(1) and limited in 5(b)(2)(i): 0.4

For contents described in 5(b)(1) and limited in 5(b)(2)(ii): 100

6. The U-235 equivalent mass must be determined by the following method:

U-235 equivalent mass equals U-235 mass plus 1.75 times U-233 mass plus 1.60 times Pu mass.

7. Plutonium in excess of 20 curies per package must be in the form of metal, metal alloy, or reactor fuel elements.

8. At the time of delivery of the loaded package to a carrier for transport, the package contents must be (1) dry (contents of inner can assembly must not decompose up to a temperature of 750°F) and the fissile material unmoderated (H to X atomic ratio less than 2) and (2) so limited that the dose rate will not exceed 10 millirem per hour at three (3) feet from the external surface of the package.

9. The maximum gross weight of the cavity contents must not exceed 40 pounds (inner can assembly, radioactive material, etc.).

10. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) Each package shall be maintained in accordance with Section 8.0 of the application, as supplemented.

    (b) Each package shall be operated and prepared for shipment in accordance with Section 7.0 of the application, as supplemented.

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

12. Expiration date: September 30, 2007.

REFERENCES

U.S. Department of Energy application dated November 7, 1991.

Supplement dated: April 10, 1992; January 27 and August 18, 1997; and July 29, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

E. William Brach
Spent Fuel Project Office
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